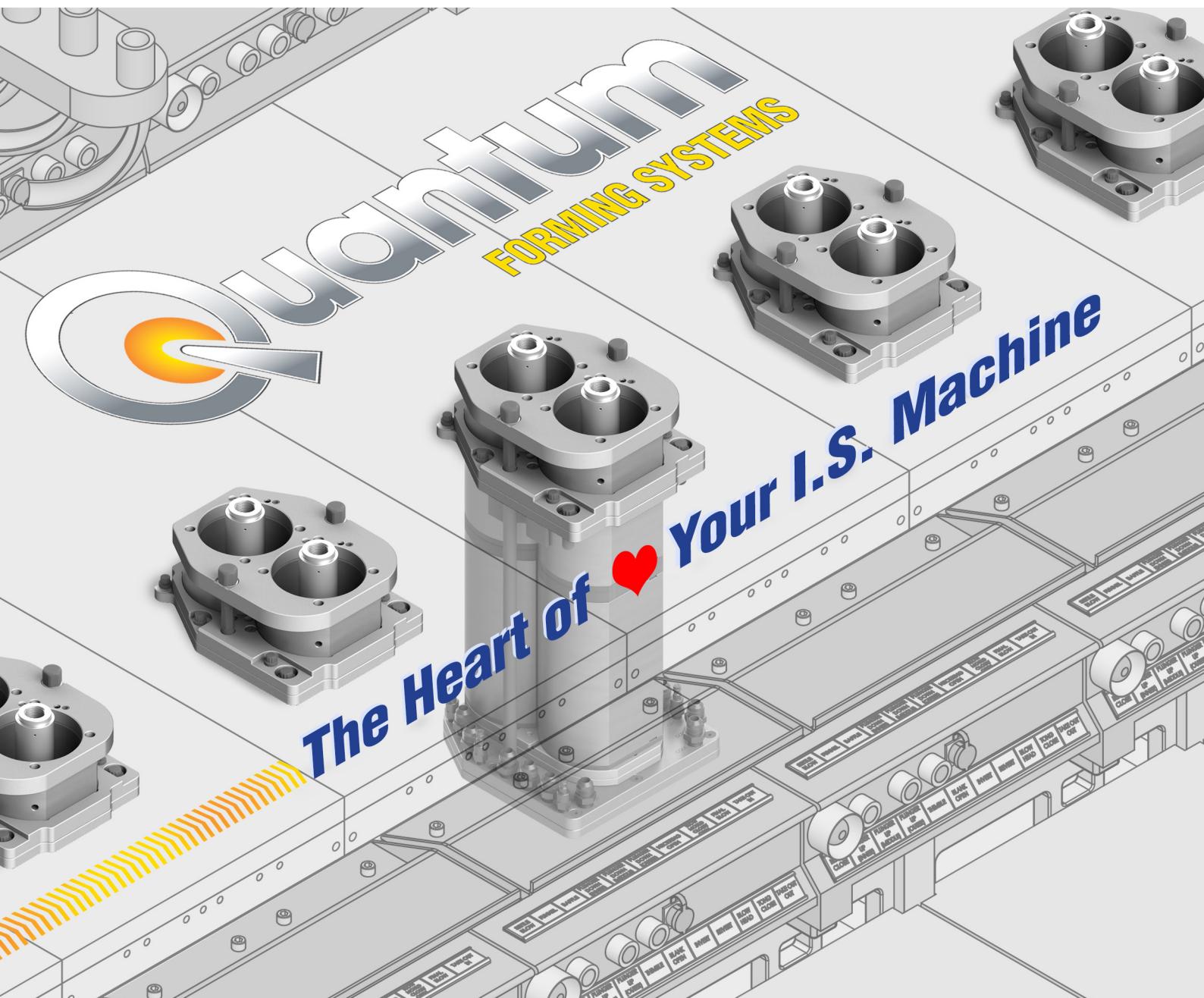


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Exclusive interviews: AGC, Ardagh, Gürallar, Ishizuka, Nihon Yamamura, NSG, Saint-Gobain & Toyo Glass. Latest news & issue highlights at [glassworldwide.co.uk](http://glassworldwide.co.uk)

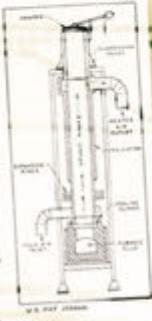


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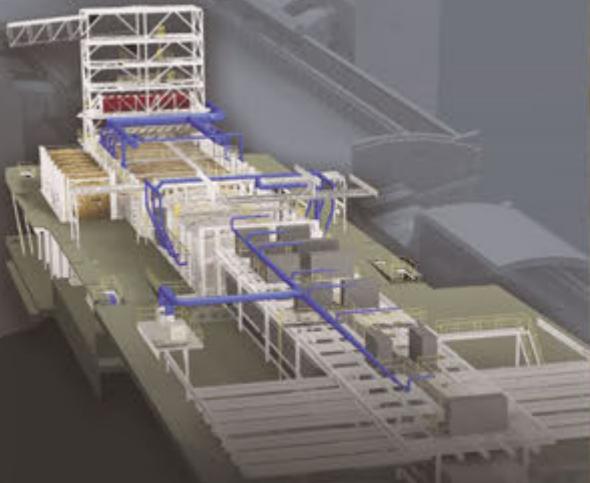
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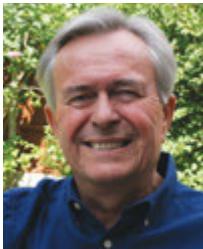
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# Welcome



In the weeks since publishing the last issue of *Glass Worldwide* and preparing this one, the world has become a disturbingly vulnerable place. As well as its sometimes devastating impact on personal health and wellbeing, the Covid-19 Coronavirus pandemic has brought much of our collective economic activity – let alone prosperity – to a standstill. As a means of

protecting their citizens, many countries are currently in a state of lockdown, with those of us that are fortunate enough to do so continuing to work from home. Clearly, this is not a viable solution for the majority of production personnel employed at glass factories and their key suppliers throughout the world. Some sites have taken the difficult decision to close temporarily, while others continue to provide valuable service to their respective value chain. Whatever your personal situation, the *Glass Worldwide* team hopes that everyone in the international glassmaking community, as well as your friends and families, remains healthy and safe until some semblance of normality returns to our daily lives.

Thanks primarily to modern communication methods, members of the *Glass Worldwide* team, our suppliers and partners continue to work remotely to deliver essential on-line and printed products for the benefit of customers. This latest issue includes a series of specially written and commissioned features, geared to accommodate the interests of flat, hollow and specialty glass manufacturers and processors. In an exclusive On the Spot interview, for example, Martin Petersson, CEO of Ardagh Group – Glass Europe discusses the Furnace of the Future, a project co-ordinated by Europe's leading glass container producers to develop the world's first large-scale, hybrid oxy-fuel furnace to run on 80% renewable energy. "This will be an important step in our journey towards climate neutral glass packaging production" Mr Petersson confirms.

Elsewhere, readers will find details of an NSG Group initiative to test the use of hydrogen as an alternative fuel for float glass furnaces. The tests will be performed at NSG's Greengate glassworks in St Helens, UK.

An extensive series of exclusive national reports is included, covering glassmaking investment activities and market trends in Japan, Turkey, China, India and Russia, while some of the latest equipment developments available from the industry's leading suppliers are discussed within this issue's specially commissioned Technology articles.

Under normal circumstances, key upcoming international exhibitions and conferences are highlighted editorially for the benefit of readers. Sadly, it has been necessary for the organisers to postpone or cancel many of these events, so our Forthcoming Events listing has been temporarily suspended as well. Instead, readers are invited to confirm the status of future events on the regularly updated *Glass Worldwide* website, [www.glassworldwide.co.uk](http://www.glassworldwide.co.uk), where you will also find the latest industry news, as well as an online library of current and past issues.

Your continued support for *Glass Worldwide* is greatly appreciated. Stay healthy, as we all look to weather the storm at this difficult time.

**John Wallis, Editorial Consultant**

[johnwallis@glassworldwide.co.uk](mailto:johnwallis@glassworldwide.co.uk)

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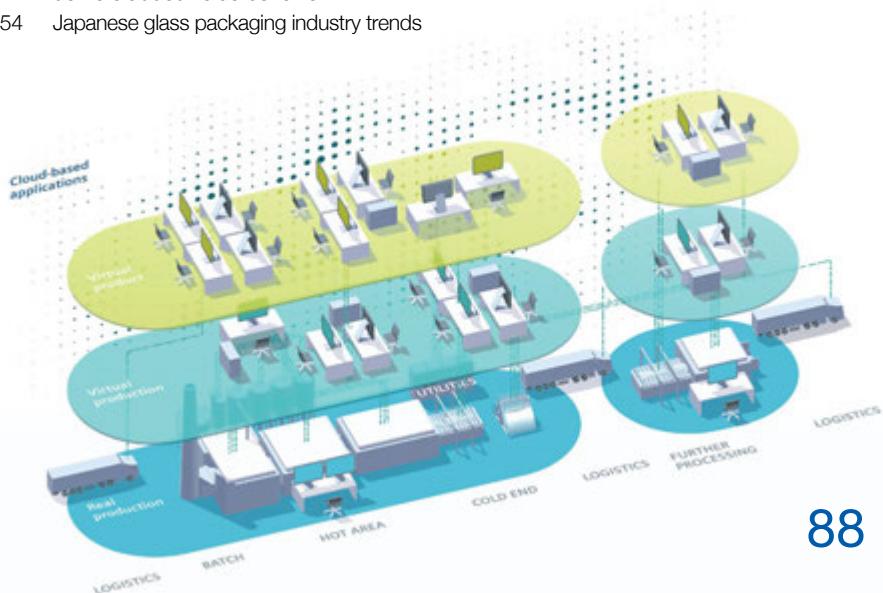
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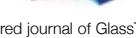
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# News

For the latest news, visit the Hot Topics section at [www.glassworldwide.co.uk](http://www.glassworldwide.co.uk)

### Project to build first large-scale hybrid electric furnace

Europe's leading glass container producers are collaborating to develop the world's first large-scale hybrid oxy-fuel furnace to run on 80% renewable electricity. According to FEVE, the 'Furnace of the Future' is a fundamental milestone in the industry's decarbonisation journey towards climate-neutral glass packaging, replacing current fossil fuel energy sources and cutting CO<sub>2</sub> emissions by 50%.

For the first time, the industry has adopted a collaborative approach, where 20 glass container producers have mobilised resources to work on and fund a pilot project to prove the concept. "We are extremely proud to announce this joint-industry project" commented Michel Giannuzzi, President of FEVE. "The hybrid technology is a step-change in the way we produce and will enable us to significantly reduce the carbon footprint of glass packaging production. The move marks an important milestone for the glass sector in implementing our decarbonisation strategy."

Ardagh Group has volunteered to build the furnace in Germany. It will be built in 2022, with an assessment of initial results planned for 2023. "With this new technology, we are embarking on the journey to climate-neutral glass packaging and ensuring the long-term sustainability of manufacturing" said Martin Petersson, CEO of Ardagh Group, Glass Europe. "We aim to demonstrate the viability of electric melting on a commercial scale, which would revolutionise the consumer glass packaging market."

An exclusive interview with Martin Petersson can be found on Page 16.

[www.feve.org](http://www.feve.org) ●

### First hydrogen tests planned at UK float plant

NSG Group is to test the use of hydrogen as an alternative fuel for float glass furnaces at its Greengate Works in St Helens, UK. Described as a global first, the initiative is part of a project managed by HyNet, a consortium of industries in the North West of England, aimed at reducing carbon emissions from industry, homes and transport.

The glassmaker will investigate whether hydrogen can be used to wholly or partly replace natural gas and oil for glass melting, thereby reducing CO<sub>2</sub> emissions by approximately 80%. The work is supported by £5.2 million of funding from the UK government under the Industrial Fuel Switching Scheme, with first trials planned for November 2020.

By 2030, NSG has targeted a 21% reduction of absolute carbon emissions compared to 2018 levels. Over the past three years, the group has reduced CO<sub>2</sub> emissions per production unit by 5%.

[www.nsg.com](http://www.nsg.com) ●

### Hydrogen carbon-free burner innovation

FlammaTec has introduced a hydrogen carbon-free burner in response to environmental challenges to reduce the glass industry's CO<sub>2</sub> footprint. A combined team of German and Czech FlammaTec engineers has worked with the Glass Service Simulation Department to create this latest generation technology.

The project required extensive computer simulation and engineering work, followed by testing at a high temperature combustion facility. The results have included proven burner parameters, flame flexibility and a highly efficient, stable combustion process.

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

### Gujarat container plant expansion confirmed

Piramal Glass has announced an investment of \$42 million for its greenfield glass container production project in Jambusar, Gujarat, India. The expansion includes an additional furnace and seven production lines, geared primarily to matching the high end specialty needs of spirits, food and beverage and pharmaceutical markets in Asia, Europe and the USA.

The Jambusar plant already houses three furnaces and 23 lines, producing 540 tonnes of glass per day. It currently employs 2130 people and with this expansion, will create approximately 700 additional jobs.

With global sales of \$357 million, Piramal Glass operates from India, Sri Lanka and the USA via four manufacturing facilities and several decoration plants. Globally, the company makes 1435 tonnes per day of glass from 12 furnaces and 63 production lines.

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

**Latest technology tempering line sold to the Netherlands**  
 Glaston Group has been awarded a contract for an FC Series tempering line with Dutch company Steinfort Glas, an expert in glass processing serving the construction, furniture, interior design and automotive industries. The order was received in early February 2020 and the line will be delivered during the last quarter of 2020. In addition, the deal includes a co-operation agreement sharing resources and linking companies core knowhow to a common learning curve.

Steinfort Glas, a longstanding Glaston customer, has always invested in the latest technology to deliver leading, inspiring glass. Due to the customer's wide product range where serial sizes are typically small and need a reliable and flexible tempering solution for efficient, mixed production, the technology of the FC Series tempering furnace was taken a step further. It is equipped with the Chinook intelligent heating system, based on the highest number of measurements combined with automatic process adjustment, Vortex pro convection technology and the Insight Assistant Pro, which automatically adjusts furnace settings based on the measured glass size and loading pattern information. This solution helps the customer to efficiently handle all product segments from selective windows to coloured automotive glazing.

[www.glaston.net](http://www.glaston.net)

#### **System streamlines coating measurement process**

The Combined Coating Measurement System (CCMS) from Agr International provides operators with a one-stop, single operation testing station for measuring and managing the container coating process. This system utilises Agr's proven reflective coating measurement technology, features a fully automated measurement approach and incorporates a number of technological advances. It provides a 33% improvement in testing throughput and a 70% improvement in precision over previous Agr coating measurement systems.

The advanced electronics, along with dedicated measurement heads for finish and body, make it possible to precisely measure very small amounts of coating in the finish region, while measuring heavier coating levels applied to the container body. These measurements are completed in one fully automated operation. Results are displayed in an easy-to-understand, colour-coded graphic format, permitting operators to identify out-of-range measurements. Job-based numerical results are also available in spreadsheet form, providing minimum/maximum/average data for each measurement (height and angle) for both body and finish regions on every container.

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



Agr's Combined Coating Measurement System (CCMS) can perform coating measurement on the bottle sidewall and finish in a single operation.

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## Encouragement for decarbonisation of the glassmaking sector

The UK glass manufacturing sector was well-represented at the Court and Livery Dinner of the Worshipful Company of Glass Sellers of London on 10 March. Richard Katz, Master Glass Seller, welcomed Stuart Hakes as one of several distinguished guests. With an international glass industry association of 57 years, Mr Hakes is President of the Society of Glass Technology, which has existed for more than a century to serve people who are interested in the production, properties and uses of glasses.

Pictured here alongside Richard Katz and *Glass Worldwide*'s Debbie Fordham at the prestigious gathering at Trinity House in London, Mr Hakes is also the Chief Executive of FIC (UK) Ltd, a leader in the design and manufacture of electric glass melting systems. He recently joined the advisory board of Glass Futures, the proposed global centre of excellence in R&D, training and innovation.

"Stuart Hakes is one of the world's leading experts on melting glass electrically and the advisory board of Glass Futures is benefitting greatly from his knowhow" commented Richard Katz, CEO of Glass Futures, in addition to his role with the Glass Sellers.

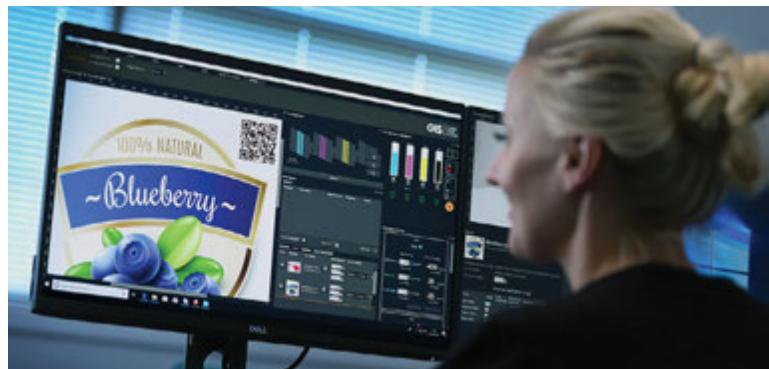
### Digital print software

Global Inkjet Systems (GIS), a strategic partner for OEMs and system builders, has introduced its latest Atlas Graphical User Interface (GUI) industrial print software, offering significant usability and functionality, with interface options and language packs.

The Atlas Software Suite enables rapid integration of software components from GIS, system builders and third parties to create entire digital print systems covering workflow, RIP, VDP, drive electronics, ink delivery systems, transport control and subsystems. The GUIs include powerful tools for system configuration and monitoring, job submission and tracking, machine maintenance and print quality enhancement. Specific UIs are also available for various applications, including labelling, corrugated, glass, direct-to-shape, varnish and security.

Key features include separate Atlas Professional and Atlas Production UI platforms to cover a wider range of end users and language packs for English, Chinese, Korean, Japanese, German, Spanish and Italian. V3 also includes enhanced system configuration tools, printhead support, job submission and tracking and advanced drive electronics UI configuration.

[www.globalinkjetsystems.com/atlas](http://www.globalinkjetsystems.com/atlas)



Atlas Graphical User Interface (GUI) industrial print software.

Emphasising the strong links between the two organisations, Mr Katz continued: "Glass Sellers was one of the founding partners of Glass Futures and the aim is to help the glass manufacturing industry understand that they can no longer continue to make glass in traditional ways. With Liveryman and Master's Assistant, Maria Chanmugam also on the Glass Futures advisory board, Glass Sellers is very involved and as a livery company is at the forefront of addressing climate change problems."

With the UK Department for Business, Energy and Industrial Strategy (BEIS) having last month placed a £7.1 million Industrial Fuel Switching Procurement Contract with Glass Futures to provide in-depth investigations of sustainable alternative fuel sources and innovative scenarios to decarbonise the glass manufacturing process in line with 'net zero' targets, Mr Katz also welcomed Philip Cohen, Principal Engineer at BEIS. "Philip and BEIS are fundamentally assisting Glass Futures in achieving our objectives" he acknowledged.

Richard Katz also stated that a leading glass industry player will

shortly be announced as the inaugural corporate partner of Glass Sellers, with other such partners expected to follow. Subscriptions for corporate partnerships will be shared between the livery company and its 'Glass in Society' charity, a project that aims to introduce teachers and school children to glass, glass technology, its uses and behaviour, as well as frequently to bring an understanding of composite technology into their education for the first time.

Despite the disruption caused by the Coronavirus, the Court & Livery Dinner attracted an impressive audience including liverymen from glass manufacturers such as Nazeing Glass Works and O-I, alongside glass artisans and a wide spectrum of industry personalities.

*Glass Worldwide* is the official journal of the Worshipful Company of Glass Sellers of London and the preferred media partner of Glass Futures.

[www.glass-sellers.co.uk](http://www.glass-sellers.co.uk) / [www.glass-futures.org](http://www.glass-futures.org)



SGT President Stuart Hakes (left), with *Glass Worldwide*'s Debbie Fordham and Richard Katz, Master Glass Seller.

### CFD software strengths reinforced

Germany's NOGRID GmbH, leading supplier of Computational Fluid Dynamics (CFD) has relocated its headquarters to Mainz. Larger office space and training rooms will help the company to prepare for further growth.

Separately, NOGRID has also announced its latest pointsBlow 3.2.5 software release (software especially for the simulation of the glass container forming process in full 3D) and NOGRID points 6.7.3, a general-purpose simulation software. Both releases provide a series of innovative features, with faster computation time ensuring reliable solutions.

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



The NOGRID training room in Mainz, Germany.

## Conveyor chain developments

Ramsey's experience in the manufacture of two pin silent chains for almost 100 years has helped the company to produce what is described as a superior glass bottle conveying chain. Continuous R&D efforts have resulted in the development of innovations and special production methods for 100% steel Sentry two pin chains.

Features of this equipment include guard links with fully recessed pin heads, 100% hardened alloy steel construction (no sintered metal), two pin chain joints and staked pin heads. Pre-stressed for reduced chain elongation, these chains are available in ½in pitch

and 1in extended pitch designs.

According to Ramsey, Sentry two pin chains blend time tested extended pitch assemblies, two pin joint designs and wear protected recessed pin heads to produce chains that are fully interchangeable with existing two pin chain designs and run on standard sprockets. A proprietary staking process is used to head the pins rather than the traditional method of laser welding. This design does not add extreme heat to the links and pins and means that the pins and links are the same hardness throughout. The result is a chain that wears consistently and has a longer life.



Ramsey, Sentry two pin conveyor chain.

Sentry links are specially designed to allow pins to slide in and out easily, making connection considerably easier, the manufacturer reports.

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

## German flat glass processing sites sold

Saint-Gobain has sold part of its glass transformation business Glassolutions in Germany to DIK Deutsche Industriekapital GmbH, a Berlin-based investment firm. The deal concerns sites in Bremen, Flensburg, Freiburg, Kiel, Murr, Potsdam and Rostock. These sites employ a total of 350 people and delivered sales of €45 million in 2019.

Saint-Gobain Glassolutions will remain present in Germany through its large glass transformation sites for industrial clients in particular, as well as its sites with specific areas of expertise such as in solar glass or curved glass. This disposal is part of Saint-Gobain's continued portfolio optimisation strategy in the context of plans to enhance the group's growth and profitability profile.

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

## Reinforcing the service team spirit

Twenty seven Heye International service experts from around the world attended a week-long service workshop in Obernkirchen, Germany recently. "What characterises the perfect team?" was among the important questions addressed, alongside "Which skill diversities can enrich the quality of a whole service team?" and "What are the benefits for the customer?"

Delegates in attendance also discovered the latest product developments at Heye. Furthermore, between the service workshop sessions, there was adequate time to maintain team spirit generated during recreational activities.

[www.heye-international.com](http://www.heye-international.com)

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## Creating the next era for smart inspection

In response to the international glass container industry's growing acceptance and adoption of 'smart' manufacturing practises, IRIS Inspection machines has expanded its NEO range of smart inspection solutions. Created in close consultation with key customers, the latest NEO technology goes beyond the conventional boundaries associated with specialist inspection machines, delivering a more comprehensive offering to face the challenges presented by the smart factory. The NEO Series heralds the arrival of an era where glass inspection is not only sustained by machines but also by accurate data and the ability to comprehend, compute and connect it.

NEO Intelligence is an innovative defect approach that relates to intelligent defect recognition and sits at the core of Evolution non-contact glass container inspection equipment. The latest generation Evolution NEO series marks an important break with other glass inspection machines, bringing the concept of the smart factory even closer. NEO eXperience is the NEO dashboard, designed to assist glassmakers to understand the causes of defects, to simplify the adjustment of settings and to reduce false rejection rates.

The inspection data created is available not only on the machine itself but remotely as well, for plant managers to monitor performance and initiate changes where necessary. In addition, defect images are available to hot end personnel, providing the ability to share critical defect characteristics and defect images in real-time, alerting IS machine operators to instances of critical defect detection.

The NEO series is the result of many years of dedicated research and development. This equipment has received widespread glass industry acceptance, generating multiple orders, in particular from European and Latin American glass packaging producers. Already, 510 machines are running NEO software throughout the world, with excellent customer feedback reported for the innovative defect approach adopted.

[www.iris-im.com](http://www.iris-im.com)

## 30th anniversary celebrations

Czech Republic-based Glass Service is celebrating 30 years' service in support of the international glassmaking industry. Together with affiliated companies FlammaTec spol s r o, FlammaTec Germany GmbH, FIC (UK) Ltd, FIC Germany GmbH, Augmented Sensors and Systems d o o (A-SENS), Glass Service provides extensive consulting and engineering services to customers.

GS is an established provider of CFD modeling of furnaces, simulation software and glass defect analysis. Its Expert System ESIII, NIR camera systems and visual information analysis are becoming standards of modern furnace operations. GS group member A-SENS develops advanced electronics and sensors for the latest generation of control systems. The engineering services provided include low emissions and energy efficient combustion systems delivered by FlammaTec in combination with electric melting systems and furnaces supplied by FIC. Recently, GS, FlammaTec and FIC responded to carbon-free energy requirements with a novel concept of high capacity electric boosting and a pure hydrogen combustion approach. GS was originally founded with four partners in 1990, before growing into a multi-national corporate group. Its team of more than 100 employees operates from nine countries, covering the Americas, Europe and Asia.

[www.gsl.cz](http://www.gsl.cz)

## Established electric melting expertise

Since introducing the all-electric furnace 50 years ago and providing boosters for more than 500 fossil-fired furnaces worldwide, SORG has an entire department dedicated to electric melting. The VSM cold top all-electric melter was first patented by the company in 1970. Subsequently, over 100 have been supplied, producing all kinds of glass, especially high quality glassware, while ensuring low energy consumption, low waste gas quantities and a dust-free factory environment. In many cases, SORG uses electricity to boost the capacity of fossil-fired melters, as well as glass quality. An independent supplier in over 70 countries, these tailor-made systems can be applied to any furnace. Technical development and pre-engineering are included in the quotation phase, together with in-house calculations and design. Technical documentation, maintenance support and a free after-sales service are also provided. Furthermore, with the need to reduce emissions more important than ever, SORG leads the way towards a more sustainable future for glass melting.

[www.sorg.de](http://www.sorg.de)

## Batch charger installation success

Vibratory batch chargers with two pusher paddles and either servo- or frequency-controlled drives from HORN Glass Industries AG are increasingly specified in the glass market. The reliability of this equipment has been reconfirmed by Wiegand-Glas in Steinbach, Germany in recent months. In 2018, HORN delivered a melting furnace together with an HRV 700S-2P batch charger, equipped with servo drive. The servo drive allows the improved adjustment of the movement of the pusher paddles. Thus, the batch layer on the glass surface can be influenced more precisely. In the course of a regular replacement of the batch charger 12 months later, the machine was replaced and handed over for maintenance, without incident during the first year of operation. The customer's positive opinion of this batch charger was quoted as "Better batch distribution, fast change and reliable."

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

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Stephen D'Angelo, owner and Chief Executive Officer of dck worldwide.

**Acquisition supports turnkey plant construction strengths**  
An investment group led by the owner of a worldwide construction company has acquired Henry F Teichmann Inc, the global process engineering and contracting firm dedicated to serving the glass industry. Stephen F D'Angelo, owner and Chief Executive Officer of Pittsburgh-based dck worldwide, completed the transaction in mid-February, positioning Teichmann as an affiliate and strategic

partner of the construction firm that has completed building projects in 125 countries.

"This is an affirmation of our world leading expertise" said Mark F Piedmonte, Teichmann's President. "The fact someone who shares our vision for safety and quality, who understands the value of engineering and who has built a global construction firm, chose to invest in us says a lot about our capabilities."

Mr Piedmonte confirmed that there will be no changes to the leadership, project or support teams at McMurray, Pennsylvania-based Teichmann. "Our clients will be working with the same experienced staff and will receive the high level of quality design and expert services that they have come to expect."

The acquisition provides Teichmann with the financial strength to design and manage even larger projects and an opportunity to leverage dck worldwide's extensive expertise in areas such as vertical, civil and brownfield construction, as well as its capabilities in site development. "Although our companies will operate separately, dck worldwide will enhance Teichmann's turnkey multi-discipline construction capabilities, while supporting our growth and solidifying our leadership position as one of the largest independent engineers and contractors to the global glass industry" Mark Piedmonte commented.

Founded in 1947, Teichmann has completed more than 1000 successful projects in over 40 countries. Services include engineering, procurement, construction and project management. Projects include full design-build greenfield/brownfield plants, glass melting furnaces, batch plants and annealing lehrs.

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



Teichmann has completed more than 1000 successful projects in over 40 countries.

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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)

## Industry veteran to maximise manufacturing efficiency and output



Martin Bracamonte.

In the USA, Vitro Architectural Glass (formerly PPG Glass) has named Martin Bracamonte as Vice President, Operations to manage its flat glass plants in Carlisle (Pennsylvania), Wichita Falls (Texas), Fresno (California) and Salem (Oregon). His primary responsibilities will include increasing operational efficiencies, production output, product quality and overall customer satisfaction.

Ricardo Maiz, President, Vitro Architectural Glass, said Mr Bracamonte brings a wealth of leadership to his latest post. "Martin has experience across a wide range of disciplines in the glass industry, from innovation to sales, operations and executive management" he explained. "As a result, he understands the demands of our customers and end users and offers an array of knowledge to help our organisation meet and – ideally – surpass their expectations."

Martin Bracamonte joins Vitro Glass from IGE Glass Technologies, where he served as President and Chief Operating Officer. During a 29 year career in the glass industry, he has held senior management and executive posts at several leading glass manufacturers.

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

## Refractories supply chain management



Michael D Van Hill.

HarbisonWalker International (HWI), the largest supplier of refractory products and services in North America, has announced Michael D Van

Hill as Vice President, Supply Chain. Mr Van Hill oversees all supply chain-related functions across the company's international network, including customer service, demand and supply planning, transportation and logistics operations, as well as HWI's 30 global sourcing centres and warehouses.

Michael Van Hill brings nearly 20 years of progressive experience in supply chain, quality and continuous improvement. Most recently, he was Vice President of Supply Chain Operations and Operational Excellence at Thyssenkrupp Industrial Services. There, he was responsible for supply chain strategy, operations and operational excellence for three Thyssenkrupp NA business segments: Tesla, FCA and Thyssenkrupp Elevator. His leadership responsibilities encompassed more than 50 sites, including 19 distribution centres, 15 supply chain/fulfillment centres, five transportation hubs and all contract service sites.

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

## GPI President to lead Glass Recycling Foundation Executive Board



Scott DeFife.

Scott DeFife, President of the USA's Glass Packaging Institute, has been named President of the Glass Recycling Foundation's Executive Board. GRF's vision is to increase recycling through sustainability education and best practices to ensure the maximum benefit for communities and the environment.

Jennifer Cumbee of Ardagh Group was also appointed to the GRF Board.

Mr DeFife succeeds Lynn Bragg as Board President and joins Ron Holmes of Diageo and Laura Hennemann of Strategic Materials as officers of the Executive Board. He takes the helm as Board President just as GRF has received the foundation's first \$50,000 to its endowment. GPI member O-I Glass and alcoholic beverage producer Diageo each made a \$25,000 donation to the fund.

[www.glassrecyclingfoundation.org](http://www.glassrecyclingfoundation.org)

## GIMAV Director named



Fabrizio Cattaneo.

Fabrizio Cattaneo has been appointed Director of GIMAV, the association of Italian manufacturers and suppliers of machinery, plant and systems, accessories and special products for glass processing. He replaces Laura Biason, who left the association at the end of 2019. Mr Cattaneo will assist the Board and GIMAV President, Michele Gusti in guiding the association in facing some significant future challenges and events.

"Fabrizio Cattaneo's lengthy, deeply rooted experience with associations and Confindustria convinced us that he was the right person for GIMAV" Michele Gusti confirmed.

[www.gimav.it](http://www.gimav.it)

## Insulating gas analysis specialist management



Jukka Manner.



Iiro Jantunen.

Following the departure of Miikael Niemi, Jukka Manner has been appointed CEO at Sparklike Oy, Finland's leading supplier of non-destructive insulating gas analysers. Mr Manner has been Sparklike's Sales and Marketing Director since early 2019, a position he will continue to perform in parallel.

Working alongside him is Iiro Jantunen, Chief Technology Officer, who has been responsible for product development, production maintenance and quality assurance since joining the business last November.

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

## Drying technology management appointments



Andre Goodson.



George Atkinson.

Nottingham, UK-based drying technology specialist for the industrial print market, Natgraph has appointed Andre Goodson as Managing Director and George Atkinson as Sales Manager for Europe, the Middle East and Africa.

Mr Goodson brings a wealth of commercial leadership experience, bringing fresh ideas to the company, with an initial focus on growth. His core involvement will be with Natgraph's global sales team and its operations group.

As EMEA Sales Manager, George Atkinson brings considerable experience, having previously worked both selling directly to end users and managing distribution networks in Asia, the Middle East and Europe.

[www.natgraph.co.uk](http://www.natgraph.co.uk)

## Customised batch plant expansion for glass wool specialist

Poland's Forglass has recently completed a batch plant expansion project on behalf of glass wool production specialist, Saint-Gobain Isover. The Chemillé plant in France was constructed some 10 years ago and recently the company decided to expand its glass wool production by constructing a second furnace. Calculations showed that the

capacity of the batch plant was sufficient to supply both furnaces. What was needed was an additional line for transporting the mixed batch to the new furnace, fully integrated with the client's existing control system.

Forglass designed, constructed and delivered the technology line, consisting of batch transport together with the control system, custom-tailored to seamlessly integrate with

Saint-Gobain's existing automation. The Polish contractor also designed and installed a special filtration system for the new line.

Particularly worthy of mention are the client's aesthetic requirements: The line had to blend in with the overall architecture of the factory. Additionally, no modifications were allowed to the building and existing structures, so Forglass was required to design all components not only to be delivered through existing openings of the building but also to fit with and around existing equipment.

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

## MBE recognition

Following the latest birthday honours awarded by the United Kingdom's Queen Elizabeth II, Hunprentco Ltd Chairman and Managing Director Edwin Neesom has received an MBE (Most Excellent Order of the British Empire) for services to exports and to the rural community in North Yorkshire. He received the award from HRH The Prince of Wales at Buckingham Palace, London.

Founded in 1969 by Mr Neesom, Hunprentco celebrated its 50th anniversary last year and with 25% of business generated from Europe and 75% from other parts of the world, the company is recognised globally as a leading manufacturer of plungers and coolers for the glass container industry. Still actively involved in the business at 88 alongside his wife Marilyn, Edwin Neesom has overseen major expansion of Hunprentco's Filey site in recent years.

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



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## News

### Significant glass excellence developments

Glass Futures, in the process of building the global centre of glass excellence in R&D, innovation and training, has announced significant progress in recent weeks, with the appointment of a new board of directors and an expansion of its team.

The board of directors comprises eight leading representatives from the global glass industry, supply chain and academia. Richard Katz, CEO of Glass Futures, commented: "We are delighted to welcome a board of such high calibre experts from various fields who are all passionate about the future of glass. This new board, in partnership with the knowhow of our growing team of full-time staff, together with the 15 strong advisory committee, will contribute significantly to Glass Futures' progression and the achievement of our goals."

Transferring from Glass Technology Services (GTS) with full support from GTS are Aston Fuller, Rob Ireson and Tracey Spaven. As General Manager, Mr Fuller has responsibility for the day-to-day running of Glass Futures alongside Richard Katz and as Innovation and Partnership Manager, Mr Ireson will be working to connect Glass Futures to the wider glass community. Ms Spaven joins as Office Administrator.

Glass Futures has already commenced work on in-depth investigations of sustainable alternative fuel sources and innovative scenarios to decarbonise the glass manufacturing process in line with 'net zero' targets as part of the £7.1 million Industrial Fuel Switching Procurement Contract announced in February. It is understood that Glass Futures has also submitted a formal application to the UK Government for a further £15 million to enable the development of its pilot plant to carry out scalable experimentation. Incorporating a 30 tons/day research furnace, it is anticipated that work will commence on the pilot plant before the end of 2020, with the intention to melt glass next year (dependent on possible disruption caused by the Coronavirus).

Furthermore, it is understood that Glass Futures is glad to see the introduction of FEVE's 'Furnace of the Future' initiative and believes the projects will be mutually beneficial and lead to increased collaboration across the glass manufacturing sector in Europe.

[www.glass-futures.org](http://www.glass-futures.org) ●



Rob Ireson, Glass Futures' Innovation and Partnership Manager, will be connecting the initiative to the wider glass community.



Seen here with Richard Katz, CEO of Glass Futures, Aston Fuller (right) joins as General Manager.

### Ampoule forming equipment innovation

Following its recent acquisition of Spain's Kyp Accessories, the positioning of OCMI-OTG as a world leader in the supply of complete lines for the production of borosilicate glass containers for medical and cosmetic use is gaining momentum. This is illustrated by growing research and development activity throughout the group.

Among the OCMI Group's key product developments is the FA36S ampoule forming machine, manufactured in Milan, with its integrated control system functions, including tube loading, machine operation and dimensional control performed by the OPTISTEM/2 camera system. The positive market reaction generated by this technology has led the group to apply the same features to 30-station MM30 ampoule forming machines, which are manufactured at the France factory of Moderne Mecanique.

Traditionally supplied with separate cabinets for machine and loader control, the MM30 machine is now available in the updated version with an all-in-one integrated control cabinet. Existing MM30 machines can also be upgraded on-site, with several such projects already having been undertaken on behalf of customers worldwide.

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



FA36S ampoule forming machine.

### Sales office opened in Japan

As packaging markets continue to expand throughout Asia, Agr International has recognised significant demand for its quality management and process control equipment for glass and plastic containers. This is evidenced by an ever-expanding customer base in the region. The recent establishment of a sales and service office in Japan, headed by Satoshi Okura, is intended to meet this growing demand, using factory-trained Agr personnel. Mr Okura holds a graduate degree in Business Management from Canadian International College. He is a veteran within the glass and plastics industries and has extensive business experience in South East Asia. Under Satoshi Okura's direction, Agr Japan will provide sales and service support for the company's complete line of products. The office is part of the Agr Bangkok Ltd territory, with overall management provided by Martin Küstner.

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



Satoshi Okura.

### Furnace inspections unaffected by travel bans

According to PaneraTech CEO Yakup Bayram, self-service SmartMelter inspections will be available to new customers for initial inspections effective immediately. This service, previously extended only to repeat customers, will help glass manufacturers ensure safe and reliable furnace operations as they are forced to adjust maintenance and repair schedules.

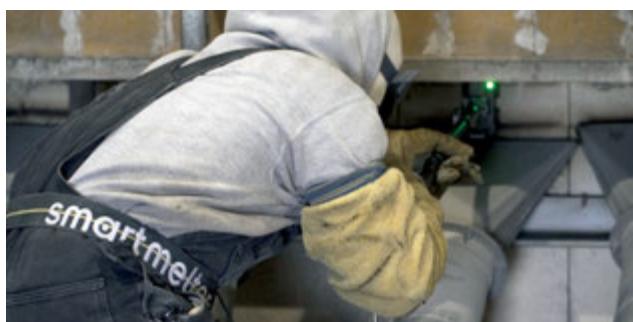
Repeat customers on a furnace previously inspected have had the option of conducting self-service inspections since the technology was released in 2017. Over 50% of SmartMelter inspections to date have been self-service inspections, performed by the glass manufacturers themselves. Because the equipment is intuitive, a short training session equips plant staff to perform all measurements.

However, initial inspections have always required an on-site member of the SmartMelter team to perform the staff training and to label the furnace. In response to recent Covid-19 restrictions, PaneraTech has developed a virtual training programme, so that new customers can still perform inspections with the help of a dedicated engineer in a convenient time zone.

Manufacturers who are performing their first SmartMelter inspection will be shipped the equipment with a longer lease period to utilise it. An engineer is assigned to their project for virtual training and daily support to guide them through the inspection process.

The SmartMelter team will provide daily reports to the company on the progress of the inspection. Once all data is collected, a report will be generated and reviewed on a call with the customer within two weeks, depending on urgency. To further advance this programme, training videos are being developed that the customer can review while performing the inspection.

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



SmartMelter inspection.



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# On the Spot... Martin Petersson

Martin Petersson, CEO of Ardagh Group - Glass Europe, discusses the 'Furnace of the Future', a project co-ordinated by Europe's leading glass container producers to develop the world's first large-scale, hybrid oxy-fuel furnace to run on 80% renewable electricity. According to FEVE, the European Container Glass Federation, the 'Furnace of the Future' is a fundamental milestone in the industry's decarbonisation journey towards climate neutral glass packaging, replacing current fossil fuel energy sources and cutting CO<sub>2</sub> emissions by 50%.

**GW:** Firstly, congratulations to you and the European glass container community for joining together to create the 'Furnace of the Future' initiative. Was it a complex task to gain the support of the industry's key players and what are the reasons for doing so?

Thank you! Indeed, this is a significant step and a major commitment by the European glass industry, which has already involved extensive discussion and evaluation. The founding members of the group have been working together on the project since 2017, as a team of technical experts within FEVE. As an industry, we are aware of the need to move towards carbon neutral glass packaging production and given the costs and expertise required to achieve this, an industry-wide approach was always the preferred option. We are delighted to have achieved this important first step, in which a new legal entity will be created as a Special Project Vehicle (SPV) to manage the project.

**GW:** How influential do you expect this project to be in creating a long-term future for Europe's glass packaging industry?

We are confident it will be a significantly influential breakthrough pilot project across Europe and beyond. It

will enable the sector to reduce CO<sub>2</sub> emissions by up to 60% (60% in the furnace and 50% across the whole factory), enabling us to support our key customers in meeting their own sustainability targets.

**GW:** What are the framework, goals and expectations for this initiative?

This is an industry-wide project, with the ambition and expectation to prove that we can operate a full-scale furnace with significantly reduced CO<sub>2</sub> emissions. This will be an important step in our journey towards climate neutral glass packaging production.

**GW:** Who will be responsible for co-ordinating and driving the project, as well as measuring the results achieved?

A Special Project Vehicle (SPV) will be

created as a new legal entity to manage the project. The SPV will then enter into a contractual service agreement with Ardagh Group to invest in the project and share knowledge. All 20 companies within the SPV will have access to the furnace and related knowhow, enabling them to roll out the technology in their own businesses. Part of the project will also provide operator training for SPV member companies at the new furnace.

**GW:** What timescale has been set for the project and where will it be conducted?

The demonstration project will be built in 2022, with first results anticipated in 2023. The furnace will be built at one of Ardagh's existing glass manufacturing locations in Germany, with more details to be confirmed once the related funding has been secured. The next steps are to apply for a grant from the EC innovation fund and set up the SPV to manage the project.

**GW:** You have decided on an oxy fuel/electric melting hybrid furnace concept. What is your motivation for following this design path, what other fuel combinations were investigated and why where they not selected?

We chose the hybrid oxy-fuel concept because it is the most proven technology, with the best available energy supply. Alternative energy sources such as hydrogen are currently not available. However, we are committed to exploring all possible pathways and hope that more solutions will be available to the industry in the future.

**GW:** What furnace size/capacity are you planning to develop and build to prove the technology's fitness for purpose?

The plan is to build a commercial- ▶



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A yellow glass bottle is shown on the left side of the image, partially cut off by the frame. It appears to be intact at the top but shatters into numerous shards of varying sizes and angles as it descends towards the bottom. The shards are illuminated from behind, creating a bright, glowing effect against a solid black background. The shards are primarily yellow and orange, matching the bottle's color, with some red and purple shards appearing further down the fall.

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[AppliedGlass.com](http://AppliedGlass.com)



scale furnace with a capacity to produce over 300 tonnes of glass per day. We will be able to provide more specific details once funding has been secured and a contract with a furnace builder has been signed.

**GW: What criteria will be adopted for selecting the furnace contractor and how soon will the decision be made?**

The selection criteria are confidential at this stage. However, experience with electric melting on a large scale will be preferable.

**GW: Your press statement refers to the use of 80% renewable electricity to run the furnace. Are you also investigating suitable options to generate electricity and if so, how will this part of the project be managed?**

We plan to use existing green energy supplies and are focusing our efforts on the development of the new furnace

technology. Once the furnace is operational, we will consider alternative energy supplies.

**GW: The 'Furnace of the Future' project will require significant financial and human resources to succeed. How will the project be financed and are you confident of securing ETS Finance for Innovation Fund Programme support?**

In addition to seeking funding via an EU grant, the industry and Ardagh Group have committed to fund the project collectively, which demonstrates our commitment in moving towards carbon neutral production. By taking a sectoral approach, we believe there is a good chance of securing the

required EU funding and we remain confident in this project's ability to meet the Commission's relevant criteria and objectives.

**GW: Are you confident of finding a solution to the European glass container industry's carbon neutral goals and when do you expect to see the results?**

The technical and research evaluation work carried out to date gives us confidence that a solution is possible and that the project will be successful. Confirmed results are anticipated in 2023, when the furnace becomes operational. ●

"We are extremely proud to announce this joint-industry project" commented Michel Giannuzzi, President of FEVE.

"The hybrid technology is a step-change in the way we produce and will enable us to significantly reduce the carbon footprint of glass packaging production. The move marks an important milestone for the glass sector in implementing our decarbonisation strategy."

Founding member companies of the 'Furnace of the Future' project are the following FEVE member companies:

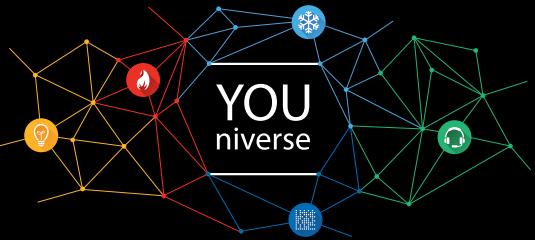
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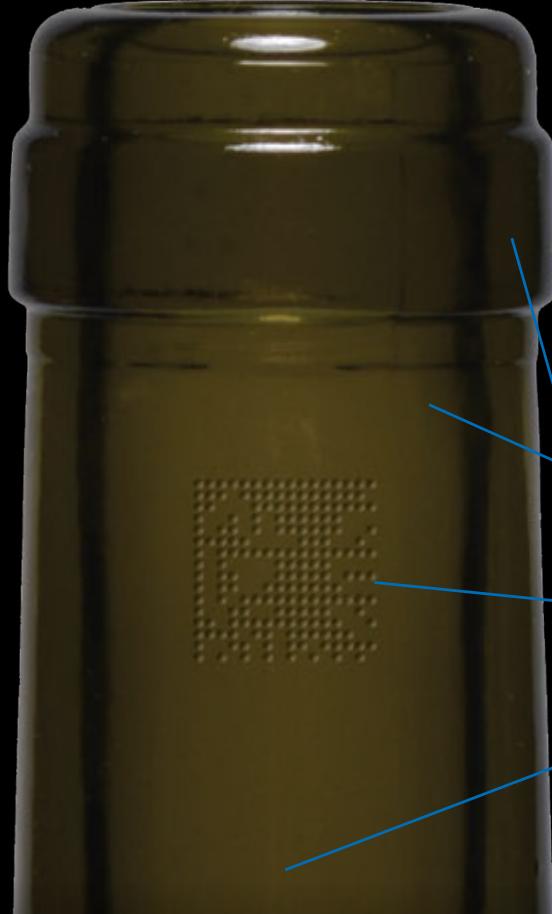
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Data – the deciding factor

# Size matters - and so does expertise

A shift in mindset has finally begun within the glass container manufacturing industry and focus is now moving towards a carbon-free future. Everyone in the industry should be excited to hear the latest news about several hybrid and all-electric melting initiatives becoming a reality. The need for larger installed power supplies brings new design challenges, as well as interesting opportunities. Choosing a power supply provider with a high level of expertise is key to achieving the most energy-efficient and cost-effective solution, says René Meuleman.



René Meuleman, Business Leader for Global Glass at Eurotherm.

As a power supply system provider, Eurotherm by Schneider Electric obviously had to anticipate this shift in developments ahead of time and fortunately, it was not rocket science to predict these advancements. Knowing that each tonne of glass produced would need approximately 2.8GJ - 3.0GJ of electrical energy, it was not difficult to calculate that a new generation hybrid or all-electric furnace would need around 10 to 12MW of installed power, to achieve an average pull rate. This is nearly five times the amount of electrical power installed for a typical furnace boosting system on today's regenerative end-port furnaces!

Even though traditional 1.5 - 2MW furnace boosting power supply systems need to be carefully designed, 10MW systems will bring entirely different design challenges. To start with, it is likely that the traditional method of firing the electrodes against each other will need to be reconsidered and discontinued. Long cables or busbars will need to be avoided to prevent unacceptable magnetic induction impacting the power system's efficiency and perhaps also personal safety. The supply current will also need to be kept as low as possible to reduce the need for expensive high current switch gear, transformers and thicker cables or busbars.

## A collective effort

New furnace designs will unavoidably need modelling studies carried out, resulting in glass resistivity assumptions that, in turn, will impact transformer design and cost. Mistakes in transformer specification and design are difficult to correct and over-engineering systems to limit design risks is both expensive and contrary to the goal of reducing environmental impact. The world's furnace builders and designers should be aware of the flexibility that modern power control systems are capable of providing. With or without the help of the few companies providing furnace modelling expertise, this flexibility will help them find the most cost and energy efficient electrode positioning for the process.

Furnace and electrical power supply designs are mainly based on physics and there are lots of parameters that affect each other. Furnace builders are well respected for their furnace design capabilities but power solution providers such as Eurotherm by Schneider Electric should be considered the power supply experts, having decades of history in specifying, designing, engineering and installing SCR-controlled systems, along with the associated products and components.

As the industry steps up to +10MW of installed electrical power,

technical knowhow is imperative, whether for an all-electric or hybrid furnace design. Therefore, furnace building and power supply expertise should now be combined together to achieve efficient glass manufacturing melting systems. Each party can provide their knowledge and IP, which will minimise the risk of failure of the whole furnace design. The way the energy is deployed from the grid to the electrodes is crucial. Therefore, the efficiency of the complete system, grid stability, personal safety and availability of the furnace are highly dependent on the selected power control system. Common sense dictates that this kind of knowledge can only come from an experienced power solution provider.

Installation of +10MW power supplies will also change the way utilities can be managed. Microgrid and smart grid power supply capabilities will put glass manufacturers' energy purchasing departments in a much better position to negotiate energy contracts. For example, by utilising the freedom of electrical power control to help stabilise increasingly unstable electrical grids and getting lower energy tariffs in return. With a +10MW installed supply, it makes absolute sense to combine glass manufacturers', furnace builders', power supply providers' and energy utilities' business cases to find win-win situations through collaboration, taking advantage of the best of multiple worlds with each party contributing their skillset. The bottom line is that with increasing power demand, both size and expertise matter! ●

### About the author:

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# Living in a transforming environment

According to General Manager Abdullah Gayret, Turkish glass container manufacturer Gürallar Cam Ambalaj is on the way to increasing production capacity and is growing. Vladislav Vorotnikov reports.



Abdullah Gayret, General Manager at Gürallar Cam Ambalaj.

Gürallar is among the world's largest glass manufacturers, having originally gained popularity with its LAV tableware brand. The company was set up in 1996 by the Gürallar family in the city of Kutahya in western Turkey. Growing at a fast pace, within two decades it has been selling the LAV products in 35,000 shops in Turkey and a further 100,000 stores around the world.

In 2014, the Gürallar Group decided to increase its glass container production with a new venture called Gürallar Cam Ambalaj. The company

expanded its production capacity by building a second plant, again located near Kutahya. The plant began operations in February 2015, with a focus on producing food jars and soft drinks bottles. It has a capacity of 400 tonnes/day.

The past year has been rather complicated for the Turkish economy, taking its toll on all market players, according to Mr Gayret. "Hit by a currency crisis that triggered a near -30% lira slide against the dollar, the Turkish economy contracted by 2.6% in the first three months of 2019 after shrinking 3.0% in the fourth quarter of the previous year. That lira slide pushed inflation to a 15 year high, severely limited companies' ability to service foreign debt and multiplied bad loans in the banking sector" he commented. "On the other hand, Turkey's economy grew by 0.9% year-on-year in the third quarter, breaking three consecutive quarters of contraction as it shook off a recession, which followed last year's currency crisis."

Despite the challenges, Gürallar managed to increase sales in both domestic and international markets. "Despite the uncertainties in the market and being a relatively new player in the glass container sector, we are among the leading glass manufacturers in Turkey. We have been working with Turkey's leading brands and carrying out important projects abroad; hence, we achieved slightly over 10% growth

compared to 2018, five times higher than the national annual industry growth" Abdullah Gayret disclosed.

"Even in the presence of economic fluctuation, we are increasing our weight in the sector by expanding our customer portfolio both in Turkey and abroad. Our goal is to increase our export figures every year and to provide a better quality service to our customers with the development of our technology. Exports of glass packaging from GCA made up more than 15% of our total revenue in 2019, up more than 500bps from last year."

## Environmental spotlight

"Turkey has a glass packaging production capacity of approximately 1.5 million tons in total and there are currently five local manufacturers in the industry" Mr Gayret confirmed. "We are evaluating the possibility of the capacity to increase next year. GCA has already been established with an infrastructure suitable for multi-furnace positioning."

To remain competitive, it would not just be enough to produce more. The requirements of modern customers both in Turkey and in the global market have become more sophisticated in recent years. This is clearly apparent from the 10 global consuming trends conducted by Euromonitor International.

"To illustrate the point, 'Everyone is an expert' (one of the trends) expresses the switch in power from retailers and brands to the consumer" Abdullah Gayret explained. "Previously, shoppers relied on brands for information to find and get what they wanted; now, companies must constantly innovate, drive prices down and streamline and increase aesthetics of their offerings to entice shoppers" he added.

"Recently, consumers both in our country and abroad have tended to prefer buying food and beverage products in glass packaging for several reasons; glass material's lack of interaction with food or beverage stored inside, protection of taste and odour of the product, resistance to internal ▶



A second furnace investment is planned for 2020.



GCA has a capacity of 400 tonnes/day.

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The GCA Kutahya glass container plant began operations in February 2015.

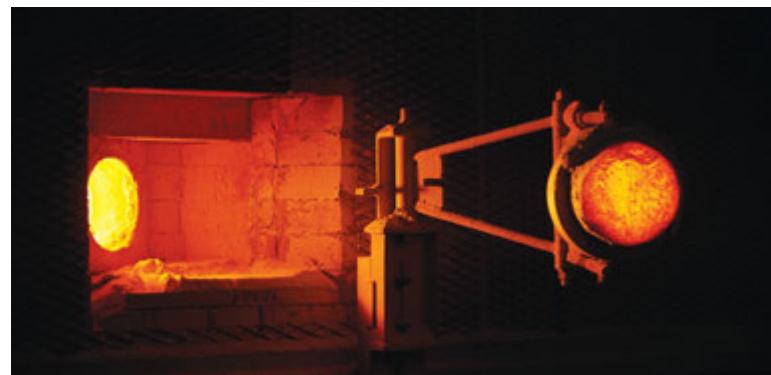
pressure, possibility of sterilisation, transparency and chemical resistance. In addition, from an environmental perspective, we observe an increasing sensitivity on a consumer basis, as they request eco-friendly and recyclable packaging materials. As a glass packaging manufacturer, we will continue to raise awareness among consumers about recycling, as well as the sustainability of glass packaging" Mr Gayret confirmed.

In addition, the Turkish Government is pushing consumer preferences towards eco-products, especially when it comes to food packaging. In early 2019, it was confirmed that deposits will be imposed on beverage containers by 2021 as part of its zero waste activity, as it endeavours to ensure Turkey's 8000km coastline. The deposit return system is planned to diminish marine and terrestrial litter, as well as supporting a new ban in the country on the land filling of packaging waste.

For the same reason, the government is stimulating glass recycling. "Glass packaging manufacturers (in Turkey) are today obliged to use 12% cullet by law" Abdullah Gayret confirmed "and this rate will increase by 3% every year. It is anticipated that glass recycling will increase in the next five years, a development that will also lead to the establishment of new recycling facilities and the creation of new business opportunities.

"With the use of recycled glass, we are able to save a considerable amount of energy. Use of cullet helps reduce air pollution, raw material waste and water consumption. Of course, we also protect our natural resources such as sand, soda and lime. For this reason, GCA is a glass packaging manufacturer that undertakes and supports various projects that will raise the awareness of consumers in order to protect nature and care about environmentally-friendly production."

According to Mr Gayret, the recycling of glass packaging is extremely important for environmental health and the economy. "To illustrate this point, the cost savings of recycling are in the use of energy. Compared to making



Exports are undertaken to customers throughout the Middle East, Africa, Europe, Australia and America.

glass entirely from raw materials, cullet melts at a lower temperature, so we can save on energy needed to melt the glass when cullet is introduced into the furnace" he explained.

## Digital transformation and growing capacities

Today, GCA has one furnace, with another furnace investment planned for 2020, in an effort to increase the company's overall production capacity. This requires a further increase in export performance.

"GCA is a company that provides service quality at a global level, which enables us to be a trustworthy supplier for international companies and countries" says Abdullah Gayret. "We currently carry out export operations in multiple countries and regions, especially in the neighbouring region of the Middle East, Africa, Europe, Australia and America.

"There is no doubt that we always try to stay up-to-date with global trends in our industry and increase our market share in international markets. For this purpose, we participate in several of the most important international food and beverage fairs and trade shows such as Anuga in Germany, Gulfood in Dubai and Sial in Paris. This allows us to meet the top food and beverage companies that are pioneers in their respective sectors" Mr Gayret added.

It is clear, however, that the future will belong to the most advanced and efficient companies, so digitalisation is also considered one of the top goals for the company. "On the technology side, we believe that machine learning and artificial intelligence tools, which are the main aspects of digital transformation in the industry, will play an active role in all processes, thus creating new customer experiences and needs" the GCA General Manager confirmed. "We professionally use digital marketing methods and increase our brand recognition to reinforce our competitive edge in the market. Research and development, engineering, innovation and industry 4.0 are among our top priorities as a glass container manufacturing company. Today, our LAV glass tableware business is one of the few companies that designs and manufactures its own manufacturing machinery in the glass tableware industry. Furthermore, we carry out our research and development activities extensively on the design and development of our glass machinery, increasing the efficiency of our existing production machines and developing new projects for customers" Mr Gayret explained.

"We have been collaborating with universities both in Turkey and abroad to realise new product development projects and creating systems adapted by industry 4.0 for enhancing our efficiencies during all production processes" he added. "Our goal is to increase our export figures each year and to provide better quality service to customers. GCA aims to be one of the leading players in the glass packaging industry worldwide" Mr Gayret concluded. ●



Exports of glass packaging from GCA made up more than 15% of total revenue in 2019.

### About the author:

Vladislav Vorotnikov is an independent international journalist



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# Turkish flat glass industry trends

Located at the crossroads of the Balkans, Caucasus, Middle East and eastern Mediterranean regions, Turkey occupies a unique geographic position, lying partly in Asia and partly in Europe. Throughout its history, it has acted as both a barrier and a bridge between the two continents. The same can be said about the country's flat glass industry. Sunder Singh provides his personal overview of Turkey's flat glass sector.

The Turkish flat glass sector has witnessed steady capacity expansions by two flat glass producers in recent years. The country's population (more than 83 million at the end of 2019), high urbanisation rate, average construction sector growth and a significantly large automotive industry has enabled Turkish glassmakers to register satisfying growth rates in their domestic market. However, demand in the last 18 months (starting from the second half of 2018) has not been at expected levels. Export markets have become a key focus, as the domestic market is unable to absorb the huge capacity additions of recent years.

The local availability of key raw materials, particularly soda ash and silica sand has enabled Turkish flat glass producers to achieve competitive production costs, despite high energy costs. In fact, with some recent acquisitions and new capacities, Turkey has become among the largest soda ash producing countries on a global scale. Sisecam Group, the country's largest flat glass producer, is also among Turkey's largest soda ash producers.

The availability of skilled manpower costs (lower than Europe but higher than most of the Asian countries) has also benefited the industry. However, high fuel prices have been a major headache. Energy price hikes in 2018 also coincided with the drop in domestic demand for flat glass products. Turkey is an energy import-dependent country and recorded \$43.0 billion of net energy imports in 2018, increasing from \$32.9 billion in 2017, which itself had increased from \$24.0 billion in 2016. Although the government has been heavily promoting new domestic energy projects, these have not yet significantly decreased the need for imported energy.

## Architectural glass

For a number of years, architectural glass was the main demand driver of flat glass in Turkey. The country



Istanbul's increasingly glass-dominated skyline.

registered huge growth in architectural glass demand during 2002-2013. In the following four years, the country registered subdued growth in architectural glass consumption. However, the last two years have seen negative growth.

The Turkish construction industry experienced a period of extended growth until early 2018, reflecting increases in per capita GDP, which led to an increase in demand for architectural glass applications in commercial and residential sub-segments. However, Turkish flat glass consumption was severely impacted by macro economic conditions in Turkey in 2018, including as a result of the depreciation of the Turkish Lira and an increase in inflation, which negatively impacted the cost of construction materials, leading to a slowdown in construction activity.

## Automotive glass

Automotive glass makes a significant contribution in Turkish flat glass output. As Turkey is an important automotive manufacturing hub for a number of leading global automotive producers, automotive glass has achieved high importance for both primary producers and secondary glass processors.

In 2018, automotive production in the country amounted to 1.55 million units. Nearly 85% of output was exported. The country registered a growth rate of 7% when compared to 2017 rates, rising to about 1318 million units in total. In monetary terms, the Turkish automotive industry exported \$32.2 billion worth of vehicles in 2018.

## Performance factors

A number of factors have impacted Turkish flat glass industry growth in the last two years. While some of these factors are cyclical in nature, others are expected to drag the growth to lower levels for some time.

Turkey's construction industry, which has been going through a slowdown in the past two years started showing signs of a possible recovery around mid-2019, according to data from Turkish Construction Material Producers (IMSAD), which represents the industry. New construction orders rose 2.9% in August 2019 from July. It was the second month of gains. Projections for 2020 indicate that it would not be a conducive year for the country's construction sector, which may keep flat glass consumption at low levels.

Turkey's construction industry was among the worst hit by a severe economic downturn, sparked by a currency crisis in 2018. Scores of companies have closed, while others have been forced to seek bankruptcy protection, repay bank loans or ▶



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restructure them as the housing market slumped and projects ground to a halt.

The Turkish economy is estimated to have declined by 2.0% in 2019 on an inflation-adjusted basis and grow by 2.0% in 2020, underpinned by persistently high inflation, declining investor confidence and deteriorating financial conditions.

A sustained deterioration in the macro economic environment in Turkey would lead to a more challenging business and operating environment for the country's flat glass industry. Flat glass production is also expected to be negatively affected by slowing global economic growth and heightened trade tensions.

High inflation in the domestic market has been one of the main culprits of lower flat glass demand in Turkey in recent years. The local economy has experienced significant inflationary pressures. Consumer price inflation was 7.4%, 8.2%, 8.8%, 8.5% and 11.9% in 2013, 2014, 2015, 2016 and 2017 respectively, with producer price inflation of 7.0%, 6.4%, 5.7%, 9.9% and 15.5%, respectively in these years. In 2018, annual consumer price inflation was 20.3% due to energy price increases and depreciation of the Turkish Lira, while annual producer price inflation was 33.6% due to the increase in both intermediate and commodity prices in terms of the Turkish Lira.

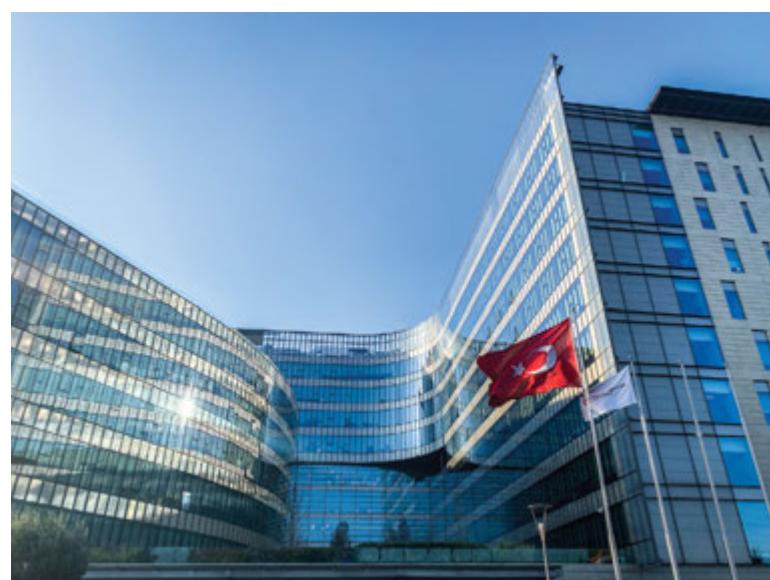
### Sisecam

Operating as part of the Sisecam Group, Sisecam Flat Glass is the largest flat glass producer in Turkey. The company, which entered flat glass production in 1961 by using Foucault sheet technology in Cayirova has gone on to become Europe's largest flat glass producer.

Operating in four main product categories consisting of architectural glass (flat glass, frosted glass, mirrors, laminated glass, coated glass, glass for architectural applications), automotive glass, solar energy glass and white goods glass, Sisecam Flat Glass serves nearly all sub-segments of the flat glass industry such as construction, automotive, energy, white goods, furniture and agriculture.

The company operates a total of seven float glass plants at four different locations (Kirkclareli, Mersin, Bursa and Ankara) in Turkey. It also operate an automotive glass plant in Kirkclareli. In the second half of 2020, the company is expected to commence commercial production from its second flat glass plant at Platali, which was initiated in 2018, with a design capacity of 750 tons/day. As a result of this investment, flat glass manufacturing capacity at the plant will jump to 1675 tons/day, while boosting the value-added production capabilities of the facility.

As part of its expansion between 2007 and 2019, Sisecam's flat glass division has made several investments in new production lines, including two float lines and a coated glass line in 2007 and a laminated glass line in 2008, all in Yenisehir, an energy glass line, a frosted glass line and a mirror glass line for the Mersin plant in 2010, 2011 and 2012 respectively and a float line and laminated glass line for the Polatli plant in 2014 and 2016 respectively. In 2018, the group



Istanbul's University Hospital Koch makes extensive use of architectural flat glass.

commissioned a second coating line with a capacity of seven million square metres/year at the Yenisehir plant.

Globally, Sisecam's flat glass division has an installed capacity of over three million tons with 13 operating lines, three encapsulation plants, four automotive glass plants and two secondary process plants for automotive glass. The flat glass group's geographic footprint provides cost-competitive benefits by minimising the costs for transportation and logistics, which is crucial for the distribution of flat glass products. The expanding geographical spread of the company's warehouses enhances the synergy within the group's operations. In addition, the group's strategic location of production facilities provides advantageous access to both rapidly growing regional markets and mature markets.

Architectural glass represented 64.5% of the Sisecam's flat glass revenues in 2018. The rest was accounted by automotive and consumer glass products. During the first six months of 2019, Sisecam's flat glass division achieved TRY 3.3 billion of sales revenue, equivalent to €515 million, which grew by 28% year-on-year in TRY terms. The company experienced a 7% year-on-year

decrease in sales volume, due mainly to a slowdown in Turkish operations. The underlying weakness in Turkey was a reflection of reduced demand in the construction industry that led to more than 20% contraction both in sales volume and overall market demand.

### Duzce Cam

Established in 2007, Duzce Cam Sanayive Ticaret AS is the other float glass producer in Turkey. Its manufacturing facilities are located in Duzce 2nd Organized Industrial Zone, about 220km from Istanbul. The company commenced commercial production of float glass in 2010, with an installed capacity of 600 tonnes/day.

In 2016, Duzce Cam added a second float glass line with an installed capacity of 800 tonnes/day, taking overall installed capacity to 1400 tonnes/day. Commercial production from the second float line started in 2017. The company claims that its new float line incorporates the latest melting technologies, in compliance with quality, output and energy performance objectives, for the production of architectural and automotive glass. Duzce Cam produces glass with thicknesses from 3mm to 12mm. In addition to float glass, the company also operates a laminating and mirror production line. ●

#### About the author:

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#### Further information:

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Company	Manufacturing plant	Location	Commenced	Products production
Sisecam	Trakya Cam Sanayii AS	Kirkclareli	1981	Flat glass, mirrors, lacquered glass
	Trakya Cam Sanayii AS	Mersin	1996 and 2000	Flat glass, patterned glass, mirrors, lacquered glass
	Trakya Yeni Sehir Cam Sanayii AS	Yenisehir	Two float glass lines and a coating line in 2007	Flat glass, laminated glass, coated glass
	Trakya Cam Sanayii AS	Polatli, Ankara	First line in 2014. Second line in second half of 2020	Flat glass, laminated glass
Duzce Cam	First line of 600 TPD	Duzce	2012	Flat glass
	Second line of 800 TPD	Duzce	2017	Flat and automotive glass

Table 1: Flat glass production facilities in Turkey.



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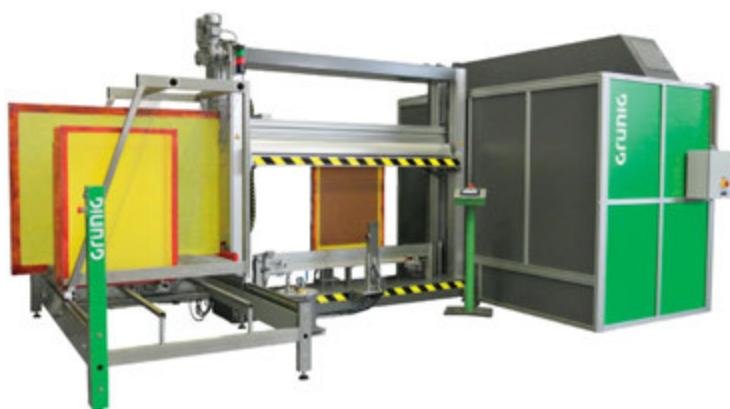
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# On the Spot... Hisatsugu Ishizuka

As President of the Japan Glass Bottle Association (JGBA) and the Ishizuka Glass Group, Hisatsugu Ishizuka spoke exclusively to *Glass Worldwide*, preferred journal of the JGBA, about prevailing market conditions in Japan, the priorities of the association and his company's diverse activities in traditional and advancing sectors.

**GW: What does it mean to you to be President of the Japan Glass Bottle Association (JGBA)?**

I joined the JGBA in 2004 as a member of the Steering Committee and am currently serving my second term as President, having initially carried out the role for a two year period in 2013.

Ishizuka Glass has been a member of the JGBA since its establishment in 1952 and I believe that the role of President is to take a positive lead for the glass bottle industry in Japan. The position of President rotates every two years with a representative from Ishizuka Glass, Nihon Yamamura Glass and Toyo Glass.

With authority related to the general management of the association as a decision-making body, the Board of JGBA Directors appoints a President, Vice President and Executive Director.

**GW: What do you consider to be the primary objectives of the JGBA?**

As an industrial association of glass bottle manufacturers, the JGBA aims to contribute to the improvement of people's lives, enhancing the business of glass bottle manufacturing and related industries and also innovating



The head office of Ishizuka is located in Iwakura, which also sites one of the two glass bottle production factories.

technology related to the industry.

Under the Board of Directors and Steering Committee that acts as an advisory body, six committees carry out activities to create solutions on various issues and facilitate the organic growth of the industry. The direction of JGBA's business operations is based on public relations and environmental activities, as well as other actions carried out by the individual committees.

Recent initiatives include increasing public awareness of the value of glass bottles by communication and education and also the collection and provision of market information.

**GW: How does the JGBA co-operate with other glass associations around the world?**

The JGBA interacts directly with FEVE, the European Container Glass Federation, for example. In addition, we have traditionally shared good relations with the Glass Packaging Institute in the USA and hope to re-establish that relationship to explore mutual opportunities. ▶



Since the company's establishment in 1819, Ishizuka has provided a variety of glass products.



For tableware production, Ishizuka utilises technology from such leading suppliers as Forma Glas, Ishizuka Machine Techno and Olivotto Glass Technologies.

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The combined annual production capacity across the Iwakura and Himeji factories is 150,000-160,000 tonnes.



From the 1880s, Ishizuka's main produce has been glass bottles.

**GW: How important to Ishizuka Glass is membership to the JGBA?**

I consider benefits of the JGBA membership to include:

- Access to various market-led information related to the glass bottle industry.
- Participation in workshops and lecture seminars etc.

- Networking with fellow members by participating at association events.
- Participating in public relations activities.
- Various environmental activities (the 'Three R's', CO<sub>2</sub> reduction etc).
- Sharing of labour information.

**GW: What is your background with the Ishizuka Glass Group?**

I joined the company in 1997 and following a spell as a Director, President and COO of the Glass Bottle Company of Ishizuka Glass Group, I was appointed Representative Director and President in 2013, with responsibility for all business segments and the general management of the Ishizuka Glass Group's subsidiaries and affiliated companies. ▶

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we're on it.



The company's tableware facilities coexist alongside glass bottle production.

**GW: What position does your company currently hold in the Japanese glass industry?**

Having celebrated its 200th anniversary last year, the company was founded in Kani City, Gifu by Iwasaburo Ishizuka, who had learned about glass production technology from a Dutchman in Nagasaki prefecture. From the 1880s, the main produce was glass bottles before expansion in 1960 into the areas of plastic containers, paper packaging, PET preforms for PET bottles and functional glasses (anti-microbial agents). Also, Narumi Corp, the manufacturer of fine bone china known as the brand of Narumi, became a subsidiary in 2015. As a result of this diversification, glass bottles account for approximately 25% of the company's sales, with customers mainly from the alcohol and food industries.

With a market position of third place in the domestic market for glass bottles and second position in the alcoholic beverage sector, the company has approximately 2500 employees on a consolidated basis in Japan and approximately 800 employees on a non-consolidated basis.

**GW: Where are Ishizuka's manufacturing facilities located and what capabilities do they provide?**

With a total annual production capacity of 150,000-160,000 tonnes, we operate two furnaces at both of our glass bottle production factories,



Hisatsugu Ishizuka (centre) alongside JGBA dignitaries and Glass Worldwide's Dave Fordham.

located in Iwakura City, Aichi prefecture and Himeji City, Hyogo prefecture. In addition, we operate secondary processing facilities involved, for example, in printing, shrink film wrapping and polymer coating.

**GW: What are the highlights of recent investment initiatives and how do suppliers of technology assist with maximising your production efficiencies?**

The cold repair of one of the furnaces at the Himeji plant was recently completed.

In general, planning and conceptual furnace design (technical investigation, market survey, running cost simulation, the colour of glass, throughput, lifetime of furnace etc) are undertaken by the engineering division within our company and the detailed design and construction of furnaces are carried out by leading manufacturers such as AGC Ceramics and Ihara Furnace.

Both of our glass bottle and glass tableware facilities are coexisting and for forming equipment, we utilise state-of-the-art technology from Bottero Glass Technologies and Bucher Emhart Glass (for bottles)

and Forma Glas, Ishizuka Machine Techno and Olivotto Glass Technologies (for tableware), with lehrs from Nissin Engineering. Inspection equipment is sourced from such suppliers as Nihon Yamamura Glass, Toyo Glass Machinery, Ishizuka Machine Techno, N-Tech and Kirin Techno-System. Caser and bulk palletisers are from Gunze and Fuji Yusoki Kogyo, while decoration/coating technology is from Koenig & Bauer Kammann GmbH and Techno-Tsukihoshi.

**GW: How would you describe prevailing market conditions in Japan?**

Since the shipping volume of glass bottles has been consistently decreasing in the Japanese market, a major issue for the whole glass bottle industry is how to revive demand. With our diversified packaging business segments, Ishizuka has the benefit of being able to differentiate ourselves.

Our philosophy of 'Master the secrets of glass and advance into new fields' has led to the development and commercialisation of functional glass by exploring new possibilities to complement our bottle and tableware activities.

**GW: What are the main activities of the Advanced Glass Company?**

Ishizuka consists of specialised companies, working together to fully share the knowhow of making glass materials, as well as containers and tableware. In our Advanced Glass Company, inorganic glass biocides 'IONPURE' have been developed, using our extensive technological knowledge of glass attained from our traditional businesses.

IONPURE has the advantages of high functionality (anti-microbial efficacy, transparency), excellent cost performance and safety. It is appropriate for various applications such as moulded articles, fibres and coatings. ●



The JGBA aims to facilitate the industry's organic growth.

**Further information:**

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web: [www.glassbottle.org](http://www.glassbottle.org)

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# Local priorities for global flat glass specialist

Masahiro Takeda is AGC Inc's Regional President for building and industrial glass throughout the Asia Pacific region. As well as highlighting his background and current responsibilities within the organisation, Mr Takeda confirms AGC's capabilities and priorities in Japan.



Masahiro Takeda has served as AGC Inc's Regional President for building and industrial glass in Asia Pacific since 2015.

One of the international glass industry's most highly respected brands, AGC specialises in the creation of added value by combining a wide variety of technologies in the fields of glass, electronics, chemicals and ceramics. Employing more than 55,000 people, the group's business extends into more than 30 different countries, with regional structures in Japan/Asia, Europe and the Americas (North and South).

It was in 2018 that the company

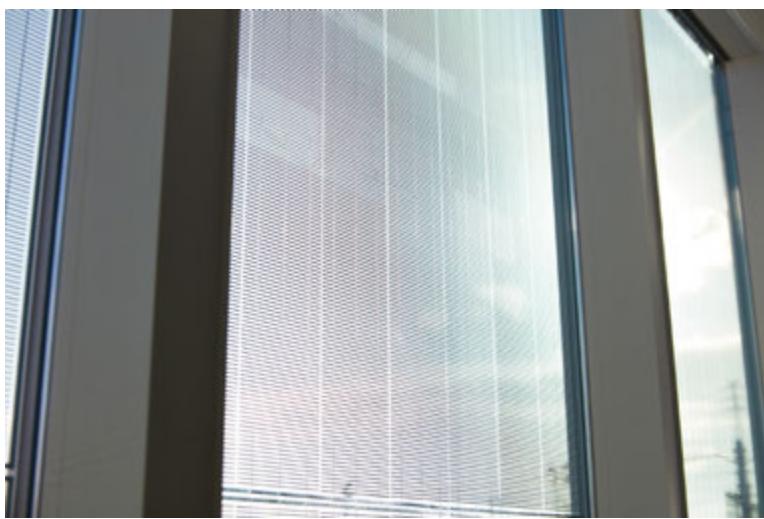


AGC's Kashima factory features an 850 tons/day float glass line.

name was changed from Asahi Glass Co Ltd to AGC Inc, establishing a brand statement that continues to be central to all communications from the AGC Group: 'Your Dreams, Our Challenge'. For more than a century,

AGC has strived to develop technologies that will change the world, its materials, solutions and partnerships helping to facilitate key innovations across diverse industries and markets.

Created in 1907 to manufacture sheet glass for domestic Japanese consumption, AGC is still firmly rooted in the glass technology business and remains one of the industry's main global players. In Japan, the company's float glass activities satisfy some 40% of total demand.



A dedicated research centre has been opened to speed up the development process for new products, including Sunjoule BIPV.



AGC's recently developed glass antennas add cellular base station functions to windows.



AGC's Kashima float glass activities satisfy some 40% of local demand.

Masahiro Takeda, who has worked for the organisation for almost four decades, is currently responsible for all architectural glass activities in a market that extends from Pakistan to New Zealand. After graduating from university, he joined AGI's Corporate Communications Division in 1982, before assuming responsibility for the sales and marketing of insulated glass units and sales of functional glass to home builders. A three year stint as Director of Sales and Marketing for the glassmaker's Indonesian operation preceded an assignment as Japan Marketing Group Leader, with responsibility for promoting the dissemination and market expansion of such materials as Low-E, interior and laminated glasses, including crime prevention materials. Subsequently, Mr Takeda enjoyed senior management roles in China, before becoming a Strategy and Planning Division Leader to AGI's Regional President for Asia Pacific, Building and Industrial Glass Company. He became President of AGC Glass Products in 2012. After a year, he was based in the USA for a short time and has served as AGC Inc's Regional President for building and industrial glass in Asia Pacific since 2015.

Today, AGC Inc employs more than 6600 people and specialises in the production of float glass for architectural and industrial use, figured/polished and wired glass, as well as sophisticated Low-E coated glasses for IGU and interior duties. Operated almost exclusively to accommodate local demand, the company's Japanese foot print includes an 850 tons/day float furnace and a separate 310 tons/day furnace for figured/polished glass, as well as two specialist coating lines.

Highlights of AGC's ongoing investment strategy for Japan have included the completion of a dedicated research centre to speed up the development process for new products. Recent technical innovations are the introduction of glass antennas that add cellular base station functions to windows and Halio smart glass. A mechanism has also been developed in-house that is expected to benefit the entire supply chain within the AGC Group.

The company is now increasing its investment in the production of highly functional double glazed glass, while also prioritising investments in digital platforms to optimise production capabilities. This includes the introduction of an advanced order receipt system, as well as preparing for the arrival of building information modelling (BIM) in Japan, involving online quotations based on drawing data for buildings. ●

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Koji Yamamura has been President and CEO at Nihon Yamamura Glass Co Ltd since 2013.

## In-house R&D and internationalisation deliver success

Nihon Yamamura Glass Co Ltd has been Japan's leading glass container producer for several years, this despite challenging times for the company and for the industry as a whole, with PET performing particularly strongly in the local packaging market. As Koji Yamamura, President and CEO explains, Nihon Yamamura Glass Co Ltd has benefited greatly from in-house R&D and joint venture glass projects in the Philippines, Vietnam and China, with a separate joint venture initiative currently under construction in the USA.

It has been a difficult few years for Japan's glass packaging community, following the introduction of PET and its success in several traditionally strong glass user markets. Unlike many other countries around the world, Japan's glassmakers are still to benefit significantly from the recent resurgence of glass packaging demand as a result of increasingly negative environmental publicity about plastics. Since the highs of the late 1980s, culminating in the industry's best annual performance in 1990, this situation has resulted in the local glass industry's consolidation, as some production capacity has closed and key businesses have merged.

### Market leader

With a rich tradition of glass container production dating back to 1914, Nihon Yamamura Glass Co Ltd (NYG) has retained its position as Japan's most influential and respected glass container manufacturer throughout this difficult period. The NYG Group currently operates four container plants in Tokyo, Saitama, Harima and Nishinomiya and satisfies approximately 40% of domestic demand.

Separately, NYG's New Glass Company subsidiary and its related businesses (five locations in Japan and one in Taiwan) also manufacture glass powders, pastes and substrates etc for the automotive, energy, electronics

and semiconductor industries, together with opto-electronics parts for the high speed optical telecommunications industry.

Yamamura Photonics produces customised, hermetically sealed glass parts such as x-ray tubes and vacuum tubes. This includes opto-electronic parts such as flat window and lens caps, glass lids and glass diffusers for high speed optical telecommunications and substrates for low temperature co-fired ceramics.

YTF produces filler materials for applications in the semiconductor industry and Yamamura Kinik Optical in Taiwan also makes moulded aspherical lenses for high speed optical telecommunications.

NYG President and CEO, Koji Yamamura joined the business as Finance Manager in 1991 and headed the group's plastics division, prior to taking over responsibility for the whole group. He has led the company for the past 17 years. Among the key influences on Mr Yamamura's glass industry management career is Noboru Ogawa, former

NYG Chairman and President. "He was a very strong decision maker" Koji Yamamura explains. "His way of leading the company influenced many people within the organisation and I hope that some of the culture he fostered is still blended into the company today."

Currently, NYG employs some 800 people in Japan, approximately 650 of whom work within the main glass container operations. This includes many internationally acknowledged experts in the field of production, plant engineering and product design, all assisting the company to deliver an end-to-end quality assurance approach.

An experienced team is responsible for the management of day-to-day operations within the company, including Fumiyoji Kobayashi (NYG Director and Managing Executive Officer and Advisor to the Environmental Office, Corporate Headquarters, Research and Development Centre), Yutaka Myojin (NYG Director and Executive Officer and Executive Vice President and Director of San Miguel Yamamura Packaging Corp) and Mitsuo Ueda (NYG Director and Executive Officer and President of the Glass Bottle Company).

### Focus on people

'Business Rests on Our People' is one of NYG's basic principles. On-the-job training and the adoption of job rotation practises are important drivers for personnel development. Meticulous technical manuals are prepared in-house for this purpose. "We embrace failures of newcomers during their training period" says Koji Yamamura. "People can learn much faster by making mistakes and their experience will vitalise and strengthen the organisation."

A technical assistance programme has also been created, whereby young people are sent to sister factories in the Philippines, for example, to gain valuable international experience.

### Production flexibility

Three of NYG's four Japanese glass container plants (Tokyo, Saitama and Harima) are operated by the Glass Bottle Company, which in total has nine melting furnaces and employs a combination of blow-blow, press-blow and NNPB processes to produce ultra-lightweight bottles (JGBA lightweighting 'L index' between 0.6 and 0.7), as well as super ultra-lightweight bottles (L index below 0.6).

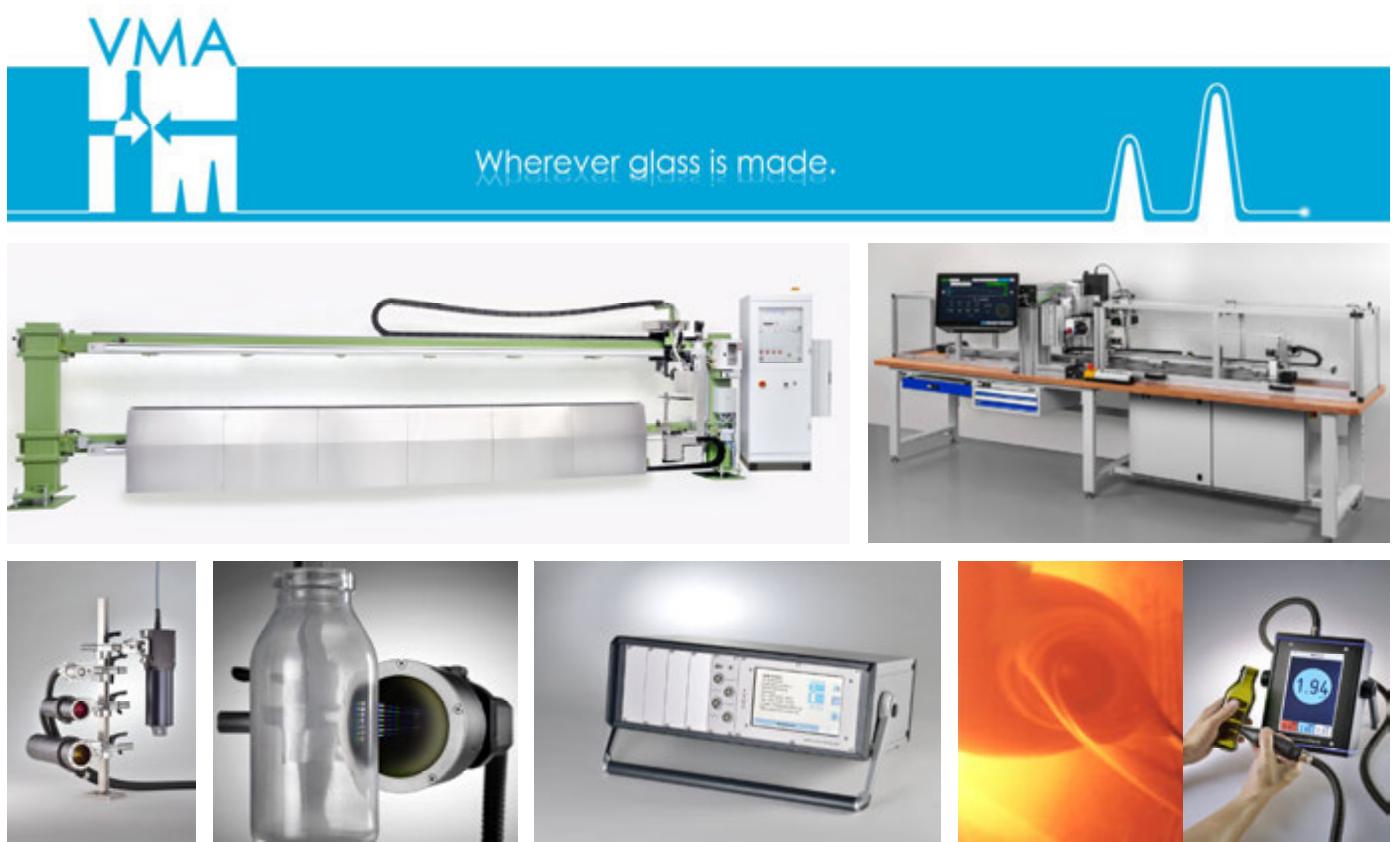
The Tokyo and Saitama factories are close to one another in the east of the country, with the Tokyo plant having a smaller furnace and specialist decoration technology for short production runs and the Saitama plant having forehearth colouring to produce different colours, thus providing a balanced portfolio. The Harima plant also houses a colouring feeder to supply different colours in the west of Japan. Bottles can be produced in colours ranging from standard flint and amber to different shades of blue, green etc and featuring ACL printing and pre-attached labels. In particular, the company focuses on glass bottles for food and beverages, especially Japanese sake, alcoholic beverages and functional drinks. The plants are highly flexible and are capable of producing various ware sizes from 30ml to 4000ml.

Separately, the single plant Yamamura Glass Works subsidiary in Nishinomiya is equipped to produce small lot bottles in customised colours and shapes.

NYG plants are characterised by quick turn-arounds and flexibility, with fast job change times between production runs. This facilitates the production of more than 1000 ware types every year, as well as small runs. Investments in the Japanese operations are generally focused on repairing one furnace annually to ensure maximum productivity.

In recent years, the weight of 500ml returnable beer glass bottles has been reduced by 20%, leading to additional savings in terms of resources and energy consumption, as well as enhancing logistics efficiency. This resulted in a World Packaging Organisation Worldstar award in 2018.

NYG has also produced a Worldstar winning 140g, 330ml one-way ultra-lightweight beer bottle, capable of ▶



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Installed at the NYG Tokyo plant is a prototype NOx reduction system, a development project with Osaka Prefecture University and NEDO.

withstanding the required internal pressure strength for beer. Despite the thinner wall thickness, this bottle also maintains the required ultraviolet absorbing performance needed to protect the contents.

#### International focus

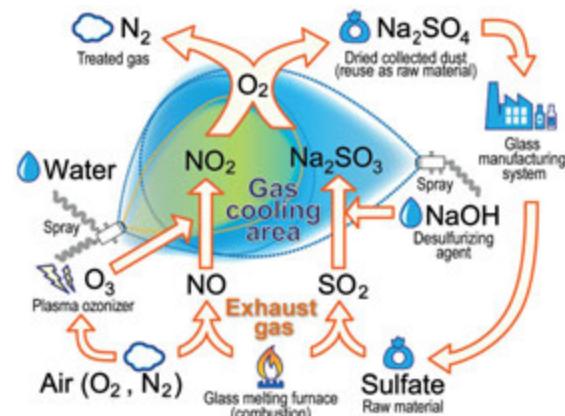
Faced with reduced market opportunities locally, the Japanese glassmaker has increasingly turned its attention to international prospects. "We are fortunate to have made many good contacts overseas" Koji Yamamura confirms "and our successful joint venture with San Miguel Corp in the Philippines has been very rewarding." Today, San Miguel Yamamura operates three glass factories in the Philippines, plus one each in Vietnam and China, with NYG having another fully-owned glass factory in China.

"And now, we are also involved in the Arglass Yamamura project in the USA, having been introduced to Jose de Diego Arozamena (Chairman and CEO of Arglass Yamamura) when exporting glass bottles from China to the USA." It was in 2019 that NYG decided to invest in Arglass Yamamura together with Cambium Arglass. This joint venture is currently building a greenfield glass bottle manufacturing plant in Valdosta, Georgia, USA, which will supply the needs of customers for flexibility, efficiency and customisation. A detailed profile of the Arglass Yamamura project can be found in the January/February 2020 issue of *Glass Worldwide*.

Although exports from NYG's Japanese plants are minimal, approximately 11% of consolidated sales are currently generated overseas. Via an extensive global network, the

glassmaker is active in various regions, notably China, South East Asia, Oceania and the USA. This international focus complies with NYG's medium-term vision... 'Towards a Global Yamamura: Conveying Yamamura's Heart and Technology to the World'.

NYG is a founding member of International Partners in Glass Research and is working hard with other members around the world to deliver a positive future for glass packaging. "IPGR is important for us because the other members are also high end technology companies and our regular meetings help us to remain aware of the latest technologies and what needs to be done" Koji Yamamura explains. "In order to be of



Flowchart of the NOx reduction process. Source: IEEE transactions on industry applications, vol 55 No 6, November/December 2019.

even more value to customers and consumers, we continue to investigate lightweighting, as well as decorating and how to add more value to bottles and help them to stand out from the crowd. Premiumisation is important, especially for spirits and whisky bottles."

#### Advanced production knowhow

In addition to producing bottles, the company also develops much of its own high quality manufacturing equipment and technologies in-house. The dedicated Technical and Development Department of NYG's Glass Bottle Company specialises in all aspects of the glass production process, performing research and development to continuously improve production in such areas as production speeds, efficiencies, quality, product differentiation and reduced environmental impact. As well as serving the glassmaker's in-house requirements, this organisation delivers equipment to fellow glassmakers throughout the world.

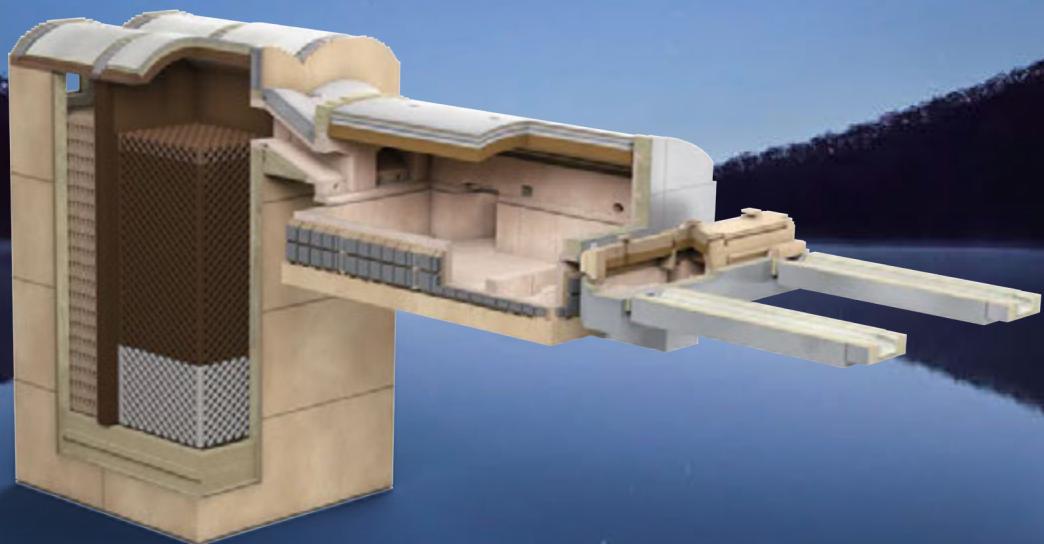
In addition to designing its own melting furnaces, for example, NYG builds most of its own IS machines and inspection equipment. "Customising much of our own technology ensures that we satisfy our customers in Japan" ▶



The NYG Saitama glass plant features rooftop solar panels.

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Cross-sectional view of a lightweight returnable beer bottle, showing the contrast before and after lightweighting.

says Koji Yamamura. "It's all about productivity and quality. Our in-house technology differentiates us, so if there is room for process improvement, we can implement changes immediately, without seeking external assistance."

Where appropriate, however, specialist equipment is also sourced from leading international suppliers, including forehearts from Fives Stein and Sorg and decorating machines from Fermac.

NYG has developed its own IT system and successfully installed it on all glass bottle production lines. This system quickly and automatically

detects, analyses and provides real-time feedback on problems that occur on the production line, allowing personnel to initiate fast and targeted action to resolve problems. Separately, the glassmaker is also evaluating the application of artificial intelligence to further ensure that products shipped are problem-free.

Among the commercially available control solutions invented by the Glass Bottle Company's Technical and Development Department are the MTC II (Mould Temperature Control) and AGM (Automatic Gob Weight Measurement) systems. The MTC II can control both blank and blow side mould temperatures by measuring each mould temperature using thermocouples and modifying cooling time as needed, in order to control the temperature to a desired setting. The system can control mould temperatures to between  $\pm 2^\circ\text{C}$  of the setpoint and also assists in fast mould temperature recovery after stoppages.

The AGM system uses cameras and image processing to capture images and create a 3D model of each falling gob. From these 3D models, the weight, length, shape and tilt angle of each gob are determined and the operator is alerted to any deviation from the desired settings for each item. The system can also automatically control the weight to  $\pm 0.5\%$  of the gob weight.

For cold end and inspection applications, wall thickness sensors are produced for non-round bottles and automatic bottle dimension measurement. Automatic capacity measurement systems are also available.

In addition, NYG provides



The Mizkan super ultra-lightweight one-way vinegar bottle.

technical assistance services to international glass bottle manufacturers to improve such areas as production efficiency and quality assurance.

#### Environmental challenge

A series of measures have been adopted to reduce the environmental impact of NYG operations, to develop deNO<sub>x</sub> systems and to stimulate the use of renewable energy technologies etc. Subject to availability, increased cullet levels are used in the raw materials mix, approximately 70% for flint compositions and 90% for amber, including in-house cullet.

"Currently, we are leading the development of new technology for the removal of NO<sub>x</sub> and SO<sub>x</sub> in exhaust gases without comprising energy efficiency, in collaboration with Osaka Prefecture University and the New Energy and Industrial Technology Development Organization (NEDO) of Japan" Koji Yamamura confirms. "A plasma and chemical hybrid process (PCHP) is used to reduce both NO<sub>x</sub> and SO<sub>x</sub> and the technology is currently being evaluated at our Tokyo plant for future commercialisation."

#### Further information:

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web: [www.yamamura.co.jp](http://www.yamamura.co.jp)



Cross-sectional wall thickness comparison of 'ultra-lightweight' and 'super ultra-lightweight' glass bottles. The 'super ultra-lightweight bottle' is used for the Mizkan vinegar bottle).

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# Glass wool insulation specialist targets eco-friendly growth potential

Francis Cholley highlights the present-day priorities of Saint-Gobain Glass in Japan, with emphasis placed on the group's glass wool business.

As a worldwide leader in the delivery of sustainable habitats, Saint-Gobain combines its products and services into innovative solutions that address not only customer needs but also the global challenges of growth, energy and the environment. The Asia-Pacific region has remained a priority in the group's international expansion strategy, having opened its first site in the region in Japan in 1917. Today, Saint-Gobain Japan employs approximately 900 people, working in building and automotive glass, ceramics, plastics, crystals, abrasives, technical fabrics and insulation, supplying leading industries with sophisticated products and technical services.

The Japanese market for technical materials is one of the world's most advanced, requiring high quality production. Saint-Gobain views Japan as a centre of innovation and strives to meet customer expectations for improvement and perfection. In essence, the company offers various products and solutions for sustainable buildings, cleaner transportation, quality healthcare and high performance manufacturing.

## Extensive management experience

Francis Cholley has been closely involved with the development of Saint-Gobain's glass industry activities throughout the Asia-Pacific region for more than two decades. As CEO Japan for the group's construction materials business, he is currently responsible for the management of two legal entities (one for insulation and another for building glass), two production facilities, 400 employees and a turnover of approximately €200 million. In addition, Mr Cholley is Chairman of the national industry organisation, the Glass Fiber Association of Japan. Other members of this organisation are Asahi Fiber Glass Co Ltd, Oneworld Co Ltd, Nittobo Group (Paramount Glass), Central Glass Co Ltd, Owens Corning and Nippon Electric Glass.

Having joined Saint-Gobain in 1994, he spent 21 years in the group's automotive glass business unit, including a period as Managing Director of Saint-

Gobain's automotive glass business in China. He also spent five years as Managing Director of the MAG-Isover glass wool business in Japan.

"When you lead a company as a Managing Director, you learn to manage all aspects of a firm, from sales to quality, from supply chain to production, as well as HR and finance" Francis Cholley confirms. "You never get bored because of the variety of challenges faced and you learn how to balance between issues that are sometimes antagonistic."

And among the greatest challenges faced in the role is the ability to lead in times of disarray, to control the response and continue to satisfy stakeholders. For example, in the case of a quality crisis, this involves controlling damage in the market, while alleviating customer concerns and convincing them that the correct counter-measures have been taken, as well as retaining their trust.

## Insulation opportunities

According to Francis Cholley, Japan's insulation standards are less stringent than those encountered in Europe, providing important future growth opportunities for glass wool and similar insulation materials. Saint-Gobain acquired the MAG business in 2008 in recognition of this valuable market potential. "MAG is a market leader for insulation products and represented the perfect entry point for Saint-Gobain" Mr Cholley confirms.

MAG-Isover has two plants in Japan, both located in the Ibaragi prefecture (north east of Tokyo). Both plants manufacture conventional and user-/eco-friendly non-formaldehyde products. The Akeno factory produces residential and HVAC glass wool products, while the Tsuchiura site specialises in residential and pipe cover glass wool products. Current and future investments at both sites are focused on the attainment of productivity improvements, including a series of digital platform initiatives. With all output sold to the Japanese market, MAG-Isover currently satisfies 30% of local demand.



Francis Cholley is CEO for the Saint-Gobain Group's construction materials business in Japan and Chairman of the Glass Fiber Association of Japan.

It was in 2016 that the company launched its Isover Standard and Isover Comfort ranges of eco-friendly products, both of which feature natural binders. It is the only company in Japan to offer such products. In addition, a comprehensive range of air and moisture management films is offered.

In total, Saint-Gobain employs more 400 people in the glass industry. Considerable in-house expertise is maintained in the areas of furnace design, fiberising and product development.

## Challenges and opportunities

According to Francis Cholley, among the main challenges currently facing the company in Japan are a depressed construction market and increased logistical costs. There are some important opportunities to exploit, however, including stricter insulation standards that are expected to compensate for the prevailing market decline and the development of a renovation market for insulation. "Renovation accounts for less than 5% of the insulation market in Japan, while it represents 50% in Europe." ●

### Further information:

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## Container specialist invests in technical advancement

Japan's second largest glass container manufacturer, Toyo Glass has a glassmaking tradition that dates back to the late 19th Century. According to Kiyoshi Kohno, President, the company initiated a major investment programme last year to change fuel types and reduce CO<sub>2</sub> emissions at its two production sites. The benefits of reduced production costs are starting to be realised.

Kiyoshi Kohno's career with Toyo Glass Co Ltd covers more than four decades. He has amassed extensive technical knowledge and experience over the decades, working in quality control and melting technology, as a Factory Manager and Development Director, before being named President in 2018.

Mr Kohno's significant technical expertise continues to benefit the company when developing future sustainable strategies. "I still love glass very much and am pleased to be

working in the industry 41 years after joining this company!"

Toyo Glass advanced lightweighting technology has produced between 30% and 40% weight reductions compared to earlier designs. Mr Kohno recognises that some significant challenges still lie ahead, however, notably the industry's

ability to reduce CO<sub>2</sub> emissions, the potential for using renewable energy sources and for maximising the use of recycled cullet.

As a Director of the Japan Glass Bottle Association (JGBA), Kiyoshi Kohno also understands the wider importance of increasing glass packaging sales, at a time when the local glass industry is downsizing and losing market share compared to competitive forms of packaging. "It is important for the JGBA to stimulate demand, as well as communicating with relevant government officers" he confirms.

### In-house expertise

Established in 1888 as Shimada Glass Factory, Toyo Glass now operates factories at Chiba and Shiga, with production capacities of 650 tons/day and 1066 tons/day respectively. Part of the multi-faceted Toyo Seikan Group Holdings Ltd organisation, the ▶



The Shiga glassworks features four furnaces and 13 production lines.



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glassmaker satisfies approximately 31% of demand in its domestic market, exporting only a small amount of output.

Established in 1971, the Chiba factory has two furnaces and eight production lines while the Shiga factory, built one year later, has four furnaces and 13 lines. Unlike Chiba, Shiga has extensive decoration capabilities, including two ACL printing machines, a labelling line, a shrink film wrapping machine and plastic coating facilities.

In total, the company employs 840 people and benefits from considerable expertise throughout the team. In particular, this expertise is evident in the areas of melting, defect inspection, quality control and maintenance technologies at the glass production sites. According to Kiyoshi Kohno, the series of company training programmes operated provides an important means of maintaining a skilled workforce.

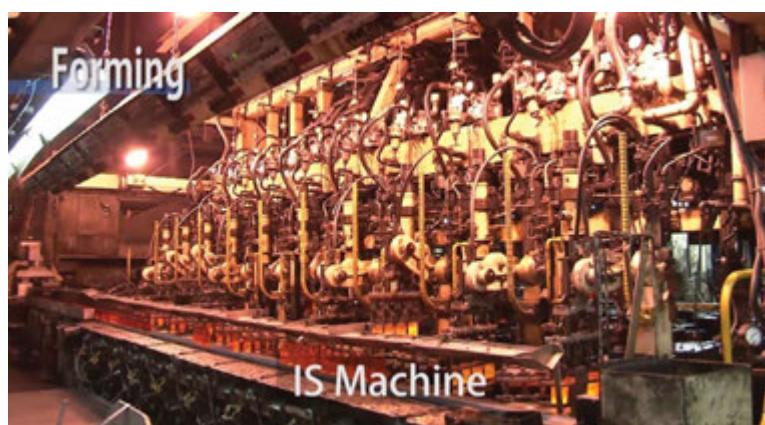
"In order to reduce CO<sub>2</sub> emissions, our most recent major technical achievement is to change all fuel sources from fuel oil to natural gas" Mr Kohno confirms. The larger Shiga plant was converted completely from oil to gas last year and during the next furnace rebuild at the Chiba factory, this plant will follow suit. "The investment at Shiga was considerable but we are now in a position to reduce production costs by saving energy" says Kiyoshi Kohno. "Of course, we also want to make our products as low in cost as possible for our customers, while maintaining top quality. In order to continue our business, it is very important to have measures in place for environmental issues, so there is balancing between environmental and cost considerations."

Glass melting furnaces and inspection equipment are designed and built in-house. "We have been using our own developed inspection machines because there is currently no other inspection technology that meets the needs of the Japanese market. Our subsidiary, Toyo Glass Machinery Co Ltd, also sells our technology to other glass manufacturers" says the President of Toyo Glass.

"We look for the best available technology" Mr Kohno confirms, also explaining that a technical agreement was previously in place with O-I, with whom Toyo Glass is still friends but without an official partnership.

To match Japan's high quality requirements, AI technologies are scheduled for introduction, with investments planned in the development of failure prediction systems for production equipment, furnace control, inspection systems, quality assurance systems etc. As part of the huge Toyo Seikan Group, valuable AI technical assistance can also be accessed. "We are able to introduce state-of-the-art technologies via our R&D Department and amid concerns over labour shortages, we are planning to introduce these technologies faster than other glass manufacturers and seek differentiation" Kiyoshi Kohno confirms.

"With glass being permanently recyclable and very environmentally-friendly, the long-term prospects for our company and for the glass industry as a whole are bright" Mr Kohno explains. "And we are aiming to reach new



A wide range of beverage, food and chemical glass containers is produced at the two Toyo Glass plants.



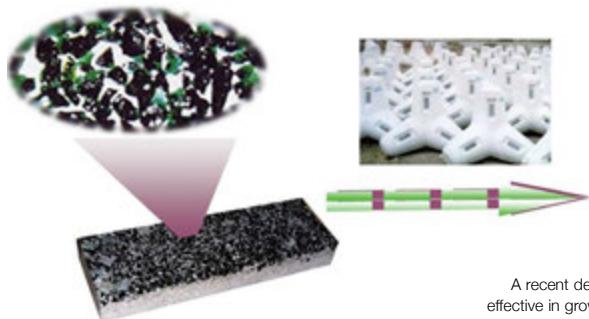
Established in 1971, the Chiba glassworks houses two furnaces and eight production lines.



To match Japan's high quality requirements and to further automate its inspection processes, AI technologies are scheduled for introduction.

markets by achieving radical innovation rather than steady improvement, investing in glass-related products to complement our core business and

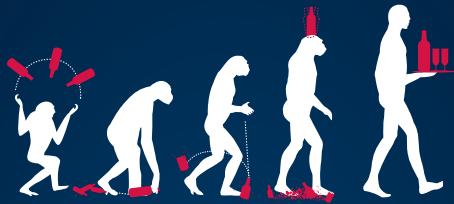
also help to address environmental issues. The R&D Department is also involved in developing a new glass product called 'Ion Culture', which is a water-soluble glass that is effective in growing seaweed that contributes to the reduction of CO<sub>2</sub>. "We want the benefits of glass to be widespread across different sectors" Kiyoshi Kohno concludes. ●



A recent development, 'Ion Culture' is a water-soluble glass that is effective in growing seaweed and contributes to the reduction of CO<sub>2</sub>.

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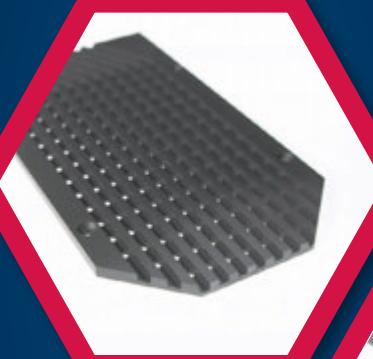
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GLASS HANDLING SOLUTIONS

# Technical glass production focus delivers added value benefits

Tadashi Deguchi discusses the specialised thin technical glass production capabilities of NSG Group's Fine Glass Division.



Tadashi Deguchi is Head of the Fine Glass Division, Technical Glass Strategic Business Unit, NSG Group.

Focused on the development of specialised technical applications for flat glass materials, NSG Group's Technical Glass Strategic Business Unit maintains major fabrication facilities in Japan, China, Canada and Europe, employing approximately 1300 people in five different countries. This strategic business unit is a world leader in thin glass for displays and optical devices for office machinery, as



The NSG Sagamihara plant in Japan.

well as glassfibre materials for battery separators, timing belts etc.

The Fine Glass Division, headed by Tadashi Deguchi, is part of the Technical Glass SBU. Having joined the NSG Group in 1991, Mr Deguchi brings almost three decades' experience in the glass industry, having joined the NSG Group in 1991. "One of the most rewarding aspects of my role is to develop new applications for

glass" he explains. "NSG glanova, for example, is a glass with a new composition, suitable for chemical strengthening. It was originally used as a cover glass for smartphones and tablet PCs but its use has expanded into cars (interior panels) and digital signage."

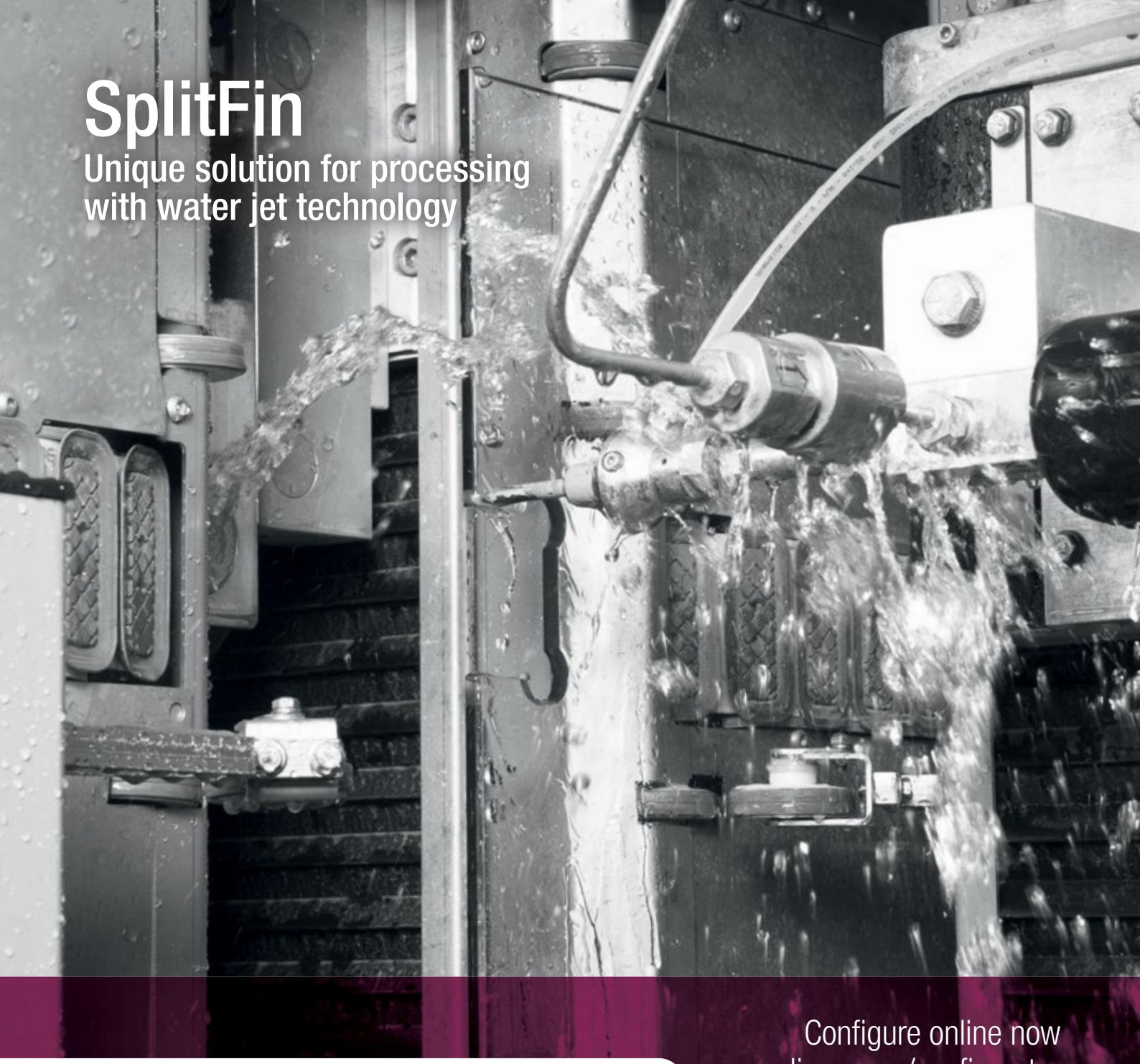
According to Tadashi Deguchi, the greatest challenge for the Technical Glass Strategic Business Unit is to identify genuinely innovative applications for its products. "Thin, sturdy and beautiful glass can be a part of many products and we are working to identify customer needs that are yet to be recognised." ▶



NSG Group currently operates a float line in Maizuru, which is dedicated to the production of ultra-fine-flat and glanova glass compositions.

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#### Global market coverage

Nippon Sheet Glass (NSG Group) was established in 1918 to bring the latest glass manufacturing technology at the time to Japan from the USA. Subsequently, the company has grown into a major global player in the architectural, automotive and technical glass sectors.

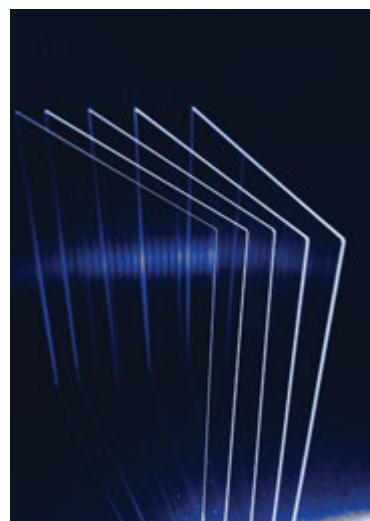
The origins of the Fine Glass business can be traced back to the mid-1970s, when demand for thin sheet glass (less than 1.0mm thickness) used in liquid crystal displays (LCDs) for watches and calculators started to escalate. NSG branded its ultra-thin glass as UFF (ultra-fine-flat) and marketed it as fine glass for electronics components, such as touch panel substrates.

Utilising a dedicated float line for thin sheet glass, NSG

Group launched glanova in 2015 as a new composition glass for chemical strengthening. Clear, with a high capability for strengthening, glanova is now in widespread use as part of smartphone and tablet PC cover glass, car displays, large screen TVs and solar modules.

NSG Group currently operates a float line in Maizuru, Kyoto Prefecture, which is dedicated to the production of these ultra-fine-flat and glanova glass compositions. As part of a long-term transformation project to evolve into a value-added glass company, the NSG Group is collaborating closely with customers globally to provide values through its products and services in the architectural, automotive and technical glass sectors.

"Within the Fine Glass Division of the Technical Glass SBU, we have achieved improvements in profitability by refocusing the product portfolio and expanding new product applications" Tadashi Deguchi explains. "We set ourselves apart from competitors by constantly improving product quality, especially the flatness of glass. We are



glanova glass is suitable for chemical strengthening.

expanding new product applications by actively engaging with external partners, including start-up companies to identify and meet significant unmet customer needs globally." ●

**Further information:**  
NSG Group, Tokyo, Japan  
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# Japanese glass packaging industry trends

Sunder Singh assesses the Japanese glass container industry's current performance, key customer sectors and demand drivers.

Comprising 18 manufacturers, the Japanese glass container industry produced 1135,000 tons of glass packaging in 2018. Total output that year was valued at 119.5 billion Yen (\$1.07 billion).

Alternative forms of packaging such as metal cans and PET have severely impacted market share for glass bottles in the last two decades. Metal cans in the beer sector and PET in the non-alcoholic beverage market have caught the fancy of consumers.

However, there are a number of factors that act as enablers for glass container industry growth. For example, Japan has one of the highest per capita incomes globally and the majority of the 125 million strong population have high purchasing power. And yet, these factors have not propelled glass container consumption growth.

It is worth mentioning that the Japanese glass container industry has achieved high recycling rates, supported by the co-operation of national and local government authorities, operators, consumers and non-profit organisations.

## Demand drivers

Beer, which represents a major glass container industry market in most Asian countries, does not hold up as a huge opportunity for Japanese producers. Only about 10% of all beer produced in the country is consumed from glass bottles. Conversely, while the large volume of beer traditionally produced in Japan still makes this an important customer base for glass bottles, it should be noted that beer production and consumption are steadily declining. According to provisional data, Japan's market for beer and quasi-beer products is expected to have shrunk in 2019. This would represent the fifteenth straight year of decline. Falling sales are

Packaging type	PET	Can	Paper	Others	Glass
Share (%)	74.6 %	12.4 %	8.5 %	3.2 %	1.2 %

Market share of different packaging types in the Japanese non-alcoholic beverage industry in 2018, based on output. Source: Japan Soft Drinks Association.

	2014	2015	2016	2017	2018
Value of materials and containers (in billion Yen)	5705.1	5672.7	5596.7	5640.4	5781.4
Ratio to the previous year	103.1%	101.3%	98.1%	98.7%	100.8%

Japanese packaging industry, 2014-2018. Source: Japan Packaging Institute.



also blamed on fierce competition from other alcoholic drinks, such as low-priced chuhai spirit-based products.

According to Kirin Beer University annual statistics, Japan produced a total of 5108,300 kl of beer in 2018. The country is the seventh largest beer producer globally. However, as mentioned earlier, metal cans have taken a huge share from glass containers in recent times.

Despite declining sales, beer is still the most popular alcoholic drink in Japan. Due to taxation issues, several types of beer-like beverages have emerged in recent times, including happoshu and new-genre beer. These beverages are taxed at a lower rate because they contain less or no malt and can therefore be sold at lower prices. Packaging of these products in



glass containers is similar to the figures for the beer industry.

Glass usage for beer packaging started to decline in the late 1980s and early 1990s, due primarily to changes in marketing. In Japan, most beer was traditionally sold in small liquor stores by the glass bottle. However, around this time Japanese brewers (led by Kirin and Asahi Beer) started to target non-traditional customers by packaging more of its beer in

Packaging category	2016	2017	2018
Paper and paperboard products	23,596	24,686	24,610
Plastic products	16,745	15,622	16,784
Metal products	9292	8747	8179
Glass containers	1282	1248	1195
Wooden products	1436	1361	1361
Miscellaneous (seals, labels, tapes, textile products, cellophanes)	4376	4304	4274
Total	56,727	56,967	56,404

Packaging materials output in Japan (based on value). All valued in 100 million Yen. Source: Japan Packaging Institute.

Share of different packaging formats (based on value)	
Paper and paper products	43.6 %
Plastic products	29.8 %
Metal products	14.5 %
Glass containers	2.1 %
Wooden products	2.4 %
Other materials	7.6 %
Total	100.0 %

Share of different packaging formats in Japan (value basis) in 2018. Source: Japan Packaging Institute.

Share of different packaging formats (based on volume)	
Paper and paper products	65.5%
Plastic products	19.1%
Metal products	6.8%
Glass containers	5.9%
Wooden products	2.7%
Total	100.0%

Share of different packaging formats in Japan (volume basis) in 2018. Source: Japan Packaging Institute.

Company	Location	Sub-segment
Nihon Yamamura Glass	Tokyo, Saitama and Harima	Food, beverages and pharmaceuticals
Japan Glass Industry Co Ltd	Shizuoka	Pharmaceutical glass
Toyo Glass	Tokyo	Food and beverage
Ishizuka Glass Co	Aichi	Food and beverage
Nihon Taisanbin Glass Co	Ogaki, Fukoka	Beverage
Okubo Glass Co Ltd	Tokyo	Pharma glass
Naigai Glass Industry	Osaka	Pharma
Japan Seiko Glass Co	Osaka	Food, beverage and cosmetics
Koa Glass	Ichikawa City, Chiba	Cosmetics, perfumery and pharma
Daisho Glass Co	Tokushima Naruto, Hokkaido Kushiro	All
Hakuyu Glass Co		
Pharmacapack Co Pvt Ltd	Toyama	Pharma
Daiwa Special Glass Co Ltd	Osaka	Pharma
Seisho Co Ltd (subsidiary company of Nihon Yamamura, Nihon Yamamura retains a 93% shareholding and Sapporo Beer owns the other 7%)	Chome	Beverage

Leading glass container producers in Japan.

cans, offering six-packs and sending the canned beer into supermarkets and convenience stores. Beer producers also became much more aggressive in their pitches to retailers who sold beer. Can packaging, which was still in its infancy in the beer industry, became a fashion statement in Japan, taking away a huge share from glass containers in a short time frame.

Latterly, spirits and wine have become particularly important categories for the Japanese glass container industry, with production in both sectors scaling new heights. The proportion of glass containers in these markets is far higher than for beer. Demand for premium glass containers has been especially important.

According to Japan National Tax Agency data, wine consumption is up over the last decade, along with whiskey and liquors, while consumption of beer, Happoshu (a Japanese low-malt beer), Shochu (Japanese spirits) and Sake have all fallen. According to industry sources, Japan's total wine consumption was 376.6 million litres in 2018. Although approximately 69% of all wine consumed is imported, the remaining 31% of locally made product represents a huge market for glass packaging.

#### Cosmetics, perfumery and pharmaceuticals

Cosmetics and perfumery have represented important growth opportunities for glass packaging in recent times, Japan being recognised as one of the world's largest markets for cosmetics and personal care products. The domestic beauty industry generated revenues of over \$37 billion in 2018, with such Japanese cosmetics manufacturers as Shiseido and Kao among the largest globally. The fact that Japanese consumers today are highly sophisticated and conscious of quality,

product value and the brands they buy and use has assisted glass container producers to increase market share in the packaging of these products.

The pharmaceutical sector has been another source of steady demand for glass packaging. According to figures from the Japanese Ministry of Health, Labour and Welfare, the local pharmaceuticals market was valued at approximately \$95 billion in 2018. In particular, Japan's rapidly ageing population presents a distinct business opportunity.

The country is the world's third biggest pharmaceuticals market, behind only the USA and China. The local market is expected to grow steadily, providing ample opportunities for glass container producers. This situation has prompted a number of international companies to venture into the local pharmaceutical glass business as well. Prominent among them are Nipro and Naigai Glass Industry Co Ltd. Nipro operates the Biwako factory at Kusatsu City (Shiga) in Japan. Established in 2014, the plant produces pre-fillable syringes and glass vials. And Niagai operates a production site at Daito City (Osaka) to produce vials.

#### Ageing population concerns

A rapidly ageing population is one of the biggest concerns for many industries in Japan, including the glass packaging sector. With a population of 124.8 million at the end of 2018, Japan was the world's tenth most populous country. The population fell by 0.8% between 2010 and 2015 (Japan conducts a population census every five years), the first time it had declined since the 1945 census.

Based on data from the National Institute of Population and Social Security Research, Japan's population will continue to decline by about one million people every year in the coming decades. This would result in a population of approximately 70 million by 2060 and 42 million by the early 22nd Century if the current projections do not change. ●

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# Marking 50 years' service to Japanese customers

This year represents a landmark anniversary for Emhart Glass Japan, a business dedicated to serving the specialist needs of Japan's glass container industry since 1970. As Marcel Germann explains, however, the local packaging market continues to be very challenging for glassmakers, requiring leading suppliers to help maintain the industry's equipment status quo, while upgrading and adding the latest technologies and process automation wherever possible.

A 100%-owned subsidiary of Emhart Glass SA in Switzerland, Emhart Glass Japan Co Ltd has enjoyed a 50 years association with the Japanese glass container industry. Based in Kawasaki, the operation employs six people in total, covering sales, project management, service, spare parts and business management. "Our longest serving colleague has been at Emhart Glass Japan for 32 years, with vast technical expertise and knowledge of the specifics of our customers' requirements" Marcel Germann confirms. "Due to retirements, the other team members are relative newcomers, having been with the company for between one and four years, except for an accountancy colleague, who has been with us for 20 years. As the market changes and new solutions are being developed, it is a good opportunity to build up the next generation team."

Marcel Germann was appointed Managing Director in 2016, having

previously worked in Japan for more than 10 years, mostly in investment goods for the printing industry and railway track maintenance. He also brings strategic business experience from his time working in China, Taiwan and South Korea.

Mr Germann's association with the Japanese glass container industry started at a time when local market conditions have been extremely challenging for his customers. "Since the early 1990s, glass container production has fallen consistently, with the annual tonnage produced now less than half of what it was 30 years ago" he explains. "Annual production fell below one million tonnes in 2019, dropping by a massive 8.6%."

The growing use of PET is largely responsible for the reduction in glass container use. Especially in the area of packaging for sauces and dressings, there is still a move from glass to plastic. "This ongoing shift is contrary to what can be seen in many other markets around the world, where a partial return to glass packaging can be observed" Marcel Germann suggests.

## Productivity focus

In the face of these challenging market conditions, Emhart Glass Japan has continued to benefit from some important customer orders in recent times, as local glassmakers endeavour to optimise productivity without the prospect of massive investment projects. There has been an increase in orders for the FlexRobot swabbing system, for example, a trend that is expected to continue throughout the industry. "Servo-driven IS machines are also increasingly becoming the standard" Mr Germann confirms. "In addition, our latest FlexIS 3 timing system is generating positive customer feedback, especially when used in association with servo motor equipped IS machines."

In the short-term at least, attention will be focused primarily on repairing and overhauling existing machinery and the introduction of added value technologies. Importantly, these developments will help to reduce machine operator numbers and ensure high process stability with a reduced requirement for highly experienced operators.

Members of the Kawasaki team are in daily contact with the global operations of parent company Bucher Emhart Glass. This



Marcel Germann, Managing Director at Emhart Glass Japan Co Ltd, has worked in Japan for more than 10 years.



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Emhart Glass Japan has seen orders increase for the FlexRobot swabbing system from local customers.

extends from sourcing engineering support on technical issues, for example, to the co-ordination of timely parts deliveries and communicating with the company's manufacturing and assembly sites in Sweden and Malaysia to keep up-to-date of schedules. At the project execution stage, essential dialogue is also undertaken with the global service organisation to schedule the necessary engineers for equipment installations.

"Being part of a large organisation means having the advantage of good support, whether it be for engineering topics, in projects, service and parts supply-related issues" says Marcel Germann. "Bucher Emhart Glass began its commitment to this market five decades ago by establishing its own presence. Even though the Japanese market has consolidated considerably over the years, this commitment remains unchanged. This was and remains the correct decision, as it would be very difficult to understand the needs of our customers without a local presence. It is also important for the delivery of timely technical support."

It is widely acknowledged that while Emhart's Japanese customers possess profound knowledge and skills to make high quality glass containers, their reliance on the skills of individual operators represents a major concern for the future. Coupled with the growing problem of identifying young operators, many highly experienced specialists are set to retire in the near future. According to Marcel Germann, this will necessitate the use of more automatic process controls to reduce the need for highly knowledgeable operators and robots where feasible. "At the same time, using the latest process control technologies will make it more attractive for young employees to consider a career in a glass plant" he says.

#### **Further information:**

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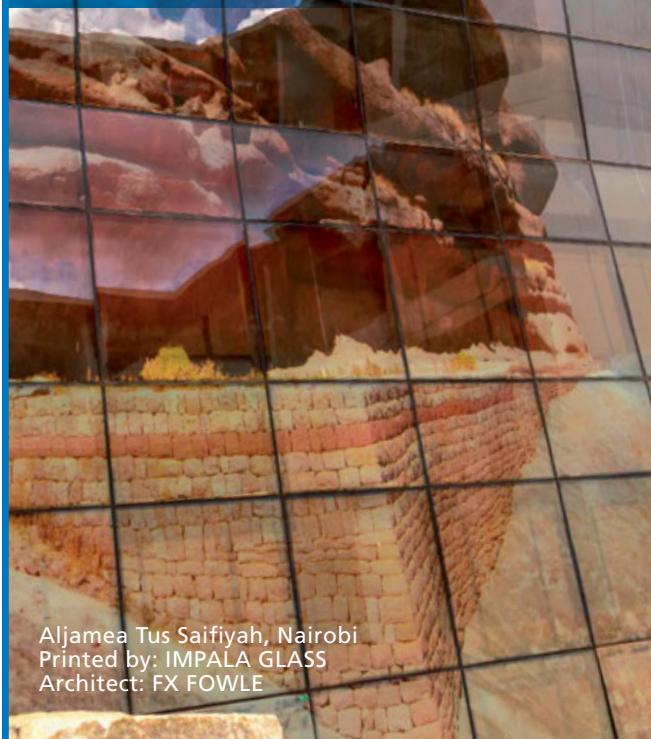
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# Will Japan's hydrogen strategy help carbon neutrality goals?

Japan is aiming to become a hydrogen-based society but will it be able to deliver the quantities of hydrogen required by glass manufacturers at an acceptable CO<sub>2</sub> emission and price level? René Meuleman discusses some of the considerations to be made regarding hydrogen combustion processes and why all-electric melting technology and control solutions provided by Eurotherm by the Schneider Electric glass expert team could be a more efficient option.

The mass production of container glass in Japan started in 1916, when Nippon Glass bought a Michael Owens automatic bottle blowing machine. Soon after, in 1919, flat glass mass production began using the Colburn process, with Nippon Sheet Glass employing the Fourcault process in 1928. Tokyo Electric Co was the first company to manufacture tube glass using the Danner process in 1927, as well as using the Ivanhoe machine to manufacture bulbs in 1929. Of course, Japan was also deeply involved in CRT tube manufacture, initiated by Samsung in 1977 using the Corning process<sup>(1)</sup>. Insulating and reinforcement glass fibre manufacturing also came to Japan and today, the Japanese glass industry has developed into one of the world's finest and most innovative glass industries. It plays an important global role and intends to stay at the forefront when investigating solutions to environmental and climate change challenges.

## National hydrogen strategy

Most of the global regions signed the Paris agreement on climate change, as did Japan on 22 April 2016, representing 3.8% of greenhouse gases for ratification, while sitting in between Germany (2.6%) and India (4.1%) on CO<sub>2</sub> emissions<sup>(2)</sup>. Consequently, Japan released its Basic Hydrogen Strategy on 26 December

2017, committing to become the first hydrogen-based society in the world. Meanwhile, many initiatives are looking into hydrogen as an energy carrier of the future and recently, the NSG Group announced that it will run a test on one of its float glass furnaces in the UK. Unfortunately, only grey hydrogen will be available. Perhaps it will provide a proof of concept, although glass manufacturers might need to doubt that and consider the implications.

Regenerative end- or side-port furnaces have been around for over 100 years and the technology was improved until it reached its physical energy efficiency constraints around 20 years ago. In other words, not much more energy efficiency can be expected from such a furnace design without installing a lot of complicated add-ons. Ideally, the whole design needs to become carbon neutral and in that respect, there is consequently no potential for the use of fossil fuels anymore. At least not in the next furnace campaign. Therefore, the industry needs to consider alternative energy carriers and hydrogen, next to electrical power, is one of them of course.

There are several ways to produce hydrogen. Grey or blue hydrogen should not even be considered, as both use natural gas as a source and will produce a lot of CO<sub>2</sub>. Sooner or later, it will be realised that these are ridiculous ways of converting natural gas into hydrogen.

The only sustainable way of manufacturing so-called green hydrogen is electrolysis; converting renewable electricity generated by solar cells or wind turbines into hydrogen and oxygen.

Looking at the conversion from electrical energy into the energy carrier hydrogen, the first question arising is: Why not directly feed the electrical power into the glassmaking process, avoiding the energy losses and the electrolyser's related investments?

Of course, the direct use of electrical power in the glassmaking process is by far the most energy efficient method. At least 85% energy efficiency can be achieved by ▶



Seetharaman Jayaraman, Glass Business Development Manager for Eurotherm in the APAC and Middle East regions.



Donghyun Shin, Technical Sales Manager for Eurotherm in North Asia.



Jay Agustin, Sales Manager for Eurotherm in the ASEAN, ANZ, Japan and Taiwan regions.

Efficiency (approximate)	Power input from source	Electrolysis efficiency	Hydrogen-oxygen	Combustion efficiency	Final Process contribution		
Hydrogen combustion	100%	80%	80%	40%	32%		
		Electrolysis efficiency		Fuel cell efficiency		Boosting efficiency	Final process contribution
Hydrogen converted for Joule heating	100%	80%	80%	60%	48%	85%	41%

Using fuel cell technology to convert hydrogen back to electrical energy for joule heating in the melting process may be more efficient than using hydrogen for combustion.

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[eurotherm.com/glass](http://eurotherm.com/glass)

applying electrical power directly via an electrical furnace boosting system using joule heating. In comparison, the energy efficiency of alkaline or proton exchange membrane electrolysis might reach approximately 81% in the near future (around 2030). However, as the hydrogen and oxygen would be used in a furnace combustion process, the overall efficiency would drop to 35% at the most. It might even become more efficient to use fuel cells to convert the hydrogen back to electrical energy and feed that into the melting process by joule heating!

The Japanese hydrogen strategy foresees that most of the hydrogen will be imported. Specifically, for hydrogen combustion in glass melting furnaces, there is obviously a concern to burn the hydrogen with outside air due to the high flame temperatures. And the presence of a high nitrogen concentration, which results in high NO<sub>x</sub> emissions. Having a free supply of oxygen from the electrolysis process available for the combustion of hydrogen would also be a great advantage to avoid NO<sub>x</sub> emissions but that means both the hydrogen and oxygen would need to be shipped from the source to Japan, most likely not in the same vessel. Alternatively, oxygen could be generated on-site at the glass facility but that would add cost.

Even if this technology is considered from a commercial perspective, it is unlikely that traditional furnace designs will be able to manage hydrogen-oxygen combustion, in the knowledge that only a quarter of the amount of heating energy is available in a normal cubic meter (Nm<sup>3</sup>) of hydrogen, compared to the amount of heating energy available in a Nm<sup>3</sup> of liquified natural gas (LNG) and 100% of water vapour in the combustion space. Most likely, new furnace designs will need to be developed and they might as well be all-electric furnace designs, leaving the energy conversion technology to the utilities and remembering that all-electric furnaces are a proven technology, having been around for over 100 years.

In 2018, the retail price of hydrogen in Japan was €0.83Nm<sup>3</sup> (100jpy) and it is predicted that the price will drop down to €0.17Nm<sup>3</sup> (20jpy) in the long-term (past 2030)<sup>(3)</sup>. 1 Nm<sup>3</sup> equals 3kWh (10.8MJ), while 1 Nm<sup>3</sup> of LNG ≈ 12kWh<sup>(4)</sup> (44MJ) costing only €0.03/Nm<sup>3</sup>. In this respect, hydrogen will be at least 22 times more expensive<sup>(5)</sup>.

The Japanese hydrogen strategy is an ambiguous and extremely innovative initiative. And of course, it makes sense to investigate and work together with partners like Australia to make hydrogen sufficiently available<sup>(6)</sup> but the question remains if hydrogen in a combustion process for glassmaking will become the future or if all-electric heating will take over from fossil fuel immediately? Until now, all-electric seems to be the most feasible technology.

### Energy saving control technology

Advanced energy saving technology for the efficient control of electric furnaces is already available from suppliers such as Eurotherm by Schneider Electric. With over 50 years' experience in supplying power control and automation solutions to the global glass industry, Eurotherm offers a wide portfolio, with a specific focus on improving and optimising energy efficiency in electric glass melting processes.

Leading the Eurotherm glass business in Japan is Seetharaman Jayaraman (Raman), who has over 25 years' engineering experience, with the last 20 years spent working within the glass industry. His primary focus is helping glass customers to save energy and reduce their CO<sub>2</sub> emissions. As Japan is the home of many glass OEMs and



Eurotherm project engineering teams and approved solution providers offer cost-effective and high performance process and power control solutions to meet the needs of global glass manufacturers and OEMs.

manufacturers in the Asian region, the Japanese market is a key focus for Eurotherm, among others such as Thailand, Vietnam, Indonesia and Malaysia.

"We have had good success with our high efficiency process control, power control and energy management solutions across the region, designed and delivered from our local project engineering bases" Raman comments. "Our capability spans from the supply of sophisticated control systems for high end manufacturing, to cost competitive control solutions for commodity manufacturing applications, as well as products for OEMs. While cheap solutions continue to come from China, they don't compete well in terms of quality when compared to Eurotherm temperature accuracy, design robustness and energy efficiency features."

Raman's direct experience of working in the glass industry provides customers with a knowledgeable interface into the subject of advanced control and power management system technology. Initially working in the maintenance team at Guardian Glass, then specialising in the design and development of glass processing equipment and various projects at Asahi Glass in India, he later joined Shanghai Pony Technologies in the

projects team and was involved in various projects in the Middle East, Russia, China and Indonesia. With his diverse knowledge and experience covering float, container, fibre, tableware, architectural and automotive glass sectors, today Raman is Glass Business Development Manager for Eurotherm in the APAC and Middle East regions.

On the subject of CO<sub>2</sub> reduction, he says: "In the past, our successes were particularly in electric boost for float glass, as well as direct platinum heating applications for glass fibre and display glass but interest is now growing in hybrid and all-electric furnace control solutions."

Other key glass team members in the APAC region are Jay Agustin, Sales Manager for the ASEAN, ANZ, Japan and Taiwan regions and Donghyun Shin, Technical Sales Manager for North Asia. Both have many years of experience in glass manufacturing processes, as well as extensive knowledge of Eurotherm high efficiency control solutions. "Historically, in the glass industry we were known for our expertise in furnace, bath and forming temperature control" Jay Agustin explains. "With our expertise in power control, we are now focused on helping customers move away from fossil fuels to electric melting technologies, to save energy and ▶"



Manufacturing quality components and providing excellent after sales service for over 50 years to the global glass container industry.



reduce CO<sub>2</sub> emissions. Eurotherm is a pioneer in this field and we are seeing a lot of interest from the flat glass sector. This is due to the increasing use of electric heating processes that warrants our level of precision temperature control, automation and power control efficiency."

On future trends, Mr Agustin continues: "Japan is likely to be a launchpad for new, revolutionary future trends in glass manufacturing. Their glass industry is broad, from flat glass manufacturing to manufacturing of glass for electronic products. Growing populations in the APAC region, increasing demand for environmentally-friendly buildings and replacement of plastic containers, will surely drive an increase in demand for glass. APAC countries, particularly in the ASEAN region, are still attractive locations for investors in glass manufacturing, which is increasing year on year. Although the region now has less than 10 years to reduce its carbon emissions to comply with the Paris agreement, gas is still the most used and preferred fuel to fire up most furnaces due to the low price and accessibility of gas. This makes it challenging for most glass manufacturer owners to start the change to cleaner power sources. The industry needs to evolve to achieve lower carbon emissions as the years progress and we already find ourselves being increasingly involved with companies switching to electrical power sources. By 2030, Japan needs to reduce its emissions by 26% compared to 2013 levels<sup>(7)</sup>. Eurotherm solutions are a perfect fit for this, as they are designed to help production teams manage their electrical power usage efficiently."

René Meuleman, global glass business development manager for Eurotherm stresses: "While Japan has committed itself to become a hydrogen-based society, research and development is still ongoing to work out if enough hydrogen can be provided in the quantities and locations required at an acceptable price level. Therefore, hydrogen combustion may not end up being the best option for Japan-based glass manufacturers. Also, companies wishing to standardise their global operations may struggle to do so if hydrogen is not readily available in all their regional bases. All-electric melting technology still seems to be the most viable solution for a lot of regions, based on current information."

### Strong collaboration network

End users, equipment manufacturers and solution providers can all benefit from the range of energy saving features and control efficiency solutions provided by Eurotherm control products. For example, a control system based on the EPower Advanced SCR controller offers hybrid firing modes for efficient control of electric heaters, while predictive load management strategies help to minimise peak power demand across the system or plant. The EPack Compact Power Controller range offers hybrid firing modes in a smaller footprint for processing machinery, while process controllers such as the T2750 PAC offer the basis for high accuracy temperature control, as well as the high availability architecture needed for 24/7 glass manufacturing processes.

"We have a strong collaboration network that enables us to support Japanese glass manufacturers and OEMs with products and solutions directly via our local sales and project delivery teams, as well as via a network of local approved solution providers and distributors" says Donghyun Shin. "Eurotherm glass solutions and service teams work across a global network, so we can easily support the design and specification of system projects initiated in Japan for delivery in other countries. Working in this way enables us to offer cost-effective and high quality solutions to meet the needs of major global OEMs spread across Europe, America, China and Japan."

Mr Shin continues: "From our process automation beginnings as Turnbull Control Systems (TCS) in the 1970s, many glass manufacturers still remember our previous system solution based on the T640 process controller. Many of these have been replaced over the years with the modern T2750 process automation controller, with EPoer controller technology for the electric heating and energy saving aspect. Eurotherm glass team members are considered as trusted advisors to the industry. We know glass processes very well and we understand what the customer needs, particularly now when they are wanting to reduce their CO<sub>2</sub> emissions and energy bills."

As a global expert in power, energy, automation and switch gear technology, Schneider Electric offers an accessible brand for glass manufacturers and OEMs worldwide. Concluding, Seetharaman Jayaraman notes: "Eurotherm glass teams possess



Predictive load management strategies and hybrid firing modes in the EPoer Advanced SCR Controller help to optimise energy use.



Eurotherm T2750 PAC provides high availability dual redundant process control, ideal for high efficiency glass manufacturing applications.

domain expertise of great depth in various glass manufacturing processes and as an associated brand of Schneider Electric, we are able to offer an enhanced and extended portfolio of solutions. Synergising our capability with global Schneider business teams enables us to serve our Japanese and wider APAC region customers with high efficiency, good value, end-to-end-solutions, helping them to reduce CO<sub>2</sub> emissions - as we like to say - from grid to glass." ●

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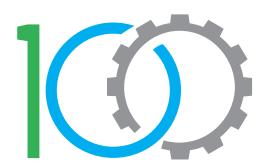
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ZIPPE YEARS

# Glass melting furnace materials and engineering expertise

Shinji Yamamura discusses the AGC Ceramics approach to glass melting furnace materials and engineering solutions and their contribution to energy savings and reliable operation.

AGC Ceramics (AGCC) is a wholly-owned subsidiary of AGC Inc, offering reliable refractory products for various furnaces used to manufacture float glass, flat displays, containers and tableware etc. Also available are design and turnkey engineering services for glass furnaces used for containers, tableware and sodium silicate etc.

The potential for energy savings is among the most important and interesting topics for every glassmaker, contributing as it does to reduced energy costs and greenhouse gas emissions. Electric boosting is useful for the realisation of glass pull and quality improvements, in addition to which the technology can reduce a furnace's greenhouse gas emissions. However, high electrical costs will increase total energy costs and it is not easy to reduce greenhouse gas emissions totally because fossil fuels are widely used for power generation. A clean and cost-competitive energy source is needed but the realistic solution at this stage is to reduce heat loss and increase heat recovery within the furnace.

## Energy saving results

End-port furnaces are widely used in the glass container sector because they provide better energy efficiency than side-port designs and can melt over 350 tonnes/day with the employment of electric boosting. AGCC has focused on improving the end-port design for a long time, the company's EcoLead furnace design (figure 1) featuring a specially created double pass regenerator and insulation design using THERMOTECT Wall technology. The development has successfully reduced energy consumption by 10%-15% for a 150 tonnes/day end-port furnace, when compared to conventional designs.

## Reliable fused cast refractory

The quality of fused cast refractory correlates closely to the life of a glass furnace. The fused cast refractory is manufactured by electric melting and casting processes. Figure 2 shows



Figure 1: The EcoLead furnace design.

unusual heavy corrosion of sidewall refractory due to internal void, which appears during solidification and shrinkage processes.

AGCC has successfully eliminated such unusual corrosion by non-

destructive internal inspection with using microwave radar. This quality assurance has been continuously applied for all important large AZS void-free or semi-void-free blocks used for glass contact areas, such as sidewall, throat and dam wall portions since 1992. Many actual results have proved its advantage and reliability.



Figure 2: Unusual corrosion due to internal void of an AZS sidewall.



Figure 3: THERMOTECT Wall.

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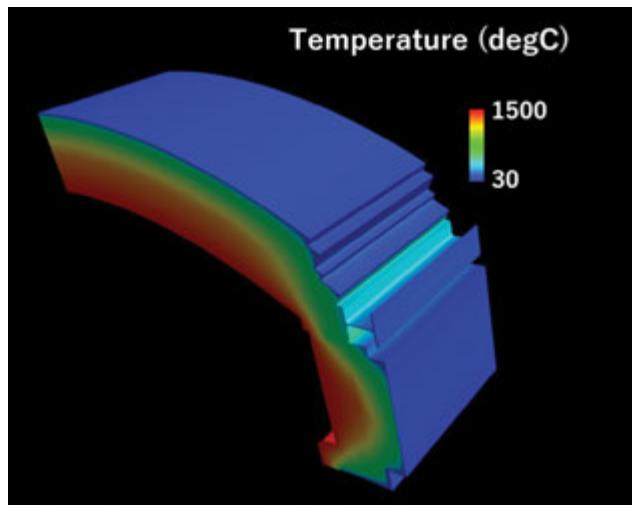


Figure 4: Upper structure temperature simulation results.

### Insulation design

Widely used insulation, boards and fibre materials contain refractory ceramics fibres (so-called RCFs) because of their low thermal conductivity. However, limitations on the use of RCFs have started internationally because of its potential carcinogenic characteristics. AGCC has developed an RCF-free monolithic insulation material, called THERMOTECT Wall, as shown in figure 3. This development received the grand prize for excellent energy solutions in Japan in 2015 because of its high insulation performance and low deterioration at high temperature. Furnace designs that maximise its performance can contribute to significant energy savings.

### Software engineering

Software technologies are among the most important tools to support engineering. Figure 4 shows the temperature distribution of a furnace upper structure with computer simulation. Heat loss and maximum temperature of refractory can be understood quantitatively, helping to create an energy saving design. Figure 5 shows the big trend data analysis system, which has over 40 times higher display speed than conventional trend systems. This system can display furnace trend data immediately in any scale, even if the recording period is over 10 years. It helps to understand long-term fluctuations of furnace data and makes it stable and long life. ●

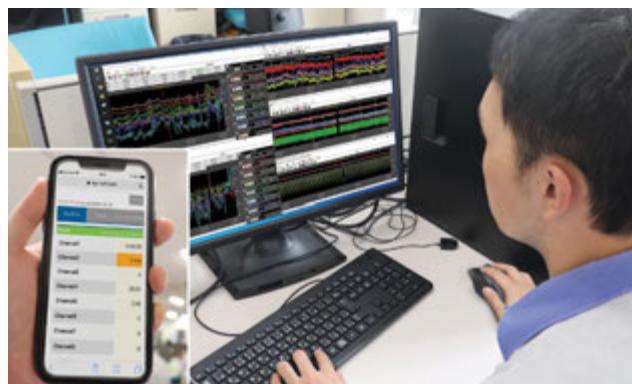


Figure 5: Big trend data analysis system.

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# Glass packaging industry trends for China's beer sector

The world's largest volume beer market, China is an important demand driver for glass packaging. In fact, consumption is more than total glass packaging production and consumption for a number of other key glass container producing countries. Sunder Singh reports.

China's brewers have surprised many of their international peers by the scale and growth they have enjoyed in the past two decades. Major brewers have achieved gigantic advances in scope and scale on account of huge local demand. These brewers require massive volumes of glass containers to satisfy their packaging needs.

In recent times, however, the Chinese beer industry has been unable to match the earlier high growth rates enjoyed between 2000 and 2010. In 2018, total beer production nationwide reached 38.12 million kl, representing a decline of more than 13% on a volume basis from the previous year. This was the fifth consecutive year of decline in production and sales. Major brewers have cited anti-corruption campaigns and inclement weather for the decline.

Currently, China's top five beer producers account for nearly 80% of the market. The vigorous promotion of various foreign-invested beers and imported beers have led to fierce market competition and operation costs are increasing. These factors are impacting packaging formats, some of which favour glass packaging, while others favour metal cans.

The country's largest brewer, China Resource Beer (CRB) operates a total of 91 breweries (currently 13 of the total are closed). The company has more than 25% market share (based on volume) of the local market. Its vastly popular Snow brand is the top selling beer in the world by volume. The company is the largest local brewer by market value, followed by Tsingtao Brewery and Chongqing Brewery

## Demand drivers

Tier three, tier four and tier five cities, as well as country areas, are expected to play a bigger role in demand for glass container growth in the future, on account of rising beer demand in these areas. At the end of 2018, the catchment areas of small and mid-sized cities (tier three to tier five and rural areas) accounted for 91.3% of the land area and 73.7% of the population of the country (source: China Chamber of International Commerce and Deloitte research, November 2019).

Consumer demand in these areas has been unleashed thanks to rising disposable incomes. Stimulated by national policies of cutting taxes to increase people's income, shanty renovation and poverty alleviation policies, a vast section of the population in tier three to tier five and rural areas is earning more every year. Consumers are living under less pressure in terms of living costs compared with their counterparts in tier one and tier two cities and the percentage of their disposable income to total income is more compared to tier one and tier two cities.

## Glass for the beer industry

The beer industry is the largest component of glass container demand in China, although there is no recent data on total volume of container glass consumption by the beer



industry in the last two years. However, a study conducted by China Industry Development Research Network during 2017 and 2018 states that 52.2 billion beer bottles were produced for the beer industry in China in 2016. Extrapolating these figures for 2018 (taking into consideration the total beer output and glass versus aluminium packaging for the year) means the Chinese beer industry needed about 46 billion glass bottles for beer packaging.

Comprising more than 100 large, mid-scale and small container glass producers, the Chinese container glass industry has made immense modernisation progress in the last two

decades. The industry, which was highly fragmented about 10 years back has consolidated to some extent during the past decade. This involves the acquisition of small container glass producers by big companies and the closure of small production units (both on account of environmental regulations and accumulated losses). However, despite these mergers, buyouts and closures, the number of container glass producers is still on the higher side.

The author believes the industry will further consolidate in the coming years. A government focus on industry efficiency and competitiveness will limit new entrants (at least in

Production (in million KL)									
Ranking	Country	2011	2012	2013	2014	2015	2016	2017	2018
1	China	48.99	49.02	50.65	49.67	47.16	46.00	44.01	38.12
2	USA	22.65	23.01	22.53	22.61	22.41	22.14	21.83	21.46
3	Brazil	13.30	13.28	13.47	14.14	13.86	13.33	14.00	14.13
4	Mexico	8.15	8.25	8.20	7.80	9.71	10.50	11.01	11.98
5	Germany	9.55	9.46	9.44	9.53	9.56	9.50	9.30	9.36

Beer output in the world's top five beer producing countries in the last five years (source: Barth Report, Barth Haas Group).

Company	Market cap (in US\$)	Number of breweries
China Resource Beer	15.00 billion	91 (including 13 non-operational)
Tsingtao Brewery	8.90 billion	64
Chongqing Brewery (Carlsberg holds a majority stake)	3.20 billion	25
Beijing Yanjing Brewery	2.70 billion	30
Guangzhou Zhuijiang Brewery	2.06 billion	27
Fujian YanJing HuiQuan Brewery	290 million	11
Lanzhou Huanghe Enterprise	210 million	13
Tibet Galaxy Science and Technology Development	160 million	10

Leading Chinese brewers and number of breweries.



some provinces). In addition, government regulations have encouraged setting up new container glass units, which are highly automated and technologically superior.

Chinese brewers are adopting a number of strategies to minimise the total cost of container glass for their packaging needs. For example, Chongqing Brewery, the third largest brewer in China launched 'Project Brave' in 2013 post Carlsberg's acquisition. The company reduced the number of glass bottle types to 20 from 86 at the end of 2018. It is targeting to further reduce bottle types to only four by the end of this year.

#### Premiumisation drives glass container demand

China's beer market has steadily shifted from the stage of 'high speed volume growth' to 'high quality development' in recent years. The premium beer category has increased at an impressive double digits pace annually. With consumers more willing to pay more for quality, most Chinese brewers have been working to enhance the higher brackets of their portfolios through premium beer and more niche offerings. High value brackets of the market are very attractive to brewers as it allows to charge higher prices to consumers. Glass packaging is playing an important role in the premiumisation of the industry.

"Changing preferences and desires from consumers are forcing beverage brands to think creatively how they can generate deep engagement, driving diversification and a redefined role for packaging," according to Arnaud Aujouannet, Chief Sales and Marketing Officer at O-I Glass. "Glass has a unique ability to bring real emotions to consumers by capturing a brand's essence. With more than 70% of purchasing decisions made in-store, packaging needs to tell a differentiated brand story at one glance and glass delivers on that. There has been a major shift in the last few years around the usage of glass. Glass is once again viewed as an asset rather than a cost, with all the evidence pointing to strong and

growing demand among consumers for premium, personalised and more environmentally-friendly packaging" Mr Aujouannet comments.

#### Case study

An analysis was conducted of the packaging mix at China's largest beer producer, China Resource Beer to ascertain glass packaging trends in the country. In 2018, glass containers accounted for 81% of the total packaging used by CRB, while aluminium cans accounted for 19%. The share of glass packaging is far higher than the industry average of 74% (see accompanying table).

In recent years, Chinese brewers have been attracted to metal packaging for their beer products due to less manual labour, higher production efficiency (90-100,000 cans per

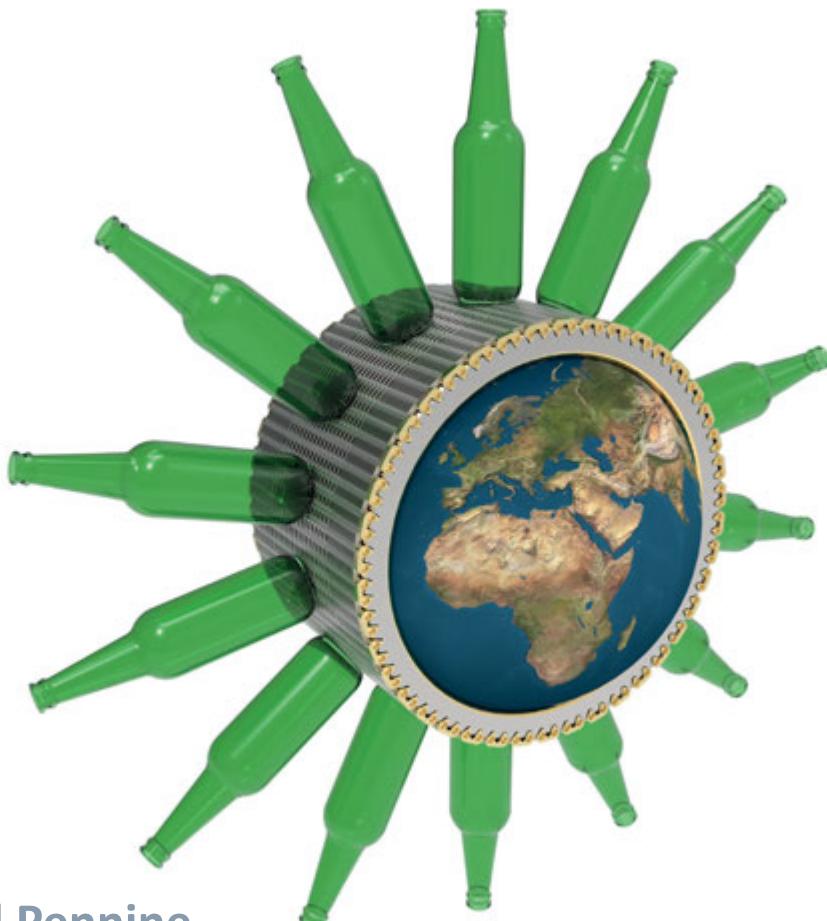
hour) and lower packaging costs using the aluminium can packaging compared to glass bottles. As the packaging cost normally represents more between 14%-18% (depending on the packaging material) of goods sold (COGS) for most of China's brewers, the gradual shift to aluminium cans cannot be ignored. However, minimum packaging cost is not the sole criterion for a beer producer. Other factors such as premiumisation, promotion and attractiveness of the finished product work in favour of glass containers. ▶

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## Glass expected to dominate

Currently, glass dominates the beer packaging market in China by a wide margin. However, metal cans have increased their market share in overall beer packaging by several percentage points in recent years. In particular, consumption of beers in metal cans has increased in the metro cities. However, despite this market share gain, glass is expected to maintain the lion's share in beer packaging for many years.

A number of recent consumer surveys have revealed that beer consumers have the strongest preference for packaging of beers in glass bottles. In comparison to glass, other forms of packaging such as metal cans and PET do not have the same appeal.

## Qinhuangdao Suokun Glass

With an installed capacity of 1.2 million tonnes per annum, Qinhuangdao Suokun Group Glass Co is among China's prominent glass container producers. Located in Qinhuangdao city, Hebei Province, subsidiary companies Zhuolu Yida Glassware Co Ltd, Qinhuangdao Suokun Glassware Co Ltd, Shenyang Hongye Glassware Co Ltd and Yantai Suokun Glass Co are all engaged in glass container production.

The company operates a total of 15 furnaces, 49 production lines and three sets of six colour screen printing machines. The company claims to produce more than 1000 types of glass bottles for beer, wine, spirits and other beverage industries in emerald green, dark green, antique green, Champagne green, cobalt, amber, dead leaf green, flint and super flint etc.

Containers are sold primarily to China Resources Snow Breweries Co Ltd and its subsidiary companies Inbev Brewery Co Ltd and Blue Ribbon Beer Group, in Xinjiang, Gansu and Ningxia.

## Shenzhen Tongchan Group

Shenzhen Tongchan Group operates a number of companies, including Shenzhen Beauty Star Co Ltd, Zhaoqing Tongchan Glass Co Ltd, Sichuan Tongchan Huajing Glass Co Ltd and Shenzhen 863 New Material Technology Co Ltd. At the end of 2018, the group had total assets of RMB 4.5 billion and employed approximately 5000 people.

Tongchan Group is mainly engaged in glass and plastic packaging. Customers of glass packaging include major brewers at home and abroad like Carlsberg, Heineken, Pearl River, Kingwei, Qingdao and Haitian. In the plastic packaging sector, the company supplies Procter & Gamble, Shiseido, Avon, L'Oréal, Unilever and Wrigley etc.

## Shandong Huapeng Glass

Shandong Huapeng Glass Co Ltd operates in glass container production via its subsidiaries Huapeng Glass (Heze) Co Ltd, Liaoning Huapeng Guangyuan Glass Co Ltd, Anqing Huapeng Changjiang Glass Co Ltd and Shanxi Huanpeng Shuita Glass Co Ltd. The company has an installed capacity of more than 280,000 tonnes/annum.

In its 2018 annual report, the company's management expressed concerns about the rising cost of glass container production in China. "The main reason for the increase in operating costs in 2018 was due to the impact of environmental protection policies" they explained. "The prices of major raw and auxiliary materials, which remained at a relatively high level since the end of 2017, have continued to remain high in 2018. This has resulted in higher production costs."

## Yamamura Glass Qinhuangdao Co Ltd

Japanese producer Nihon Yamamura Glass entered the Chinese glass container industry by establishing a joint venture with existing Chinese glass producer, Qinhuangdao Fangyuan Glass Co Ltd in 2013. Operating since 1958, Qinhuangdao Fangyuan Glass achieved total sales of RMB 256 million in 2012.

Located in the coastal city of Qinhuangdao, Hebei Province, the company operates a total of four furnaces and 11 production lines, with an installed capacity of 200,000 tonnes of glass containers. Yamamura acquired full ownership of the company by buying the remaining 15.25% stake in the venture. Through the advanced production technologies of Nihon Yamamura Glass, the company has become a leading supplier to many major brewers in the country.

## Guangdong Huaxing Glass

With 14 production sites throughout China, Guangdong Huaxing Glass is one of the largest glass container producers globally. Headquartered in Foshan City, Guangdong Province, Guangdong Huaxing Glass operates in Guangdong, Hubei, Henan, Gunagxi, Fujian, Jiangsu, Zhejiang, Hebei and Xinjiang provinces.

The company operates a total of 35 furnaces and 169 production lines to cater for almost all segments of food, beverage and pharmaceutical industries. According to Feng Qunying, Vice President of corporate finance at Guangdong Huaxing Glass: "In 2018, the company achieved sales revenue of about 6.7 billion Yuan."

For additional information on Guangdong Huaxing Glass, see the March/April 2019 issue of *Glass Worldwide*.

## Changyu Glass

Changyu Glass (Yantai Changyu Glass Co Ltd) is a leading producer of glass containers for the beer industry. With 500,000 tonnes production capacity, the company also supplies China's wine industry and ranks among the top 10 producers in the country.

## Guilin Jingsheng Glass

Guilin Jingsheng Glass Co Ltd, formerly known as Guilin Glass Factory, was founded in 1956. In 2002, it was restructured from a state-owned enterprise to Guilin Jingsheng Glass Co Ltd.

Country	Glass	Can
Germany	96	4
Australia	82	18
Belgium	78	22
China	74	26
France	71	29
Singapore	69	31
Global	62	38
South Korea	59	41
Vietnam	56	44
Canada	54	46
Taiwan	34	66
UK	32	68
USA	28	72
Japan	12	88

Beer packaging breakdown worldwide for 2018.

Year	Glass	Can
2010	85	15
2011	83	17
2012	80	20
2013	79	21
2014	78	22
2015	77	23
2016	77	23
2017	75	25
2018	74	26
2019 (estimated)	72	28
2020 (forecast)	71	29
2021 (forecast)	69	31

Beer packaging breakdown in China (2010-2021 forecasts).

The company has invested more than \$60 million in a technological transformation over the last five years. Currently, it has three furnaces, nine production lines and two specialist printing lines. The company's leading products are beer bottles, with an annual output of more than 400 million units, mainly supplying leading brewers such as Yanjing, Qingdao, China Resources and other beer brands.

## Summary

Despite its achievements of the past two decades, the Chinese beer industry (and glass packaging for the segment) now faces serious challenges, including slowing growth rates and slim profit margins. To break the bottleneck, the country's brewers are adopting a number of strategies. Packaging (glass containers) is expected to play a very important role in these strategies.

Competition between the two main formats (glass bottles and aluminium cans) for beer packaging is set to intensify. As attitudes shift, the cost pressure intensifies and the issue of recycling gains more importance, a number of format innovations are expected, as well as fiercer competition for market share. ●

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# Russian glass production set to remain stable

The production of glass in Russia will remain stable this year, despite the negative effects of the Coronavirus pandemic on the local economy and industrial activities throughout the country. This is according to recent statements from leading Russian glassmakers and foreign companies operating in the domestic market, as well as local analysts in the glass business. Eugene Gerden, freelance correspondent reports.

According to Viktor Osipov, head of the Russian United National Council of Glass Industry Enterprises (StekloSouz), total production of glass in Russia amounted to 243 million m<sup>2</sup> in 2019, slightly higher than figures recorded in previous years.

To date, the current spread of the Coronavirus, according to the majority of local analysts, has not had a negative effect on demand for glass from major consuming industries in Russia, which remains generally high. This contributes to the launch of new investment projects in the industry and an expansion of existing production facilities.

In fact, the glass portfolio produced in Russia has expanded significantly since 2017, due to the production of sophisticated and innovative types of glasses by domestic businesses and foreign companies operating in the local market. Analysts expect a further surge of investment activities this year, including the participation of foreign investors.

Recently, for example, Czech company Crystalex announced plans to establish Russia's first full-cycle production of Bohemian glass. The production site will be located in the Krasnodar territory and according to the Governor of Krasnodar, Veniamin Kondratiev, its capacity at the initial stage will reach up to 300,000 products per year.

In addition to Crystalex, other foreign glassmakers are considering an expansion of their presence in Russia, signing individual contracts with local businesses. One such contract has been signed by the Borsky Glass Factory, a leading Russian glassmaker that operates one of the oldest glassmaking factories in Russia (owned by AGC) and Claas Russia, the local subsidiary of the German producer of agricultural equipment and machinery. Under the terms of this agreement, the Borsky factory will supply large glass panels for the needs of Claas harvester



Mir Stekla exhibitions take place at the Expocentre in Moscow ([www.mirstekla-expo.ru](http://www.mirstekla-expo.ru)).

thrashers in Russia. The first deliveries are scheduled for September 2020.

Lybov Petrenko, Director of the Strategic Marketing and Business Development Department at AGC Glass Europe exclusively revealed to the author that at present, the company is modernising production lines at the Borsky glass factory, which is planned for completion in 2021. According to Ms Petrenko, work is currently underway to localise product lines both in Russia and other eastern European states, taking into account design trends and the ever growing demand for 'green' construction. She added that the company is trying to provide Russian customers with access to all of the company's European products but with an emphasis on local market features.

Leading Russian analysts predict that in addition to AGC, other global glassmakers may announce expansion plans in the local market this year. Reportedly, a particular interest of investors may be related to the further

expansion of the safety and energy efficiency sector, which currently shows the highest growth rates of the entire Russian glass market.

In the case of safety glass, analysts suggest, the volume of production and consumption in Russia has increased several times over since 2016/17. Currently, its share in the overall structure of float glass produced in Russia is estimated at about 6% and according to analysts' predictions, will reach 8%-9% during the next few years.

Ever growing local demand for safety glass is associated primarily with the increased construction of large infrastructure projects in Russia, such as business centres, stadiums, train stations, airports and similar facilities. ▶



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Almost the same situation is currently observed with respect to energy efficient glass, the demand for which from local customers, according to analysts of StekloSouz has also significantly increased in recent years.

Separately, energy saving glass will provide additional opportunities for growth. One of the reasons for this is the recent adoption of the new version of Construction Directives and Rules, a legislative act that sets out new requirements for the construction sector in Russia. The directive officially came into force in June 2019 and significantly tightens requirements for heat transfer resistance for windows.

In accordance with the new rules, the use of at least two low-emission glasses in double glazed windows, produced in Russia, is required. According to analysts, the adoption of these norms will contribute to a further increase in the production of glass with an energy efficient coating.

As analysts predict the residential real estate sector will continue to be the main consumer of glass in Russia during the period of 2020-2021, however, the share of the non-residential construction sector in the overall volume of glass consumed in Russia, is also expected to grow. Moreover, the share consumed by the automotive industry will also continue to grow and reach 40% in the overall structure of glass consumption during the next two years.

### Attractive investment option

In contrast to previous years, the investment attractiveness of the hollow glass sector has significantly increased in recent months, creating conditions for its further development and growth. The sector's ongoing consolidation has helped to create this situation.

At the end of last year, Maxim Volkov, a Russian businessman and former head of Phosagro (one of Russia's largest producers of mineral fertilisers), completed the acquisition of the Aleksinsky plant, a Russian producer of glass packaging. According to sources close to the businessman, the deal is part of his plans to establish a new leading producer of glass containers in Russia.



The investment attractiveness of the Russian hollow glass sector has significantly increased in recent months, creating conditions for its further development and growth.

While financial details of the deal have not been disclosed, local analysts estimate the acquisition to be valued at approximately RUB 3 billion (US\$100 million). This is among the record deals recorded for the entire glass sector in Russia in recent times. According to Russian media reports, the Aleksinsky plant will not be an isolated glass asset to be acquired by Maxim Volkov, with the businessman currently talking to other leading local producers about the possible acquisition of their assets as well.

Most local analysts consider the hollow glass sector as a promising niche for the future development of business in the Russian glass market. Reportedly, at present the sector shows high growth rates, despite the ongoing local decline of beer consumption.

### Export potential

In addition to a further increasing domestic glass output, producers and government share a desire to realise increased export performance from the industry. According to analysts from the Russian Ministry of Construction, energy-efficient glass remains probably the most promising export item of all glass exports, with Western European countries considered the main destination. According to producers and state analysts, the ever growing demand for Russian glass from foreign markets can be explained primarily by its high quality, which meets all existing international standards.

The potential to increase exports is expected to be one of the main priorities for Russian glassmakers. State plans suggest that thanks to good raw materials availability and relatively cheap energy resources, Russia may become one of the world's largest glass exporters. Demand will also continue to grow in the domestic market, as confirmed by leading domestic producers.

"These trends are clear to us now" comments Lybov Petrenko. "As glazing areas become larger, there is a need to increase production volumes. There is also an ever growing number of orders for multi-function glass for interiors and facades from customers in Russia."

According to Ms Petrenko, modern architects actively implement energy-efficient glazing standards in their projects. "A particular interest is associated with multi-functional glass, which is used not only as a building material but also as part of the climate control system, thanks to its ability to regulate light transmission and temperature conditions in rooms. For many modern construction and architectural projects that are currently implemented in Russia, glass is not just a material... it is literally an opportunity to bring ideas to life 100%, without compromise." ●

#### About the author:

Eugene Gerden is a freelance correspondent

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# Russian hollow glass producers eye recovery

In 2020, the Russian government may subject glass container exports to logistics subsidies, establish a nationwide network for used glass collection and prohibit the sale of beer in plastic bottles. According to Vladislav Vorotnikov, local analysts suggest that planned state support measures could become a real game changer for the crisis-ridden industry.

Total sales of glass containers in Russia were close to 10.2 billion units in 2019, according to estimates from the Moscow-based think tank BusinessStat. The market volume grew from 10.4 billion units in 2014, to 10.5 billion units in 2015, 11.1 billion units in 2017 and 11.3 billion units in 2018. At that point, however, sales stalled and excess capacity resulted.

"In 2008, when sales to the Russian beer market were soaring, numerous glass plants were built in the country, which drove the industry to oversupply" commented Vadim Drobiz, Director of the Russian Federal and Regional Alcohol Market Research Center, explaining that growth in production capacities took place simultaneously with the decrease in sales. "The main factor contributing to that decrease was the Russian demographic crisis, with an ageing population, since young people are the main target category of customers for beer companies" Mr Drobiz explained.

The Russian Union of Beer Brewers estimates that beer consumption in Russia reached its peak of 12 billion litres in 2007, when most beer was packed in glass. Demand fell to eight million litres in 2014 and was ranging between four and five million litres in 2019, often packed in plastic. This further restricted demand for glass containers. Sales are expected to start growing again in 2020, reaching 11.4 billion units in 2023, BusinessStat projects.

In the early 2000s, the payback period for a new hollow glass plant in Russia was limited to three years but harsh competition and price dumping has undermined the industry's profitability. Now, hollow glass production in Russia is described as a low margin business, according to Maxim Volkov, a co-owner of the Alexinsky glass plant.

## Oversupply crisis ends

The Russian hollow glass market has been experiencing an oversupply crisis throughout the past decade and several plants have been shut down as a result, commented Elena Emelyanova, Executive Director of the Russian hollow glass



Hollow glass production is set to increase in Russia.

industry production association. "The dynamics in the market began to improve in 2018 and we witnessed strong growth in 2019, approximately 9% compared to the previous year. We can describe this growth as a recovery. It is associated primarily with improvements in the industries using glass containers. And without doubt, the recovery in the industry is linked to the earlier closure of some glass plants" Ms Emelyanova confirmed.

Improved market prospects over the past couple of years have prompted investors to restore production at the capacities that were taken out of operation. For example, Ruscam Glass Packaging Holding has recently announced plans to put back into operation its plant in Sazonovo, Vologda Oblast. The cost of the project is Rub 1 billion (\$18 million) and the planned production capacity is estimated at 65,000 to 70,000 tonnes of glass containers per year. The plant was closed in 2013 and was expected to resume operations in the spring of 2020.

"The plant was shut down because of a slump in demand for hollow glass in Russia" Oleg Kuvshinnikov, Governor of Vologda Oblast confirmed, while also indicating

that the project could be subjected to tax breaks as it is important to the local economy. "There is demand and long-term contracts with big clients, which is a guarantee that our products would be in demand" commented Aydin Suha Onder, Plant Director.

Elena Emelyanova confirmed that plans are in place to put back into operation capacities for 1000 tonnes of glass container production per day. "Some capacities have already been relaunched, while others are planned to be relaunched during 2020. It is safe to say that building new glass container plants in Russia at this time is senseless. Despite the positive dynamics of the past few years, so far it is too early to forecast any sustainable growth in the industry's average profitability."

Some companies are considering expansion projects, however, including Stavropol-based Kavminsteklo, who recently announced plans to invest \$18 million to commission its third furnace by 2021. The plant produces 470 million glass containers and the planned expansion should increase that figure by 25%, according to Vladimir Shevchenko, Deputy Energy, Industry and Infrastructure Minister for Stavropol Krai. "The demand (of local) companies for hollow glass is gradually ▶"



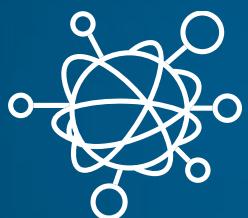
The availability of more waste glass could benefit Russian hollow glass plants.

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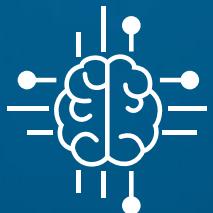
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The Russian hollow glass industry is set for recovery.

growing and putting new production capacities into operation would allow this growth to be addressed" Mr Shevchenko added.

#### Full focus on demand

Investors in Russia are careful to avoid detailing their future plans, because it is not yet clear how the sales dynamics in the domestic market will develop in the coming years. "The overall demand for hollow glass in Russia was shrinking between 2011 and 2016" Elena Emelyanova commented. "This trend ceased in the second half of 2017, with demand starting to grow in 2018 and moderate growth also registered in 2019."

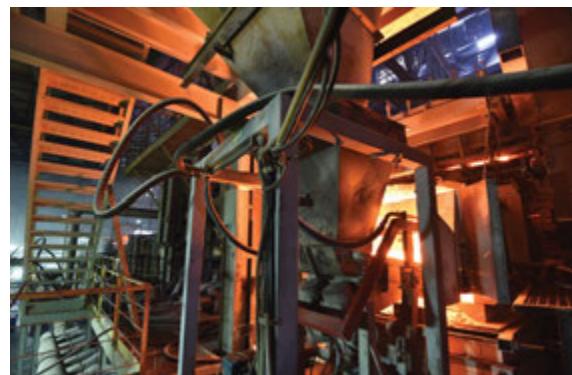
One of the main factors contributing to the market recovery was Russia's hosting of the Fifa World Cup in 2018. "Aside from that, the summer of 2018 was warm and long" Ms Emelyanova added. "In 2019, there was more inertia. Although sales in some categories recorded growth, it would be wrong to say that there was a solid growth trend last year, however.

"In 2020, the excise rate on alcoholic beverages should increase, some decision should be made in regard to selling beer at football stadiums and some ecological issues affecting the packaging industry are expected to be addressed, so it would be better to make forecasts regarding future demand at the end of 2020" Elena Emelyanova confirmed.

Since 2018, the Russian government has been considering the introduction of restrictions on the use of plastic for beer packaging on environmental grounds. A decision is expected during 2020. This move could greatly support domestic demand for glass containers.

#### More waste glass in the supply chain

Additionally, the government wants to embark on a container deposit system in Russia. The idea is a simple one, with a deposit charged on a wide variety of containers made from plastic, glass and aluminium. Moscow alone will spend Rub 20 billion (\$300



Russian hollow glass plants could benefit from the country's ecological campaign.

million) to establish the necessary infrastructure.

It is expected that the new system could become operational in 2021, supplying hollow glass plants with more cullet and hence improving production costs throughout the industry. "Russian plants experience a strong shortage of waste glass" Elena Emelyanova explained. "As of now, recycled cullet in Russia accounts for 10%-15% of the furnace batch, of which 7%-10% is in-house material. Separate waste collection will undoubtedly positively impact the Russian glass industry."

The government wants to pay Rub 5 (\$0.08) to Rub 7 (\$0.11) per glass container within the new system and deliver the collected material to glass plants free-of-charge. Some plants are already collecting used glass containers but without great success. In Novosibirsk, for example, the price per glass container is Rub 0.5 (\$0.008) to Rub 1.5 (Rub 0.024). The Russian glass plant Ekran is paying Rub 3.5 (\$0.056) per kg of waste material. It is widely believed that the price offered by glass plants is not high enough to encourage consumers to recycle their used glass containers.

#### Export potential

Russian plants are currently selling 10%-15% of output to non-Russian customers, exporting roughly one billion units every year, according to Russian hollow glass industry association estimates. The main sales markets include post-Soviet Union countries and the European Union, with some plants planning to expand their export initiatives.

"In 2019, the Dagestan hollow glass plant DagestanStekloTara managed to double exports to \$4 million" said Gadji Sultanov, Dagestan Economy Minister. "In 2020, the company plans to expand its production of glass in line with European quality standards via a project valued at Rub 2 billion (\$33 million)" he added. The company is exporting glass containers mainly to Georgia, Azerbaijan and Armenia.

Separately, Russia has recently introduced logistics subsidies for the export of selected industrial goods, possibly including hollow glass. Under the terms of this programme, Russian companies could seek a reimbursement of up to 80% of the costs associated with delivering their goods to foreign customers. It is yet to be seen whether hollow glass plants could apply for state aid but if so, the new programme could significantly expand Russian hollow glass exports in the coming years. ●



Profitability levels are low in the Russia hollow glass industry.

#### About the author:

Vladislav Vorotnikov is an independent international journalist

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# Exports could bring Russian float sector back on growth track

Reportedly, some of Russia's biggest float glass plants are considering expansion plans, as exports show signs of growth and as margins increase. Vladislav Vorotnikov reports.

The Russian float glass industry's production performance remains stable, despite flat sales dynamics in the domestic market. Estimates from the Russian State Statistical Service, Rosstat indicate that during the first 11 months of 2019, Russian plants manufactured 222.9 million square meters of float glass. This was 0.2% up compared to the same period of the previous year.

In financial terms, production has grown by between 12% and 15% annually. The shift is driven by the industry's improved effectiveness and a slight change in local demand towards higher added value products. This is according to research conducted by the Moscow-based think tank Vestnik Stroy.

## Innovations in the spotlight

In recent times, growing revenue in the industry has been associated with increased demand for low-emissivity glass. "The emissivity parameters of translucent structures have significantly improved compared to the solutions applied 15 years ago" said Alexander Kruglov, Product Manager at the Russian float glass company SP Glass.

Demand for premium float glass in Russia is growing because, among other benefits, it prevents frost penetration. The product is in high demand in the harsh conditions of



New regulations are needed to boost Russian demand for innovative float glass.

the Russian climate, according to Mr Kruglov. "Glass is increasingly popular as a cladding for buildings and Russian glass plant marketing departments are putting in a lot of effort to give additional momentum to this trend."

It is believed that the Russian float glass industry will continue to shift towards innovative products, including bird-friendly, low bacteria growth and smart glass innovations. This requires the plants to allocate

investments in order to keep up with market demand. "From a technological point of view, this (shift of demand towards innovative float glass) would prompt glass companies to expand their equipment fleet" commented Dmitry Bernt, a spokesperson for Pilkington Glass Russia. "Russian companies are also looking to embark on new technologies to produce ultra-thin rolled glass, multi-component and composite materials."

However, according to Victor Osipov, President of the Russian glass industry association StekloSouz, the growth in demand for innovative products in the Russian glass industry is not fast enough. "One of the main problems typical for the entire (Russian) building materials industry is a lack of demand for modern, high quality products. While manufacturers allocate significant resources to secure the quality and safety of their building materials, the construction ▶



The Russian float glass industry is shifting towards innovative products.



Russia's float glass industry is largely controlled by foreign owners.

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Some float glass producers in Russia have gone into bankruptcy, including the Irbit Glass plant, shown here.

industry is not always reciprocating. It is no secret that Russian builders frequently opt to use, in the first place, cheap building materials, sacrificing quality and safety."

Legal changes are necessary in order to discourage construction companies from using the cheapest building materials. "The existing technical regulations in Russia do not encourage the use of modern types of float glass in buildings, especially for the purpose of higher safety. Because of this, glass with increased strength and fire protection glass are not used widely. It is necessary to develop and adopt appropriate regulatory documents, making the application of safe, high strength glass mandatory" Victor Osipov commented.

In 2016, together with key glass plants and leading

Russian scientific institutes, StekloSouz formed a working group called 'Industrial processing, Fire protecting and safe glass'. Its main purpose is to promote the more active use of innovative glass in the industry. Conversely, some people believe the demand for cheap float glass in the Russian market is only a temporary phenomenon. The purchasing power of the Russian population has not grown since 2014 due to a cocktail of different factors, including western sanctions introduced against several segments of the Russian economy and price fluctuations for hydrocarbons in the global market. "At some point in the future, when economic growth resumes, we will be able to introduce all the innovations accumulated in the glass industry" said Victor Osipov.

#### Exports drive production growth

Russian flat glass plants are estimated to have increased their export performance to 55 million m<sup>2</sup> in 2019. Furthermore, factories commissioned within the past decade have secured almost complete import replacement in the local market; now, imports account for less than 5% of all sales.

"Float glass is one of the few Russian building materials that is competitive in the global market" the StekloSouz President confirmed. "The geography of Russian float glass sales is very broad and includes CIS countries, the European Union, the Middle East, Africa and Asia.

It was exports that allowed Russian glass plants to maintain their production performance, when local demand slumped by 35% a few years ago."

According to Mr Osipov, exports will continue to represent an important factor of the industry's future growth plans. "Right now, Russian investors are planning to build two new float plants in the country, each with a production performance of 600m<sup>2</sup> per day." Additionally, the largest Russian company, Salavatsteklo is considering building a float plant in Novosibirsk Oblast, Russia. Citing its own sources, Russian newspaper *Kommersant* said that the daily designed production capacity of the plant is expected to be 800m<sup>2</sup>, while the cost of the project is estimated at \$200 million.

By 2030, the Russian industry is expected to have almost doubled its



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Russian float glass production is set to grow.

annual production performance to 500 million m<sup>2</sup> of float glass, according to forecasts issued by StekloSouz in 2017. This means that Russia is likely to beat the record of 300 million tonnes of float glass set in the Soviet Union in 1985. Several glass plants have reported plans to increase export levels, including Caspian Glass Plant, who boosted sales by 20% in 2018, launching export initiatives to Albania, Greece, Lithuania and Romania.

Pilkington Glass Russia began exporting glass in 2016 and last year, the company sold 40% of its float glass to non-Russian customers, according to Roman Tarasov, Export Development Director. "We pay a lot of attention to planning delivery times, as we are located in Russia and need to supply glass to all continents throughout the world."

So far, delivery time is not among our advantages, compared to competitors located closer to customers."

#### Challenging factors

The continuing sanctions war between Russia and western countries raises concerns about the future prospects for some industries, where the presence of foreign capital is considerable. The float glass industry is among them.

"Certain concerns emerge because of the continuing concentration of high-tech production capacities in the hands of foreign financial and industrial groups" commented Victor Osipov. "Today, Japanese companies control about 40% of float glass production in Russia. These corporations also hold the world's most modern technologies, scientific and technical developments in the glass industry and the rights to use them."

In solidarity with G7 countries, Japan imposed sanctions on Russia in 2014, following its annexation of Crimea and the destabilisation of eastern Ukraine. A broad range of different companies in Russia,

including some in the construction sector, have been subjected to international sanctions. Foreign companies are not allowed to do business with them, under a threat of so-called secondary sanctions and this may pose certain problems to sanctions-hit businesses.

Separately, concerns have been raised that Russia's float glass industry could be heavily impacted by the problems of Bashkir Soda Co, the biggest producer of soda ash in the post-Soviet era. Bashkir Soda Co produces 2.2 million tonnes of soda per year. Reportedly, the company may cease operations in the coming years, since its current raw materials sources will be depleted in 2022. There are no other suitable material resources in Russia, except in the Tratau Mountains, although no industrial operations are allowed in this territory. ●

#### About the author:

Vladislav Vorotnikov is an independent international journalist





# Indian glass industry investments review

The Indian glass industry has continued to perform disappointingly in terms of new investments and capacity additions in all three major sub-segments. Despite vibrant growth of the country's economy in the past decade, India is still one of the lowest per capita consumers of glass products. Sunder Singh tracks the industry's latest investment initiatives.

With an installed capacity of 12,000 tonnes/day in container glass, 7000 tonnes/day in flat glass and 1000 tonnes/day in table glassware, the Indian glass manufacturing industry continued to perform modestly in 2019. Output figures for 2019 are not available at the time of preparing of this article but major glass consuming segments such as alcoholic and non-alcoholic beverages, the construction and automotive industries experienced a lacklustre year in 2019. Glass demand has remained flat for the past three years, despite a number of government-led initiatives.

Advanced GDP estimates for India's 2019-20 financial year released in the second week of January showed that growth this year may plunge to an 11 year low of 5%, with manufacturing expected to grow for the full year by a mere 2%, while construction is expected to crawl at 3.2%. With the first half of FY20 (April 2019-September 2019) cumulative growth at 4.8%, advance estimates are actually assuming only a marginal improvement in the second half (October 2019-March 2020).

## Glass packaging

The Indian glass container industry is expected to see some churning after a gap of nearly four years. The country's second, third and fourth largest producers (AGI glasspac, Piramal Glass and Can-Pack India) have announced the addition of new capacities this year and next.

Local glass container demand is expected to gain momentum in 2020, as the Indian spirits and beer industries, which collectively account for more than 50% of consumption, have posted satisfactory numbers during the first six months of the current financial year.

After a year of falling demand, beer sales in India grew by 4.6% in 2018, helped by the fading impact of a highways ban in some states. However, when it is considered that growth in the local beer market has been in the range of 8% to 18% between 2009 and 2016, these low single digit growth figures look disappointing.

India's annual alcohol intake increased by 38%



between 2010 and 2017, according to a study published in *The Lancet*, the study of 189 countries' alcohol intake between 1990 and 2017. Between 2010 and 2017, alcohol consumption in India increased from 4.3 to 5.9 litres per adult per year, according to researchers from TU Dresden in Germany, who also published this research in *The Lancet*.

In the absence of new capacities in glass container production, user industries are facing a shortage of bottles in the domestic market. Speaking at the company's conference call last November, Berend Odink, Chief Financial Officer at United Breweries, India's largest beer producer and one of the largest consumers of glass container stated: "Container glass prices have been up in India by around 25% and on top of that, the glass industry in India is having some shortages. We also have a portion of our glass is imported from abroad, where prices are again 25%, 30% above domestic prices."

## AGI glasspac

AGI glasspac, the second largest glass container producer in India, has announced plans to set up a plant at Cuttack in the state of Orissa. Involving an investment of \$50 million (INR 3.50 billion), this greenfield project will have a capacity of 130,000 tonnes per annum. In addition to the new glass container plant, the company will invest \$18.5 million (INR 1.3 billion) on acquiring NNPB technology and glass recycling equipment for its existing facilities. Both investments are expected to be completed in the current year.

## Piramal Glass

Piramal Glass, one of the leading producers in the pharmaceutical, cosmetics and perfumery business, is expanding operations at its Kosamba, Gujarat-based plant with an investment of \$33 million this year. With the

proposed investment, the company will add three new production lines by May 2020.

In 2019, Piramal Glass invested some \$85 million on modernising one of the company's premium perfume bottle furnaces and associated decoration facility at the Kosamba plant.

## Can-Pack India

According to documents which the company has furnished with the state authorities (Maharashtra Pollution Control Board) to obtain the pollution approval, Can-Pack India Pvt Ltd is contemplating the addition of a new furnace with an installed capacity of 130 tonnes/day at its Aurangabad (Maharashtra) glass container plant.

Can-Pack operates two furnaces with an annual installed capacity of 328,000 tonnes of container glass with seven production lines.

## Schott India

The German specialty glassmaker, Schott will expand its installed capacity at Jambusur in 2020, via



According to Berend Odink, Chief Financial Officer at United Breweries, container glass prices have increased by approximately 25% and the local glass industry is experiencing shortages.



an investment of \$29 million. In November 2019, Schott India inaugurated its new glass tank in Jambusar, Gujarat with an investment of \$24 million. This advanced facility - the largest in Asia - caters for domestic demand and exports to overseas markets. With the latest addition at Jambusar, Schott's Indian capacity stands at 17,000 tonnes.

The company is optimistic about pharmaceutical glass demand from ampoules and vials, intended for filling injectable drugs and sterile solutions. In addition to serving the domestic market, Schott currently exports nearly 20% of output from its Indian operations.

With the commissioning of the latest furnace in 2020, Schott will double its capacity in India to 34,000 tonne per annum. The company recognises India and South East Asia as promising markets to unlock the next level of growth for its highly specialised FIOLAX tubing material.

"The pharmaceutical industry as a sector is one of the fastest growing in India and as long as the pharma industry is growing, demand for pharmaceutical packaging is also growing" said Dr Patrick Markschaeger, Executive Vice President, Schott's Business Unit Tubing at the time of commissioning the furnace in November 2019. Dr Markschaeger confirmed that Schott has emerged as a key supplier of glass tubing, a primary packaging material that enables pharma companies to export drugs to international markets and that it also has all regulatory certifications in place.

"While the domestic market remains our key focus, our India plant also caters to the Asian market, thereby contributing to pharmaceutical industry exports and the Indian government's vision of becoming a global pharmaceutical hub" Georg Sparschuh, President, Schott Glass India added. In India, through a separate joint venture with an India partner, Schott makes tubular ampoules, vials, glass syringes and cartridges used in pharmaceuticals and cosmetics.

#### Flat glass trends

In comparison to container glass, capacity addition in Indian flat glass has been healthier in the past three years. Saint-Gobain and Gold Plus Group have each added one float line in this timeframe. A recent slowdown in the local construction and automotive sectors has discouraged existing producers and new entrants from adding more capacity.

#### Saint-Gobain India

The country's largest flat glass producer, Saint-Gobain invested INR 12 billion across projects at its Sriperumubudur manufacturing complex near Chennai in January 2019. The company's new float glass unit, an advanced magnetron coater and glass solutions lines were inaugurated in early 2019 in the presence of Pierre-André de Chalendar, Chairman and Chief Executive Officer, Compagnie de Saint-Gobain, France.

"It has been a great journey for us here in the last 20 years and India is one of the fastest growing markets for Saint-Gobain" he observed. "A lower level of penetration of glass products in India offers long-term growth prospects. Sriperumubudur is the single largest location in Saint-Gobain's world that has different capabilities."

"It is a very large float line" Mr B Santhanam, Managing Director, Saint-Gobain India Pvt Ltd added. "It has a large amount of industry 4.0 built in and uses early stages of AI for decision making. In the Saint-Gobain world, this is the best of its kind at this point of time in terms of capabilities."

The company has also established an advanced magnetron coater and glass solutions' lines. With this installation, the complex will have the capacity to manufacture 140 million ft<sup>2</sup> of high performance and energy-efficient glass. This business eyes more export opportunities.

Anand Mahajan, Chairman, confirmed that the company had ▶

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been growing at a rate of 10%+ in recent years and has set an ambitious target to triple sales in the next decade. Sales of \$985 million (INR 70 billion) were realised in 2018.

With the latest spend, Saint-Gobain's cumulative investments in its Indian glass business increases to more than \$774 million (INR 55 billion) and \$422 million (INR 30 billion) in the state of Tamil Nadu alone.

For a full profile of Saint-Gobain India, see the July/August 2019 issue of *Glass Worldwide* or view the article in the AIGMF's online library of *Glass Worldwide*'s articles at [www.aigmf.com](http://www.aigmf.com).

### Asahi Glass India

The country's second largest float glass producer, Asahi Glass India is expected to commence commercial production from its new automotive glass plant at Patan, in the state of Gujarat later this year. The company will invest a total of \$70 million (INR 5 billion) for this project.

Output from this plant will primarily meet the automotive glass requirements of Suzuki's recently established Hansalpur facility in Gujarat. In the first phase, the plant will have capacities to produce one million laminated glasses and 1.2 million tempered glass sets per annum. In a second phase, the plant will have capacity for 2.4 million units. This will be completed by 2022.

"Despite the market slowdown, work continues in full swing at our plant at Patan, Gujarat" an Asahi India spokesperson commented. "It is going to be a state-of-the-art automotive glass plant with world class technologies and many unique features."

In 2019, the company commissioned a brownfield expansion of a new truck and bus furnace at Chennai. It is also setting up a new sub-assembly unit at Anantapur (Andhra Pradesh) to cater more effectively for future demand automotive glass demand from Korean automaker, KIA Motors.

### Gold Plus Group

In March 2019, flat glass producer Gold Plus Group signed a Memorandum of Understanding with the Andhra Pradesh Economic Development Board to construct a float glass manufacturing unit in Visakhapatnam, with an investment of approximately \$322 million (INR 22 billion).

According to Jimmy Tyagi, Executive Director at Gold Plus, the proposed plant will not only reduce lead times for supplying glass in the state but will also be more cost-effective and thus will contribute for the growth of the state.

The company has not shared the timeline for this project. Currently, it operates two float plants in Roorkee, (Uttarakhand state), with a total installed capacity of 1100 tonnes/day. Gold Plus is also into value added glass manufacturing, with production facilities in Sonepat (Haryana) and Kala Amb (Himachal Pradesh). The current installed capacity of these two lines is 427,000 tonnes per annum.

Post-commencement of its second float line in February 2018, Gold Plus refurbished its first production line with a major investment during the period from April to September 2019. With the commencement of production from its second line, Gold Plus Glass has emerged as the third largest glass manufacturing company in India on the basis of installed capacity, behind Saint-Gobain and Asahi India. The capacity enhancement has enabled the company to enter the tinted glass sector, which garners higher realisations and superior profit margins compared to clear glass.



The Indian flat glass industry has been impacted by a slowing national economy.

### Vedanta Resources

London-based Vedanta Resources Ltd is expected to make significant investments in the Indian glass industry in the coming years. This diversified global natural resources company produces aluminium, copper, zinc, lead, silver, iron ore, oil and gas and commercial energy. Vedanta has operations in India, Zambia, Namibia, South Africa and Australia.

Speaking at the India Economic Conclave in Mumbai last December, Vedanta Resources Chairman Anil Agarwal said the company is planning to invest around INR 600 billion in India in the next two-three years. "I am keen on developing the glass industry that will be used in electronics. We are developing the glass used in mobiles, TV sets and computers in countries like Korea, Taiwan and Japan. If the atmosphere in India is conducive, we will get to do that here as well. This will give a boost to the electronics industry.

"I am committed to India. I have already invested \$35 billion in India in the past 10 years. I have bought 13 companies so far including Hindustan Zinc, Balco, Sesa Goa and Cairn and all of them are doing well. " Mr Agarwal added.

### Future targets

The Indian government has undertaken a number of important initiatives in recent years, all of which are expected to play a key role in glass industry growth.

In the Union Budget 2019-20, the Government of India (GoI) gave a massive push to the infrastructure sector by allocating INR 4.56 lakh crore (INR 4.56 trillion, \$63 billion). A large part of this spend would go for construction activities, where flat glass plays a significant role. In addition

to this announcement, Indian Prime Minister Narendra Modi has stated his intention to make India a five trillion dollar economy. To achieve the ambitious target in the next five years, the manufacturing sector is expected to contribute significantly.

Separately, a potential ban on single use plastics has been gaining momentum in India. The glass container industry is expected to see immense benefits if this ban becomes law. And from 1 January 2020, the state government of one of the southern most states (Kerala) has banned the manufacture, sale, storage and transportation of various single use plastic products including PET bottles of less than 500ml capacities.

Cheap spirits is one of the sub-categories where PET bottles have made great inroads in packaging. Considering the ban on PET bottles, The Excise Department at the state of Kerala (the department responsible for the distribution and sale of liquor) has proposed a steep hike in registration and a labelling fee for distilleries that package their products in PET. The Excise Department will offer incentives to liquor companies that opt to sell their products in glass bottles instead. This inducement would help distillers to offset the marginally higher costs associated with liquor sold in glass bottles. A 750ml glass bottle costs distillers INR 7, whereas a PET bottle of the same capacity costs only INR 3. ●

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# Multi-layer laser cladding on cast iron moulds

Multi-layer laser cladding of Ni-based powder on grey cast iron glass moulds has allowed users to obtain a high coating on the substrate. Today, it is possible with this innovative technique to obtain perfect metallurgical bonding without affecting the mould's main properties. Thanks to the results obtained, a gain in the final product thickness is possible, as F Bourahima, M Rege and A I Amaral explain.

Laser cladding of an Ni-based powder on cast iron moulds was performed with a 4kW Nd: YAG laser. The cast iron is used as a thermal exchanger in the glass mould industry. But the issue of this material is its poor resistance to corrosion and abrasion. The role of the Ni-based alloy is to protect the mould, without affecting its thermal properties.

The purpose of this research is to produce a multi-layer coating without pores or cracks and with a very small dilution zone on a complex surface. The impact of the processing parameters, power (1585-2200 W) and scanning speed (6.5mm/sec) on the coating microstructure was investigated with SEM analysis, microhardness and residual stress tests. The influence of the dendrites growing direction during solidification on porosity and cracks appearance was noted.

It has been observed that with conventional cladding methods on complex geometry, several issues can occur (pores, cracks and lack

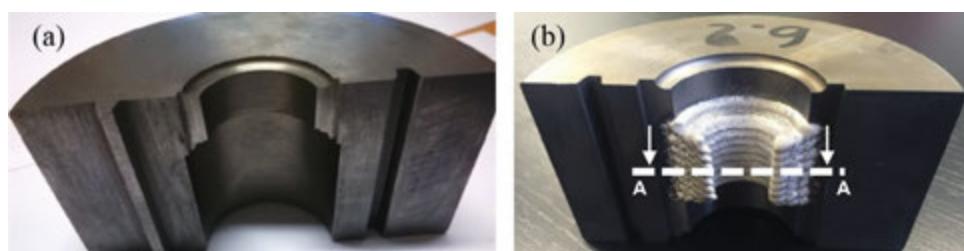


Figure 1: Half of the mould ring (a) before and (b) after Ni-laser cladding.

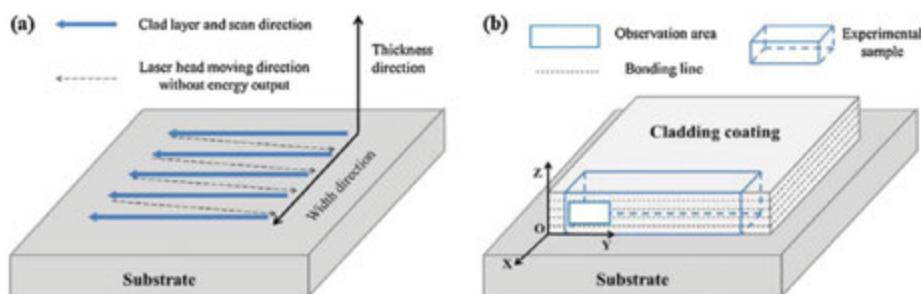


Figure 2: Schematic diagram<sup>(1)</sup> of (a) the first layer cladding process strategy and (b) observation plan (Y-O-Z) across a multi-layer cladding<sup>(1)</sup>.

of bonding). An optimisation of the processing parameters was necessary to ensure multi-layers without faults.

The manufacturing process for a bottle consists of injecting a viscous glass (700°C-1200°C) within a grey cast iron mould. In the knowledge that they also serve as heat exchangers during the production cycle, glass problems appear during moulding since abrasion and corrosion occur on sensitive mould parts, as well as thermal fatigue associated to the moulding cycle.

The moulds must therefore undergo a specific treatment (surfacing using a high property suitable material) from the beginning of manufacturing on large surfaces. To do this, Ni powder deposition was carried out by multi-laser cladding, especially at the neck of the glass mould on a curved area. The microstructure has been observed by optical microscopy, scanning electron microscopy (SEM) and energy dispersive spectroscopy (EDS). The influence of the process parameters on the bonding quality and the coating microstructure is presented below.

## Materials, experimental protocol and results

Laser cladding consists of melting an injected powder on a cast iron substrate by a 4kW laser beam to produce a metallurgical bonding. The materials used are shown in tables 1 and 2.

A half of the cast iron mould of the bottle ring is shown in figure 1, before and after cladding. The cladding methodology is operated as described in the literature (figure 2).

Elements	C	Si	Mn	S	P	Fe
% wt	2.5-4	1-3	0.2-1	0.02-0.25	0.02-1	Base

Table 1: Grey cast iron.

Elements	Ni	Si	B	Cr	C	Mn	Fe
% wt	Base	2.5	1.3-1.7	< 0.3	< 0.5	< 0.1	< 1.0

Table 2: Ni powder.

Sample	Layer N°	Scanning speed V (mm/s)	Power P (W)
1	1	6.5	1800
	2		1585
	3		2000
2	1	6.5	1785
	2		2200
	3		1985
3	1		
	2		
	3		

Table 3: Parameters according to the first method.

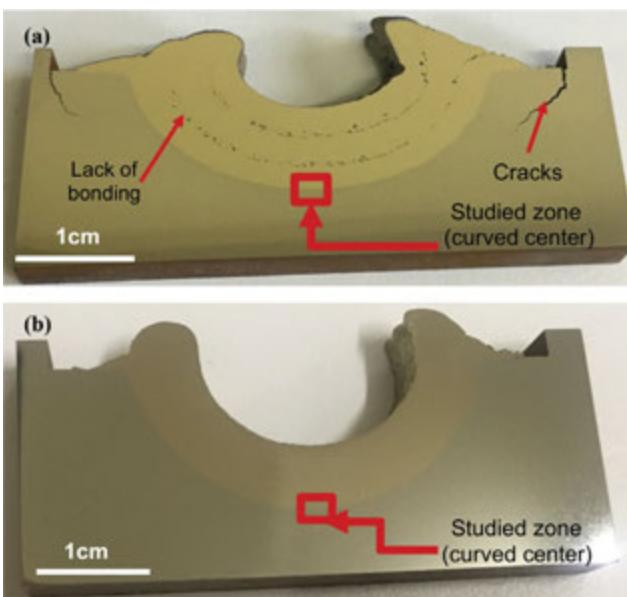


Figure 3: Cut and polished cross-section observed (a) before optimisation and (b) after optimisation of the processing parameters.

As shown in figure 2, the first layer is clad with a power usually used for cladding Ni on grey cast iron (with an absorptivity of Fe of 0.25). Then, for the second and third layers, a lower power is used due to the higher absorptivity of Ni based powder ( $\approx 0.32$ ). The processing parameters are given in table 2.

Figure 3 shows the image observation of a section after multi-layer laser cladding. In figure 3a, a lack of bonding can be observed and cracks. Optimisation of the processing parameters was necessary by changing the cladding logic. The revised parameters are confidential. In figure 3b, after cladding of two layers with the new laser cladding parameters, no cracks and no bonding issue are present, at least with the micrographic observation. ●

#### Reference:

1. K Y Luo, X Xu, Z Zhao, S S Zhao, Z G Cheng and J Z Lu, Microstructural evolution and characteristics of bonding zone in multilayer laser cladding of Fe-based coating, *J Mater Process Technol* 263 (2019) 50–58, <https://doi.org/10.1016/j.jmatprot.2018.08.005>.

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# Twins rarely occur alone

Digitalisation has become a key topic for almost all businesses in the glass industry and the necessary technologies are now available. But along with progress come new questions: For example, how to start the digitalisation process and where? And what are the benefits to the bottom line? Learning more about digital twins will bring readers closer to the answers, says Bernhard Saftig.

The good news first: The digitalisation process can start at any point in the value chain in new or existing glass plants. Making a start will then open up fresh perspectives on a comprehensive approach that incorporates product design, process and plant design, engineering and commissioning, operation, plus services. Understanding in detail how the virtual and real worlds complement each other makes it easy to appreciate the prospective benefits of a fully digital company, where all business processes are integrated and digitalised. The underlying principle is an integrated concept of the much-vaunted digital twin, which takes three forms: The digital twins of the product, production and performance. In the glass industry, this specifically involves digital twins of product, process and plant design, a digital twin covering all aspects of engineering and commissioning and a digital twin for ongoing glass production.

The digital twin helps glass manufacturers, machine builders and plant manufacturers to use the correct infrastructure (hardware, software, communication, security, services) to

establish a self-contained link between virtual and real production. Using this link, they can optimise virtual production using the performance digital twin of the real production process. When the simulation process has been completed and these optimisation scenarios have been put into practice, the cycle starts over. "The goal is a closed circuit that connects the virtual world of product development and production planning with the physical world of production system performance and product performance" Bernhard Saftig, head of the Glass Business at Siemens explains.

## How the digital twin grows, step-by-step

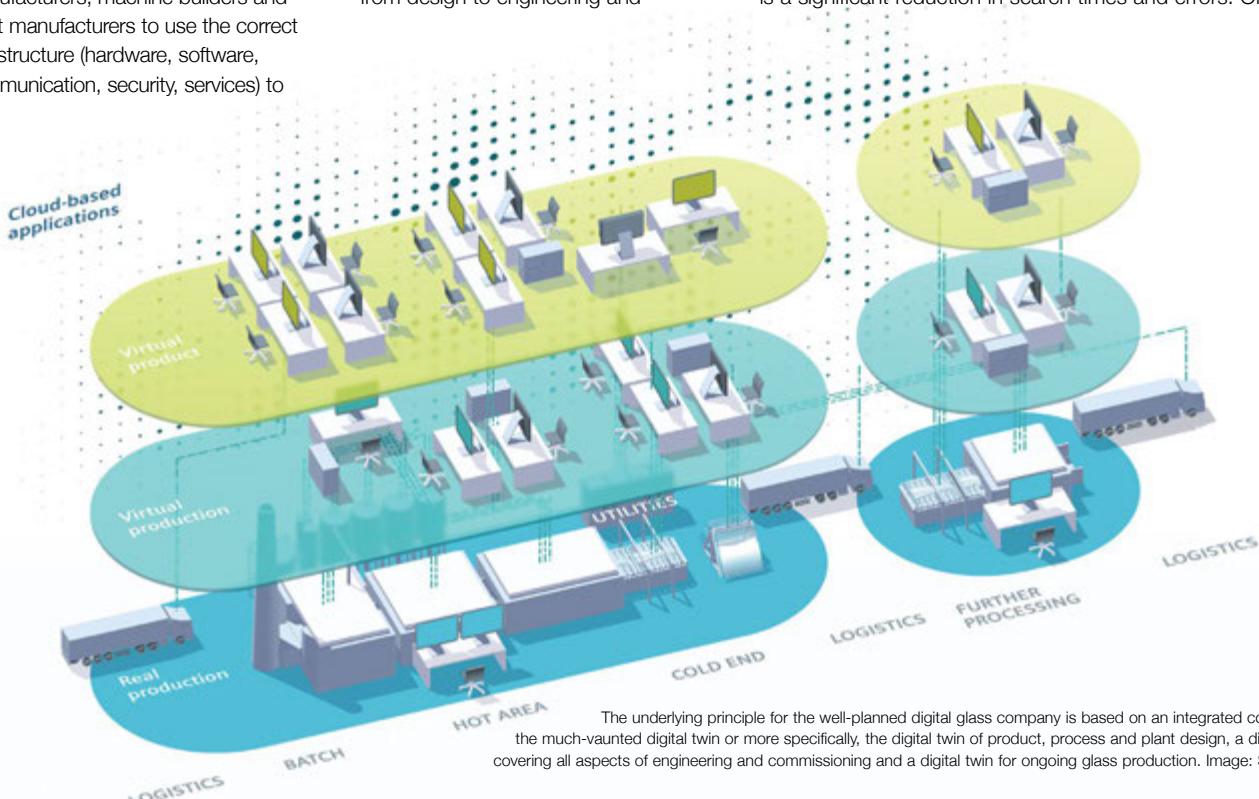
At greenfield plants, virtual production begins in the stage of process and plant design. In other words, when the focus is on designing, simulating and engineering the process plant. A digital twin of the plant, including its automation systems, is generated automatically, building from collaborative platforms and with full data integration from design to engineering and

commissioning. The digital twin can then be used in real production with minimal effort, saving engineering costs and reducing the time to actual commissioning.

The same applies to machine design, which means that machine builders can support glass manufacturers with digital twins, both in the early stages and later, during virtual commissioning and in ongoing operation. With digital twins, users can also develop better glass products in a much shorter timeframe. The digital twin makes the design process more efficient, because it can be run and tested with more configurations than would be physically possible in real-time.

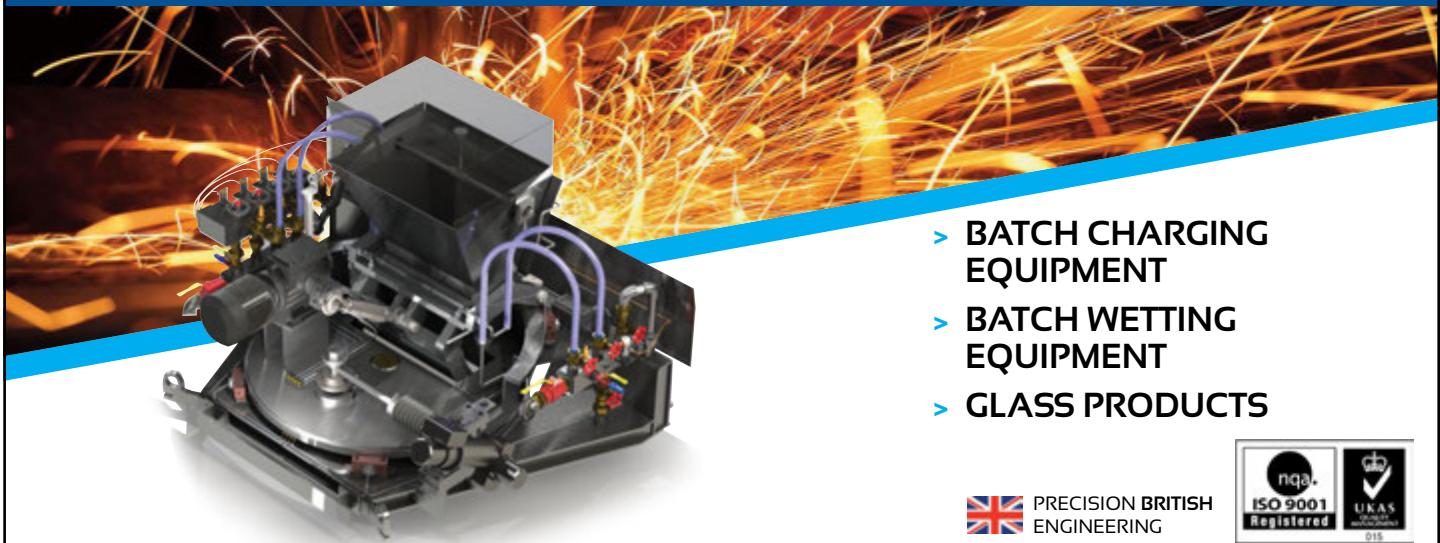
In the real world, process control systems and manufacturing operations management (MOM) ensure that production runs reliably. They also help gather relevant data in order to generate a digital twin for performance. The performance digital twin is created on the basis of the real production systems and is enriched with IoT data. It can then be used to optimise production and maintain critical equipment.

Existing plants already have hardware, software and processes in place – in some cases, for decades. But even in these cases it is still possible to draw on the huge benefits that digital twins offer, in order to optimise existing processes and equipment. A digital twin of an existing glass plant can break down information silos and ensure that modernisation and maintenance activities are performed using up-to-date documentation and relevant operational data. The result is a significant reduction in search times and errors. Once ▶



The underlying principle for the well-planned digital glass company is based on an integrated concept of the much-vaunted digital twin or more specifically, the digital twin of product, process and plant design, a digital twin covering all aspects of engineering and commissioning and a digital twin for ongoing glass production. Image: Siemens.

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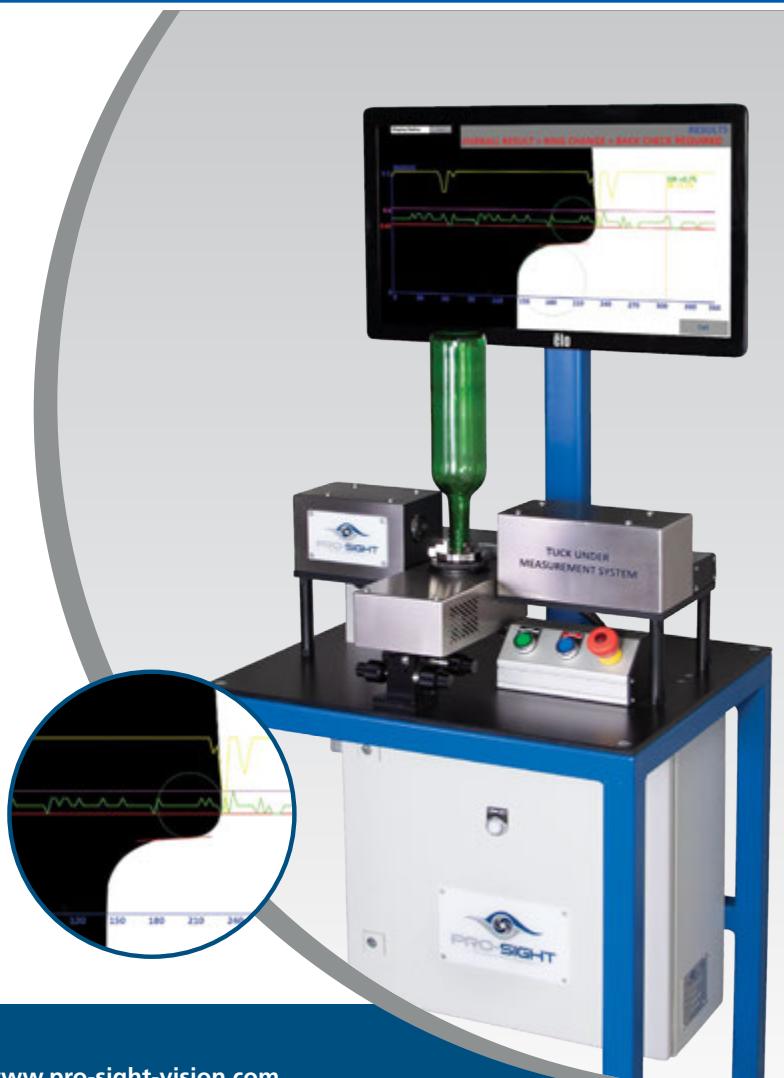
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the digital twin has been generated, integrated workflows can be used to keep it up-to-date for the remaining service life of the plant, creating a permanent closed circuit between the virtual and real production systems. The simulation of optimisation scenarios, for instance, can help glass plant operators optimise plant performance and seamlessly integrate their supply chains in conjunction with the integrated collaboration platform.

#### Practical integration of future technologies

"Although we can now provide a clear description of how the virtual and the real can be profitably combined, a number of managers would justifiably welcome guidance from established experts, especially since new technologies are appearing at a very fast pace" says Bernhard Saftig, alluding to the proven digitalisation consulting services offered by Siemens. "Our teams bring together industry-specific knowledge, from raw materials to the finished product, with expertise at the field, automation, process and company management levels and in the associated IT requirements. The result of the consulting process is a digitalisation roadmap that takes account of specific requirements, business models and existing infrastructure (IT and OT) and examines and assesses them."

The digital transformation can then unfold based on planning laid out in the roadmap, which also includes ROI calculations, in addition to the digitalisation measures defined. "The result is a transformation to a company that operates digitally – a transformation which the glass company itself can carry out" Mr Saftig continues. "For our part, we offer an integrated portfolio of customised solutions, comprising hardware, software, communications, security and services."

A technology that is currently being talked about a lot – and not just in the consulting process – is Edge computing. Cloud or Edge? Thanks to Industrial Edge, this question is no longer relevant. With Industrial Edge, users will enjoy all the benefits of Edge and cloud computing – optimally tailored to the company's specific requirements. Industrial Edge allows them to analyse all data at the machine or preprocess it instantly. The optimised data points can then be transferred more efficiently to a cloud-based, open IoT operating system, like MindSphere, where users have access to more computing power and larger storage capacities. Among other things, this enables a precise analysis of data over longer periods of time.

"Artificial intelligence is also an important design feature in the future of automation in the glass industry" Bernhard Saftig affirms. "Scalable solutions from the field level to the controller and the edge level all the way to the cloud will be feasible in the future. This means that an AI solution can be adapted to its environment and target application as needed, either at the machine or for solutions across all machines or even plants. Production processes for downstream glass users will also be fully automated in the years to come. This will mean a boost in transparency and efficiency at all levels."

#### The bigger picture

It is well known that the whole is greater than the sum of its parts. Only a smart combination of hardware, software and services leads to Industry 4.0, the frequently invoked digital transformation of industrial processes. The drivers of this development include all the fields of technology described and those still to come, as well as the companies that have a well-thought-out plan. ●

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# Developing customised ware handling solutions

An Indonesian glass container manufacturer was facing challenges in reaching high production efficiencies due to improper ware handling. Wesley Weaver describes how specific issues in the hot ware handling process were identified and solutions to help the glassmaker exceed its efficiency goals were provided.

During a routine technical support visit to a container manufacturer in Indonesia, the production department raised concerns about inefficiencies in its hot ware handling. One of the production lines was achieving a forming efficiency of 90%. However, they expected that it should be higher because the container being produced was a standard round bottle, a 116g amber energy drink. The 12-section production line had a triple gob set-up and ran at a speed of 495 bottles/min.

Upon observation, the Dura Temp technical specialist determined the pockets used in the sweepout area were problematic and advised there

was room for improvement. Although the factory was already running Dura Temp sweepout assemblies, it appeared that the incorrect pocket size was being used for the container produced. The containers were not being captured well by the pockets, causing them to become unstable and tip before and during the sweepout motion. This caused misalignment on the main conveyor and downed ware. The container was sitting too far into the 90° angle of the pocket, making it more likely to come into contact with the screws and metal bracket, potentially causing checks. Guide wires were also used to stabilise the

containers at the neck as they moved to the main conveyor. When sweepout pockets do not properly fit the container produced, manufacturers can also experience stuck ware and dented/damaged containers.

## The solution

To select the right pocket for a container, there are many factors that should be considered. These factors include the size of the container, specific dimensions such as height and diameter, the shape of the body and any critical non-contact points. Taking these into account will ensure the pocket correctly captures the container, avoiding any excess clearance between the container and the pocket.

The energy drink container was evaluated with the client considering the aforementioned factors. Based on this evaluation, it was confirmed that the pockets equipped on the sweepout assemblies were the wrong size and needed to be

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This pocket is too large for the container. The arrows demonstrate two of the problem areas.



This pocket is the correct size for the container.

changed in order to improve handling.

The sweepout pockets used by the client were designed for a container approximately 10mm larger in diameter than the container produced. However, the existing sweepout assembly did not need to change. The sweepout assembly had fixed centre-to-centre spacing between the pockets and the current container spacing on the conveyor was acceptable. The assembly also had adjustable offset spacing. This adjustable feature is important because it allowed for spacing modifications to properly align the containers on the conveyor as new sweepout pockets were installed.

After this on-site analysis, Dura Temp recommended its SMP-421-15 pocket, which is specifically designed to handle the 41mm diameter of the energy drink container. Once the new sweepout pockets were installed, the containers were successfully pushed from the dead plate to the main conveyor in an upright position. Since the pockets were the correct fit for the container, they no longer tipped during the sweepout motion, which allowed them to remain in a straight line on the main conveyor.

#### Results

Forming efficiency on the line producing the 116g energy drink container was improved by 6% after the correct sized pockets were implemented. This increase in efficiency can result in savings of tens of thousands of dollars in lost production every week. Additionally, the previously 'troubled' line is now able to run without the use of guide wires, which can often be problematic

by causing checks in containers.

Dura Temp was able to educate the production team on the importance of selecting the correct pocket size for every container to eliminate alignment issues and downed ware. Since the company was able to assist in implementing these changes, all lines at the plant are being systematically reviewed to make sure the correct products are used. The client made the following statement: "Dura Temp always provides us with fast responses when we contact them regarding any ware handling issues. The representatives provide detailed action plans for improvements and teach our associates integral ware handling techniques. The solutions and advice from Dura Temp are not only helpful but very successful. We plan to use Dura Temp products and services on many upcoming projects."

After seeing the results described above, the container manufacturer in Indonesia has gained more confidence in Dura Temp and is now using more of the company's solutions and services. As in the previous case, Dura Temp will often assist clients with on-site visits to ensure that all details of a project can be discussed and reviewed. In situations where on-site technical visits cannot take place in the desired timeframe, the team of technical specialists also uses videos, photos and drawings to understand the challenges and develop ware handling solutions for glassmakers. ●

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# Bridging the gap to deliver future furnace designs

The technologies available today can improve conventional glass furnace performance in compliance with EU regulation requirements and gaining time to solve outstanding issues for a sustainable glass manufacturing industry. Pietro Ercole reports.



Pietro Ercole.

Over the last 120 years, slow but gradual and constant technological development has been achieved, making it possible to sustain the growth of container and flat glass consumption. Today, the most recent conventional glass container furnaces can consume high levels of cullet (75%-80% of the glass pulled), keeping energy consumption between 3.8 and 4 Gigajoules/ton of melted glass.

This goal has been achieved through different measures and in particular, by generating and exploiting intense convective motions in the glass melt. This possibility allows an improvement of conventional furnace performance and more importantly, the exploitation of a technology that can increase the share of electricity by up to 50% of the total energy needed, using so-called 'super boosting'. This process allows compliance with the first three steps of the EU Emissions Trading System for greenhouse gases and the possibility to gain time (20 years or more) that can be spent on solving pending problems.

It is indeed clear that the use of full electric furnaces to replace conventional melters, in the short/medium-term, does not make sense. The number of all-electric furnaces necessary to achieve the daily capacity currently supplied by conventional

furnaces for container and flat glass would require, today, a heavy layout revolution of industrial plants. This hasty solution will necessarily be transitory, until the production capacity with all-electric furnaces will be high enough to cover market needs.

In order to maximise the benefit on greenhouse gas emissions, all glass producers could push the full effect of the 'super boosting' technology up to 50%. By doing so, CO<sub>2</sub> emissions, from 2020 and for a long time, will be much lower than the targets imposed by EU regulations. This would allow the industry to benefit from the accumulation of CO<sub>2</sub> vouchers that can be sold to less virtuous European companies. Gaining time will be indispensable to face and possibly to solve other issues raised that could put at risk the targets for CO<sub>2</sub> emissions reduction (85%-90%) from 2050 forward.

The main issues are:

- The renewable energy power plants (mainly solar power) replacing existing thermo-electric plants using fossil fuel combustion, would require huge surfaces to install the photovoltaic (PV) panels. To date, European renewable electric power production is about 450 Gigawatts/year and the amount foreseen for 2050 will be at least 10 times higher (4500 Gigawatts/year). Therefore, a strong stance of environmentalists aiming to protect the environment from the impact of large sunny surfaces covered by PV panels, continuous exploitation of natural resources and landfill areas collapse that, at the current state-of-the-art, will have to receive millions of End-of-Life (EOL) PV each year, is expected to be very strong.
- A great and complex question to be solved concerns the recovery and recycling of the different materials present in the EOL PV panels. It is known that the

average life of the panels is 25 years. Therefore, it is clear that the accumulation of EOL PV panels will increase, with the expected growth of renewable energy power to meet EU regulations, to reach its maximum in 2050. It should be highlighted, once again, that today's consumption of renewable energy is only 10% of the expected amount. Thus, the accumulation of EOL PV panels and the lack of a reliable recovery recycling process are matters of serious concern.

In the following sections, these questions and proposed solutions will be described and analysed, with the hope that all experts in the field will agree that 'super boosting' is going to be essential to face the issues presented above.

## Super boosting

An important study carried out in 2008 by Professor Beerkens, a very engaged TNO researcher who was dedicated to chemistry and glass engineering topics, led to a fundamental paper that clarified the ways to exploit each phase of the glass melting process. This masterpiece, entitled 'Analysis of elementary process steps in industrial glass melting process tanks - some ideas on innovations in industrial glass melting', explains that recirculation of the melt in the furnaces could be very intense in order to achieve convective currents with five to eight up times before the melt leaves the tank. Figure 1 expresses how these essential convective motions can be generated and maintained over time using a particular super boosting that delivers heat only for the width and a certain thickness of the glass top.

The well melted and fined hot glass laps the batch. The mix containing many bubbles and unmelted grains, falls down at the furnace bottom, driven by its much lower viscosity and then comes back to the hot spot again. This powerful recirculation greatly reduces the temperature difference between surface and bottom, significantly improves the quality of the glass and reduces the specific energy consumption. ▶

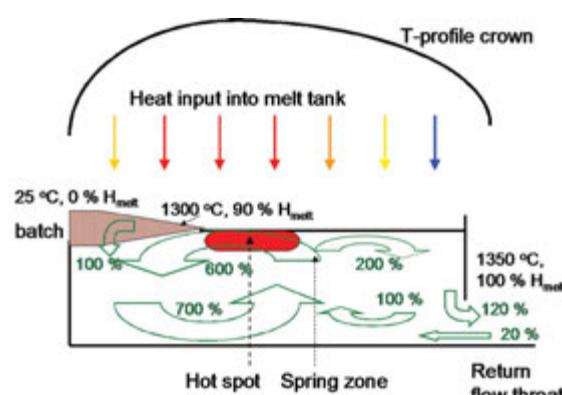


Figure 1: Schematic representation of convective motions in the glass melt.



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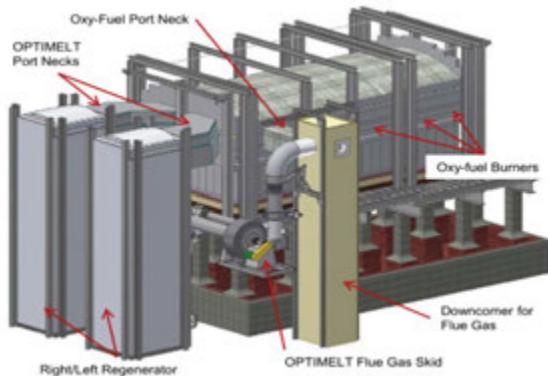


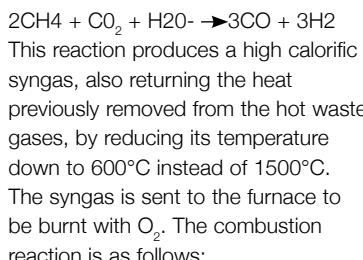
Figure 2: Optimelt technology layout and incorporation in oxy-fuel furnaces.

In the study, it has also been observed that the energy consumption, referred to the kilowatts delivered by super boosting, is lower than the theoretical value. That is due to the strong recirculation of the glass, which drags part of the heat supplied by the combustion towards the bottom. The amount of energy that can be supplied by this kind of super boosting should reach up to 50% of the total energy consumption. Taking as a reference the targets set by EU regulation for greenhouse gas emissions reduction (20% in 2020, 30% in 2030, 40% in 2040 and 85–90% in 2050), from the baseline of 1990 CO<sub>2</sub> emissions (when standard electric boosting was not popular at all), it clearly appears that, by exploiting the principle described above (super boosting), the use of totally electric furnaces can be postponed at least beyond 2040. Of course, throughout this period, the targets set by the EU regulation will be respected in any case.

### Oxy-fuel furnaces

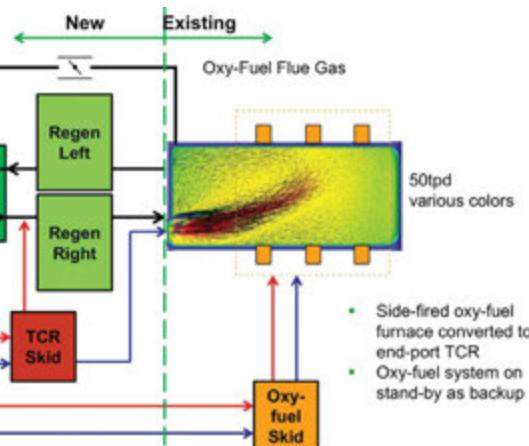
Furnaces operating with oxy-fuel combustion could exploit a new smart technology studied and developed from 2013 to 2016, based on natural gas reforming that reacts with H<sub>2</sub>O and CO<sub>2</sub> present in the furnace waste gas,

with a strong endothermic effect, in the absence of a catalyst, producing H<sub>2</sub> and CO according to the following reaction:



$$\text{CO} + \text{H}_2 + \text{O}_2 \rightarrow \text{CO}_2 + \text{H}_2\text{O}$$

The resulting lower CO<sub>2</sub> emissions, never considered previously, have been achieved by inserting two small reactors downstream of the furnace, where the natural gas is fed counter current to the combustion waste gases, at 1500°C. The combustion products at 600°C are suitable for further energy recovery, both at the glass plant and/or outside. This process (Optimelt) has been developed by Praxair, in collaboration with the US glass group Libbey. The process has been tested continuously for 25 months on a 50 tons/day pilot furnace, confirming the reduction of greenhouse gas emissions by 30%–40% and NOx emissions at very low levels, obtaining significant financial and economic benefits. In 2017, an industrial



plant with a capacity of 100 tons/day, erected in France, confirmed the same results. Figure 2 details the system, alongside a schematic representation of the incorporation of the technology in an existing oxy-fuel furnace. This technology could be exploited for oxy fuel-fired furnaces only, in order to achieve the targets set by EU regulation on greenhouse gas emissions and to postpone the full application of all-electric furnaces by at least for 20 years.

### Recovery and recycling of end-of-life PV panels

The time earned by using the most appropriate technologies for complying with the targets of EU regulation for the reduction of greenhouse gas emissions seems long enough to allow the development of a process for recovering and directly recycling materials from EOL PV panels, with the aim of producing sustainable PV panels (recycling silicon and conductive metals) and a total reuse of materials by other industries (aluminium and glass cullet recovery and recycle).

The life cycle impact of PV panels has been largely explored in several studies but generally, the EOL phase has been excluded or neglected from these analyses. It is expected that the disposal of PV panels will become a relevant environmental issue in the coming decades. In the regular-loss scenario, waste from PV modules amounted to 43,500 tons by 2016, with a projected increase to 1.7 million tons by 2030. An even more drastic rise, to approximately 60 million tons, can be expected by 2050. The early-loss scenario projection estimated much higher total PV waste streams, with 250,000 tons by the end of 2016. This estimate would rise to eight million tons by 2030 and a total of 78 million tonnes by 2050, as the early-loss scenario assumes a higher percentage of early PV module failures than the regular-loss scenario.

Taking into account both scenarios, in 2015, as SASIL SpA consultant and in co-operation with Stazione Sperimentale del Vetro, the author initiated a study for the development of the FRELP (Full Recovery End of Life Photovoltaic), as part of the European 'LIFE' programme. The study was presented at the 32nd European PV Solar Energy Conference and Exhibition ICM International Congress Centre in June 2016 in Germany. The FRELP project focuses on the development of an innovative process based on a series of mechanical and chemical treatments to recover and recycle waste consisting of crystalline-silicon (C-Si) from PV EOL panels.

The process assumes that several materials could be sorted from PV waste, including very clean glass cullet (98%) and aluminium (99%). The possibility to separate all other precious elements (metallic silicon, copper, silver etc) became clear when an innovative technology to separate ▶

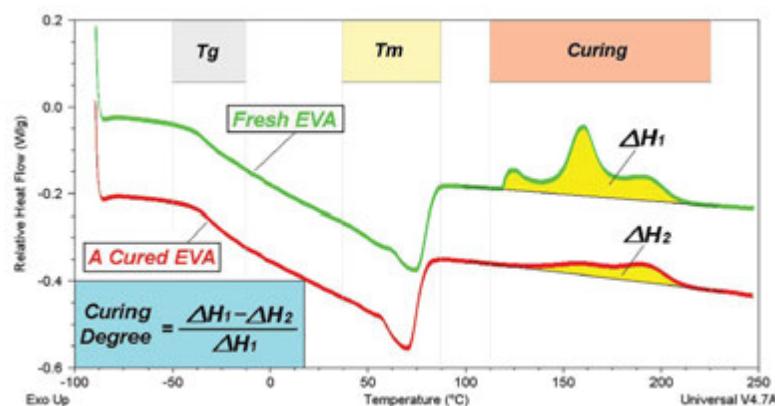


Figure 3: Behaviour of virgin and cured EVA at different temperatures.

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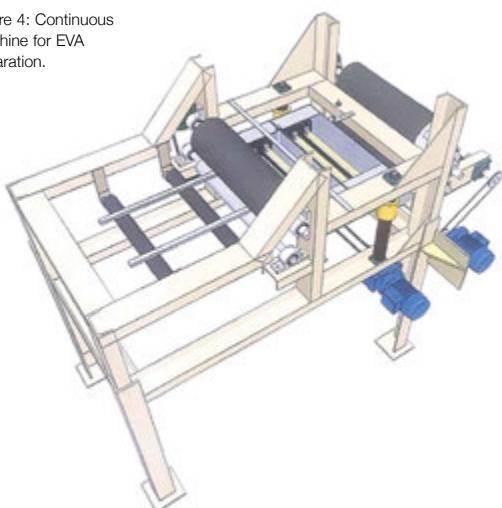
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Figure 4: Continuous machine for EVA separation.



glass from ethylene-vinyl acetate (EVA) was developed, exploiting the graph shown in figure 3 and found in the technical literature.

The graph shows two lines. The green one refers to the original (virgin) polymer, employed for silicon PV modules lamination, that does not contain crosslinking bonds. The second line refers to EVA extracted from an EOL PV module, in which 65% of the initial double bonds have been spent for crosslinking reactions during the module lamination. It is clear that in the EVA present in the EOL PV panels, there is still 'room', both in terms of time and temperature, for favouring glass separation. This result has been achieved by softening the EVA thickness, below the flat glass, by means of controlled infrared rays. Figure 4 shows the continuous machine designed and utilised for EVA separation.

Starting from this result, the process should involve the following treatments:

- Combustion of EVA and other polymeric layers at 850°C, controlling time and conditions for the conductive metals complete oxidation.
- Treatment with nitric acid ( $HNO_3$ ) in slight excess to transfer metallic nitrates in solution.
- Filtration of metallic silicon.
- Separation of various metals from the solution, by electrolysis.

It should be mentioned that the ashes obtained after the controlled combustion of EVA presented a high glass percentage (35%-40%), despite the separation efficiency

being 98%. This is obviously due to the fact that 2% of glass left on the EVA, after combustion, presents a weight comparable to that of the resulting ash. Moreover, the laboratory tests, already difficult and economically uncertain, clarified that the hypothesised chemical treatments were highly disturbed by the glass dilution.

The experiments carried out for improving glass separation from EOL PV panels and/or separating glass from the ashes after combustion of EVA, so far have not provided acceptable results. Therefore, additional questions must be faced and solved. The most important is that the several millions EOL PV modules produced in the last 25 years have been made with different assembly models. The differences, in terms of glass types and their thicknesses, conductor metals and ratios between them, backing sheet materials etc used during the overall period with the aim of reducing costs, panels weight and increasing power generation capability, will generate different scenarios. Due to these open questions and the issues mentioned, the feasibility of the FRELP project should also overcome an experimental completion, bonding together the steps listed above.

### Conclusions

This study aims to highlight that the EU regulation on greenhouse gases leaves the necessary time to avoid an early transformation of conventional fuel/air or oxy-fuel glass furnaces into fully electric, even bearing in mind that compliance with the targets set by the EU regulation for emissions reduction practically imposes this transformation from 2050 onwards. This period of time (20 years or more) allows the industry to avoid

major economic efforts for transitory solutions. The results of the research, which are currently positive, allow the prediction to be made that, within a few decades, total electric furnaces with adequate capacity will be available, hopefully big enough for containers and flat glass production. Therefore, the time that could be gained through the use of the most recent conventional technologies, in particular super boosting and oxy-fuel combustion with natural gas reforming, will be fundamental to tackle the big issue concerning the recycling or reuse of all materials present in the photovoltaic panels that today go to landfills.

This ambitious goal clearly requires that all stakeholders directly or indirectly involved must give their contribution, mainly technical, to achieve concrete and efficient solutions. This effort needs to be addressed in co-operation with all industries involved including those that produce PV panels, raw materials suppliers etc, either in Europe or elsewhere. This major task should directly involve the European Union both economically and through its technical and scientific support.

The EU, which has allocated a large amount of economic resources for climate change solutions, is expected to support the work aimed at developing a more sustainable glass manufacturing industry. ●

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The Tiama Cold Lab delivers an automatic cold end sampling solution.



## An automatic sampling solution

As Sébastien Beltran explains, Tiama is moving forward on production-oriented sampling measurements by completing its product range with an automatic cold end sampling solution.

The production of container glass is a very complex and demanding process that requires quality control and high productivity to satisfy the most demanding customers and maintain glassmakers' competitiveness in the market. Meeting both requirements is not an easy task. Therefore, in order to better understand glassmakers' needs and issues and the difficulties to achieve these goals, Tiama has conducted many on-site visits, conference calls and an online survey in recent years.

The results of these investigations showed that most glass plants reported that existing quality control

processes are already difficult to achieve due to higher production capacity, higher production speed per line and the evolution of quality requirements. Available budgets for new equipment and the high constraints on human resources were also pointed out as key issues, since sampling operations and routine diagnostics are still made manually in most cases.

To reduce this human factor and to increase the efficiency of cold end sampling operations, budget-performed automation is the key. In 2017, therefore, Tiama took the decision to complete its product range with an automatic cold end sampling solution called Tiama Cold Lab.

### Automatic sampling solution

This Tiama solution is a laboratory machine that can be integrated in the production line for automatic sampling.

Designed for round and non-round containers, Tiama Cold Lab presents two main advantages. First, the automatic loading will remove the low value of manual sampling operations. It will also reduce the workload and increase glassmakers' profitability. Then, automation of the measurements, by reducing the human factor, makes the machine less dependent on an operator's level of expertise. These two advantages make the Tiama Cold Lab a reliable machine, increasing the overall sampling frequency, precision and efficiency of the procedure. It will resolve one of the main issues that glassmakers encounter, since it will remove the high constraint on quality human resources.

As its name suggests, Tiama Cold Lab can also be used as an off-line laboratory machine. Infeed and outfeed conveyors are designed for a full range of samples, with no need to position the bottle by hand. For the last three years, the equipment has achieved reliable sampling operations in standard cold end environments on four continents, especially at four leading glass groups and six factories.

### A full range of measurements

The multi-station solution delivers a full range of precise and accurate ▶



Non round article measurement by the Tiama Cold Lab.



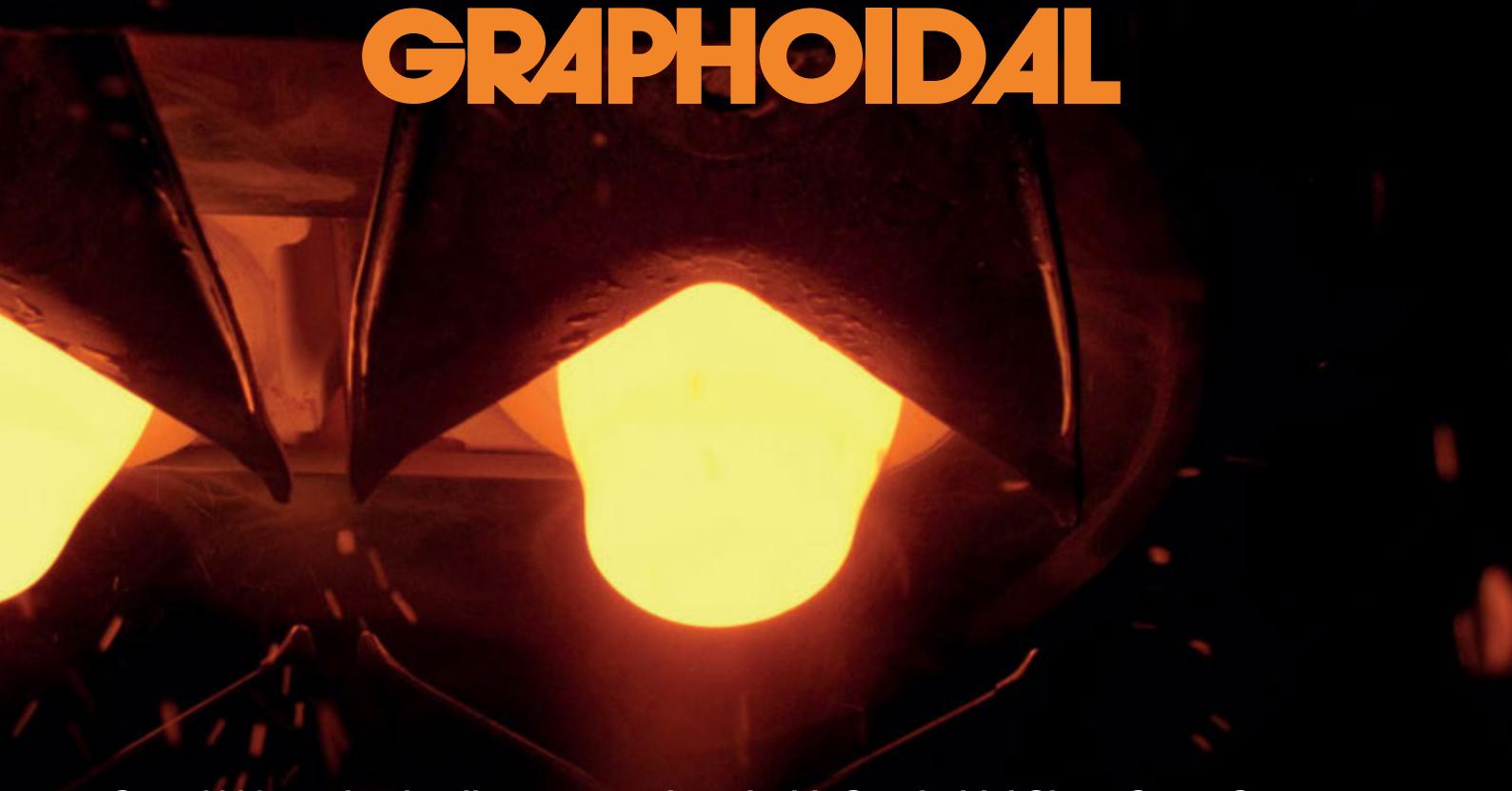
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Example of an in-line Tiama Cold Lab.

measurements, including the finish and body measurements such as D angle, sunk and bulge, verticality and bent neck. Optional features can be added. This includes internal bore gauge by compass and laser (13mm-32mm depth, up to 47mm), weight by high precision weighting scale (0-2kg) or thickness by chromatic probe (0.5mm-8mm). Tiama also wanted to add a series of complementary, optional measurements such as pressure, volume, capacity and impact, which is possible thanks to its collaboration with Somex Innovation.

Measurements can be taken on a wide assortment of round or non-round containers (square, rectangular, oval, flask) as long as the container height is between 40mm and 400mm and its diameter is between 40mm and 120mm.

#### Smart factory compliant machine

In recent years, Tiama has developed its YOUNiverse smart factory concept, where its five areas of expertise (monitoring, inspection, traceability, service and intelligence) all work together to move towards Industry 4.0. With sensors displayed in its machines, Tiama's goal is to retrieve and analyse all available data to have a better view of the process and improve production efficiency.

It is with this goal that the Tiama Cold Lab was designed. Each and every measurement, result, warning and error threshold operated by the system will be registered and compiled into reports, removing another monotonous task for operators. These reports can then be sent into the company's intelligent systems such as Tiama IQ Scan, allowing users to have a full vision of their performance.

Aware of the specific constraints of automatic cold end sampling, Tiama has oriented its latest product as a real Industry 4.0-compliant alternative to existing solutions in terms of performance, optimised budget for complete solutions per line, compatibility with most existing cold end lines, easy-to-use procedures for operators who are unused to inspection machines, responsive R&D and service. ●

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SmartLine 2 is the latest generation of Heye's starwheel inspection machine series.

## Starwheel inspection innovation benefits Stoelzle

Stoelzle Oberglas in Köflach, Austria, has successfully operated the latest glass container inspection technology from Heye International for more than a year. According to Gerd Schütz, the SmartLine 2 starwheel inspection machine combines speed, reliability and flexibility to deliver accurate results.

SmartLine 2 is the latest generation of Heye's starwheel inspection machine series. Developed and manufactured at the company's dedicated cold end centre in Nienburg, Germany, SmartLine 2 glass container inspection equipment can be configured in several different ways, with up to six inspection stations available. The Nienburg facility employs a team of experts and features a modern production layout. Importantly, the centre is close to the Ardagh Group's Nienburg glassworks to undertake essential testing work.

### Flexible inspection options

Among the SmartLine 2's highlights are faster job changes thanks to the equipment's improved design and accessibility, the potential to use existing tooling sets and its enhanced user interface. Full data connectivity to all plant information systems is possible, with easy integration into existing lines. As well as featuring

the latest non-contact inspection innovations, the equipment benefits from outstanding control reliability to avoid downtime.

Depending on the customer's requirements, various container characteristics can be checked:

- Tightness.
- Finish diameters.
- Container height.
- Finish and shoulder checks.
- Bottom and heel checks.
- Body checks.
- Wall thickness inspection (non-contact).
- Defects on the finish surface (LOF - line over finish).
- Out-of-round, body diameter.
- Mould number reading (dot code and alphanumeric).
- Dark check inspection.

In addition, the latest non-contact inspection features are integrated, as well as a self-learning system for camera-based check detection by Ranger 2.

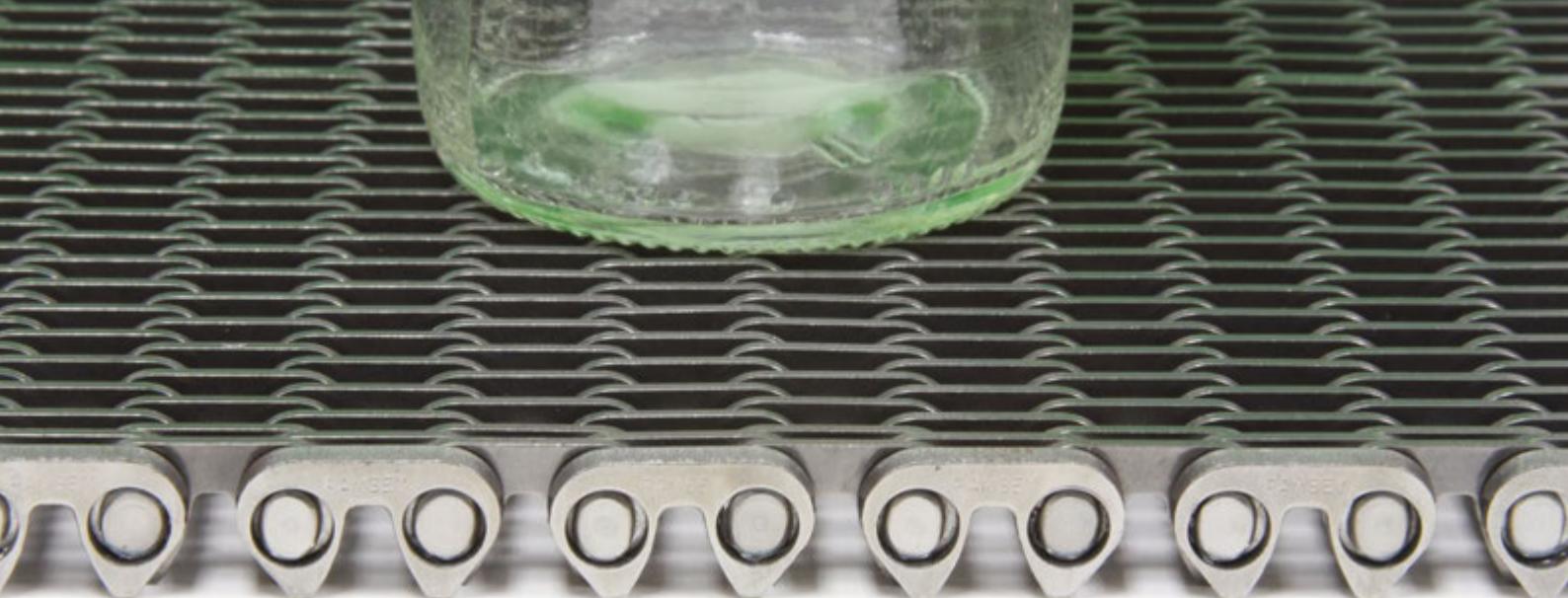
### Positive feedback

Feedback generated from Heye International customers has confirmed the SmartLine 2 equipment's robustness and reliability. Stoelzle Oberglas in Köflach, Austria, the first glass plant to implement this latest generation, is very satisfied with the benefits of the SmartLine 2. Following its launch at glasstec 2018, the company purchased three machines that run reliably and safely.

"Knowing that the SmartLine 2 was brand new, we trusted in the competence of Heye" commented Gerd Müller, Cold End Manager at Stoelzle. "Our long-term and proven partnership finally led us to go for this new generation ▶"



SmartLine 2 equipment can be configured in several different ways, with up to six inspection stations available.



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Gerd Schütz, Heye's Product Development Manager Cold End, praises Stoelze Oberglas as a competent partner for the installation of the first SmartLines 2. "We are very happy to have performed the first installation of this latest generation together with the Stoelze team. It was an easy commissioning, without any start-up difficulties."

The mechanical design and drive system in particular are highlighted for their robust design, while the control system is renowned for its reliable operation. "Sales figures of SmartLine 2 exceeded our expectations" Gerd Schütz confirms. "Joint development in co-operation with our customers turned out to be the right way." For the coming year, Heye expects further growth potential.

### Reliability and robust construction

It is essential for innovations to stand the test of time. In the case of many 21st Century developments, this requirement is achieved by the use of robust industrial electronics and a climate-controlled electrics and electronics compartment, together with high quality components. A touchscreen monitor, simplified access to all electronic components and an extricable mounting plate for frequency inverters and servo controllers enhance operational usability.

Hazard-free working conditions for the operator are provided by a micro-processor-controlled safety module. The machine sets the standard in terms of reliability and robustness. The user interface has been improved and makes job changes as easy as possible. Both the mechanical design and also the control unit are extremely reliable and easy to operate.

The large hood gives optimal access to the working space, reducing job change times to a minimum.

### Improved job change times

The application of servo technology results in a high degree of flexibility. Fast and easy changes to an item's indexing positions and optimal use of the servo torque for up to four rotation stations are possible. Optimised motion sequences allow faster reactions to changing process parameters.

The maximum article height accommodated is 400mm (up to 500mm on request), with angular, oval and round containers processed. Thanks to the servo-driven star wheel, indexing positions from six to 48 are possible.

The enlarged working radius guarantees good compatibility with many existing tooling sets on the market. The tooling range includes a body starwheel, neck starwheel, outfeed guide, centering piece, plug/gauge, stripper and infeed screw. ●

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# Laser mapping the future of glass furnaces

Since its adoption by the steel industry in the 1970s, 'hot' laser mapping of refractory linings has evolved into a powerful tool for time and cost savings, design optimisation and safety improvements. Corey Forster reports.

Early 'hot' laser mapping technologies were limited to measuring a single point at a time and required spatial reorientation between measurements. Today's systems can measure a million points per second by constantly collecting data via a mirror rotating rapidly on two axes. This means that high resolution scans are finally affordable and time-efficient to generate.

Advances in laser technology, optics, rotary encoders and processing software has allowed for rapid collection and processing of point clouds, consisting of millions of individual measurements. The technology has now matured to the point that it warrants implementation in the refractory industry.

The accuracy and consistency of these measurements can yield significant manufacturing benefits, including cost efficiencies, higher production and safety improvements. The integration of high temperature laser mapping with process data can provide a more precise measure of refractory performance, compared to the subjectivity of visual inspection or thermal imagery. Scanning has even been incorporated into production processes, providing real-time data and more exact control over processes and decision making, all without any delay to production.

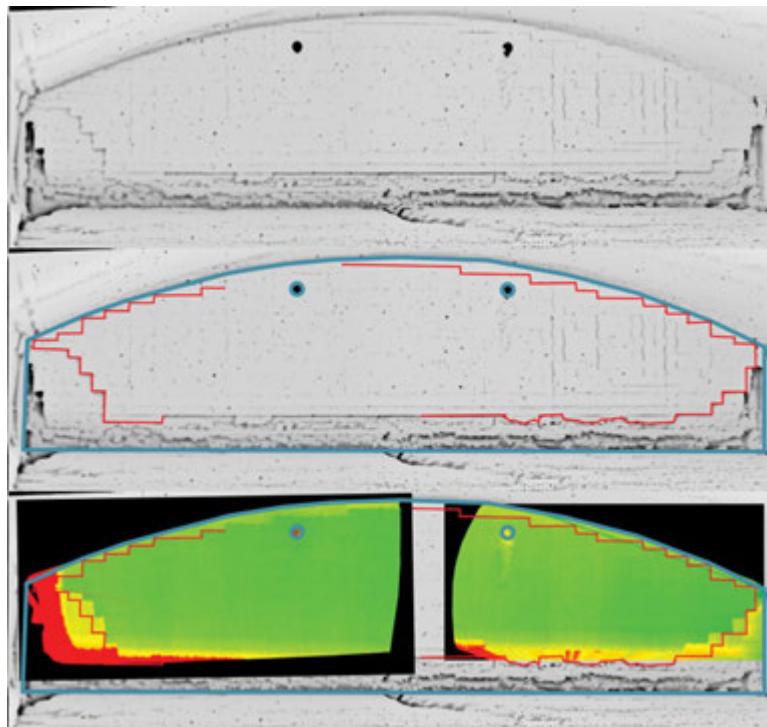
## Current glass industry applications

Building on earlier successes in the steel industry and elsewhere, the prospective applications of high temperature laser mapping in the glass industry are becoming increasingly evident. In the following case study, an operating float furnace was scanned using a laser to determine whether readings of glass refractory compositions at typical glass melting operational temperatures could be obtained. Line of sight measurements were successfully taken through peepholes protruding into the furnace at elevated temperatures on common above-the-melt-line glass refractories.

The potential effects of combustion atmospheres or byproducts in the laser's line of sight have not yet been fully analysed but given that the sampling speed and rate were sufficient to obtain measurements during furnace reversals, these concerns are likely a non-issue. Although the optical characteristics (reflection/refraction) of above-the-melt-line refractories were conducive to capturing distance measurements, glass coatings may have the potential to limit measurement. Because the technology is at present incapable of producing measurements 'through' molten glass, it can only currently be used to evaluate above-the-melt-line refractories in a hot state.

Initial proof of concept targeted breast wall refractory at an operating temperature of 2700°F (1482°C) and a distance of 25ft (7.5m) from the laser to the opposite wall. The scan yielded geometric details and a resolution that even made refractory joints visible.

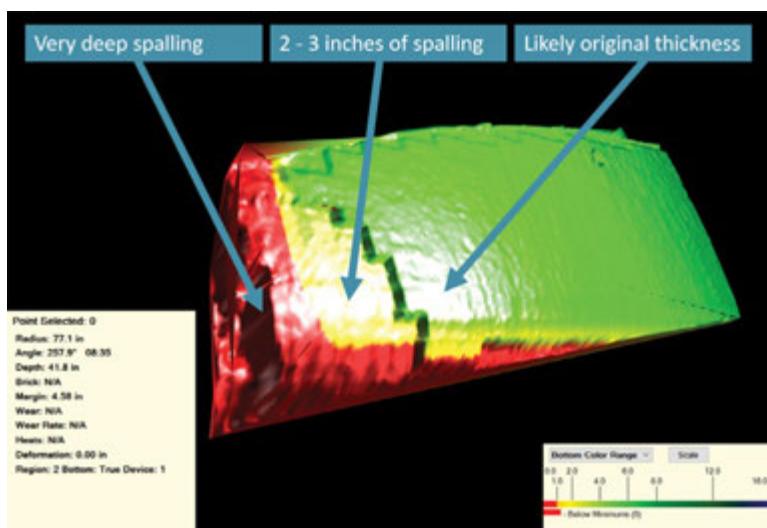
Later work expanded the technology evaluation to



Infrared photography showing surface features and laser measurement outputs overlaid onto the infrared photography.

measuring the back wall (roughly 100ft (30.5m) away) of a melter near batch injection. Although exact thicknesses could not be derived without a baseline reference point, the scans nevertheless yielded information about

the depth of the spalling apparent from earlier infrared imaging. In addition, a comparison of the infrared imaging and hot laser scanning showed that more material had spalled since the infrared imaging. ▶



Isometric view of the laser scanning output, with colour coding to show wear.

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## Future applications

While traditional 'cold' laser measurement technology can certainly help a process owner evaluate variations in 'as-built' versus 'as-designed' geometries or even rapidly capture information during an end of campaign inspection, the ability to capture data from high temperature surfaces opens up even more potential applications.

'Hot' laser measurement could help to evaluate thermal effects at temperature, such as expansion joint closures and could also facilitate 'in-process' monitoring. When deployed both throughout a campaign and at its outset, laser scanning technology can provide useful volumetric information about the potential scope of repair. This information can influence purchasing decisions, reducing both over- and under-purchasing and increase confidence in the estimation of required material.

Above and beyond the usefulness of volumetric data at any given time, these snapshots, when integrated with production data, can yield rates of change that allow for more intelligent planning of future repairs. Although the system is limited to surfaces measurable by line of sight, a glass tank has no shortage of refractory issues above the melt line, including crown subsidence and breast wall deterioration.

The data collected can also be a valuable source of information for the furnace design team. For example, having access to real-time data about historical wear patterns or specific material performance in particular conditions can provide design engineers the insight necessary to use high performing materials where necessary and economical materials where feasible. Guided by this information, engineers can incorporate additional material compositions to zone furnaces, maximising savings, while also minimising risk.

Finally, refractory failures can pose serious risks, not only of production losses and facility damages but more importantly, of personal injury or even fatality. These risks can be significantly mitigated through the use of advanced measuring systems capable of tracking refractory wear. These systems may find use not only in helping to evaluate hazards before an end of campaign entry but also in reducing time spent inspecting or even eliminating the need for entry altogether.

## Conclusion

Laser scanning technology can be leveraged to inform in-process decision making, based on production data in conjunction with laser mapping data. Post-construction scanning, in-use monitoring and end-of-campaign inspections can each serve valuable data collection functions but incorporating all three applications is likely to provide the greatest return on investment.

Full utilisation of laser mapping throughout the campaign of a furnace will enable glassmakers to more accurately estimate the repair scope and project life of a refractory lining. The data generated through laser measurement will prompt new, more sophisticated refractory zoning designs with significant economic and material benefits. Most importantly, by improving operational decision-making and reducing the hazards associated with cold inspections, it will create a considerably safer work environment.

If it capitalises on these rapidly advancing technologies, the glass industry stands to benefit significantly, building a richer, safer and more profitable understanding of refractory performance and operation - one point at a time. ●

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# Remote customer support delivers real-time assistance

Roy Clarkson summarises the 24 hour customer support service available to glass container industry customers from UK-based ware handling equipment specialist Shepppee.

The world has changed in the blink of an eye! When the calendar changed to 2020, it was inconceivable to imagine what everyone was about to face because of the impending Covid-19 global pandemic.

As the glass industry adjusts to the health crisis and all of its associated challenges, the ability to support one another and react quickly to situations has never been more important. With travel restrictions in place, the possibility of sending engineers around the world simply has not been an option. Quite simply, however, the industry cannot afford unnecessary production losses in these difficult times, thereby creating an opportunity for the Shepppee 24 hour remote support service to emerge as an essential lifeline if customers are to continue manufacturing glass containers at maximum efficiency.

For more than a decade, Shepppee has maintained a dedicated 24 hour Customer Support Department, with a team of support engineers available to support glass bottle manufacturers around the clock. The team responds with technical and product support for glass container manufacturers' engineers and customers have benefited greatly in the intervening years. Issues have been resolved quickly and efficiently, enabling customers to resume glass production



Shepppee maintains a dedicated 24 hour Customer Support Department, with a team of dedicated support engineers.

wherever they may be in the world and at whatever time of day.

One of the key factors in the design of Shepppee equipment is the provision of remote connection services to its lehr loaders. By allowing remote access, the company has the ability to monitor its equipment and provide real-time assistance, where its engineers are able to run remote diagnostics and even to check that the equipment is set up and commissioned correctly.

During this period of unparalleled uncertainty, having remote access to equipment has never been more essential and all Shepppee three axis lehr loaders feature remote access capabilities. Furthermore, the Triflex 'S' and recently launched Speedliner 'S' equipment harness the Siemens 'Mind Sphere' platform. This state-of-the-art Industry 4.0 technology gives Shepppee the facility to gather live machine running data from lehr loaders. By analysing this data, it can be determined whether customers need to be alerted to anomalies that may be of concern and that require attention to ensure maximum glass production uptime.

The 24 hour support service is free-of-charge to customers. To access this service, customers are invited to dial the dedicated +44 117 987 5421 (international) or 0844 826 5421 (UK) lines or to contact support@shepppee.com.

Shepppee has always recognised that excellent partnerships are imperative to the future success of any business and all industries and it is the company's aim to ensure that all of its partners are operating to their maximum potential. ●



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## Integrated expertise to benefit pharma packaging customers

According to Alessandro Crescentini, 2020 promises to be a year full of news and opportunities for OCMI Group, following its recent acquisition of KYP Accesorios, the Spanish company active in the field of automatic ampoule production lines since 1992.

Successful completion of the KYP Accesorios deal at the end of 2019 has been followed by a progressive process of commercial and technical

integration, within a spirit of co-operation from both parties. This acquisition marks a significant milestone in both companies' growth strategy. By joining forces, OCMI-OTG and KYP intend to deliver customers with a wider range of products, better service and constant investment in R&D.

"This acquisition expands OCMI-OTG's portfolio of successful businesses and marks another key investment in the pharma packaging field" Michele Gusti Chairman of OCMI-OTG SpA confirmed. "KYP is an excellent company, with a remarkable story of innovation and dedication to its customers. Via this operation, OCMI-OTG reinforces and consolidates its market share in the ampoule making machines sector, widens its current range of products and increases its production capacity. The addition of a great team strengthens our manufacturing footprint, adding more technological capabilities."

KYP Accesorios owner, Raul Paz commented: "We are proud to become part of an international and customer-oriented group like OCMI-OTG. Via this deal, KYP moves another step forward on its path to continuous growth and innovation and broadens its future horizons. It is a project I strongly believe in and I am honoured to join the OCMI global management team."



Tommaso Gusti, CEO of OCMI-OTG SpA (right), with Raul Paz (Director of KYP Accesorios).

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Equipment assembly at the Moderne Mecanique factory in Chelles, France.

With this arrangement, OCMI-OTG has consolidated its identity as a multi-national company, with manufacturing subsidiaries already established in France (Moderne Mecanique) and India (OCMI India) and a commercial organisation in China, now also equipped to provide after-sales service and spare parts (OCMI Glass Technology (Shanghai) Co Ltd).

The integrated production range will be introduced to the market as soon as possible, with updated documentation and updates of websites made in real-time. International sales meetings have already taken place in Madrid and Milan to outline the first strategic guidelines for this latest adventure.

The co-operation will also provide an important boost to specific OCMI activities like vials, dropper and cartridge manufacturing lines, for which the OCMI Group also aims to become a market leader.

The merger of accumulated knowledge maintained within the technical departments of OCMI Group and KYP will deliver technological innovation and the development of solutions at each step of tubular glass processing, starting at tube loading and working through tube forming, container finishing, inspection and packing. According to Raul Paz and Michele Gusti, the proactive approach of personnel involved in this project is permeating both companies and will also be apparent to customers throughout the world. ●



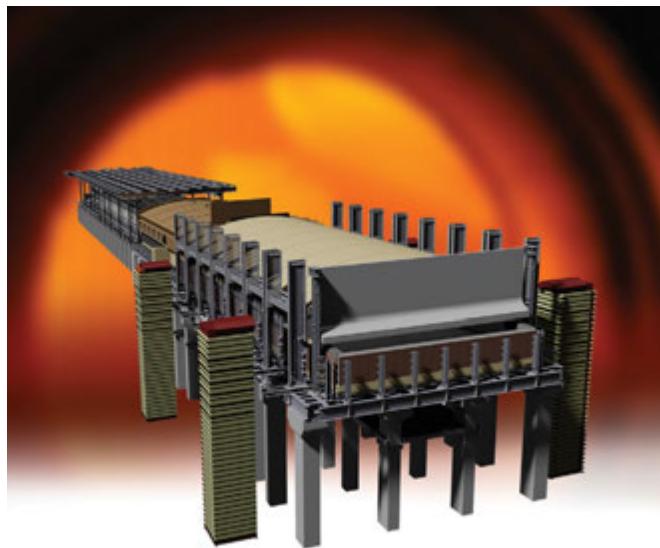
OCMI-OTG headquarters in Milan.

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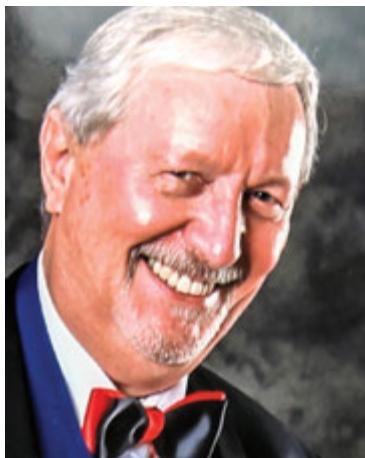
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# SGT meeting plans for 2020

In the face of the escalating international Coronavirus pandemic, Stuart Hakes outlines some of the activities planned by the Society of Glass Technology during 2020.



Stuart Hakes.

As we are all well aware, the Covid-19 (coronavirus) has had a dramatic impact on all our lives across all continents. I sincerely hope that all of you and your loved ones have heeded the advice and managed to avoid close contact and have come through this pandemic unscathed. We live in very difficult times and we all have to adapt. Let us not forget that many people have lost love ones before their time.

The virus has had a huge impact on the Society of Glass Technology. Unfortunately, we have had to furlough most of our loyal and hardworking staff as our landlord, quite correctly, decided to close the offices to ensure

social distancing. We hope to get them back to work as soon as the situation allows.

It has also been decided to reschedule the Training Day 8 and Furnace Solutions 15 Conference to run on 30 September to 1 October respectively at Lucideon, the usual venue. We have no choice as it is clear that it is very unlikely that we will be back to normal at the beginning of June, the event's usual timing. All confirmed speakers have confirmed they are available (see more details below).

I am pleased to announce that the Society now has a redesigned website. It is the same address as previously ([www.sgt.org](http://www.sgt.org)). Once fully operational, it will become not only the primary portal for all members but will also offer a lot of information on all glass matters. Members will still have access to all the existing information and improved content. If there are any problems with accessing membership pages, please email the Society for assistance in the normal way. Of course, members have access to the journals *Glass Technology* (GT) and *Physics and Chemistry* (P&C), depending on which they nominate with their membership package; it can be either or both. *Glass Technology* is aimed primarily at a general readership and *Physics and Chemistry* is peer reviewed papers. It is likely that P&C will move to online only, as this is generally what all academic institutions prefer.

It is planned to use the website to introduce students and others to the industry and show them the exciting and wonderful world of glass. It will explain what glass can do in our daily lives and how it can have a very positive impact on reducing carbon emissions. We have lots of additional plans for the website that will be unveiled over the coming months.

The Society is actively engaged with Glass Futures, which is a very exciting development for the global industry. Although partially funded by the UK Government, it has a worldwide membership of major glass manufacturers in both flat and holloware glass segments.



Seen here with PaneraTech CEO Yakup Bayram, Fred Aker (left) will introduce a furnace health platform that captures audit data from multiple sources and ongoing risks.

## Training day focus

An exciting schedule has been planned for Furnace Solutions this September, with a series of interesting presentations, designed to pass on knowledge to a younger audience and people new to the industry. Among this year's confirmed speakers is Hans Marenholtz of Glass Service in the Czech Republic, who will discuss 'A different approach to furnace audits'. This is not the usual look at the ways of furnace auditing and should be very informative.

Also planned is a presentation by Alan Stevens of Fives entitled 'Forehearth audits – Is glass conditioning equipment at its best?' Glass conditioning takes place in the working end and forehearths and is a vital part of good glass production. Ensuring it is functioning as it should and knowing when it is not is a prerequisite for a well-run container plant. The session will provide a brief outline of the steps necessary to achieve this, structural condition, combustion system set-up, cooling equipment functions and temperature control system operation.

The training day will also feature a paper by Jan Du Plessis Theron of Lucideon entitled 'The challenges of tin bath blocks in the float process and how to test them'. Tin bath blocks are exposed to a distinct operating environment and if not produced correctly, they will create all sorts of problems such as tadpole faults, transpiration faults, seven inch splitting and nepheline flaking. To avoid these disasters in the float glass melter, there are a number of tests that can be performed on the material. The training session will cover the use of special tests, in addition to bespoke tests, an overview of more standard tests. The interpretation provided will allow end users to identify the risks of a specific batch of refractory material that is intended for use in tin baths.

A separate presentation has been arranged from Pauline Darbouret of Ferro France on 'Forehearth colour technology, today's performance needs and new challenges of tomorrow'.

The colouring of molten glass in a forehearth instead of inside the tank has been a key innovation for tableware and premium packaging glass manufacturers. This technology has helped the customisation of glass items when mass colouring was usually dedicated to long coloured glass campaigns. The running of forehearth colours requires expertise, patience and a deep understanding of the molten glass physical chemistry. Pauline Darbouret's talk proposes a ▶



Rob Ireson of Glass Futures will focus on alternative low carbon fuel technologies for glass manufacturing.



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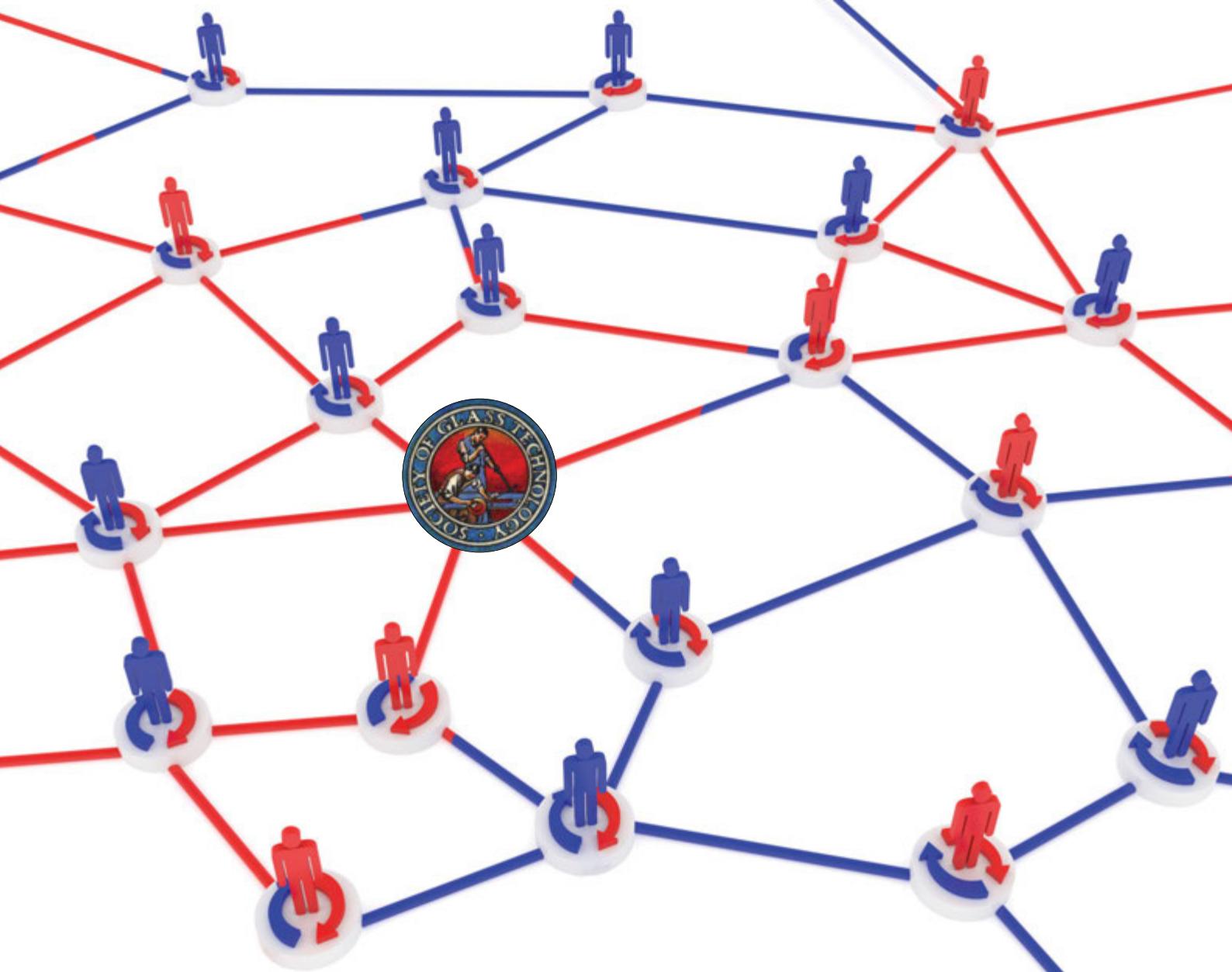
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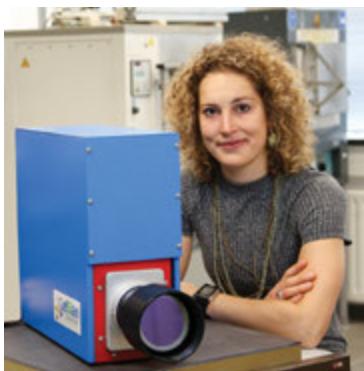
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Lieke De Cock from CelSian Glass & Solar will discuss applications of glass sensors.

quick overview of the daily challenges, looks at glass defects and how they can be overcome. The second part of the presentation will cover sustainable ways of supplying the glass industry with colourful ideas.

CelSian Glass & Solar's Lieke De Cock is also scheduled to speak at this September's meeting, with a presentation entitled 'The application of glass sensors in the glass industry', while a talk by Rob Ireson of Glass Futures on 'Alternative low carbon fuel technologies for glass manufacturing' aims to cover the wide range of projects and opportunities run by

Glass Futures in this field. This includes an update on the Fuel Switching project and may well also include the outcome of a Capital bid for the pilot plants proposed by Glass Futures.

A separate paper by Mathias Hagen of Luft- und Thermotechnik Bayreuth GmbH will discuss NOx, looking at its sources in glass production, current and future limits, the possibilities to reduce NOx, concepts and advantages, as well as storage areas for reactant impacts on planning permission.

Fred Aker from PaneraTech will concentrate on 'Reliable manufacturing', introducing a furnace health platform that captures audit data from multiple sources and discussing ongoing risks. Separately, Saveway GmbH's Dominic Oates will highlight 'Real-time monitoring of refractory lining status in glass melt tanks'. Saveway has developed a portfolio of systems that enable real-time lining measurement in harsh environments such as glass furnaces.

In addition to *Glass Worldwide*, supporters and sponsors of Furnace Solutions include AMETEK Land, Calumite, DSF Refractories, Eurotherm by Schneider Electric, FIC, Fives,

Glass International, Glass Technology Services, Guardian Glass, HarbisonWalker, Lucideon, Nippon Gases, Parkinson-Spencer Refractories, Sefpro, Sibelco, Super Glass, Saint-Gobain and TECO Group.

#### Annual meeting and awards

The SGT's Annual Meeting will take place in Cambridge from 6 to 9 September, adopting the theme 'Changes & Challenges'. This meeting will also incorporate GLASSAC 2020. Further details about this event will be provided in the next issue.

The Society is currently sifting through nominations for the Sir Alistair Pilkington Award – so far, five nominations have been received. This award will be given at the ESG/ICG meeting in Krakow, Poland starting on 13 September.

The Michael Garvey Award will again be presented during this year's Furnace Solutions meeting. Separately, it is planned to create the David Martlew Award. This will be aimed at the history and heritage/arts side of the greater glass industry, in honour of Dr Martlew's significant impact on this field.

All in all, these continue to be exciting times for the Society of Glass Technology! ●

#### About the author:

Stuart Hakes is President of the SGT

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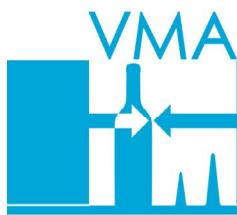
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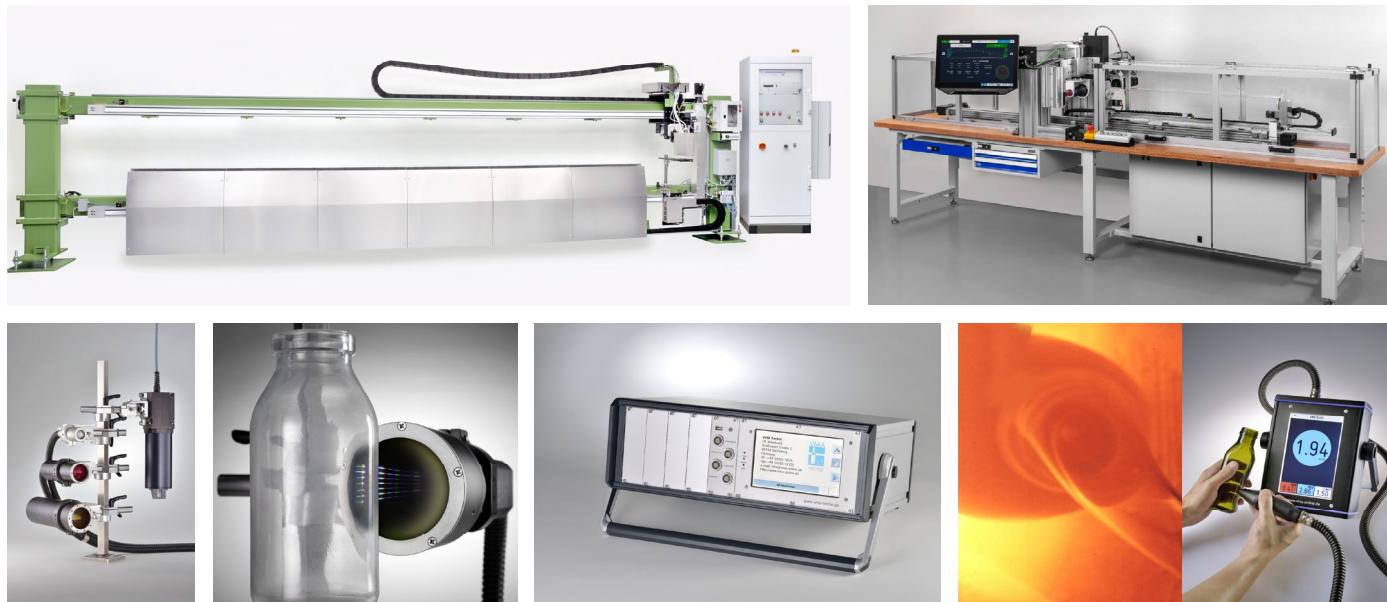
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# Репутация, основанная на высоких показателях производительности

Furnotherm Glass Projects India — это ведущая компания по строительству стеклоплавильных печей, которая базируется в штате Махараштра, Индия. Как рассказывает Джогендра Сингх, компания предоставляет комплексные услуги строительства «под ключ» — от дренажных работ и сноса до введения в эксплуатацию, в том числе сооружения.



Jogendra Singh.

Furnotherm располагает мощной базой квалифицированной рабочей силы и оборудования, что позволяет ей одновременно реализовывать несколько проектов по строительству печей в разных странах мира. Например, недавно были завершены проекты для таких компаний, как Schott Glass T65, Piramal Glass Ceylon, Piramal Glass India, Vitrum Glass India и Sirdaryo Glass (Узбекистан). В настоящее время компания одновременно работает над задачами Schott Glass T66, Piramal Glass (с производительностью 145 тонн в день), Frigo Glass Nigeria и Sunrise Glass India.

Furnotherm постоянно разрабатывает инновационные и современные технологии для монтажа. Компания также создала собственные цехи по производству оборудования для сталелитейных и стекольных заводов.

## Достижения в отрасли

Основатель компании Джогендра Сингх в течение последних 20 лет работал в стекольной

промышленности. За это время он построил множество стеклоплавильных печей как в Индии, так и за ее пределами. Джогендра Сингх выполняет проекты, обеспечивая при этом максимальное удовлетворение требованиям заказчиков. Он имеет высокую квалификацию в отрасли строительства стеклоплавильных печей и работает по принципу «полу-под-ключ».

Furnotherm — это единственная компания-строитель стеклоплавильных печей в Индии, которая обеспечивает максимальный спектр услуг — от дренажных работ до прогрева, сноса, модернизации, установки стальных и жаропрочных конструкций, проведения коммуникаций, установки электро- и технического оборудования.

## Деятельность

Компания Furnotherm обладает требуемыми знаниями и опытом в области строительства печей, а поэтому предлагает комплексные услуги во всех аспектах в соответствии с требованиями клиентов.

Высокая квалификация ее специалистов позволяет гарантировать максимально высокое качество обслуживания в таких областях:

- Снос и утилизация отходов
- Изготовление и монтаж стальных конструкций
- Контролированное охлаждение печей
- «Горячее» бурение и установка электродов
- Логистическое управление жаропрочными и стальными конструкциями
- Монтаж комплексных жаропрочных конструкций
- Сооружение промышленных

- дымовых труб и жаропрочной оболочки
- Ремонт в «холодном» и «горячем» состоянии
- Горячая запайка и изолирование
- Разогрев печи и наполнение стеклобоем
- Предварительное изготовление и монтаж системы трубопроводов для канала охлаждения металлической линии, через которую проходит воздух для горения, и установка электровентиляторов
- Прокладка кабелей электропроводки и технического оборудования, а также установка электрооборудования

Компания Furnotherm нацелена на предоставление комплексных услуг и повышение коммерческой ценности предприятий в стекольной промышленности, начиная с разработки концепции проекта и заканчивая выполнением и введением в эксплуатацию. Благодаря опыту, полученному за два десятилетия работы в разных уголках мира, персонал компании понимает, что внимание к деталям и качеству, равно как и предоставление специализированных услуг, являются ключом к успеху компании.

Высокий уровень квалификации сотрудников, а также применение наилучших и современных технологий позволили компании Furnotherm стать лучшей в области строительства стеклоплавильных печей. Кроме всего прочего, эта компания работает по принципам безопасной организации работ и обеспечивает хорошие трудовые отношения. Результативный мониторинг соблюдения требований помогает добиться высоких производственных показателей при надлежащем качестве.

Все эти обстоятельства дали компании Furnotherm возможность одержать преимущество в конкурентной борьбе, так как она показывает высокую производительность в реализации высококачественных решений, рентабельные расходы и высокий уровень удовлетворенности клиентов. ●

## Автор

Джогендра Сингх, управляющий директор компании Furnotherm

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# Предотвращение аварийных отключений электроэнергии и сокращение тарифов на электроэнергию

Пиковое потребление электроэнергии со стороны неуправляемых электротопительных систем может повысить риск аварийного отключения оборудования и прекращение электроснабжения, особенно, в случаях, если такие системы работают от аварийных источников электроснабжения. Когда возникает произвольная потребность в электропитании многочисленных зон нагрева, это потенциально может вызвать пере-грузку системы электроснабжения с последующим отключением систем аварийной защиты или генераторных установок. В худшем случае, не-управляемое потребление электроэнергии многочисленными электроотопительными системами может создать ситуацию, в которой стекольные заводы вынуждены будут эксплуатировать основной блок энергоснабжения на предельном уровне, создавая таким образом риск аварийного отключения электроснабжения в масштабе всего предприятия. Эпизоды максимального потребления электроэнергии также влияют на измерения, используемые поставщиками электроэнергии для определения тарифов и расчёта счетов, что, в свою очередь, приводит к излишне высокой стоимости электроэнергии. Рене Мойлеман и Амбер Уоткин объясняют, как применение стратегий управления прогнозируемой нагрузкой в контроллере мощности EPower Advanced с тиристорным управлением может помочь максимально уменьшить пиковую нагрузку энергосистемы с помощью технологии «распределения нагрузки» и «сброса нагрузки».



René Meuleman.

На стекольном заводе может эксплуатироваться множество энергоёмких агрегатов, питание которых обеспечивается от основного источника энергоснабжения. Самые «злостные вредители» — электроотопительные системы, такие как дополнительный электронагрев печей, нагрев железной заслонки ванны расплата и лера для отжига. Если такое оборудование оставить без наблюдения, электроснабжение может включаться их контрольными устройствами произвольно.

В случае одновременного включения нескольких таких зон нагрева, нагрузка на источник электроснабжения достигает

пикового предела. Это чревато не только повышением платы за электроэнергию, но и, в худшем случае, может привести к превышению максимальных возможностей основного или аварийного источника энергоснабжения, и последующему полному отключению электричества.

Стекольный завод должен работать круглосуточно и перерывы в электроснабжении крайне нежелательны. Отключение электропитания влечёт за собой сбои в работе температурных датчиков, систем управления выбросами и технологическими процессами, что в свою очередь приводит к производственным потерям и отходам производства, которые могут оказаться чрезвычайно дорогостоящими и повлечь за собой дополнительные затраты, штрафы за превышение пределов выбросов газа в окружающую среду и, потенциально, повреждение печей и прочего дорогостоящего оборудования из-за температурного фактора.

Учитывая наличие высокотемпературных технологических процессов, на заводе должны действовать соответствующие аварийные процедуры, обеспечивающие

безопасность производства в случае неуправляемого перерыва в энергоснабжении и во время восстановления системы. В большинстве случаев для поддержания работы электронагревательных систем используются аварийные электрогенераторы, но эти устройства чувствительны к гармоническимискажениям напряжения и легко отключаются из-за нестабильных кратковременных пиковых нагрузок при неуправляемом потреблении электроэнергии. Пиковая нагрузка может стать проблематичной, особенно, во время модернизации технологического процесса, усовершенствования продукции или расширения производственных мощностей, когда дополнительная нагрузка может привести к превышению номинальной мощности индивидуальных трансформаторов или основного источника питания.

Частые неконтролируемые случаи пиковой нагрузки приводят кратковременным механическим перегрузкам в высокоамперных компонентах оборудования, таких какшинопровода и трансформаторы, что в свою очередь сокращает срок эксплуатации оборудования или повышает расходы на техобслуживание. С точки зрения экономической эффективности системы, случаи потери энергоснабжения в значительной мере связаны с необходимым энергетическим ресурсом, обеспечиваемым системой. При расчёте энергопотерь значение тока всегда возводится в квадрат. Поэтому эффективнее применять конкретное количество электроэнергии при стабильном более низком уровне тока, чем то же самое количество электроэнергии при флюктуирующем токе.

В некоторых регионах пиковая нагрузка энергосистемы может повлиять на измерение, производимое поставщиками электроэнергии для расчёта согласованных тарифов и платы за электроэнергии. Коммунальным компаниям необходимо

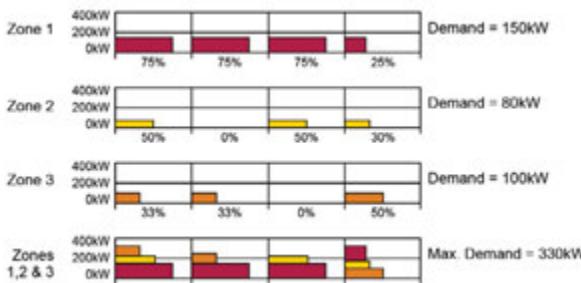


Рисунок 1. Неуправляемые зоны нагрева могут произвольно включаться вместе, вызывая пиковое потребление электроэнергии.

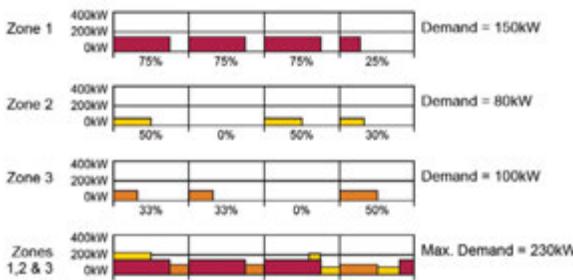


Рисунок 2. Стратегия распределения нагрузки компании Eurotherm балансирует потребление электроэнергии за счёт включения зон подогрева в разное время в период модуляции.

обеспечить наличие энергоресурса для надёжного снабжения электричеством своих потребителей даже во время пиковых нагрузок. С целью рационального планирования производится оценка пикового потребления пользователем и в счёт вносятся дополнительные начисления.

Такая «плата за потребление электроэнергии» может рассчитываться по-разному в зависимости от региона. Расходы показателей пикового потребления могут быть приplusованы к плате за потребление электроэнергии на протяжении всего расчётного периода, что неизбежно приводит к более высокой плате за электроэнергию, чем необходимо. Согласованные тарифы также в большинстве случаев предусматривают такие случайные пиковые эпизоды потребления, спать-таки, без надобности повышая общую стоимость электроэнергии.

Региональные задачи по рациональному использованию электроэнергии и охране окружающей среды заставляют стеклозаводы сокращать энергопотребление и объёмы выброса газа CO<sub>2</sub>. Поскольку бытует мнение, что печи, работающие на органическом топливе, достигли своего предела с точки зрения значительного улучшения показателей будущей эффективности, ожидается, что дальнейшие действия будут предусматривать переход на преимущественно электрические и полностью электрические печи. Учитывая, что срок эксплуатации типичной печи, работающей на органическом топливе составляет 15–20 лет, то у стеклозаводов в арсенале остаётся одна-две печи, после которых им необходимо будет переходить на более эффективную технологию, чтобы выполнить задачи местного правительства, многие из которых запланированы на период до 2050 года. В рамках такого перехода на более эффективное оборудование необходимо также предусмотреть и более высокоеэффективные методы энергоснабжения.

#### Управление прогнозируемой нагрузкой

Компания Eurotherm работала в сотрудничестве со стеклозаводами разных стран над разработкой

решения. Известная под названием «управление прогнозируемой нагрузкой», эта высокотехнологическая запатентованная функция контролера, которая используется в контроллере мощности EPower с тиристорным управлением компании Eurotherm, одновременно решает проблему пиковой нагрузки и перегрузки. Прежде всего, путём применения функции «распределения нагрузки», которая управляет нагрузкой на многочисленные мощности с целью сократить случаи пиковой нагрузки энергосистемы. Такой подход эффективно «сглаживает» среднюю требуемую нагрузку на систему энергоснабжения и, что важно, поддерживает желаемую мощность для каждой зоны. И во-вторых, «бросок нагрузки», оптимизирует и ограничивает максимально дозволенные уровни пикового потребления электроэнергии. Эта функция используется в сочетании с методом пересечения нулевого уровня (также известного, как импульсное отпирание или полно-циклическое отпирание), применяемым в контроллере мощности EPower Advanced с тиристорным управлением. Функции «распределения нагрузки» и «броска нагрузки» предоставляют стеклозаводам возможность эффективно управлять пиковыми нагрузками и поддерживать энергопотребление в пределах мощности своей системы снабжения и тарифа на электроэнергию.

Система управления в контроллере мощности EPower основана на модуле, который может управлять одновременно до четырёх тиристорных силовых блоков в конфигурации, аналогичной „PLC“. В эксплуатации есть возможность синхронизировать до 64 зон нагрева с помощью протокола CAN-шины отдельно от использования протоколов ло-кальной сети, такой как Ethernet или PROFIBUS. Зоны нагрева можно мониторить, например на одной печи, на нескольких печах или даже в масштабах завода, с целью оптимизировать энергопотребление в рамках основной сети электроснабжения. В процессе распределения энергоресурсов функция управления прогнозируемой нагрузкой учитывает различие между зонами нагрева и тот факт, что зона с нормой потребления 10 кВт демонстрирует совершенно другие показатели нагрузки

по сравнению с зоной, норма по-потребления которой 100 кВт. Данное решение может применяться для такого оборудования, как линии для формовки стеклоизделий, печи для закалки стекла и автоклавы, а также ванны для флоат-стекла, леров для отжига и комплексных многосекционных установок для дополнительного нагрева многосекционных печей.

#### Почему используется метод пересечения нулевого уровня?

Хотя контроллеры-тиристоры традиционно используют метод регулирования фазового угла, поскольку он обеспечивает гладкое управление питанием, но он также вызывает сильное гармоническое искажение сигнала и низкий коэффициент мощности (типичный показатель <85%), что отрицательно влияет на энергетический коэффициент полезного действия. Несмотря на то, что метод пересечения нулевого уровня вызывает мерцание сигнала (фликкер-эффект), приводящий к случайному пиковому потреблению энергии, тем не менее, этот метод формирует намного более чистую волну с минимальными гармоническими помехами, а также обеспечивает высокий коэффициент мощности (типичное значение >95%).

#### Многие коммунальные компании взимают

дополнительную плату, когда коэффициент мощности опускается ниже 95%. К концу года это может перерасти в тысячи или даже десятки тысяч долларов, в зависимости от масштабов предприятия. Поскольку случайные пики энергопотребления можно контролировать с помощью управления прогнозируемой нагрузкой, в данной ситуации метод пересечения нулевого уровня рассматривается как более эффективное решение контроля. Значительно более высокий энергетический коэффициент полезного действия способствует снижению затрат на электроэнергию и объёмы выбросов газа CO<sub>2</sub>.

#### Стратегия распределения нагрузки

Стратегия распределения нагрузки компании Eurotherm играет значительную роль в функциональности управления прогнозируемой нагрузкой за счёт использования не-скольких



контроллеров мощности EPower с тиристорным управлением в режиме пересечения нулевого уровня для поддержания стабильного потребления электроэнергии в целом. Стратегия предусматривает распределение мощности для разных нагрузок, обеспечивающее сбалансированное потребление электроэнергии и минимизирует количество кратковременных пиковых нагрузок.

Каждая зона нагрева, управляемая с помощью контроллера мощности EPower с тиристорным управлением, определяется на основании выходной мощности, длительности цикла и максимальной мощности, которые могут быть представлены в виде прямоугольников (см. рисунок 1 и 2). Система управления нагрузкой равномерно распределяет данные прямоугольники (как показано на рисунке 2) и не разрешает им в произвольной форме накладываться один поверх другого в один промежуток времени, как показано на рисунке 1, и таким образом обеспечивает равномерное и гарантированное потребление электроэнергии в любой текущий момент.

**Важно понять, что выходная мощность не изменяется, а балансируется и смещается для выравнивания уровней энергопотребления.** За счёт интеллектуального распределения нагрузки проблемы фликкер-эффекта и возникающие в результате случайные пиковые нагрузки в основном устраняются, выравнивая энергопотребление в целом.

**Стратегия сброса нагрузки**  
Функция сброса нагрузки компании Eurotherm разработана для систем, где энергопотребление может превысить мощность оборудования нагревательной системы или основной системы энергоснабжения. Данная функция может быть настроена так, чтобы ограничить и сбрасывать нагрузку только в тех случаях, когда энергопотребление потенциально может превысить заданную максимальную мощность системы. Управление потреблением электроэнергии так, чтобы нагрузка не превышала установленные пределы, помогает предотвратить избегаемое срабатывание местных и общезаводских аварийных выключателей и сократить риск повреждения дорогостоящего оборудования.

В регионах с высокой стоимостью электроэнергии функция сброса нагрузки также может быть использована для ограничения потребления электроэнергии в рамках установленного тарифа на электроэнергию. Например, если общая установленная мощность 2,5 МВт, но пользователь желает ограничить потребляемую мощность в пределах тарифа в объёме 2 МВт, то функция сброса нагрузки будет сбрасывать нагрузку в масштабах всей сети и поддерживать общее энергопотребление ниже установленного предела. Функция также позволяет корректировать потребление через протоколы промышленных сетей (PROFIBUS, DeviceNet и Ethernet), принимая во внимание дополнительную плату за потребление электроэнергии в периоды пиковой нагрузки.

За счёт динамической корректировки максимального порога для установки, стекольные заводы могут контролировать максимальную плату за потребление электроэнергии, что в результате даёт значительную экономию затрат. В некоторых регионах дополнительная плата иногда начисляется на протяжении последующих 11 месяцев расчётного периода, в зависимости от условий договора. Поэтому даже единоразовое превышение максимального предела потребления электроэнергии может стать результатом штрафа, начисляемого на протяжении вплоть до 12 месяцев. Мониторинг и управление нагрузкой в значительной мере могут уменьшить затраты на электроэнергию. Функция управления прогнозируемой нагрузкой позволяет устанавливать приоритеты, определяемые пользователем, и таким образом распределять нагрузку по мере возникновения необходимости.

### Заключение

В перспективе ожидается, что стекольная отрасль промышленности увеличит использование технологий нагрева с помощью электроэнергии в преддверии более энергоэффективного будущего, поэтому есть необходимость рассмотреть наиболее оптимальные методы работы в области управления, направленные на повышение рентабельности при одновременном уменьшении экологической нагрузки на окружающую среду. Использование интеллектуальных

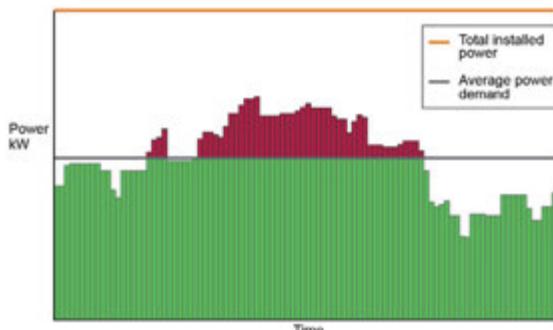


Рисунок 3. Без стратегии управления прогнозируемой нагрузкой, потребление электроэнергии происходит на произвольной основе, вызывая пиковое потребление при средней нагрузке.

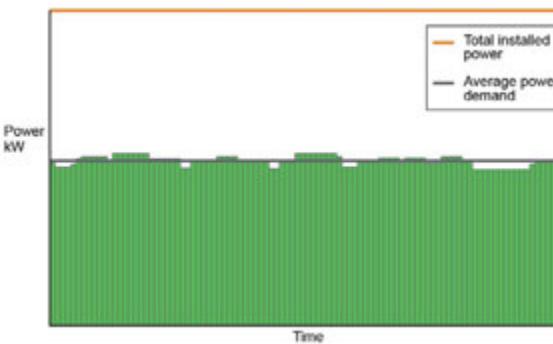


Рисунок 4. Со стратегией управления прогнозируемой нагрузкой потребление электроэнергии распределяется, сокращая пиковые нагрузки.

стратегий управления прогнозируемой нагрузкой в контроллере мощности EPower с тиристорным управлением помогает стеклозаводам поддерживать энергопотребление в пределах мощности своей основной системы энергоснабжения. На существующих предприятиях это предоставляет возможность установить дополнительное оборудование электрического нагрева без риска в будущем вызвать аварийное отключение электроснабжения. Тарифы на электропотребление также можно держать под контролем, сокращая риск потенциальных дополнительных расходов и штрафов и создавая возможности для обсуждения более экономически выгодного тарифа.

Преимущества более высокого коэффициента мощности, полученного за счёт применения контроллеров мощности EPower с тиристорным управлением на основе метода пересечения нулевого уровня, в сочетании с управлением прогнозируемой нагрузкой также способствует улучшению коэффициента полезного действия заводской энергосети, в результате сокращая плату за электроэнергию и выброс газа CO<sub>2</sub>. Специалисты в области стекольной промышленности компании Eurotherm могут предварительно рассчитать экономию энергоресурсов с целью оправдать переход на более эффективную технологию, основываясь на потенциальной окупаемости вложений. ●

### Об авторах статьи

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### Дополнительная информация

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# Компания-производитель плунжеров и охладителей отпраздновала 50-летний юбилей

Ведущая компания-производитель плунжеров и охладителей для изготовления стеклотары Hunpreco Ltd в 2019 году отпраздновала 50-летний юби-лей.

Основатель и президент этой британской компании Эдди Нисом, не-давно получивший Превосходнейший орден Британской империи за вклад в развитие сельского хозяйства в Северном-Йоркшире в категории экспорт-ных услуг, рассказывает о начале своей деятельности и последующем успехе на международном уровне.

## **GW: Как началась Ваша карьера в инженерной отрасли?**

Я закончил учебу в 1947 году и в течение пяти лет проходил стажировку в компании English Electric Co в Брадфорде, что послужило прекрасной основой для моего дальнейшего роста. Два года я состоял на службе в национальных инженерных войсках, а затем вернулся в English Electric Co. Поначалу моя работа заключалась в демонтаже деталей и их осмотре. Позже я занял должность инженера по рационализации производства в летнем подразделении компании — это была невероятная работа. Затем я перешел в сталелитейную отрасль и работал в нескольких ведущих компаниях того времени.

## **GW: Как Вы попали в стекольную промышленность?**

Я был техническим представителем по продажам в сталелитейной компании, но в свободное время занимался механикой и инженерно-техническими работами в заброшенной конюшне. Я случайно встретил представителей компании Rockware Glass (сейчас входит в ArdaghGroup) и узнал, что они

ищут поставщика высококачественных плунжеров. Поначалу они хотели, чтобы я переделал имеющиеся плунжеры, которые не соответствовали их требованиям (это было для них большой проблемой). Хотя на тот момент я уже имел высокую квалификацию в механических и инженерно-технических работах, мои представления о спе-цифике стекольной промышленности были очень ограничены. Но заказчики дали мне всего 48 часов на поиск решения!

Существовали компании литейного производства, которые среди прочего изготавливали плунжеры, однако не специализировались исключительно на них. В то время приходилось вручную снимать покрытие с плунжера и заново наносить его путем напыления. Это был устаревший способ, и мы начали делать лекала, чтобы механизировать процесс. Я всегда шел на осознанный риск, так — мы вложили много средств в персонал и оборудование. Не было как таковых новых технических приёмов, но существовала реальная потребность в создании специализированной компании, которая дорабатывала бы плунжеры, приспособливая их к высоким стандартам. Таким образом, мы могли сэкономить клиентам значительные средства.

## **GW: Насколько быстро компания выросла, чтобы стать способной отвечать возросшим потребностям клиентов?**

Когда я основывал компанию в 1969 году, то назвал ее Hunmanby Precision Engineering Co. Это слишком сложное название, поэтому я сократил его до Hunpreco. Количество персонала постепенно увеличивалось, и вскоре я нанял

двух технических специалистов из стекольной промышленности.

Было сложно находить квалифицированных инженеров, которые бы соответствовали нашим требованиям. Поначалу я обучал их своими силами на обычной, а не на автоматизированной технике. Я работал самостоятельно, а когда начали сыпаться заказы, нам нужно было быст-ро расширяться. Сегодня наша компания — самый крупный в мире изготовитель плунжеров и охладителей для сферы производства стеклотары.

## **GW: Насколько быстро выросла клиентская база?**

Мы быстро заработали доброе имя, поскольку поставляли высококачественные плунжеры за разумную цену, и привлекли таких британских клиентов, как Beatson Clark. Так компания начала развиваться. Следующим важным шагом был выход на международный рынок, вви-ду чего появились новые сложности и возможности. Мы оценили все перспективы, а затем члены команды начали посещать потенциальных клиентов, которые базировались в Европе.

Мы регулярно получали заказы от PLM (сейчас также входит в ArdaghGroup), и вскоре лю-ди заговорили о наших решениях. Но успех не пришел к нам мгновенно, и мы по несколько раз посещали одни и те же заводы. Некоторые клиенты были настроены на сотрудничество в долгосрочной перспективе. С самого начала мы демонстрировали высокое качество, и компания продолжала постепенно развиваться, поскольку о нас узнавало все больше людей, а наши решения говорили сами за себя.

Раньше рискованно было отправлять посылки авиапочтой и все наши изделия поставлялись в Европу



На двух производственных объектах общей площадью в 6200 м<sup>2</sup> работают 115 сотрудников, среди которых квалифицированные механики и металлурги с глубокими знаниями в области методов изготовления стеклотары.



Вместе с женой Мэрилин кавалер ордена Британской империи Эдди Нисом до сих пор активно вовлечен в семейный бизнес.



автотранспортом. Во многих отношениях в то время требования к доставке были не такими строгими, как сейчас. 25 % наших клиентов — это европейские компании, а 75 % — из других частей света. Все они могут быть уверены, что Hunprentco вовремя доставят качественные товары.

#### **GW: Когда компания вышла за пределы Европы?**

Было много историй успеха, и наше продвижение в Европу стало платформой для последующего расширения. Мы наладили сотрудничество с компанией в Японии, затем — в Австралии и на Ближнем Востоке. Все время мы в срок поставляли качественные изделия, устанавливая на них справедливую цену.

#### **GW: Как усовершенствовались ваши инженерные методы ввиду увеличения ассортимента продукции и расширения компании?**

С самого первого и до сегодняшнего дня я ни разу не сомневался в целесообразности вложения средств в новое оборудование и технологии. Мы анализируем все возможности и, если они в перспективе принесут нам пользу, мы инвестируем. Решение переходить на самые современные методы и технологии всегда было правильным. Следование этому принципу — главная причина, по которой мы добились такого успеха и которая позволит нам не терять позиции в будущем.

Мы внедрили новые методы машинного производства на основе новейших технологий, по-этому работаем быстрее и более продуктивно, чем при использовании старого оборудования. Среди прочего мы используем различные типы напыляемых веществ, аппаратов и режущих инструментов, всегда стараясь работать оперативнее и выдавать более высокое качество, чтобы опередить конкурентов. Мы используем в производстве множество инновационных процессов, в том числе применяем технику с ЧПУ и выполняем контроль, шлифовку, полировку, чеканку, микросверление и штамповку на базе ЧПУ.

Но даже 50 лет назад изготавливались качественные плунжеры, при том, что напыление и наплавление выполнялись вручную. Когда в 1970-х при производстве изделий с узким горлышком начал

использоваться метод прессо-выдувания, понадобилось больше плунжеров, имеющих лучшую сцепку покрытия и основного материала. Продолжая двигаться в этом направлении, после испытаний в компании O-I я убедился, что пора переходить на роботизированные технологии. Когда мы начали использовать такое оборудование, оказалось, что в изготовленных плунжерах отсутствует пористость, и теперь в Hunprentco шесть роботизированных установок. Сейчас ни один плунжер не напыляется вручную. Покрытие наносится путем высокоскоростного газопламенного напыления (HVOF), что обеспечивает соответствие высочайшим стандартам.

Много лет назад мы своими силами собирали шлифовальные станки, которые в точности соответствовали бы нашим требованиям. Мы до сих пор используем несколько таких станков, чтобы обеспечить высокое качество поверхности. Это уникальные станки Hunprentco, которые помогают нам оставаться лидером в отрасли.

Основная деятельность компании нацелена на изготовление плунжеров и охладителей для процессов, которые выполняются при производстве изделий с узким горлышком путем прессо-выдувания (NNPB), а также при прессо-выдувании (PB) и двойном выдувании (BB). Мы также изготавливаем различные компоненты высокой точности, которые удовлетворяют требованиям клиентов.

#### **GW: Каковы планы компании относительно дальнейших инвестиций?**

В течение многих лет нам удавалось вовремя принимать правильные решения. Очень важно иметь планы на дальнюю перспективу — именно так нам удавалось постоянно развиваться в течение многих лет. Мы всегда будем осуществлять целевые инвестиции, но не только в технологии. Компания Hunprentco недавно сделала крупную инвестицию в систему планирования корпоративных ресурсов, чтобы внедрить инструмент управления в процессы сбора, хранения, контроля и анализа данных о деятельности компании. Это была очень большая инвестиция, но в современном мире нужно управлять этим аспектом бизнеса максимально эффективно.

#### **GW: Как компания Hunprentco инвестирует в персонал?**

Девиз нашей компании — нужно заботиться о людях. Это относится не только к клиентам, но и к сотрудникам. Важно знать своих людей, а инвестиции в команду — это основа всего, что мы делаем.

Технологии развиваются так быстро, что в некоторой степени знания и опыт требуются все меньше, но навыки живых людей так просто заменить не удастся. Важно собрать правильную команду и использовать правильные машины. Компания Hunprentco очень гордится своим персоналом и применяемыми технологиями.

Это самый крупный работодатель в окрестности: в Hunprentco трудятся 115 людей, среди которых квалифицированные механики, металлурги и другие рабочие с глубокими знаниями в области методов производства стеклотары.

Hunprentco — это семейное предприятие, и в свои 87 лет я все еще активно вовлечен в биз-нес, как и моя жена Мэрилин. Наши эксперты работают в Центральной и Южной Америке, а также в Азии. Компетентность нашей команды не имеет равных, а поэтому компания сможет успешно двигаться вперед. Важно делать инвестиции в следующее поколение, поскольку оно определяет наше будущее. Каждые несколько лет мы берем стажеров, хотя я уверен, что от национального правительства и ассоциации отрасли должны исходить более значимые инициативы поощрения такого подхода. Я с большим энтузиазмом отношусь к стажерам и призываю всех в отрасли объединиться и сделать так, чтобы компании на подобие Hunprentco охотнее брали стажеров.

#### **GW: Каким Вы видите развитие компании в будущем?**

За последние годы база Hunprentco в г. Файли значительно усовершенствовалась. После увеличения производительности отдела по изготовлению плунжеров и охладителей в 2016 году мы сосредоточились на развитии отдела точной механики.

Мы установили самое современное оборудование для термического нанесения покрытий, в том числе для плазменного и высокоскоростного газопламенного напыления, а также используем традиционные механизмы газопламенного напыления. Таким образом, мы можем наносить высокотехнологичное покрытие из различных материалов — от карбидов до оксидов, — в том числе металлоконтактных для других отраслей промышленности, где изнашивание и коррозия сильно влияют на срок службы деталей. Кроме того, мы тестируем и проверяем механические, структурные и химические свойства всех покрытий в полномасштабной лаборатории.

Сейчас компания состоит из двух расположенных рядом производственных объектов общей площадью в 6200 м<sup>2</sup>. Мы заняли дополнительные помещения, что позволило нам расшириться и произвести реорганизацию для увеличения производительности. В нашем распоряжении еще достаточно места и у нас есть много инициатив, на которые можно ориентироваться в будущем. ●

#### **Информация о компании**

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# Удивительные открытия. Выпуск 21: смазывание при производстве путем двойного выдувания

После рассмотрения различных действий, которые необходимо выполнить для оптимизации стабильности формования и снижения веса стеклотары, в следующих выпусках Пол Шройдерс рассказывает об удивительных открытиях, связанных с разработкой устройства BlankRobot от XPAR Vision. Представленное на прошлогодней выставке glasstec, устройство BlankRobot поистине революционное для области формования стекла, ведь его использование значительно сокращает частоту простоев во время формования, что способствует эффективной автоматизации этого процесса. В этой публикации внимание уделяется в первую очередь смазыванию и самому устройству BlankRobot.

Как объяснялось в 74-ом и последующих выпусках, ввиду тем, раскрытых на Конференции по климату в Париже (COP21), а также собственного решения о серьезном принятии социальной ответственности, все или по крайней мере многие компании, занимающиеся упаковкой продуктов питания и напитков, начали активно работать над сокращением количества выбросов углекислого газа. Поскольку выбросы углекислого газа в ходе производства изделий упаковочной промышленности составляют значительную часть, налаживание сотрудничества в цепи поставок является залогом успеха. С учетом высокой конкуренции с отраслями производства изделий из металла, пластика и биологического сырья единственным вариантом для стеклопроизводства является переработка и уменьшение веса путем оптимизации соотношения упаковки и ее содержимого. Уменьшение веса требует последующей оптимизации стабильности процесса формования.

В течение 20 лет нидерландская компания XPAR Vision возглавляла разработку высокотемпературных датчиков для усовершенствования процесса формования стеклотары. На недавней выставке glasstec в Дюссельдорфе компания представила устройство BlankRobot.

Как уже понятно по названию, устройство BlankRobot создано не только для смазывания, но и для других действий. Благодаря применению специального смазочного средства в четко

отложенном процессе частота циклов смазки уменьшается до одного раза в три часа, а поэтому у устройства остается достаточно времени для выполнения других задач.

В этой публикации рассказывается, почему важно знать все нюансы смазывания, чтобы обеспечить эффективное использование роботизированных устройств.

**Ежедневная эксплуатация**  
В предыдущих публикациях XPAR Vision (выпуски 18–20) мы рассказывали о том, что можно и что нельзя делать в процессе роботизированного смазывания при производстве стеклотары. В выпуске 18 описывалось, как устройство BlankRobot от XPAR Vision снижает время простоев для выполнения смазывания и увеличивает стабильность производства. В выпуске 19 рассказывалось о важности применения надлежащего смазочного средства с помощью правильного устройства, а в выпуске 20 — о необходимости получения от поставщика роботизированного смазочного устройства сведений и поддержки касательно взаимодействия самого устройства и смазочного средства, которое оптимизировано для производства соответствующих изделий. Различные клиенты XPAR Vision используют устройства BlankRobot ежедневно. В этой статье представлены важные аспекты роботизированного смазывания при производстве путем двойного выдувания.

## Влияние смазывания

В последней статье этой серии перечислялись аспекты, влияющие на эффективность автоматизированного смазывания, которая выражается в качестве сосудов, показателях производительности, необходимости нанесения покрытия на стеклоформовочные машины и длительности их эксплуатации. В результате длительного использования устройств BlankRobot при производстве путем двойного выдувания мы выявили такие воздействующие факторы, как интенсивность загрузки, единообразие положения стекломассы при загрузке в стеклоформовочные машины и профильная конструкция этих машин.

Вес бутылок, изготовленных путем двойного выдувания с автоматическим смазыванием с помощью устройства BlankRobot, составляет 500–800 г при производственной скорости 130–200 ед./мин. Такие показатели были получены при производстве изделий из зеленого и прозрачного стекла.

Если проанализировать различные влияющие факторы, то производительность смазывания главным образом определяется профилем стеклоформовочной машины. Например, если машина узкая и конусообразная, требуется точный баланс между толщиной слоя применяемого смазочного средства и областью профиля, на которую он наносится. У машин с широким профилем, естественно, свои особенности.

Когда параметры смазывания не соблюдаются, на изделиях остаются следы трения, если графитовый слой слишком тонкий или неравномерный. Поэтому



Paul Schreuders, Chief Executive Officer, XPAR Vision.



задача — найти правильный баланс между толщиной слоя смазочного средства и интервалом смазывания. Для выполнения этого требования нужна роботизированная технология, которая бы точно задавала толщину графитового слоя в области горлового кольца на профиле стеклоформовочной машины.

Устройство BlankRobot от компании XPAR Vision без проблем выполняет эту задачу. Роботизированное смазочное устройство, не смазывающее заготовки (например, путем распыления внутри отверстия стеклоформовочной машины) или не выполняющее крекинг ацетилена, не будет эффективным при производстве бутылок путем двойного выдувания.

## Результаты

Полученные результаты свидетельствуют в пользу автоматического смазывания. Показатели ежедневной эксплуатации при производстве путем двойного выдувания у разных клиентов XPAR Vision демонстрируют ожидаемую производительность устройств BlankRobot, заявленную на презентации на выставке glasstec 2018. Ожидалось, что устройства обеспечат эффективное автоматическое смазывание, которое будет способствовать увеличению интервала между процедурами.

Поскольку благодаря сокращению частоты смазочных циклов процесс формования прерывается реже, стабильность формования возрастает, что способствует увеличению производительности и улучшению качества бутылок. Кроме того, повышение стабильности процесса формования дает возможность оптимизировать производство, например изготавливать изделия с меньшим весом за более короткий срок времени, удовлетворяя при этом потребности клиентов и соблюдая их требования.

Благодаря автоматизированному смазыванию с помощью устройства BlankRobot клиенты могут выполнять производство путем двойного выдувания с интервалом смазывания 120 минут. При ручном смазывании или применении устройств других производителей



Paul Schreuders = Пол Шройдерс, генеральный директор компании XPAR Vision

эта процедура выполняется каждые 20–30 минут. Это доказывает, что использование устройства BlankRobot повышает стабильность процесса и способствует повышению экономической выгоды ввиду сокращения потерь на этапе высокотемпературных работ благодаря смазыванию.

С точки зрения качества, средние показатели брака при наличии следов трения на этапе работы с охлажденными изделиями равны показателям при ручном смазывании или ниже их, в то время как распределение материала значительно улучшилось (меньшая разность толщины стенок).

## Нанесение покрытия на стеклоформовочную машину

Кроме положительного воздействия на качество изделий и процесс формования, важно оценить влияние на само производство. Один важный фактор при этом — время эффективной работы стеклоформовочной машины. Как показывает опыт, длительность эксплуатации стеклоформовочной машины по крайней мере не сокращается, благодаря чему срок ее службы остается прежним.

Кроме того, хотя такого никто не ожидал, после перехода на устройство BlankRobot для автоматического смазывания клиенты, которые раньше применяли специальное покрытие для стеклоформовочных машин и выполняли смазывание вручную, теперь для производства путем двойного выдувания используют

только отполированные машины. Им не приходится дополнительного тратиться на покрытие, содержащее вредные вещества, а поэтому воздействие на окружающую среду уменьшилось и, что еще более важно, теперь нет угрозы для здоровья и безопасности операторов формовочных машин.

## Вывод

Опыт клиентов, которые ежедневно используют устройство BlankRobot, соответствует ожиданиям. В устройстве BlankRobot имеется специальная технология, которая применяет смазочное средство компании LubriGlass. Это воздействует на производственный процесс только самым положительным образом. Интервал между смазочными циклами увеличился до 120 минут, в то время как при ручном смазывании и использовании роботизированных устройств других производителей он составляет максимум 30 минут.

Использование устройства BlankRobot также положительно сказывается на стабильности процесса, что дает возможность уменьшить вес бутылок и увеличить скорость производства, а также получить большую экономическую выгоду благодаря сокращению количества бракованных изделий на этапе высокотемпературных работ.

## Последующие выпуски

Процессы производства путем двойного выдувания, прессовыдувания и смазывания горлового кольца имеют различную динамику. В последующих публикациях мы подробнее расскажем о производстве изделий с узким горлышком путем прессовыдувания и о смазывании горлового кольца. ●

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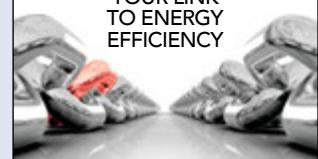
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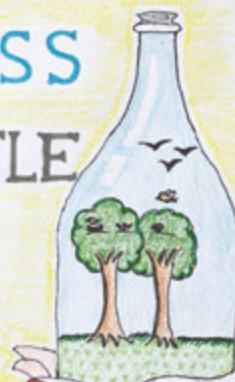
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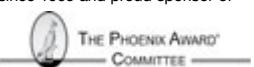
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