glass WORLDWIDE

January/
February 2020

Featuring Arc, Ardagh, Arglass, Guardian, NSG, O-I, Saint-Gobain, SGD Pharma, Sisecam & Verallia. Latest news & issue highlights at glassworldwide.co.uk

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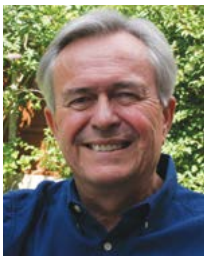

Reports relating to what is expected to be another successful decade for the international glass industry start here. Our first issue of 2020 is full of specially written features, highlighting some of the latest investment initiatives and market analyses from around the world.

France is among the countries that come under the microscope in this issue, including specially compiled analyses of the significant factory investments underway at local O-I and Verallia sites, as well as a report that summarises a €35 million glass wool production line recently commissioned by Saint-Gobain Isover. Sebastien Donze discusses his role as Research & Development Director at tableware specialist Arc and as a member of the GlassTrend advisory board, while Melianthe Leeman, Director of O-I's Global Innovation Platform, is On the Spot, explaining how direct-to-glass digital printing technology at O-I Innoval is adding value to glass packaging.

Our annual Focus USA supplement includes an interview with Jose Arozamena, Chairman and CEO of Arglass Yamamura and Koji Yamamura, President and CEO of Japan's Nihon Yamamura Glass about their joint greenfield glass container project in southern Georgia, while Richard Altman, Regional Director for Architectural Glass and Solar in North America, discusses the commissioning of NSG Group's first float line in the USA since 1980.

An exclusive Personality Profile interview with Professor Dr Sener Oktik, Sisecam's Chief Research and Technological Development Officer, explains future plans for the Sisecam International Glass Conference and how they align with the group's ambitious R&D goals. The intention is to transform the symposium into a comprehensive international glass conference, bringing together compelling new ideas in glass science and technology. This ambitious goal is the result of the Sisecam Group's sense of responsibility as the only global player that is active in flat glass, glassware, glass packaging, glassfibre and chemicals for the glass industry. To be renamed the Istanbul International Glass Conference when next staged in 2021, this meeting is expected to provide an unparalleled opportunity to foster international collaboration and improve the industry's clock speed to influence the velocity of change.

In yet another positive report, freelance correspondent Vladislav Vorotnikov explains that some semblance of normality is finally returning to war-ravaged Syria. Local glass packaging manufacturer, Modern Co for Glass Industries (MCGI) has managed to survive civil war thanks to its export efforts and recently initiated a capacity expansion programme. We would like to congratulate the glassmaker and its personnel for their resilience and hope that their positive growth continues throughout the decade.

We hope you enjoy reading the latest issue of *Glass Worldwide* and look forward to receiving your feedback, as well as any recommendations for future editorial coverage.

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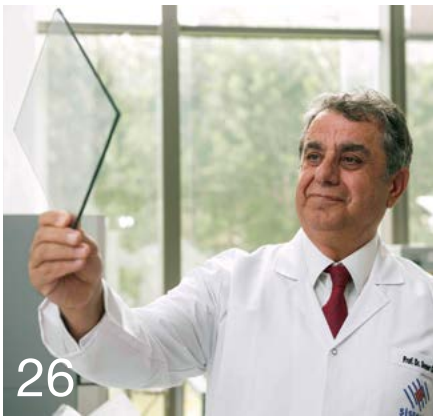

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www.aigmf.com

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www.ipgr.com

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Preferred journal of Union of Architects of Russia
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AFGM ASEAN FEDERATION OF GLASS MANUFACTURERS
Official journal of AFGM
www.aseanglass.org

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Preferred journal of Japan Glass Bottle Association'
www.glassbottle.org

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www.feve.org

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www.hvg-dgg.de

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News For the latest news, visit the Hot Topics section at www.glassworldwide.co.uk

€55 million float investment completed in Italy

The renovation and modernisation of Sisecam Group's Manfredonia flat glass plant in southern Italy has been completed in record time. This €55 million project includes a furnace rebuild, where an advanced design has been installed, as well as the completion of five million m^2/year coating and 3.5 million m^2 lamination lines.

A recent inauguration ceremony for the facility, which became operational two months earlier than planned, was attended by Giuseppe Conte, Prime Minister of Italy and Murat Salim Esenli, Ambassador of the Republic of Turkey in Italy, as well as local government representatives and employees.

Manfredonia is Sisecam's second float project in Italy, the group having previously acquired the Porto Nogaro plant in the north of the country in 2016. Sisecam Group's investments in Italy now exceed €150 million, its annual flat glass manufacturing capacity in the country having been increased to 410,000 tons.

www.sisecam.com.tr ●

The inauguration ceremony for Sisecam Group's Manfredonia flat glass plant in southern Italy was attended by Giuseppe Conte, Prime Minister of Italy.

Gujarat production capacity to increase by 50%

Schott AG has inaugurated its latest furnace in Jambusar, Gujarat following an investment of €21 million in 2018. The company forecasts rapid growth for high quality glass in the pharmaceutical industry and has committed additional investments of €26 million for another tank in 2020. Each of the new production facilities, with a combined investment of €47 million, will double the capacity of Schott Glass India's manufacturing plant, allowing the group to produce its highly specialist FIOLAX tubing material for both domestic and export demands.

"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" commented Managing Director Georg Sparschu. "Schott also takes cognizance of the Indian Health Ministry's initiative to provide affordable and accessible healthcare to its citizens. In this regard, we wish to be part of such initiatives by contributing to the pharmaceutical value chains and by providing high quality glass products for pharma packaging, ensuring the highest global safety standards."

www.schott.com ●

Belgian glassworks sale completed

Vidrala has completed the sale of its glass container production facility in Ghlin, Belgium to the Saverglass Group. The transaction includes a supply agreement, by means of which Vidrala will acquire part of the Belgian site's production for five years, enabling the company to secure customer service while planned investment projects are developed to replace capacity across the group.

www.vidrala.com ●

Architectural glass business integration in Japan

AGC has concluded a memorandum of understanding with Central Glass concerning the integration of their architectural glass businesses in Japan. According to AGC, the local architectural glass business is facing demand structure changes associated with declining new housing starts and the dissemination of multi-layered glass. The business environment has continued to be sluggish, despite continued streamlining efforts and restructuring of the distribution system. As a result, drastic reform for the entire industry is considered necessary.

www.agc.com ●

Grenzebach to acquire CNUD EFCO GFT

The Grenzebach Group has agreed with the BMT Group to acquire its float glass engineering division CNUD EFCO GFT. This business is well known in the glass market as a leading provider of annealing lehrs and tin bath solutions, including accessories, with a global presence and locations in Belgium, Germany, Romania and China. Besides the glass business, where CNUD EFCO GFT has worked on more than 300 float glass production lines since 1957, the company is active in the metal construction business, via its manufacturing site in Romania.

"We have many times built our cold end glass production line alongside CNUD's tin baths and annealing lehrs in the past and we could clearly see that our two companies share the same passion for technology and quality" commented Egbert Wenninger, Senior Vice President, Business Unit Glass at Grenzebach.

"Grenzebach has an outstanding image and position in the market, which will provide excellent possibilities to strengthen and grow our business even further" added Robert Lamy, Chief Sales Officer at CNUD EFCO GFT. "Together, we can serve our global customer base better and offer integrated solutions instead of separated delivery shares."

www.grenzebach.com / www.cnudefco.com ●

App identifies non-compliances in pharmaceutical glassware

SGD Pharma has launched the first App to identify non-compliances in moulded glass bottles intended for the pharmaceutical industry. Resulting from a development project between SGD Pharma Quality and Marketing Departments, this digital tool makes it possible to identify non-compliances that may be discovered during an incoming inspection or during on-line inspection at the client's site.

Available free from the Apple Store and the Play Store, it only takes a few clicks for users to create their account and have unlimited access to a 2D visual compilation of the most frequently encountered forms of non-compliance. Users can refine their searches by administration method (parenteral, oral or nasal), by location or non-compliance types corresponding to various effects on the patients or on filling lines (critical, major or cosmetic).

Once a non-compliance has been identified, the user accesses a dedicated page including a visual, a definition, the type of non-compliance and its associated acceptable quality level (AQL) in conjunction with the international standard ISO 2859-1. As an added benefit, the SGD Pharma standards are then cross-referenced with the two quality benchmarks recognised and accepted by the pharmaceutical industry: Technical report 43 from the Parenteral Drug Association (PDA) and the list of moulded glass container non-compliances from Edito-Cantor-Verlag (ECV).

www.sgd-pharma.com ●

Portogruaro factory expansion success

Earlier this year, Zignago Vetro expanded production capacity at its Portogruaro factory near Venice for flint, Georgia green or dark green glass. The expansion involved building a greenfield production area, including hall construction and the required infrastructure. As part of this project, the company also took the opportunity to optimise the production areas from melting to packaging.

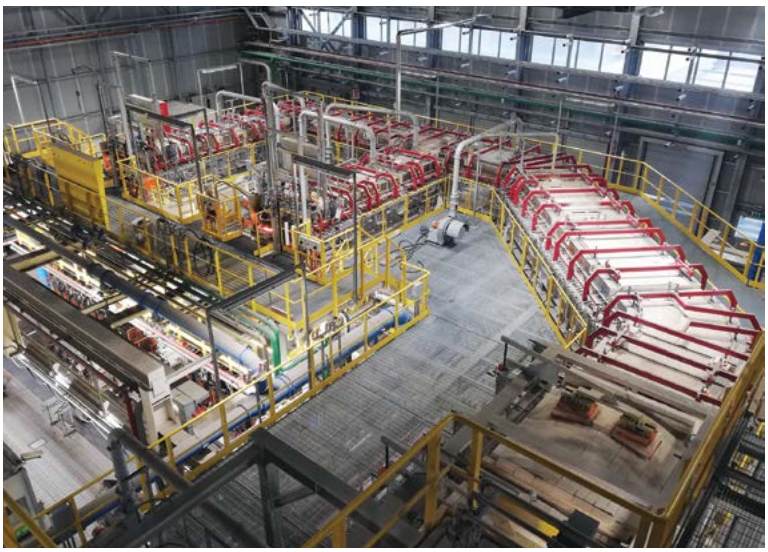
The melting furnace supplied by Nikolaus SORG GmbH is a state-of-the-art regenerative end-fired furnace, featuring low energy consumption values and NO_x emissions. SORG also supplied the complete heating system (including emergency heating), as well as the control and SCADA systems. Combustion is performed via gas or alternatively, heavy oil. The waste gas rail is intended for the subsequent connection of an emission control system. Moreover, the furnace is equipped with a melting booster and a barrier booster, as well as a refiner and throat booster, which leads to a higher melting capacity.

The glass conditioning system consists of a SORG STW working end and two SORG 340S tandem forehearths in an F-shape. This type of tandem forehearth provides considerable flexibility and is therefore easy to install. Each of the forehearths is equipped with a stirrer system and supplies IS tandem machines with glass.

The batch charging system was supplied by EME GmbH and features two IRD doghouses and two EME-NEND S2 screw chargers. This type of batch charger is characterised by a completely sealed doghouse, which eliminates the uncontrolled entry of false air and reduces dust formation. Furthermore, the EME-NEND S chargers enable optimal batch distribution and minimise wear to the screw, which ensures an increased lifetime.

The plant is designed so that melting capacity can be extended during the first furnace repair. Furnace construction was carried out by SKS Iberica and equipment installation by Nikolaus SORG GmbH. Since the start of production in February, glass quality has exceeded expectations and the energy consumption as well as CO_2 emissions were lower than predicted.

www.sorg.de ●



Two SORG 340S tandem forehearths have been installed at Zignago Vetro's Portogruaro factory in an F-shape.

Two EME-NEND S2 batch chargers are installed.

€30 million glass-ceramic competence centre opens

Schott has officially opened a state-of-the-art CNC competence centre for its ZERODUR glass-ceramic in Mainz, Germany. Glass-ceramic components will be processed in accordance with individual customer specifications at the production facility by using electronically-controlled CNC machines. The investment amounts to more than €30 million. Up to 70 highly qualified specialists will be employed at the site.

The production facility bears the name of Jürgen Petzoldt, the pioneer of glass ceramics at Schott. Dr Petzoldt was responsible for the development of ZERODUR glass ceramic from 1966 and was also one of the fathers of the CERAN glass ceramic cooktop panels. From 1988 to 1996, he was a member of the Schott Board.

The centre is one of the largest investment projects in recent years at the group's main site in Mainz. It is also the largest component of a multi-part investment programme for optics manufacturing in Mainz, which has a total volume of over €40 million. This also includes a CNC machine facility for processing glass-ceramic parts up to 4.5m in diameter, which was put into operation in 2017.

www.schott.com ●

To commemorate a special day, a ZERODUR disk was signed by (from left) Herman Ditz, Member of the Management Board, responsible for Advanced Optics; Rhineland-Palatinate Prime Minister Malu Dreyer; and Dr Frank Heinricht, Chairman of the Schott Board of Management. Image courtesy of Schott.

Investment support for inspection equipment specialist

LiteSentry LLC has partnered with Benford Capital Partners LLC to support its long-term growth and success. USA-based LiteSentry is a leading provider of automated inspection and process control systems to the flat glass processing market. Benford Capital's investment will support incremental growth, an expansion of workforce and business development efforts to build upon the company's legacy as a market leading test and measurement equipment manufacturer.

www.litesentry.com ●

Flat glass processing expertise

Turkey's Yakut Cam is reliant on LiSEC as its solution provider for its flat glass processing expertise. The company specialises in the production and processing of structural glasses, double and triple insulated glass, shower glass and glass tables, mirrors, parapet glasses, partition glasses and insulated glass with georgian bars. The production of structural glass accounts for 70% of turnover

The co-operation with LiSEC began in 2007. "We investigated the market in search of possible suppliers and knew that LiSEC has a very good reputation regarding machinery and software for this business" commented owner, Fatih Poyraz. "We took this reputation as the basis for our discussions but wanted to sense the reputation LiSEC has in the co-operation with us in order to confirm or not."

LiSEC was able to meet the requirements set by Yakut Cam and delivered and installed a series of lines and machines, including the necessary software for order processing and production management. This included one jumbo glass cutting line type ESL, a glass cutting table base CUT, a jumbo size laminated glass cutting bridge type VB 60, a KSR for edge seaming, a vertical CNC drilling machine from the Schraml range of products and two IG lines including sealing robot.

www.lisec.com ●

LiSEC flat glass processing equipment in operation at Yakut Glass.

Mathematical modeling partnership

Glass melting technology provider FORGLASS Sp zoo has partnered with CelSian Glass & Solar BV to provide GTM-x software for computer modeling studies of the Polish company's furnace designs. After a thorough assessment, FORGLASS chose CelSian because of the many co-operation possibilities the company offers. CelSian's glass melting expertise and laboratory work were also important factors in the decision.

CelSian has been investing heavily in the GTM-x software, adding many advanced features, as well as a more user-friendly interface. By using the software, FORGLASS can provide better emissions and energy consumption solutions, while enhancing product quality and furnace lifespan.

Both companies look forward to working together on projects that will improve their clients' operations, while supporting the glass industry's quest for better efficiency and ecology.

www.forglass.eu / www.celsian.nl ●

FORGLASS has partnered with CelSian on mathematical modeling.

Bystronic glass/HEGLA partnership terminated

Glaston Corp and HEGLA have decided to terminate their co-operation agreement due to changes in the companies' competitive positions. The agreement, which was entered into in 2012 by Bystronic Lenhardt GmbH, Conzzeta AG, Hegla GmbH & Co KG and LEWAG Holding AG, was terminated at the end of 2019.

The purpose of the co-operation agreement has been to be preferred partners, meaning co-operation in cross selling by products for architectural market and making use of each other's sales and service network. Termination of the agreement has been made in mutual understanding.

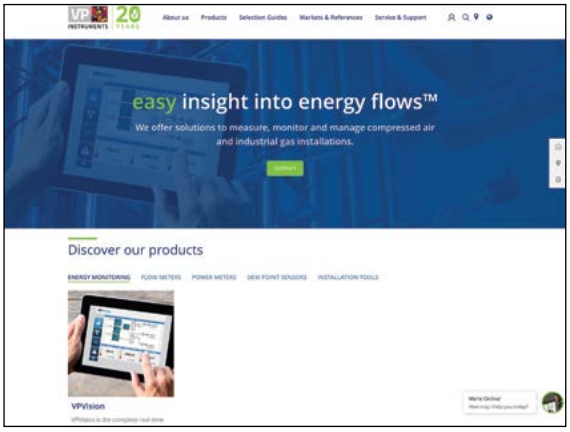
www.glaston.net / www.hegla.de ●

Energy management solutions website

Energy management solutions specialist, VPInstruments has made significant improvements to its website in recent weeks, making it faster, more user-friendly and more modern. In particular, the layout for both the desktop and mobile versions is a major difference.

Thanks to the simplified structure, navigation and finding the correct information has been greatly improved. Moreover, there is now a dedicated location within the website to share interesting information with distributors and customers, including eBooks, articles, webinars and videos.

www.vpinstruments.com ●



Increased gauge sales reported

An expansion to Penico Gauges' premises in the UK has allowed increased stock levels to be provided. Penico has invested in more machinery, including a Charmilles WEDM machine that is contributing significantly. More grinding machines have now been added to the gauge finishing area, while extra skilled machinists have been employed.

The enhanced effiencies have resulted in a larger inventory of gauges stocked. Delivery times are now much reduced and small orders have often been shipped within days rather than weeks. As a result, the company has seen increased orders. Penico's range of digital gauges and hollow mill gauges have continued their sales growth, with the blank mould dovetail reamers still the best selling product.

www.penico.com ●

Pre-processing equipment order

Glaston Group has closed a deal for several pre-processing machines with China's Xinyi Glass Holdings Ltd, one of the region's leading companies in the field of float, solar, coated and automotive glasses. The first phase, valued at approximately €1 million, will be delivered during the early part of 2020.

Xinyi Glass is an established Bystronic glass customer, with a total of 34 Bystronic glass automotive machines installed and running at the company's premises. Now Xinyi Glass will set up a factory in Malaysia, with automotive glass as one of its main businesses. For this factory, six pre-processing machines have been ordered for windscreen, sidelite and backlite glass processing.

The second phase of the deal is dependent on completion and acceptance of the first phase. The value of the second phase delivery is at the same level as the first.

www.glaston.net ●

Radar technology enhances furnace inspection capabilities

Fosbel Inc, a leader in furnace refractory maintenance services, is enhancing its audit and inspection services to include SmartMelter radar technology. Fosbel will be the first company to join the SmartMelter Certified Partner programme.

"I am very grateful for the speedy adoption of SmartMelter radar technology in the glass industry as the new standard for monitoring the health of glass furnaces" commented Yakup Bayram, PaneraTech CEO. "As demand grows, our partnership with Fosbel enables us to reach even more customers with some of the best technical talent in the world. For many decades, Fosbel has shown to be one of the top maintenance and audit firms. Adding them to our certified partner list is testament to our commitment to deliver not only the best technology to our customers but also an integrated inspection solution from a respected partner. We are calling this exciting new service SmartAudit."

The Certified Partner programme allows furnace audit and repair providers to incorporate SmartMelter radar technology into their audit, inspection and maintenance programmes. This significantly improves visibility of furnace health, to detect vulnerabilities one-three years before visual and thermal indications. The programme enhances risk management by providing deterministic data for furnace maintenance decisions.

Fosbel has a history of innovation in refractory repairs, including ceramic welding and hot bottom repair. Introduction of the SmartAudit service will expand its innovative services and offer clients a comprehensive view of their furnace condition.

"Fosbel is excited about adding SmartMelter radar technology to its well-established global inspections and audit offering" Bob Chambers, Fosbel Managing Director, Americas confirmed. "This partnership allows glass manufacturers to obtain full furnace diagnosis through non-destructive technologies measuring glass containment refractories. This technology, added to our service portfolio, facilitates risk management and actionable maintenance activities."

www.smartmelter.com / www.fosbel.com ●

Towards a record high in engineering services

Batch and cullet plant specialist ZIPPE is facing strong demand growth for engineering services, as shown by a record 30% increase last year alone. Glassmakers are increasingly outsourcing engineering resources, with German company ZIPPE developing its capabilities accordingly.

By further strengthening its capabilities in laser scanning and 3D modeling, the company is providing the 45 engineers within its Engineering Department with the latest tools to support customers in the most efficient way, creating safe, clean and cost-effective solutions.

ZIPPE´s services comprise basic engineering, layout engineering and detail engineering, as well as providing specialist services for building permissions, tendering, feasibility studies, steel structural drawings, including statics and load plans etc, all in the fields of batch and cullet plants.

www.zippe.de ●

Temperature measurement of ultra-thin glass

Optris has introduced the CTlaser G7 infrared thermometer to measure the surface temperatures of ultra-thin glass components in the range 100°C-1200°C. The device works at a special wavelength of 7.9 µm, optimised for low reflection measurement on ultra-thin flat glass. Measurement errors, which are caused by the transmission of radiation, are therefore virtually eliminated. The measurement error is only 1% of the measuring value 1.5°C at low temperatures.

www.optris.de

CTlaser G7 infrared thermometer from Optris.

Optimising the benefits of training

Quantum provided valuable training for its international agents during 2019, both at the company's USA headquarters and at agents' locations throughout the world. Training has been identified as key to the firm's success and is an essential part of its mission statement. Investing in training on a regular basis is expected to give Quantum a competitive edge and boost morale, confidence and ownership of its products and services.

By providing personalised training seminars, the company ensures that customers receive an overall high return on investment, with proper training on its mechanisms. As a result, clients are said to experience enhanced productivity, less downtime and better profitability.

www.quantumforming.com

Quantum agent training, July 2019.

Quantum training in Turkey, June 2019.

Fully automated and digitalised glass processing collaboration

With its FeneVision ERP system, software specialist FeneTech has completed the Siemens automation and digitalisation portfolio for the glass processing sector. "At the heart of digital solutions from Siemens is the digital twin, a virtual image of plants based on an end-to-end data model" Heinz-Josef Lennartz from Siemens Vertical Glass in Karlsruhe explains. "The consistent use of these solutions along the entire value chain in glass manufacturing and processing and throughout the entire life cycle pays off."

According to Mr Lennartz, in glass processing, which tends to be performed by medium-sized businesses, an integrated and customised ERP solution is still required. "In numerous discussions with customers, both we and FeneTech, independent of one another, keep hearing that there is a demand for completely integrated solutions in glass processing" he explained.

"With the FeneVision ERP solution from FeneTech combined with Siemens MindSphere, customers would take a big step closer to the digital factory" Horst Mertes, CEO of Luxembourg-based FeneTech Europe SARL explained.

Ron Crowl, President of FeneTech Inc, added: "FeneTech has been supplying software products to the glass processing and window manufacturing industries for more than two decades. Industry processes are more efficient because errors are minimised throughout the company. Recent advances in Industry 4.0 and IoT offer the opportunity to integrate all machinery fully into the ERP software from FeneVision and establish a digital factory. Through the planned collaboration with Siemens, we would be able to bring fully networked and integrated solutions to market faster."

www.fenetech.com/siemens ●

Anti-fingerprint coating launched

MetaShield, an advanced materials company, recently launched Nanoprint, an anti-fingerprint nanotechnology-based coating which, according to the company, reduces the appearance of fingerprints and smudges by as much as 70% on a variety of consumer and commercial glass products.

Among the glass-based applications for the coating are automotive interiors, mirrors, architectural glass, display cases, storefront and residential windows.

Nanoprint is a sol gel-based formula comprising a patent-pending technology that creates a single, thin layer adhering to glass surfaces to absorb/repel dirt, water, oils, sweat and smudges that cause unsightly fingerprints. By adjusting the chemistry on a glass surface, Nanoprint produces an oleophilic and slightly hydrophobic coating that repels fingerprints, largely preventing them from sticking to the surface, making them less visible and easier to clean.

www.metashield.com ●

Heat-up capabilities expanded in Cebu

Hotwork International Asia-Pacific recently celebrated its 20th anniversary by inaugurating extended warehousing facilities in Cebu. The first generation leadership of the Köster family founded the company in the Philippines in 1999. At that time, the company was leasing its office space and warehousing. Latterly, less than two years after a management transition to the second generation, the company acquired its own facility. Now in its fifth year, this facility has tripled in size. More than $1.5 million has been invested to date and expansion plans continue. The company aims to satisfy growing market demand, focusing on quality service, research and development, together with workforce training, paired with the company's five core values of teamwork, versatility, dependability, innovation and trust.

www.hotwork.ag ●

The Hotwork International Asia-Pacific team in Cebu.

People & posts

Do you have a company appointment to tell the world about? Email us at news@glassworldwide.co.uk

Prominent UK politician joins Ardagh Board

Following the death of Ardagh Group Director, Wolfgang Baertz last September, the Rt Hon Philip Hammond has been appointed to the Board as a Non-executive Director and as a member of the Audit Committee.

A member of Parliament from 1997 to 2019, Mr Hammond held a range of ministerial offices, most recently serving as Chancellor of the Exchequer from 2016 to 2019. Prior to this, he served as Foreign Secretary (2014-2016), Defence Secretary (2011- 2014) and Transport Secretary (2010-2011).

Separately, Shaun Murphy has been appointed to the Board as an Executive Director. Mr Murphy joined Ardagh as Chief Operating Officer this September. Prior to joining the business, he was a partner in KPMG for almost 20 years and earlier this year completed a six year term as Managing Partner of KPMG in Ireland, a practice of some 3000 people, as well as serving as the Lead Director on KPMG's Global Board from 2015 until 2019.

www.ardaghgroup.com ●

Jim Ulmer remembered

Jim Ulmer.

The international glass container industry is mourning the loss of one of its most respected equipment suppliers of recent decades. Jim Ulmer, 88, was the owner and President of US lehr manufacturer E W Bowman Inc for more than four decades.

Prior to his retirement and the sale of the business to Henry F Teichmann Inc, Mr Ulmer built the Uniontown, PA organisation into a highly successful global enterprise. He was largely responsible for the company's establishment of strong business relationships with glassmakers throughout the world and was widely admired by customers and work colleagues alike. ●

Temperature measurement solutions specialist

Philippe Kerbois.

Philippe Kerbois has been appointed Global Industry Manager for the glass sector by AMETEK Land. Based in France, Mr Kerbois has spent eight years at the company, where he was most recently Regional Sales Manager EMEA–Glass and prior to that Regional Sales Manager for France.

Having worked at AMETEK Land since 2012, he initially managed the sales of infrared temperature measurement solutions into line builders in glass and steel furnace OEMs within France. In his latest role, however, Mr Kerbois will work within the global glass market and actively promote the Near Infrared Borescope (NIR-B) Glass thermal imaging solution for glass furnaces. He has extensive sales and project management experience in the steel, glass and automotive industries, which includes previously working at Rockwell Automation and ABB.

www.ametek-land.com ●

Leading Italian processing machinery hub in the USA

Doug Mangus.

Doug Mangus, Machinery Sales Director with Salem Distributing Co Inc, has been selected to head up the soon to open Bovone North America. Selected as General Manager based on the important experience gained over numerous years of working side-by-side with Bovone's Italian headquarters, Mr Mangus will take up the challenge of achieving the many important goals in a strategic market like North America.

"As one of our own, Doug is the obvious choice for this position as General Manager for Bovone NA" says Mike Willard, CEO/Owner of Salem. "He has assessed operations, consulted on and sold machinery and is the pivotal contact for Salem's customers."

www.bovone.com ●

Solving furnace design and process challenges

Johan Lötter.

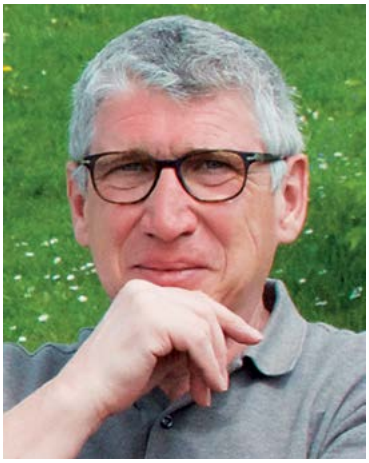
Johan Lötter recently joined CelSian Glass & Solar in the Netherlands as a CFD Engineer, with responsibility for specifying and delivering high level solutions for complex furnace designs and process challenges.

Since obtaining a Master of Science in Engineering, Mr Lötter worked for PFG Building Glass in South Africa for almost a decade. His last role was Process Technology Manager, overseeing PFG's melting lines.

www.celsian.nl ●

Considerations for alternative furnace fuels - where to start?

As the glass industry looks towards a more efficient future, new fuel sources and melting technologies may need to be considered to suit different regions. René Meuleman discusses some of the alternatives.



René Meuleman, Business Leader for Global Glass at Eurotherm.

To be honest, I cannot recollect when the discussion around carbon footprint and zero emissions started, even though NO_x has been an issue for as long as I can remember. And I have been around for some time! The introduction of oxy-fuel has helped to reduce NO_x emissions but I question and doubt if it has had a positive effect on energy efficiency. The technology of controlling the access of air has also had an interesting side effect on energy efficiency improvements.

The GlassTrend 2017 seminar in Haarlem, Netherlands was a mind opener, mostly because an important glass bottle customer presented some harsh statements regarding his company's desired progression towards the greenest bottle. Since that day, the Paris Agreement on Climate Change has appeared on many presentation slides at countless seminars, several of them coming from me. All-electric, hybrid and hydrogen fired furnace designs have moved back into focus, being perceived as a new technology, which they are not. However, the harsh truth is that only non-fossil fuel fired systems will be able to come close to zero CO_2 emissions and in that respect, only electricity and/or hydrogen energised melting technologies are practical.

Hydrogen fuel

There is no discussion that electrical furnaces are the most energy efficient and feasible solutions known today. Hydrogen options will not be able to come close in comparison, simply because the combustion process is extremely inefficient. The heat recovery system managing the polluted watery flue gases is likely to be complex and expensive and I assume that hydrogen/air combustion will be out of the question because of the related NO_x emissions. In that respect, I urge those who are dreaming about huge solar farms in the desert converting electricity into hydrogen and transporting it to glass manufacturing plants; don't transport the hydrogen if you cannot supply the oxygen as well! In my opinion, that is why using the existing natural gas infrastructure for hydrogen will not work either. And what about the conversion from 100% natural gas towards 100% hydrogen in a time frame of 30 years, which only represents two furnace life cycles? It is even still questionable if all domestic boilers will be able to manage such a conversion without drastic and complex technical refurbishments.

Several institutes have started tests on hydrogen combustion and they are likely to conclude that hydrogen use is possible but the remaining problems will still be the efficiency and availability of hydrogen and oxygen. Some people in the industry have the opinion that all-electric furnaces are inflexible from a pull rate, glass colour and high cullet percentage point of view and cannot be built large enough to accommodate customers' requirements. But what about the drawbacks that will come from full hydrogen/oxygen furnace designs that have a close to 100% H_2O furnace atmosphere? It is questionable, even though the final designs are still to arrive.

Bio fuel

Bio fuels from traditional ethanol feedstocks such as corn and sugar cane are also under discussion but the growth to processing cycle is very energy-intensive, so it is arguable whether the level of environmental benefit is justifiable. Research is being carried out to find more energy-efficient, economically viable feedstocks that will not affect food supplies and the environment. For example, cellulosic ethanol is made from plant-based waste that would not typically be recycled. Grasses, algae, animal waste, cooking grease and wastewater sludge are also possible contenders for bio fuel feedstocks if efficient, cost-effective ways can be found to convert them into viable fuel[1]. Perhaps the biggest drawback in the use of bio fuels for glass manufacturing is the fact that other industries such as aerospace, automotive and cement have less potential use cases.

Fuel from plastic waste

Thermal processes can be used to break down plastic into oils for use as fuels. According to a recent article in *The Chemical Engineer,* the pyrolysis method involves high temperatures up to approximately 800°C or the use of catalysts.

The newer pressurised thermal depolymerisation method, hydrothermal liquefaction, uses comparatively lower temperatures up to 500°C[2]. Perhaps the waste heat of a glass furnace could be utilised as part of a more cost-effective recycling solution for plastic waste but how would the resulting fuels behave during combustion? Would the end result justify the means? ▸

René Meuleman participated at the GlassTrend 2017 seminar in Haarlem, Netherlands.

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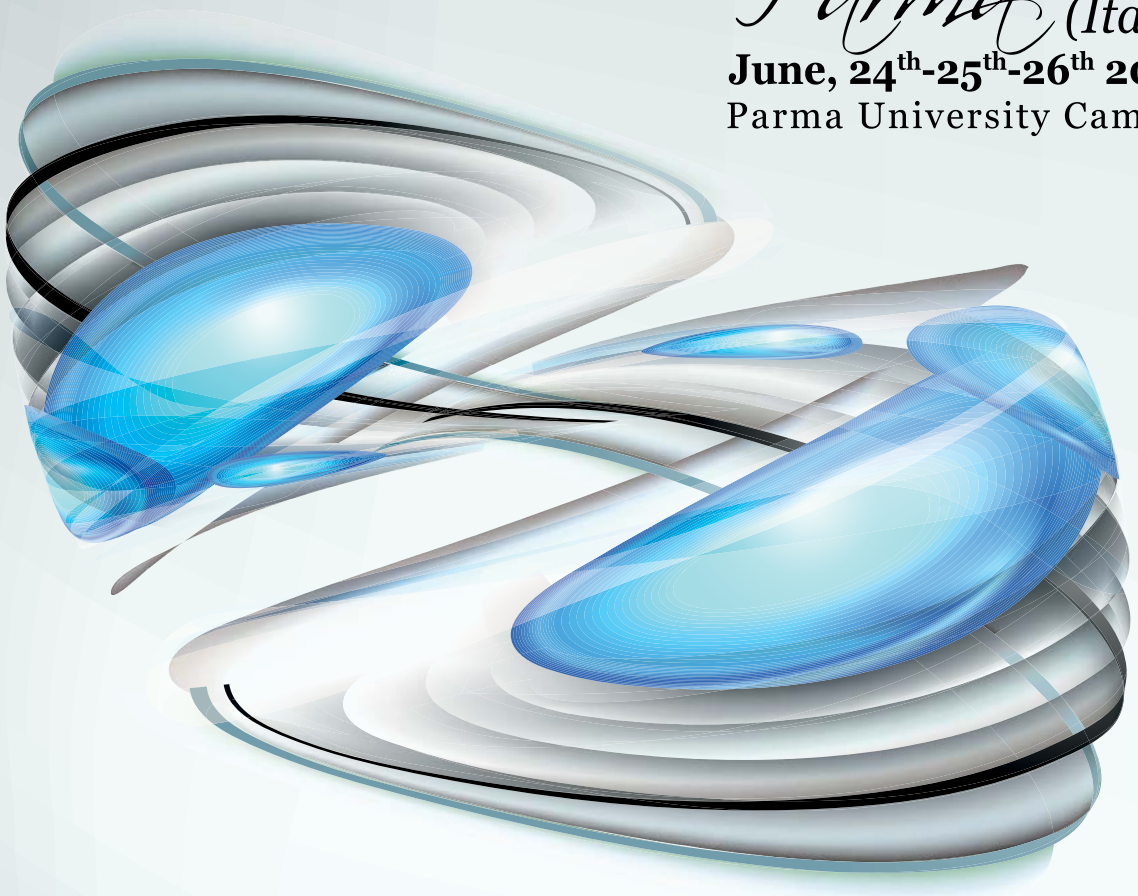

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Consider different regions

What comes to mind is that we need to look at what energy sources will be sufficiently available and efficient, while being economically acceptable. Think about what will happen to CO_2/ton price levels in future?

Today, it seems that a specific design could work in one region but would be completely inappropriate in another. If geothermal power or hydro power is sufficiently available close to your facility, your choice will be clear and you can start work on solving any all-electric melting issues, if there are any. If you are close to a huge solar farm providing kWhs almost for free but only during the day, you will find yourself in a different position. Will you start looking for a combined all-electric and all hydrogen design in one? Perhaps start looking for fuel cells that can provide enough electricity during the night to run a simple all-electric furnace? If you do the maths, you will most likely find such a design to be even more energy-efficient. The use of bio fuels will probably not fly in India but perhaps converting plastic into fuel might become feasible there.

And then there is a cost comparison consideration. Historically, furnaces were built with only one fuel in mind. Energy markets were seen as something vital but out of your control, therefore often relegated to a single line on your OPEX spreadsheet, despite having a much larger €/tonne impact than any CAPEX or efficiency consideration. In the future, there will be choices. What are the risks involved in those choices and how can we help senior managers quantify that risk before investment decisions are made?[3]

Suppliers can help

So where do you start? Perhaps by first studying the sustainable energy market in depth and how it will evolve as far as possible in the future. Remembering that the situation in one region might be different from what others predict when located somewhere else. It will involve combining different business cases to investigate how the available energy can be used in the most efficient way, finding synergies, working with communities, tying in the supply grid owners and utilities and finding political support.

Why even begin to investigate new technical melting solutions before figuring out which energy carriers will become available and commercially acceptable? There are companies who can help start these conversations and collaborations. The Schneider Electric Energy and Sustainability Services team, as well as Eurotherm by Schneider Electric glass expert team welcome those questions and discussions. ●

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Professor Dr Sener Oktik addresses the Sisecam International Glass Conference in Istanbul last November.

Istanbul meeting reinforces Sisecam focus on sustainable growth

More than 650 people registered for last November's Sisecam International Glass Conference in Istanbul, including strong support from international glassmakers and the academic community. John Wallis spoke to Professor Dr Sener Oktik, Conference Executive Chair and Sisecam's Chief Research and Technological Development Officer about future plans for the conference and how they align with Sisecam's ambitious R&D goals.

Staged in association with the 34th annual Sisecam Glass Symposium, the Sisecam International Glass Conference attracted representatives from 26 different countries to Istanbul, Turkey in November 2019. Although 657 people registered in advance, just fewer than 500 people ultimately attended, still representing strong industry support for this launch event.

Writing in the event literature, Professor Dr Ahmet Kirman (Conference President and Vice Chairman and CEO of Sisecam) and Professor Dr Sener Oktik (Conference Executive Chair and Sisecam CTO) explained that the meeting was the result of 33 years of uninterrupted effort to establish a platform for the dissemination of recent progress in glass science and technology and to promote Istanbul as an attractive and neutral hub for such international gatherings. Ultimately, the aim was to provide scientists, researchers and engineers from around the world with a scientific discussion forum to exchange ideas and recent progress in research and technological development. "Under the theme 'Glass in the sustainable future: Achieving what is possible…', we also hope the meeting fosters international collaboration in the sector" they confirmed.

"Our hope is to bring compelling new ideas in glass science and technology" Professor Oktik added. "Sisecam now aims to transform the Sisecam Glass Symposium into a comprehensive International Glass Conference. This ambitious goal is a result of Sisecam Group's sense of responsibility for being the only global player active in all core areas - flat glass, glassware, glass packaging and chemicals for the glass industry."

An impressive 60% of the English language papers delivered in Istanbul were accepted from international speakers but members of the extensive Sisecam RD&T team were also well represented. This emphasises the growing importance placed by the group on product innovation and production advancement, with presentations covering everything from 'Emerging trends and technologies in the glass industry' to 'Digitisation, data analytics and process monitoring' and from 'Thin film coatings and large area coating technologies' to 'Energy, environment and sustainability'.

Via a series of plenary and parallel sessions, the meeting featured 111 oral and 12 poster presentations to maintain the interest and participation of glass manufacturers and members of the associated science and research community over two days. In addition, five specialist training sessions were organised the day before the main meeting by leading technology providers CelSian, Glass Service, Eurotherm, AMETEK Land, RHI-Magnesita and SEFPRO.

International plenary speakers included Dipak Q Chowdhury (Division VP and Technology Executive, Corning Technology Centre Korea) and Ludovic Valette (President, Global Technology, Owens-Illinois). Dr Chowdhury summarised the current state of flexible glass technology and discussed some of its latest applications as a substrate and superstrate. Ludovic Valette identified the role of glass ▸

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Professor Oktik is especially proud of his pivotal role in the creation and management of a dedicated corporate Research and Development Centre in Gebze-Kocaeli.

Sisecam's corporate Research and Development Centre employs 167 full-time researchers.

as the material of choice for sustainable packaging solutions.

At the last minute, Professor Oktik also stepped in as a plenary speaker, presenting a topic close to his heart and one that has occupied his professional career for many years; the development of solar skins for the photovoltaic industry.

Fulfilling an international role

Professor Oktik confirmed the intention to rename the meeting the Istanbul International Glass Conference, supported by Sisecam and to stage it next in 2021. Thereafter, meetings will continue to be held every two years, with the traditional and equally relevant Sisecam Glass Symposium held for the group's management and technical personnel in the intervening years. In the future, help will be secured from national and international parties in the glass industry value chain to facilitate an eco-system to initiate many new contacts to exchange exciting developments on a global scale.

It is strongly believed that the conference provides an excellent opportunity to update and discuss the latest developments in glass science, technology and production. "On the other hand, it will demonstrate Sisecam's ongoing commitment to foster international collaborations to improve the 'clock speed' in the glass industry."

It is since Sener Oktik joined Sisecam in 2012 that the policy of opening up these meetings has been successfully pursued, initially to the Turkish academic community and then to international delegates. As a result, a genuinely international platform has been created to foster and encourage the exchange of valuable ideas and knowledge. To have attracted almost 500 people to last year's meeting was a significant achievement for the team, laying the foundation for future successful events.

Another important benefit of the meeting was to raise the visibility and profile of the Sisecam Group, which is now acknowledged as one of the world's largest, most successful and influential glassmaking businesses. The group operates 43 specialist production facilities in flat glass, household glassware, glass packaging and glassfibre, as well as soda and chrome chemicals. Today, Sisecam is the world's leading supplier of chromium compounds and the seventh largest synthetic soda ash producer. Furthermore, it is the third largest manufacturer of household glassware and the fifth largest glass packaging and flat glassmaker globally. With production facilities throughout Turkey, in Germany, Italy, Bulgaria, Romania, Slovakia, Hungary, Bosnia-Herzegovina, the Russian Federation, Georgia, Ukraine, Egypt and India, the group has 22,000 employees and has set the goal of becoming one of the top three global producers in each of its main business fields.

Strong R&D focus

Professor Dr Sener Oktik has been heading Sisecam's extensive research, development and technology organisation since 2012 and as Chief Research and Technological Development Officer, he is a member of the group's Executive Board. He successfully bridges the gap between fundamental scientific research and the specific industrial development needs of Sisecam's manufacturing businesses. Since joining Sisecam, his team has been responsible for repositioning research and technological development at the heart of the organisation.

"In the glass industry, the competition in every ring of the value chain will continue to grow with increasing speed" Professor Oktik explains. "Collective and collaborative research and technological development activities are the most important drivers for pushing the pre-commercial frontiers from basic science research to a prototyping stage."

R&D priorities can be grouped in three interrelated shells:

- Improvement/optimisation of existing (core) technologies and products.
- Development (or transfer) of new products and technologies at adjacent fields of the glass industry. ▸

The conference attracted almost 500 delegates from 26 different countries.

According to Professor Oktik, research to boost the strength of thin glass with chemical tempering technology was accelerated in 2018.

- Development (or transfer) of new products and technologies at transformational fields.

"Complying with the key global drivers in the glass industry such as climate change and digitalisation, we embark on our ambitious journey towards exploring and hopefully achieving 'what is possible' to differentiate and innovate with an improved 'clock speed' in production technologies and products portfolio."

Professor Oktik graduated in physics in 1976 and received an MEng in applied physics in 1977 from the University of Ankara. He was awarded a PhD from the UK's University of Durham in 1982. Subsequently, he received an associate professorship in 1986, before working as a lecturer/research scientist/senior executive at Durham University, Lecce University in Italy, Stuttgart University in Germany and Selcuk and Mugla Universities in Turkey. His career has also included key roles as a senior research scientist/senior technologist/expert/senior executive at ICI plc, BP Solar (UK), the Industrial Research Laboratories at Durham University, Anel Group and Arikanli Holding, prior to serving as Vice Rector, then Rector at Mugla University in the south west of Turkey.

Throughout his Sisecam career, Professor Oktik has served as a member of the ICG's steering committee and is now a member on the Advisory Committee. He has also been a member of the international advisory board of the International Conference on Coatings on Glass and Plastics (ICCG), the Society of Vacuum Coaters (SVC) and The Center for Functional and Surface Functional Glass (Slovakia) (FunGlass). A member of the Scientific Committee of the European Photovoltaic Solar Energy Conference (EU-PVSEC), he was Chairperson of the Turkish Solar Energy Industry Association (GENSED) until 2018, before being named GENSED's honorary Chairperson.

The Research and Development Centre houses 27 well-equipped, subject-specific laboratories and a design centre.

Leading glass science laboratory

Since his appointment as Chief Research and Technological Development Officer eight years ago, Professor Oktik is especially proud of his pivotal role in the creation and management of a dedicated corporate Research and Development Centre in Gebze-Kocaeli. Opened in 2014, this advanced facility is among Europe's leading laboratories in glass science and technology.

The STDC building has international GOLD LEED certification, housing 27 subject-specific, well-equipped laboratories and a design centre. Currently, 167 full-time researchers are employed, 59 of whom have a postgraduate degree (one Professor, 18 PhDs and 40 MScs). They are actively involved in every link of the value chain, from basic science research and pilot-scale production trials at the laboratory or industrial scale, to the commercialisation of products and technology. Additionally, 75 full-time researchers within the Sisecam Group's four main business lines (glass packaging, flat glass, glassware and chemicals) provide direct support to the activities of Research and Technological Development (RTD) and conduct quality control and quality assurance activities in regional laboratories (10 in Turkey and seven abroad).

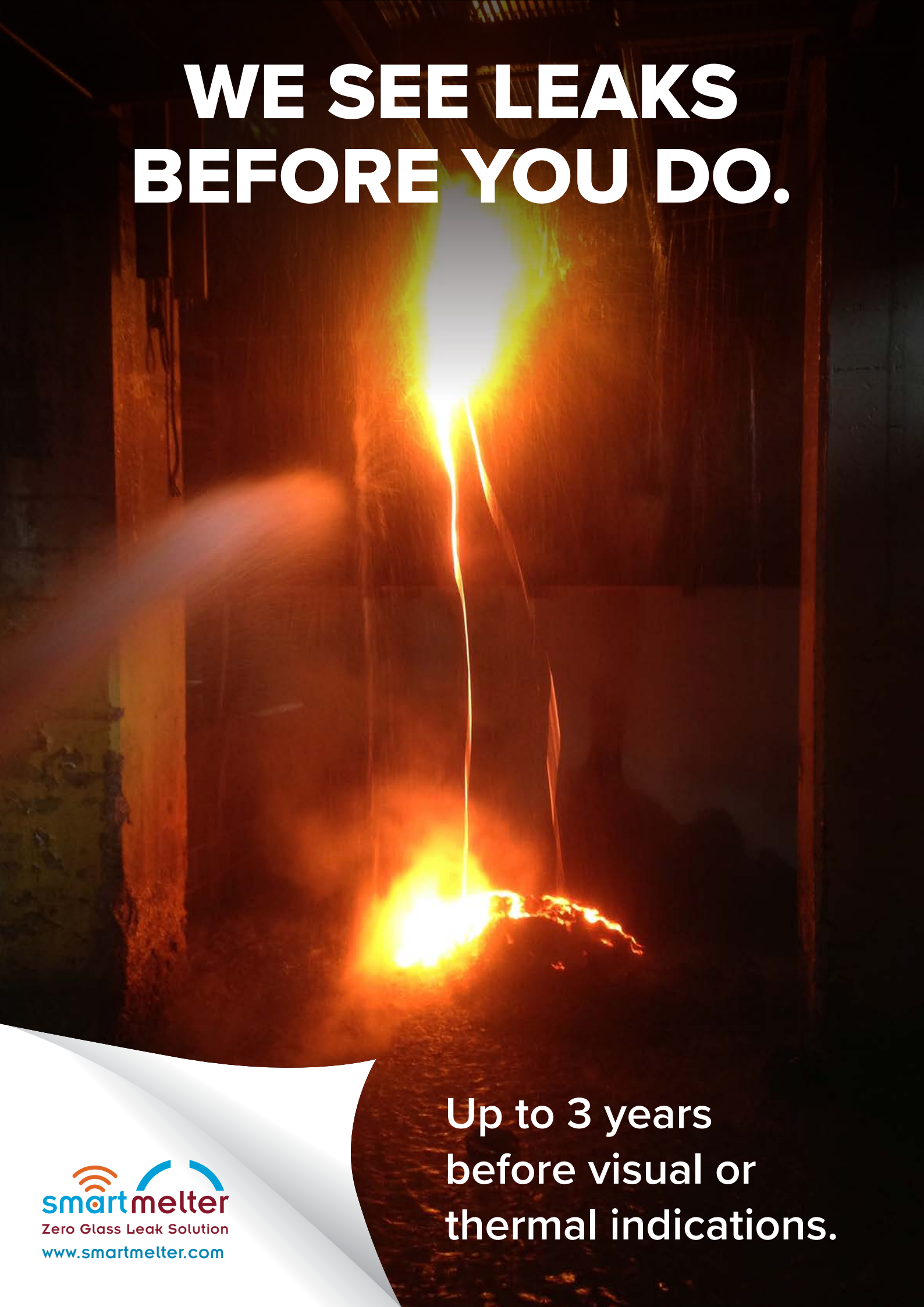
RTD activities are focused on sustainability and excellence goals at every step – from raw materials to finished product. In line with the strategic priorities and objectives of the global glass industry, studies in research, technological development and design can be grouped into a series of major categories. These include production process efficiency, energy efficiency, environmental impact, innovative technologies, products and designs, as well as corresponding new application areas that will grow the market.

In 2018, the RTD Department conducted studies on 237 work packages within 42 umbrella projects. Of these, 34 were in furnace investments, 89 were in new products and technology development and 123 were in operational excellence, such as product, technology and process improvements, cost reduction analysis and support services. That year, 21 new products and technologies were commercialised, 15 patent applications were filed, with three patents and 13 designs registered.

According to Professor Oktik, research to boost the strength of thin glass with chemical tempering technology was accelerated in 2018. And in the flat glass business, side lite and quarter lite glasses prepared as prototypes for the automotive sector were well received by customers. In the glassware business, stemware glasses – featuring higher mechanical strength in free fall, bending and impact tests compared to competitor products in the ultra-light stemware products category with lead free crystal composition – were offered to the market with similar technology.

Three new flat glass, six new functional glassware and two different glass packaging products were commercialised by using atmospheric coating technologies. These products included pyrolytic low-E, a solution for offline AR coated product for flat glass, 'Cosmo-Fairytale' series, neon products with screen printing, metallic and gilding effect coated products, interference effect 'Midas' series and thermo-chromic products that are coloured when heated for glassware. In the glass packaging business, alternatives were created for the currently used inorganic spray and enamel printing paints.

In architectural applications, light and thermal transmittance-adjustable, temperable low-E coatings (71/54, T50/33, T41/27) and low reflective coatings (T60/28) became commercial products. Production trials for T80/65 and low-E U:1.0 products as well as heatable athermic glass for the automotive sector were completed; certification efforts are ongoing. In addition, studies were conducted on new technologies to boost the strength of vacuum-coated products and improve the conductivity and optical performance during the heat treatment applied for some products. During the year, the infrastructure was formed to obtain higher quality product output. ▸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Production expertise

With 84 years of experience, Sisecam Group has excelled in 'end to end' glass production and utilises this experience in the design of new production lines and cold repairs of existing furnaces. Core competences in furnace technologies include glass furnace design, CFD modeling simulations, the design and implementation of batch house systems, combustion, emissions and energy efficiency, furnace electrical and control systems, troubleshooting and furnace auditing, as well as refractory benchmarking and selection.

Complementary core glass technology competences cover the evaluation of new and alternative raw materials, the design and improvement of glass compositions, improving the melting/fining behaviour of batches, measurement of physical properties of hot and cold glass, measurement of optical properties of glass, development of new and functional glass colours, programming colour transitions in the furnace and follow-up, mechanical properties, fractography, gas analysis of glass bubbles by mass spectrometer, troubleshooting, off-line coating vacuum coating for architectural and automotive applications, as well as atmospheric coatings for functional and decorative applications for all production groups.

Professor Oktik explains that new sensor applications became widespread in furnaces as part of Industry 4.0 practices. "Along with expanding digitalisation applications, data-based production system optimisation efforts continue intensively to enhance furnace life and performance" he confirms. "A proposal was submitted to the European Commission's LIFE fund for a project that targets boosting production capacity by up to 15% via the integration of smart burners that incorporate advanced sensors with process control technologies in flat glass production."

Furthermore, efforts to expand and improve the existing energy database (ENIS - Energy Monitoring System) for integrated management of production systems and energy efficiency have been accelerated, with regular reporting starting during the 2018. Glass forming simulations aid product and process development, especially bending complex 3D automotive glass, while simulation efforts have played a significant role in securing and maintaining design partner status with major multi-national automotive companies. "On the other hand, expertise in artificial intelligence is being developed by adopting artificial neural networks and similar techniques to optimise production processes based on operational data" Professor Oktik confirms.

The advanced facility is among Europe's leading laboratories in glass science and technology.


In 2018, the Research and Technological Development Department conducted studies on 237 work packages within 42 umbrella projects

Carbon emissions are regularly monitored from the group's business processes. Since 2011, Sisecam has disclosed the data obtained from its monitoring efforts through the Carbon Disclosure Project (CDP). Longstanding expertise in glass furnace modeling has been extended to the simulation of forehearths, energy recovery systems and secondary operations such as tempering for optimum design and operation.

Energy audits are conducted across the group and pressure air leakage tests and leakage elimination analyses are performed. Using these finding, capital investments were also made to ensure energy consumption minimisation and saving.

As part of Sisecam's renewable energy efforts, in 2017 6.2 MW of solar power panels were installed at the Mersin flat glass production facility. This represents one of the world's largest roof-type solar power generators. In addition to this solar power plant, 330 solar panels with a total installed power of 87 kW have been installed on the roof of the Sisecam Science, Technology and Design Centre.

Moreover, 15 MW of electricity is generated annually by the waste heat recovery facilities operating at four plants. Feasibility studies have been completed for new waste heat recovery facilities, which are expected to be commissioned to boost capacity further at flat glass plants in Italy and in Ankara, Turkey. Natural gas consumption savings have also been achieved via hot water generated within the system.

"Sisecam Group's investments priorities have been towards sustainable growth by focusing on advanced technology, Industry 4.0 applications and the efficiency of our production management systems" Professor Oktik concludes. "It is expected that the digital transformation project will enable 360 degree integration of our value chain – from research, technological development and design via supply chain to customer experience. Furthermore, ownership of advanced technologies will accelerate Sisecam Group's competitive capabilities for a smart future and sustainable growth."

Potentially, these and many other glass research-related subjects will be addressed by the Sisecam research and technological development team in Gebze-Kocaeli and hopefully discussed at future Istanbul International Glass Conferences. ●

Further information:
Sisecam Group, Istanbul, Turkey
web: www.sisecam.com

Syrian glass industry recovers despite war-torn economy

The first investments in many years are being allocated in Syria's glass industry, raising hopes that the worst days of the conflict may be over. Vladislav Vorotnikov reports.

What began as a peaceful uprising against President Assad in 2011 has become a full-scale civil war. As of 2019, it has not only caused countless human losses and ruined the infrastructure all over the country but the conflict has has decimated the national economy. This means there is virtually no demand for any industrial goods, as well as most consumer goods on the domestic market. It also means that the way back to normal life will not be short.

There is only one hollow glass plant in Syria, located in a region that fortunately, is unaffected by the armed conflict, so it has managed to stay alive. Quite a few glass workshops all over the country were not so lucky.

In recent months, various statements have been made about the upcoming recovery of the Syrian economy. According to Busein Shaaban, political advisor to Syrian President Bashar Assad, the Syrian government hopes that Russia, China and Iran will help to restore the national economy, once the last pockets of resistance are eliminated in the south eastern regions. He added that those countries that fought against Syria would not be allowed involvement in the country's economy projects.

Large-scale economic assistance to the Syrian economy may be provided by Russia, according to Vladimir Padalko, Chairman of the Trade and Industrial Chamber of Russia, while speaking during a press conference earlier this year. Approximately 100 Russian companies have agreed to launch joint projects with the local companies in industries considered of vital importance, including the food and construction industries.

Demand for hollow glass in Syria is described as 'miserable' but MCJI continues to develop opportunities.

In total, the Syrian government estimates that it may require investments of around $400 billion for the country to recover from the long lasting civil war and it is impossible for the country to find that amount of money without international aid.

Production of glass containers increases

The situation was somewhat uncertain for Syrian container glassmaker Modern Co for Glass Industries (MCGI) over the first years of the conflict. The plant is located in the Hasyaa Industrial Zone not far from the city of Homs, Syria, where there was an escalation of violence between 2012 and 2014.

The plant managed to avoid stopping the production process throughout, although there were several blackouts around Homs in 2013 and 2014, since the local electricity grid was repeatedly damaged. The city suffered from artillery bombardments and was nearly completely destroyed during the three year standoff. ▸

Islamic glass production in Syria is close to oblivion.

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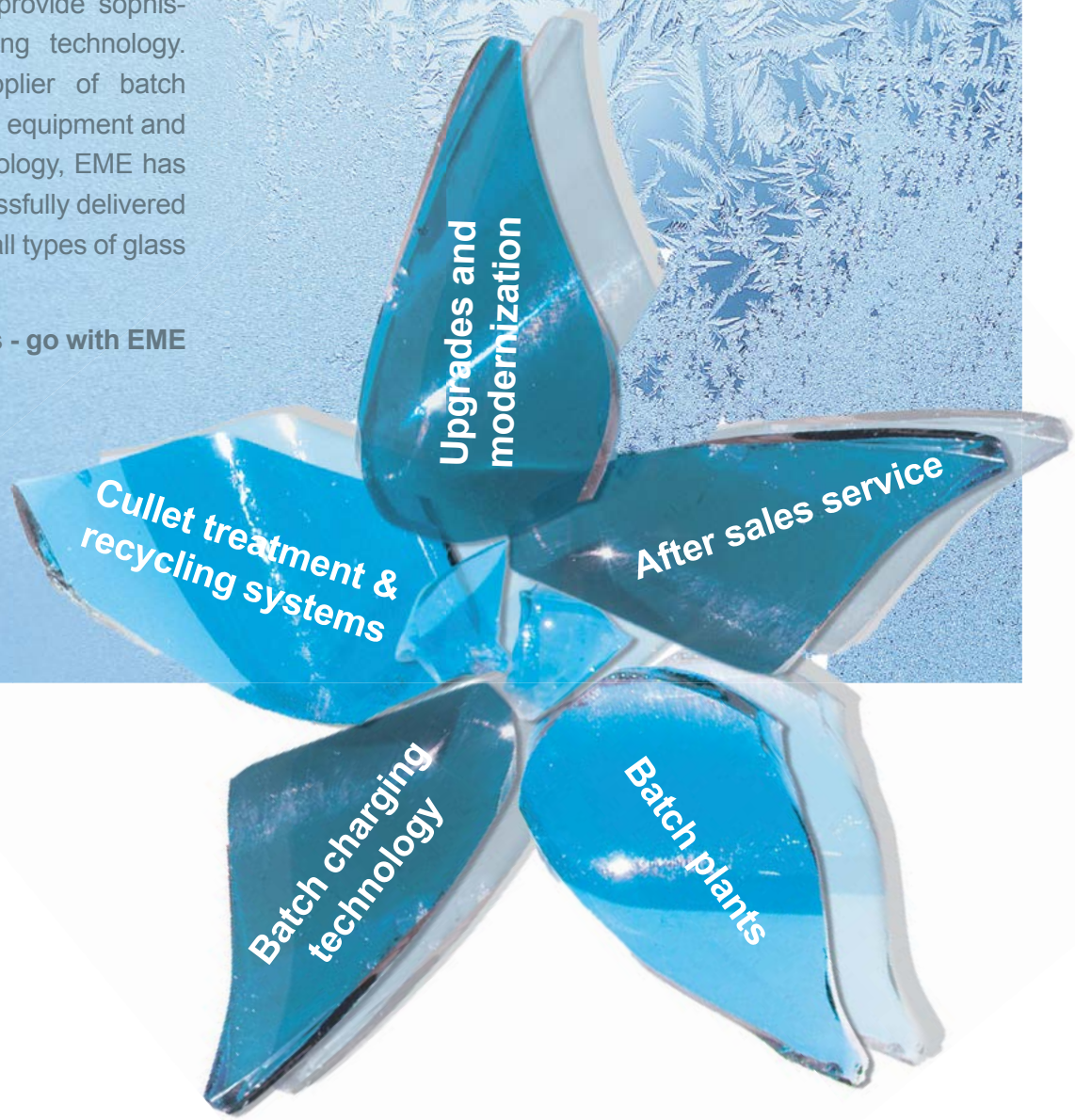

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In 2014, a ceasefire agreement was reached so the final rebels laid down their weapons and left the region. Although there was no full-fledged war in Homs for almost five years, the city is still in ruins. Despite this situation, MCGI has recently executed €13 million investment plans it has harboured for a long time. The company installed a second furnace and increased production from 115 to 230 tonnes/day or roughly 90,000 tonnes/year.

MCGI was founded in 2010, only a year before the current crisis and this is the first modernisation conducted since that time. The company is lucky to be located not far from the border with Lebanon, as over the past several years, it was exporting around 70% of all manufactured glass containers. The main production facilities are also located not far from the sea ports of Tartus and Tripoli, Lebanon, so some products are being exported to destinations a distance from Syria.

In 2015, MCGI established a subsidiary called Raslan Enterprise Ltd in the UK, targeting the promotion of its products in the EU. This step was taken despite there being heavy international sanctions imposed on Syria that make it extremely difficult to take anything in or out the country, with the exception of humanitarian aid.

Dogs of war

Over the years, MCGI has had to deal with a broad range of challenges. From the very beginning of the conflict, one the main problems faced was the lack of employees, as most engineers, technicians and other highly skilled employees fled the country, running for their lives, commented a spokesperson of the company who wished not to be named.

For example, from an estimated pre-war population of 22 million, the United Nations identified 13.5 million Syrians requiring humanitarian assistance, of whom more than six million are internally displaced within Syria and about five million are refugees outside Syria.

Some men were lucky to find jobs in other countries, while others stayed because working at the plant is the only means of existence, not only for them but also their families, the spokesperson said. As a result, a major issue was to maintain the equipment in proper condition, especially since equipment suppliers for the safety of their employees have not been sending maintenance staff to Syria.

Another problem is the absence of a domestic market. Before the civil war, Syria was a middle-income country but now, it is one of the poorest in the world, with almost half the population living in poverty, suffering from starvation. Needless to say, domestic demand for glass containers slumped significantly and is still miserable, although there is no official estimate on the state of the market.

Syria's only hollow glass plant is located in the city of Homs, which was almost completely destroyed during the civil war.

Syrian hollow glass company MCGI is investing in modernisation.

Nevertheless, the domestic market is showing signs of recovery, as the Syrian beverage industry picks up. Recently, a plant producing juices and carbonated beverages under the Sinalco brand began operations in the Syrian province of Damascus. The $12 million plant is expected to deliver 18,000 one litre and two litre bottles of beverages, thereby increasing local demand for hollow glass.

Saving exports

An initiative that allowed MCGI to make it through the civil war has been its export business. The company has major customers in neighbouring countries, including Iraq and Saudi Arabia. Strong demand from international markets was the main reason why the company embarked on its recent capacity expansion programme.

"There are clear opportunities to expand export supplies, since our products appear to be very competitive both in terms of price and quality" commented a company spokesperson. "The company operates equipment from leading European suppliers, which means it runs a good plant, albeit not located in the best environment."

MCGI is able to export its products since the glassmaker is not subjected to sanctions. As of 2019, there were several packages of sanctions introduced against the national economy by the USA and the EU that affect about 300 companies in total. Although delivering products to other countries is complex, foreign sales are not limited by any regulations.

"The company has never been engaged in any activity that could push foreign governments to introduce sanctions against it" the spokesperson suggested, claiming that despite this, MCGI is frightened that international restrictions imposed against Syria may negatively impact its business.

Glass workshops close to extinction

Before the current crisis, there were hundreds of private workshops in Syria producing Arab-style glass bottles, jars and other products. It is well-known that Syria is home to one of the world's most ancient glass industries, as the people of Aleppo and Damascus were glass manufacturers and exporters since the so-called Golden Age of Islamic Glass in the 12th Century.

"Prior to the civil war, Islamic glass was in high demand, while now, there is no market" commented Anvar Angazi, owner of a private glass workshop in Damascus. "Almost all private glass factories in the country were family-owned and most of them have their own styles and secrets that were passed from father to son through several generations" Mr Angazi added. "Now, everything is lost, as almost all workshops in Syria were destroyed and closed. It is very unlikely they could ever be rebuilt, even if their owners are still alive."

According to Anvar Angazi, glass handicrafts are a part of Syria's national heritage, so the few workshops that have managed to stay in business need to maintain operations. "Otherwise, Syrian glass could pass into oblivion completely" Mr Angazi said. ●

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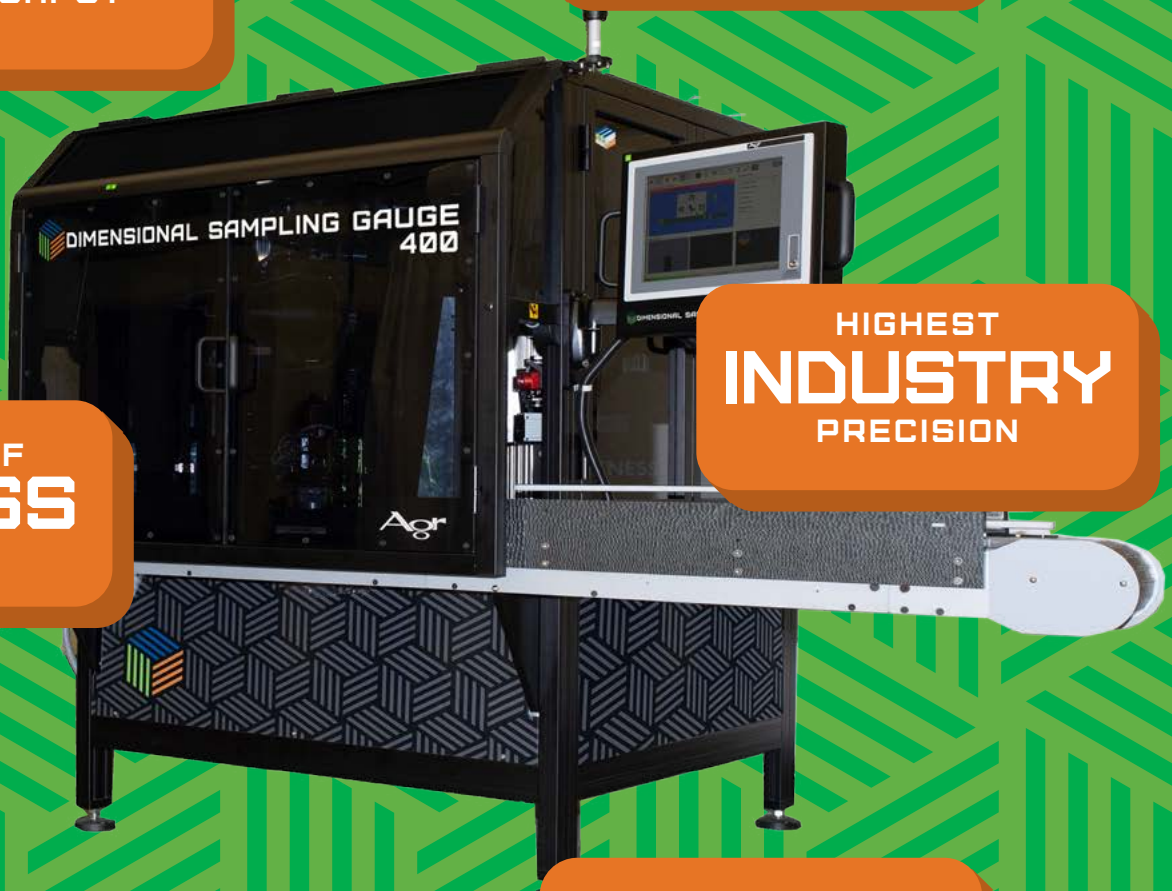

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The $123 million Arglass Yamamura glass container manufacturing plant at Valdosta, Georgia is scheduled for start up in November 2020.

Flexibility focus for greenfield US glass container project

Following an official ground breaking ceremony in southern Georgia, USA last October, partners in the proposed Arglass Yamamura glass container project are targeting a November 2020 plant start up. Jose Arozamena, Chairman and CEO of Arglass Yamamura and Koji Yamamura, President and CEO of Japan's Nihon Yamamura Glass share common goals for the ambitious initiative, involving flexibility, efficiency and sustainability, as John Wallis discovered.

Construction is underway for a $123 million glass container manufacturing plant that has been conceived with the ambitious goal of revolutionising the North American glass container industry. Arglass Yamamura has been created to deliver customer requirements for flexibility, efficiency and customisation, satisfying smaller volume requirements rather than concentrating on the US industry's traditionally longer production runs. This is what the company has described as a 'European model', emphasising the difference in evolution of the US glass industry compared to that more commonly favoured throughout Europe. Potentially, the greenfield start-up in Valdosta, Georgia will use what is described as best-in-class technology to serve US customers, while also reducing imports.

A subsidiary of new holding company Arglass Yamamura, Arglass Yamamura South East will target the food and beverage, spirits and wine industries using the latest technology for efficient glassmaking in what is expected to become one of the world's most modern plants.

Arglass Yamamura, a joint venture between the privately held merchant bank Cambium and leading Japanese glass container manufacturer Nihon Yamamura Glass Co Ltd (NYG), has invested heavily in putting the plant on the map. The site is on schedule to produce its first saleable bottles by November 2020. And by early 2021, its single furnace and three lines will be capable of producing up to five different products simultaneously in up to two different colours, for a total of more than 100,000 tonnes (265,000,000 units) per year.

Family roots

The Arglass project is the brainchild of Jose de Diego Arozamena and was developed within his family's New York-based investment vehicle Cambium, in association with Chief Financial Officer Jose Ruiz Luque. Together, they have worked full-time on the project for the past four years.

Jose Arozamena grew up in the glass packaging industry and has always been passionate about the material. "You could say I have glass in my veins" he suggests. After graduating in industrial and systems engineering from the University of Southern California, he worked in the early 1980s as General Manager and Vice President of Sales at the family glass business. Although the decision was taken to exit the industry some years later, Jose Arozamena maintained his fondness for glass. Subsequently, he has been involved in myriad private equity transactions, acting as Chief Executive Officer in various different industries and countries, covering such activities as branded consumer goods, beverages, shipping and media. More recently, he was an advisor to Apollo Global Management in the acquisition of Verallia, where he currently serves as a board member.

"There is an innate beauty in glass that no other packaging material possesses" says the Arglass Yamamura pioneer. "Being natural, safe, inert and endlessly recyclable, it is the perfect packaging material, especially now that we're realising the health concerns and damage that plastics have caused – and continue to cause – to people and the environment."

According to Mr Arozamena, a modern, efficient glass plant that uses a high percentage of cullet can produce the most environmentally-friendly packaging material available. "I believe that glass is back and that with improved flexibility, creativity, efficiency, fast product development time and a high sustainability score, glass will be the preferred packaging material for more health-conscious consumers."

Strong customer support

Georgia, specifically Valdosta, was selected to site the company's first greenfield glassworks investment after analysing and scoring various other states and locations. ▸

Diginitaries at the ground breaking ceremony included (from left to right): James Burchett, Georgia House of Representatives, District 176; Ellis Black, Georgia State Senator, District 8; John Corbett, Georgia House of Representatives, District 174; Bill Slaughter, Chairman, Lowndes County Board of Commissioners; Jose M Ruiz Luque, Arglass Yamamura CFO; Jose de Diego Arozamena, Arglass Yamamura Chairman and CEO; Brian P Kemp, State of Georgia Governor; Koji Yamamura, Nihon Yamamura Glass President and CEO; Tom Call, Valdosta-Lowndes County Development Authority Past Board Chairman; John Gayle, City of Valdosta Mayor; Pope Langdale; Bill Langdale; and John LaHood, Georgia House of Representatives, District 175.

Valdosta scored highly in many of the rankings assessed, providing an excellent business environment and a good quality of life, as well as competitive costs. The city is also conveniently situated to serve the markets targeted. "The Valdosta Lowndes Economic Development Authority and many community leaders have played a key role in delivering their strong support for our project from the outset" Jose Arozamena confirms.

Customer support has also been instrumental in bringing the project to its current advanced state, providing valuable encouragement to move it forward. "Customers who are seeing the fast changing demands of consumers are excited finally to have a glass company that can be a real partner in helping them to meet their needs" Mr Arozamena adds. "The glass container industry has to adapt to the changes in consumer habits that have and will continue to occur. Gone are the days when consumers were monolithic and consumed the same products all the time. Younger consumers especially are constantly looking for new things, new products, new flavours and new formats etc."

According to the Arglass Yamamura CEO, today's successful products target specific niches and are replacing mass market items that are often considered too similar and boring. At the same time, he contends that consumers are now more environmentally aware and want to ensure that the products they consume have the smallest possible environmental footprint. "Our plant has been designed specifically to address these issues. It will be the most flexible glass plant in North America in terms of sizes, shapes, colours, minimum run sizes etc, while having an extremely high level of efficiency and implementing best-in-class environmental systems and controls."

Experienced partner

In Nihon Yamamura Glass, the business has attracted one of Asia's most respected glass container manufacturers as a partner to help bring the project to fruition. Based on more than a century of expertise, Japan's leading glass packaging producer has developed a strong reputation for quality, flexibility and innovation. "The creation of Arglass Yamamura brings together the experience, knowhow and excellent reputation of Yamamura with our intimate knowledge of the US market and business practices " says Jose Arozamena. "We could not have asked for a better partner."

Koji Yamamura, President and CEO of NYG echoes this sentiment, as his company looks to expand its platform to other parts of the world. "With favourable energy and labour costs, as well as the many business incentives provided by Georgia and Valdosta, we believe this location is the best choice for Arglass to maximise its potential and to grow rapidly" he confirms. "We are looking forward to starting production by late next year and providing our customers with quality products from this plant."

When fully operational, the Valdosta glassworks will feature one melting furnace and three production lines. It will be capable of producing up to five different products simultaneously in up to two different colours.

Established in 1914, NYG achieved sales of $633 million in its last reported financial year and provides employment for some 2600 people across the group's glass packaging, engineering, plastics and 'New Glass' companies. Its glass container division operates high productivity facilities in Harima, Saitama and Tokyo that satisfy 39% of Japan's glass container demand. In addition, a pan-Asia production network has been created, involving manufacturing operations in China, the Philippines and Vietnam.

The company's strengths are closely aligned with the vision proposed for the Arglass project. A diversity of standard and custom bottles is produced, with minimum orders as low ▸

as 20,000 units and in sizes from 30ml to 4000ml. More than 60 colours can be produced via the use of forehearth colouring or furnace colour changes. NYG's flexible production scheduling system allows in excess of 1000 bottle types to be made via more than 3000 job changes annually. Furthermore, in-house research and development of manufacturing technologies helps the company to improve production efficiency and sustainability. In particular, NYG produces some of the world's lightest bottles, while a series of decoration options are provided to enhance product individuality.

Jose Arozamena, Arglass Yamamura CEO addresses participants at last October's ground breaking ceremony in Valdosta.

Low carbon footprint goals

From the outset, the Arglass Yamamura management team has been intent on creating the most environmentally-friendly glass container plant in North America. Jose Arozamena confirms that the latest and best available technology will be applied throughout, including the furnace design, emission control systems and closed loop industrial water system.

Separately, the company intends to be particularly active in the area of cullet recovery and processing and will be working closely with State and local authorities to maximise recycling opportunities. "We cannot simply stand by, hoping that others resolve this issue" Mr Arozamena suggests. "Recycling is our future and we're committed to it. This is what we are conveying with our logo, which depicts a gob of glass and its endless life cycles."

Recruitment underway

An extensive recruitment process is currently underway, as Arglass Yamamura looks to create a team with the best talent from the industry. "We want to attract people that are dynamic, performance-oriented and fully committed to the plant's success" says Jose Arozamena. "We are offering very competitive compensation packages, good career development opportunities and the chance to be part of a team that changes the industry for the better."

In total, 151 people will be employed at the site. Suitable candidates are being identified and selected with the help of specialist firms, as well as the Georgia Department of Labor.

Challenges and opportunities

"As with any start up and greenfield project, there will be many challenges but over the last four years, we have worked with our team to anticipate and address all foreseeable challenges" Jose Arozamena confirms. With the involvement of NYG, the management team at Arglass Yamamura is further confident in its ability to address any challenges that may be faced in building the plant on time, within budget and operating efficiently and that there could be opportunities to explore similar operations for other parts of the USA in the future.

"We believe there is a large, untapped potential in the US consumer market for glass" Mr Arozamena explains. "Other than substituting imports for glass made here, our goal is to help more producers choose glass as a healthy, safe and environmentally responsible material that, at the same time, can be customised, dynamic, colourful and cost-competitive." ●

News updates

In the weeks since finalising this fast-developing feature, a series of additional important announcements have come to light, covering key aspects of equipment selection and management appointments.

Batch and cullet treatment systems specialist EME GmbH confirms that engineering work for the Arglass project near Valdosta, Georgia is nearing completion. Arglass emphasised the importance that the batch plant and cullet return system had to be designed with the best available technology and with a layout to provide for high quality, highly flexible and efficient production.

First shipments of the EME equipment are scheduled for early 2020. The furnace, supplied by EME's sister company Nikolaus SORG, is set to start up at the end of 2020, with full operation expected by early 2021.

Luis Gonzalez Sada has joined Arglass as Vice President of Sales and Marketing. With significant experience in sales, marketing and new product development in the glass container industry, he reinforces the company's commitment to provide customers with the best quality and service.

Mr Gonzales was VP Sales and Marketing for the Vitro Glass Containers Division in Mexico from 1997 to 2001, after which he spent two years as VP of Planning, Logistics and Marketing, before his appointment as CEO of Vitro America. He also served as Director of Sales and Marketing at Owens-Illinois Packaging Solutions in 2018-2019, based in Plano, Texas.

Jose de Diego Arozamena, founder and CEO at Arglass, commented: "Arglass is putting together the best team in the industry to bring a whole new level of capabilities, flexibility, innovation, creativity, quality and service to the US glass industry."

Michael R Lane has been confirmed as Senior Operations Advisor at Arglass. Mr Lane has enjoyed a 30+ year career in the North American glass container industry, including spells as Vice President Operations for American Glass Containers in Pittsburgh and 11 years as Regional Director for Anchor Glass Container Corp, where he was based in northern Florida and enjoyed profit and loss responsibility, delivering customer service for major accounts.

Earlier in his career, Michael Lane spent five years as Plant Manager at Glenshaw Glass in Glenshaw, Pennsylvania, prior to which he was Operations Manager for the Anchor Glass Streator glassworks in Illinois and Plant Manager at the Dayville site in Connecticut for three and two years respectively.

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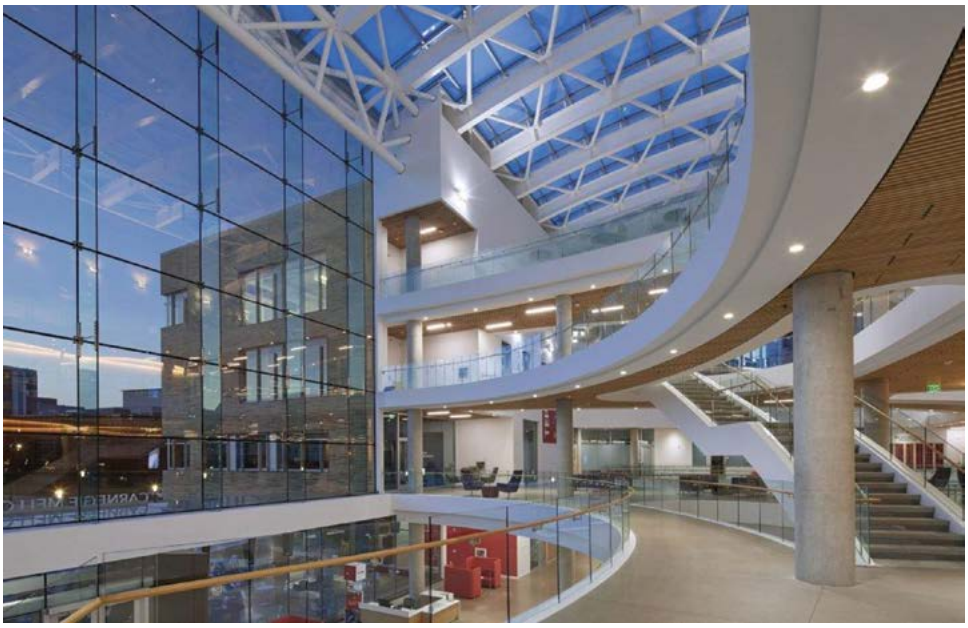
Solar energy focus for US float plant investment

Later this year, NSG Group is scheduled to commission its first new float line in the USA since 1980. Regional Director for Architectural Glass and Solar in North America, Richard Altman, who has worked for the Toledo-based organisation for four decades, discusses opportunities for the flat glass production specialist, as well as some of his personal career highlights.

Richard Altman, Regional Director for Architectural Glass and Solar at Pilkington North America, has worked at the organisation for four decades.



The Caregie Mellon Tepper School of Business makes extensive use of Pilkington North America glass.

NSG manufactures and markets glass and glazing products for architectural and automotive markets in North America. The company's latest float plant in Troy Township, Ohio is scheduled for commissioning in October 2020 and will support the group's plan to expand production capacity of online TCO (transparent conductive oxide) coated glass to support a growing solar sector.

As well as this facility, five float lines are currently operated in the USA; two in Rossford, Ohio, another two in Laurinburg, North Carolina and a fifth in Ottawa, Illinois. In addition, the company maintains an extensive network of automotive original equipment and aftermarket fabrication facilities in the USA, Canada and Mexico, producing a portfolio of laminated and toughened products. Total workforce in North America exceeds 4600 people. An important part of the global NSG Group, the former Libbey-Owens-Ford operation that became Pilkington and later NSG focuses increasingly on value added products and service, while also continuing to supply commodity products. "The North America market and the solar business have been significant contributors to NSG for several years and are a key component of our forward growth strategy" Richard Altman, Regional Director for Architectural Glass and Solar confirms. "Furthermore, glass has moved from being a passive object to look through to more of a dynamic object

The Rossford glassworks in Ohio houses two float lines.

Aerial view of the float plant under construction in Luckey, Troy Township.

Float glass production at the Rossford site.

High levels of process automation are employed by Pilkington North America.

to add or create functionality in one form or another."

Mr Altman is confident that the USA still represents a cost-effective manufacturing hub for flat glass production. "One of the key cost elements of glassmaking is energy, as melting glass is an energy-intensive process. Energy costs in the USA are the lowest in the world, in addition to which glass is a heavy commodity, so the cost of shipping the material is high compared to the end value of the product, all of which supports domestic production."

Company stalwart

Since joining Libbey-Owens-Ford in 1979, Richard Altman has enjoyed a successful management career and a variety of responsibilities, covering finance, supply chain and manufacturing (as a plant manager). As Regional Director for Architectural Glass and Solar, he is now responsible for the company's architectural activities and growing solar business, with global accountability for the NSG thin film solar operations. This embraces all aspects of the business from manufacturing to product sales and service and involves supporting team members to satisfy customer needs. "As part of these activities, I strive to make sure we always keep the customer first and our people a very close second" Mr Altman ▸

Flat glass storage at the Laurinburg float plant in North Carolina.

The Milwaukee War Memorial features Pilkington Spacia glass.

explains. "Without customers, we don't exist and without a highly motivated team, we fail the customer."

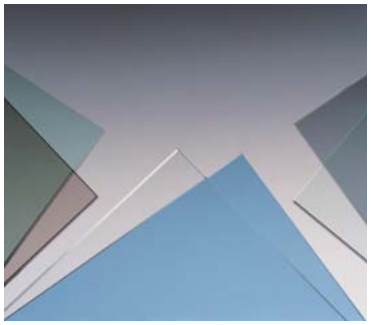
Throughout his career, people-related aspects of every role have always been among the most rewarding. "Encouraging someone and supporting them to be successful can be very rewarding" Richard Altman confirms.

Among his greatest challenges is the need to maintain focus on long-term business goals in times of slow down. "Here in the USA, despite a slight slowing in the market, the recruitment and retention of good people are challenging, especially as we are currently in an expansion phase with the addition of a new plant."

Solar energy focus

Focusing on the production of coated glass for the solar market, the company's new float facility in Troy Township has been built within 10 miles of the largest solar panel manufacturing operation in the western hemisphere, owned by First Solar. This facility is dedicated largely to serving the North American market and will represent one of the glassmaker's key global customers.

"Solar glass is very much a growing market as costs have become much more competitive compared to fossil fuels and it is more environmentally-friendly" says Richard Altman. "Renewable energy is here to stay in the USA and solar will continue to be a key part of that."

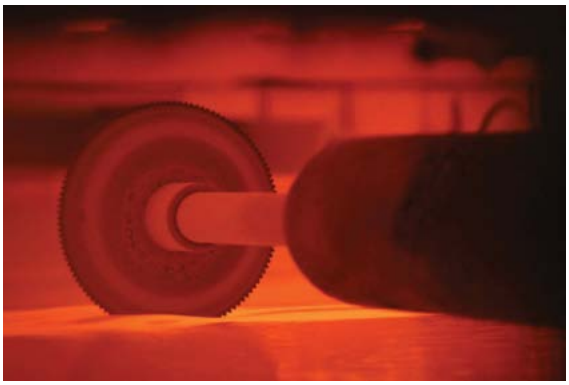


NSG tinted glass options.

With good access to natural gas and a rail network for inbound raw materials, the Troy Township site in north western Ohio also delivers a skilled labour market. In addition, it is close to the company's R&D facilities and other operations. The local community has been fully supportive of the initiative, which will be highly automated, featuring the latest advances in glassmaking and on-line coating technologies. "It may surprise potential young employees to see the amount of high technology employed compared to what are considered 'high tech' industries" Mr Altman explains. "We knew it would be challenging to attract young people to work at the plant, so we are planing to create a 'preferred' work environment for our employees. As one of the world's leading glass manufacturers, however, we hope to differentiate ourselves with our people, our innovative focus on new products and processes and our comprehensive pay and benefits package."

Collectively, the main criteria for selecting technology suppliers to support the investment are capability, reliability and cost, together with a proven track record. A high priority has been placed on environmental factors, the new plant employing the latest emissions reduction technology. In addition, several other projects have been initiated to minimise the factory's carbon footprint.

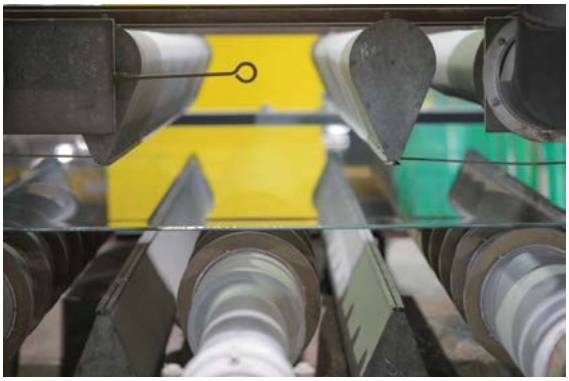
By concentrating on the needs of the expanding solar market, the Troy glassworks is expected to free up production capacity at existing Pilkington North America float plants to serve other customers and markets. "In recent years, we have been constrained from a capacity perspective and this project will be a big help" Richard Altman confirms.



Pilkington North America currently operates five float lines, with a sixth scheduled for commissioning in October 2020.

The company's R&D efforts in North America will continue to play an important role for the global NSG Group in the future, working closely with customers towards the development of product innovations. "Perhaps many potential applications have still to be recognised but they will continue to emerge" Mr Altman concludes. "The past 40 years have provided a lot of change and excitement… I am interested to see what the next 40 will provide!" ●

A new roof was required for the Ottawa float plant in Illinois, after a tornado strike in 2017.



Online coating at the Ottawa float plant.

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Glass packaging industry trends

The glass packaging industry in the USA shows continued growth in some segments but also continues to face headwinds as market demand declines in other areas. According to Richard McDonough, regulations discouraging the use of plastics in some single use products potentially expands the market for both glass and aluminium products, while changes in customer preferences have affected demand for glass in the beer industry in the USA.

Glass packaging is utilised for a variety of products, including those used in the beverage, pharmaceutical and healthcare, beauty and other business markets in the USA. The markets for glass packaging saw promise as well as difficulties during 2019.

The value of shipments from glass container manufacturing firms totaled $5,074,286,000 in 2016 (the most recent year for this report), according to the United States Census Bureau (Census Bureau). This represents a modest increase from the value of shipments in 2010 – 4,937,651,000.

A total of 13,636 people worked in glass container manufacturing businesses, with a payroll of $895,757,000 in 2016, according to the Census Bureau. These numbers represent a continued decrease from employment levels in both 2006 (14,193) and 2010 (13,834).

The weight of glass containers and packaging products generated in the USA has been in steady decline since 1980, according to the United States Environmental Protection Agency (EPA). In 1990, 11,830,000 tonnes of glass was generated; in 2000, 11,040,000 tonnes; in 2010, 9,360,000 tonnes; and in 2017 (the most recent year for this report), 8,930,000 tonnes of glass was generated.

The Forest Grove plant of Gerresheimer is located in Vineland, New Jersey (image courtesy of Gerresheimer).

Recycling of glass containers and packaging products in the nation, according to the EPA, increased from 2,620,000 tonnes in 1990 to 3,190,000 tonnes in 2015. Since then, recycling of glass has decreased. In 2017, 3,030,000 tonnes of glass were recycled.

Gerresheimer produces pharmaceutical glass packaging at its plant in Chicago Heights, Illinois (image courtesy of Gerresheimer).

Pharmaceutical specialisation

One of the major segments of the glass packaging industry includes manufacturers of containers for the pharmaceutical and healthcare industries. Gerresheimer, a firm headquartered in Germany, is one of the largest. This international firm has three facilities in the USA.

"We are developing first class glass solutions to meet highest quality requirements" stated Dietmar Siemssen, Chief Executive Officer of Gerresheimer AG. "In our new innovation centre (built in the USA), we will bundle our glass expertise and all our experts to develop new products and technologies, together with our customers in one place."

In 2018, operations in the Americas represented 27% of the global revenue of Gerresheimer. Eleven percent of all company employees were working in the region.

Beverage focus

Containers for beverages are another critical part of the glass packaging industry.

Ardagh Group, headquartered in Europe, is one the largest suppliers of containers for beverages. This company has facilities that produce glass packaging in a number of communities in the USA. The firm recently reported that revenue in its Glass Packaging North America unit "increased by 1% to $438 million in the third quarter (of 2019), compared with the same period last year, principally reflecting increased selling prices to recover higher input costs, partly offset by unfavourable volume/mix effects."

The first nine months of 2019 saw Ardagh Group take ▸

$12 million in charges for exceptional items, including restructuring and impairment charges to goodwill, in North America. This was in addition to an impairment charge to goodwill of $186 million taken by the firm in 2018 regarding its North American operations. Ardagh Group reported at that time that "the impairment charge primarily… (arose) as a result of a challenging market backdrop of continuing reductions in demand and volumes of glass packaging for domestically-produced mass beer brands as a result of the growth in consumption of imported beer (in the USA)."

Owens-Illinois (O-I), an international glass package manufacturer headquartered in the USA, also took impairment charges in 2019. During the first nine months of 2019, O-I took $70 million in restructuring, asset impairment and other charges, as well as a $595 million charge for goodwill impairment. This last charge reflected the "unfavourable beer trend in North America," according to a report from O-I.

One of the major global beer and spirits companies that uses glass bottles for much of its packaging is Diageo. "According to data from our consumers and customers, we know they prefer the luxury of glass packaging for the brands they enjoy" stated Ronald Holmes, Packaging Director, Diageo North America. "We also want to use packaging which has the lowest environmental impact whilst protecting, delivering and presenting the quality of our brands."

Overall, Mr Holmes and other business leaders anticipate continued growth in the use of glass for packaging purposes. "Glass usage will fluctuate according to market trends; however, it usually remains the same year to year - approximately 80% of the company's global packaging is in glass by weight" stated Mr Holmes. "However, as volumes grow or as innovations take off, glass usage will increase."

Newly established businesses in the spirits industry have also decided to use glass for most or all of their packaging needs. Wolf Spirit Distillery is an example of one of those newer beverage companies that made the decision to use glass – new glass – for its packaging; the firm started selling vodkas in March of 2019.

"Vodka is a highly delicate liquid, so the most neutral packaging possible is critical for the end taster to be able to discern the various character notes; as of today, glass is the most neutral container" explained Umberto Luchini, founder and Proprietor of Wolf Spirit Distillery. "Aluminium, the second most eco-friendly packaging, slightly alters the character of the liquid. PET would never be an option for obvious eco reasons."

Travertine Spa utilises glass packaging for its personal care products (image courtesy of Travertine Spa).

Supply chain challenges

One of the problems noted by several businesses that utilise glass for their packaging are difficulties in the supply chain for glass. "The main external force impacting our business has been the ever growing demand for glass, coupled with the consolidation among glass producers" Mr Luchini noted. "This has led to long lead times to get the production quantities needed, as the big players tend to get priority and there are only a handful of big glass manufacturers left."

The sustainability of glass packaging is a key aspect considered by many in the beverage industry. "A glass bottle can be bought, product consumed, recycled and back on the shelf in as little as 30 days" stated Laura Hennemann, Vice President of Marketing and Communications of Strategic Materials. "Glass is inert and will not leach – and does not require a plastic liner like aluminium cans – preserving the taste of the product and providing health benefits to consumers.

"We believe glass will continue to be a preferred alternative to single use plastics" Ms Hennemann added.

Businesses that manufacture personal care products for home use are further major users of glass packaging, where for some, the colour of the glass packaging is especially important. Travertine Spa is one of those businesses. "We use glass to protect our line of premium organic and wild-crafted skin care products" Terry Carter, Chief Executive Officer of Travertine Spa confirmed. The business uses both purple and red glass to package its products. "Most essential oil products should be packaged in opaque or dark glass to protect the oils."

Alternatives to glass continue to be options for containers for businesses with packaging needs. Containers for products used in the shower, for example, are more likely to go with aluminium containers. Box wine and wine sold in aluminium cans (with liners) are options in that industry.

Wolf Spirit Distillery uses glass bottles for all of its Blood x Sweat x Tears Vodka (image courtesy of Wolf Spirit Distillery).

Tariffs represent another external force that currently affects or may affect in the future of many in the glass packaging industry. "In the summer of 2018, the Glass Packaging Institute voiced its support for tariffs to be placed on imported Chinese glass food and beverage containers" stated the GPI's Scott DeFife. "…there had been a sustained and significant increase in the import of glass containers from China, representing nearly 35% of global food and beverage glass container imports since 2008. In addition, Chinese glass container imports have increased over 40% since 2008."

Mr DeFife explained that the tariffs "appear to have had a positive impact on domestic glass bottle manufacturing. Through the third quarter of 2019, versus the same timeframe in 2018, USA wine bottle shipments to customers from our domestic plants have increased by 2%. Imports of Chinese wine bottles (750ml size) have decreased nearly 7% during the same timeframe and overall, Chinese food and beverages container imports are down 16%."

Glass continued to be a major part of the packaging industry in the USA during 2019. Projections indicate that glass will continue to be a major component of packaging for the beer, wine, spirits, food, pharmaceutical, healthcare, beauty and related markets. Governmental entities are likely to continue to implement new mandates to encourage the use of glass and aluminium to replace the use of plastics. With these potential regulatory changes, the glass industry will have opportunities to compete with other options to expand the use of glass. ●

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Supplier of choice aspirations in strongly competitive market

According to John T Shaddox, Chief Commercial Officer at Ardagh Group, Glass – North America, the glass packaging manufacturer continues to gain market share in highly competitive US markets.

John T Shaddox, Chief Commercial Officer of Ardagh Group, Glass – North America.

John T Shaddox discusses a new wine bottle design with members of the Product Design team at Ardagh Group.

With 13 strategically located manufacturing facilities throughout the USA, Ardagh Group, Glass – North America designs, develops and produces bottles and jars for the beer, beverage, food, spirits and wine markets. Innovative designs have been created for more than 125 years, supporting the organisation's status as one of the US market's leading players.

Chief Commercial Officer, John T Shaddox has been associated with the US glass packaging industry for 25 years, honing his management skills with some of the sector's key players and building long-lasting business relationships with key customers, suppliers and work colleagues. "We are all in this together and I count on those relationships for us all to be successful."

A successful career in the glass container manufacturing industry began in 1995 with Mexico's Vitro, occupying various key roles in pricing, sales and supply chain management, before becoming President of the group's US Division in 2007. In mid-2015, Vitro's food and beverage business was acquired by Owens-Illinois and John T Shaddox served as General Manager of O-I's Wine and Distribution business unit.

Having joined Ardagh Group in early 2017, he was promoted to the role of Chief Commercial Officer for Glass – North America two years later. The core responsibilities of this role include managing the sales, customer service, marketing and new product development functions. "Growing the business and providing superior speed-of-

John T Shaddox visits Ardagh Group's Winchester, Indiana facility with Plant Manager, Aaron Wine.

John T Shaddox visits Ardagh Group's Winchester, Indiana facility in the USA.

response and service to our customer base are essential pillars of the job" Mr Shaddox confirms. "In order to be the preferred packaging partner to the world's leading brands, we must exceed expectations, improve every day, protect our base and grow. We want to become the supplier of choice for all of our customers."

While acknowledging that the North American glass packaging industry has faced significant challenges within the past decade, John T Shaddox remains confident of the material's continued success in the future. "Increased competition from imports, changing consumer preferences and alternative packaging options keep us focused on identifying opportunities to grow market share" he explains. "While there are opportunities for us across all areas of the glass container market, expanding our reach across the entire spectrum of customers within those segments has been a major focus for Ardagh Glass – North America. Historically, we have relied on distribution partners and have seen dramatic increases in competition from imports so recently, we successfully implemented and expanded our Ardagh Direct sales division that offers customers of all sizes the ability to buy US-made glass direct from the manufacturer in less than truckload quantities."

According to Glass Packaging Institute statistics, the wine and spirits markets have seen growth in domestic glass container shipments in 2019. "While there is no disputing that tariffs on Chinese imports have had a positive impact on this demand, these are also categories that are historically very committed to glass and having success in growing their share of the alcoholic beverage market" Mr Shaddox explains. Furthermore, he confirms that Ardagh Group will continue to be very active across all market sectors, describing 2020 as "a very exciting year."

Ardagh Group strives constantly to improve its cost competitiveness, in line with all other US glass packaging producers. "Freight sensitivity and other supply chain constraints make it vital for our customers to have manufacturing options close to their facilities, as well as the importance of supporting jobs in the US" says John T Shaddox. "My expectations for 2020 are that Ardagh Group will continue to prove to our customer base that we are the supplier of choice and that we will continue to gain market share in this very competitive market."

Further information:
web: www.ardaghgroup.com

John T Shaddox remains confident of continued success for glass packaging in North America.

Smart structural glazing connects cutting-edge university complex

"This is not just a new building ... this is a new vision of education." That is how David A Tepper, the billionaire businessman and philanthropist describes the newly opened home of the business school that bears his name at the prestigious Carnegie Mellon University (CMU). Glazing has played a key role.

The David Tepper School of Business sits at the heart of the university's campus in Pittsburgh, Pennsylvania and aims to facilitate collaboration with academics from across the whole institution, bringing together disciplines that are often kept separate. This meant that fostering a sense of connectedness was a fundamental principle in the design, and glazing has played a key role in achieving this aim.

The centrepiece of the 295,000ft² scheme is an atrium lobby, whose multi-level interior features a wide range of spaces designed to facilitate different interactions between people, from large gatherings to formal and casual meetings between groups of any size. This five storey space is flooded with natural light thanks to a spectacular, uninterrupted 51ft tall wall of Pilkington Planar glazing positioned above the entrance.

The centrepiece of the 295,000ft² scheme is an extensive five storey atrium lobby. Image: W&W Glass LLC.

State-of-the-art

The wall of glass is supported by laminated fins that are suspended from a steel truss structure at roof level. The architect's initial plan for the construction was to use two free-span vertical steel trusses and horizontal steel beams with stainless steel tension rods connected to the front to help support the weight and transfer wind load deflection. But engineers at the glazing designer W&W Glass advised that transparent fins could be used, both removing visual interruptions from the surface and helping to reduce costs.

This is possible thanks to the strength of the Planar I SentryGlas system laminated glass that was used in the fins, as well as the capabilities of the Pilkington Planar 905 series heavy duty fittings that hold the system in place.

The clear facade glass is made of large toughened glass units that offer both low-emissivity insulation and solar control in order to help control the climate in the building and help to reduce the reliance on heating and air conditioning. The 10ft by wide 7ft 5in units are made of Pilkington Suncool 66/33 T and are held in place with heavy duty stainless steel countersunk bolts, anchoring them to the supporting glass fins.

The Tepper School of Business and Quadrangle, Pittsburgh, Pennsylvania. Image: W&W Glass LLC.

In addition to the main atrium glass fin wall, the lower entrance below utilised point-supported structural glazing as well as cantilevered, painted steel plate beam blades to allow for expansive 13ft 4in tall structural glass panels at the ground floor, with only one row of mid-clip fittings.

Dynamic installation

The fact that the significant weight of the glass is supported by a steel truss that spans the space added complexity to the installation, as it needed to be pre-loaded to avoid any deflection once the units were in place – something that could have compromised the build.

This was achieved using temporary tension cables that simulated the weight each part of the structure would hold, both in terms of the structural glazing and the steel roof beams, which support the roof glazing.

These tensioned cables were removed one-by-one throughout the process as the glass was installed, so that the position of the supporting structure remained fixed. Chris Lalonde, architectural sales at W&W commented: "The lynchpin position this building occupies at the quadrangle in the broader CMU called for a landmark architectural feature and the wall of structural glazing completely delivers this, while also helping to create a stunning interior space for collaboration.

"It's another installation that demonstrates that Pilkington Planar is the world's leading structural glazing system. It is the quality of the product and the time-tested engineering that backs it up that gives us the confidence to create these ambitious structures."

Phil Savage, Commercial Contracts Sales Nanager at Pilkington United Kingdom Ltd said: "Our structural glazing system offers great possibilities to architects and structural engineers and this building is one of the best examples we've seen of that potential being realised. We're enormously proud that our product has been selected as the 'front door' to this world class university."

Further information:
Pilkington North America
web: www.pilkington.com

The 80th Conference on Glass Problems By The Numbers

By Robert Weisenburger Lipetz, MBA – Executive Director, Glass Manufacturing Industry Council and 80th GPC Conference Director

www.glassproblemsconference.org

1 Tour of Owens Corning's Newark plant - for GPC students

2 Venues staging the conference (Greater Columbus Convention Center and Columbus Hilton Downtown)

85 Years since first conference (the conference took a hiatus during WWII)

74 Exhibitors

20 Speakers including 6 plenary session speakers

570 GPC attendance.

49,522 Square feet of space used for technical sessions, exhibiting and hospitality events

21 Countries participating

8 Years of Glass Worldwide being exclusive GPC journal

24 Hospitality suite hosts

6 Technical programs (2 Plenary; Refractories; Melting & Combustion; Batch, Environmental and Modeling; and Sensors and Controls)

4.38 Average attendee rating of conference out of 5

17 Industry experts in the GMIC symposium, Sustainability in Glass Manufacturing

40 Students attending

2 Short course instructors. C. Philip Ross Batch and Furnace Operations, Michel Gaubil Refractories

October 26 through October 29, 2020
Dates of the 81st Conference on Glass Problems

Growing opportunities for glass

Glass continues to be an important element in sustainability efforts in the USA, although difficulties in the collection of glass for recycling have increased in recent years. Glassfibre firms continue to utilise substantial amounts of cullet. While glass packaging faces headwinds as aluminium cans become more in demand for beer packaging, the potential for growth is likely to increase for glass as a replacement for single use packaging for other products. Richard McDonough reports.

Parts of the glass industry in the USA are quite vibrant and growing, based on statistics and statements from leaders within the industry. Some sectors, however, are facing headwinds from foreign competition, changes in consumer tastes and regulatory actions taken or planned by governmental entities. In this news column, the author looks at four broad segments of the glass industry in the USA: Glass packaging, glass recycling, glassfibre and innovative glass products.

According to the United States Census Bureau, 90,507 people worked in glass and glass product manufacturing in the nation in 2016 (the most recent year for this report). The payroll for these individuals was $4,754,118,000 in 2016. These overall numbers represent an increase from 2010 (75,539) but are still below the numbers for 2006 (100,919).

The value of shipments from glass and glass product manufacturing firms totaled $26,230,901,000 in 2016 (the most recent year for this report), according to the Census Bureau. This represents an increase from the value of shipments in 2010 – $20,712,765,000 and the value of shipments in 2006 – $23,760,248,000.

Glass packaging

"The glass container industry continues to see increasing bottle and jar use among brands in a variety of food and beverage markets" stated Scott DeFife, President, Glass Packaging Institute. "Shipments of spirits bottles from our USA plants continue to increase and are up nearly 8% since 2017. USA wine bottle shipments to customers have also increased in 2019.

"Food, spirits and wine bottle and jar shipments have also increased their share of the overall USA glass container marketplace, reflecting consumers' desire to purchase high quality products in glass" Mr DeFife continued.

Changes are projected for the wine industry. The domestic glass bottle market may be impacted in coming years by continuing changes in the wine industry, according to the *State of the Wine Industry Report 2019:* "Bottled imports will take additional market share from USA producers."

This report, written by Rob McMillan, Executive Vice President and founder of Silicon Valley Bank's Wine Division, also detailed that "the wine industry's sales growth has been muted for the past several years and is now close to moving into negative territory for the first time since 1993."

The craft beer industry is another segment of the beverage market undergoing changes in the USA. "Glass makes up a significant portion of the packaged beer craft brewers sell in the market" explained Paul Gatza, Senior Vice President of Professional Brewing Division at Brewers Association. "That percentage share for glass and craft brewers is likely between 30% and 40%."

Other packaging options, taking the place of glass, are becoming more common for craft brewers. "Aluminium cans are growing share of packaging rapidly for a number of reasons" according to Mr Gatza. Among those reasons cited by him are "weight, customer adoption of cans in the past 15 years or so (and) mobile canning systems so a brewer doesn't need as large of an upfront investment on packaging lines. Smaller brewers have had concerns with minimum can ordering sizes."

Recycling

Recycling continues to be a major part of the glass industry. Economics and environmental goals both continue to push recycling as an integral part of the glass industry.

"Use of recycled glass cullet back into bottle or glassfibre

Glass bottles and jars before and after crushing into processed glass aggregate (image courtesy of Northeast Resource Recovery Association).

Pictured here is a glass clean up system located at one of the largest single stream material recovery facilities operated by Rumpke Recycling in Cincinnati, Ohio (image courtesy of Rumpke Waste & Recycling).

furnaces saves a substantial amount of energy, thereby also reducing air emissions and greenhouse gases" explained Scott Mouw, Senior Director of Strategy and Research at The Recycling Partnership. "In addition, (glass recycling prevents) …environmental damage and energy consumed in the extraction of virgin materials."

Problems have arisen in recent years with the processes used to recycle glass in various communities throughout the USA. These problems revolve around structural issues of the recycling industry, as well as overall costs.

Materials recovery facilities and waste hauling firms in a number of communities have stopped accepting glass for recycling. Some municipalities have faced steep cost increases for glass recycling and have dropped that option for their residents. Single stream recycling, while overall efficient in many respects, creates a greater likelihood of contamination among glass being recycled, thereby reducing the value of the glass collected through recycling.

As part of the glass industry's efforts to encourage recycling, Scott DeFife cited the Glass Recycling Foundation (GRF), a non-profit organisation founded in 2019. "The GRF has received initial funding commitments to support the glass recycling infrastructure and recycling programmes from both brands and manufacturers" Mr DeFife explained. "The GRF plans to provide an announcement of funding and programme initiatives in the first quarter of 2020."

Glassfibre

"Recycling glass into glassfibre insulation or processed glass aggregate enables glass, a valuable resource, to stay out of landfills and be reused" according to Reagan Bissonnette of Northeast Resource Recovery Association. "Recycling glass also saves money for municipalities when tipping fees to dispose of municipal solid waste continue to rise, especially in the north east."

The glassfibre industry is the second largest user of cullet in the USA; the glass packaging industry is the largest user of cullet in this country. Cullet is used in the production of many glassfibre insulation products, from loose fill blown into attics to pipe insulation and from insulation used within appliances to residential batt insulation.

"They use (cullet) in place of virgin materials such as sand" explained Ms Hennemann of Strategic Materials. "Recycled glass melts at a lower temperature, providing energy savings and a reduction in CO_2 emissions, which directly impacts climate change. Further, the lower melting temperature is easier on manufacturers' furnaces, helping to lengthen the life of the furnace and reducing maintenance."

The North American Insulation Manufacturers Association (NAIMA) estimated that more than 2.1 billion pounds of recycled glass was used in the production of residential, commercial, industrial and air handling thermal and acoustical insulation in the USA during 2018 (the most recent year for this data). "Our members would welcome the opportunity to use more cullet in their products" said Angus Crane, Executive Vice President and General Counsel of NAIMA. "Key factors to increasing cullet use are the availability of clean cullet within close range of glassfibre production facilities. Geographical considerations are important because of transport costs.

EcoTouch insulation, produced by Owens Corning is seen being installed in a ceiling. According to information from the firm, one of the largest manufacturers of glassfibre insulation in the USA, this insulation is "certified by Scientific Certifications Systems to have a minimum of 58% recycled glass content, with at least 36% post-consumer recycled and the balance pre-consumer recycled glass content." Image courtesy of Owens Corning.

"Governmental regulations also encourage the use of cullet in a variety of glass products, including glass packaging products and glassfibre insulation products in California" Mr Crane continued.

The amount of cullet varies among glassfibre insulation products. "Some companies use up to 65% cullet," Mr Crane noted. "On average, businesses use 40% to 45% cullet in their glassfibre insulation products."

This sustainability is a critical component for many in the industry.

Innovative products

Glass has been utilised for a variety of innovative products through the years. One of the newer products uses glass in photography and art. "We chose glass because as a material it conveys a sense of timeless elegance, whilst also being seen as modern and minimal" Abhi Lokesh, Chief Executive Officer at Fracture explained. "Our usage of glass has certainly increased in 2019 ... (with) sales … (up) approximately 55% year-over-year from 2018."

External forces may impact the growth of some consumer products that utilise glass in future years. "The biggest external force is really consumer sentiment and buying power and the overall state of the economy" Mr Lokesh explained. "Our product depends on consumers feeling confident about their financial security and being willing to spend their discretionary income on products like ours."

Overall, the glass industry is relatively strong in the USA. There is both potential for increased as well as decreased usage of glass in different sectors of the industry. Businesses are considering costs, customer tastes and governmental mandates, among other factors, to determine whether glass is the best option for their products. ●

"Fracture is a photo decor brand" stated Abhi Lokesh, Chief Executive Officer and co-founder of Fracture. "Our first product is a glass print that allows you to print your moments in vivid, high quality colour directly onto a piece of glass." Image courtesy of Fracture.

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North American year in review

The Glass Packaging Institute's Scott DeFife assesses market conditions in North America for glass packaging in 2019, as well as recent trends.

2019 was an active year for the Glass Packaging Institute (GPI) and its member companies. After a lengthy leadership search, the author was honoured to be selected by the GPI Board of Trustees as association President, effective 1 August last year.

Mr DeFife spent his first four months connecting with the membership, learning about the industry, its supply chain, brands and packaging associations. He looks forward to supporting and strengthening the glass container industry, identifying opportunities for growth and increasing the membership base.

2019 domestic shipment numbers

Shipment and production data collected and aggregated by Precision Consulting show the US glass container industry will have shipped about 2.6 billion containers to customers in 2019. While shipments of beer bottles to customers remain slightly down, glass containers for liquor, wine and non-alcoholic beverages experienced quarterly increases in the first three quarters of the year.

While beer continues to be the largest market segment, it now represents 51% of the glass container industry's shipment volume (a decrease of 4% over the past 18 months). The food category accounts for 20% of the industry's volume, followed by non-alcoholic beverages (10%), wine (9%), and spirits at 6%.

Chinese imports and US exports

For the first time in several years, 2019 imports of empty wine bottles for all food and beverage containers from China were down 17% (through October) and for the 750ml (standard wine bottle size) category, decreased by almost 10%. This downward trend follows double digit import growth of Chinese glass container imports in both 2017 and 2018.

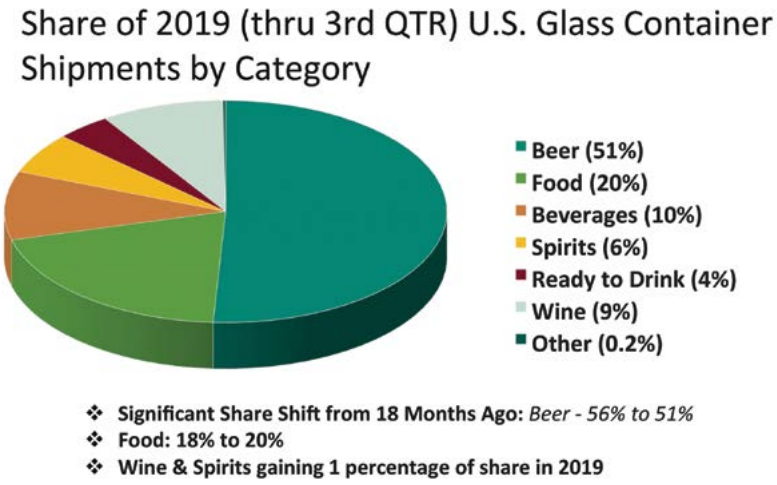
In the fourth quarter of 2018, tariffs of 10% went into effect on glass container imports from China, which was followed by an increase to 25% in May 2019. The tariffs imposed appear to have stabilised and strengthened demand for domestically produced wine bottles, which have seen an increase in shipments to customers of 2% through the third quarter of 2019, after a small decline in 2018.

Exports of empty, unfilled glass containers for both the food and beverage markets remained positive, continuing an increase from 2018. This highlights the demand for glass containers and the increasingly global nature of the supply chain.

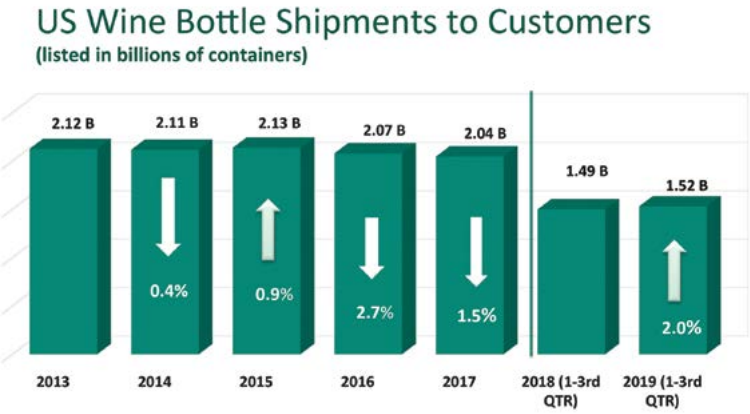
Market trends

GPI and member companies remained active in their support of brands and customers in 2019. Efforts included a key, joint sponsorship with GPI's wine bottle producing members, promoting and encouraging brands to purchase wine bottles made in North America, at the Unified Wine & Grape Symposium in January. At the symposium, Ardagh Glass, Gallo Glass and O-I highlighted the advantage of wine bottles produced in North America, showcasing individual company efforts focused on their bottles' high levels of recycled content, lightweighting initiatives and convenient, nearby ordering options. All of these efforts support the brands' efforts to reach company sustainability goals.

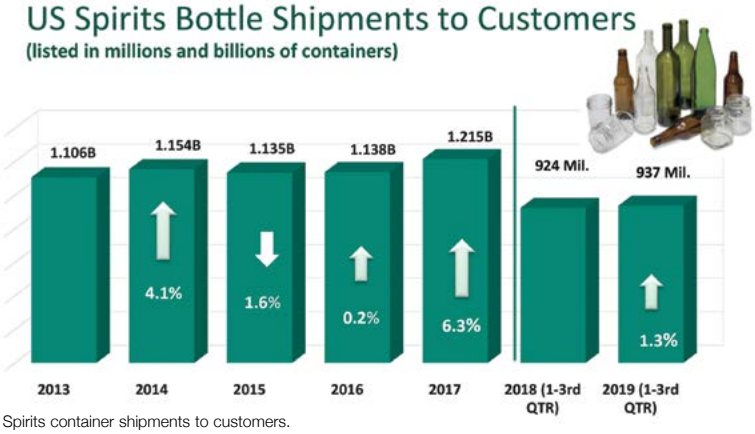
The spirits industry also continued its growth, both in sales and its use of glass packaging. Shipments of glass containers for the spirits market have now increased the past three years, with the spirits industry increasing its overall share



Glass container shipments.



Wine bottle shipments to customers.



Spirits container shipments to customers.

of the alcohol market the past nine years. Spirits containers continue to be a valuable end market for the industry, showcasing the premium qualities and design options for glass.

With 10% of the glass food and beverage market make-up, non-alcoholic beverages remain key to the growth of glass containers in a variety of smaller end markets. Nielsen recently reported on the shift to non-alcoholic beverages, with coffee drink options, teas, juices and flavoured carbonated drinks as the leading categories, with the most innovations over the past year. Clear and amber bottles continue to offer product visibility to customers and protection from sunlight when required by the customer.

A sustainable choice for brands and consumers

Package recyclability, recycled content and other sustainability attributes remain at the top of brands' and glass customers' list of priorities. Glass bottles and jars, made from sand and other natural ingredients, are well-positioned to meet these demands. As a 100% and endlessly recyclable package, glass is a natural packaging option and choice.

2019 saw over a dozen states, along with the US Congress, introduce legislation to reduce overall packaging waste, single use plastic and further curb non-recyclable packaging from the marketplace.

GPI and its member companies continue to connect with legislators to emphasise the value of glass bottles and jars in recycling programmes, its lower impact on the environment in contrast to many of its packaging competitors and as an ideal packaging option, as legislators look to reduce packaging waste in the marine environment and other waterways.

Certification programme created

The Glass Recycling Coalition (GRC) continues to make strides in programme growth and outreach. In addition to national and regional conference engagement by member company representatives, in 2019, the GRC also created a materials recovery facility (MRF) Glass Clean-Up Certification. The first of its kind, the certification programme requires MRFs to test and submit the results of glass sizes and associated quality metrics. An independent review panel reviews the quality of the output suitable for the container and glassfibre end markets.

In addition, GRC leadership helped to finalise the formation of the Glass Recycling Foundation (GRF), an independent foundation that will financially support glass recycling efforts through targeted grants to municipalities and recycling companies. The GRF received financial commitments to seed the effort from brands, glass manufacturing companies and trade associations and is currently reviewing metrics and other grant requirements for applicants and will announce the application process in the first quarter of 2020.

Looking ahead

GPI is working closely with its leadership and membership on the 2020 agenda, with an emphasis on resurrecting programmes to achieve a prior 50% recycled content goal. GPI will prioritise efforts around sustainability, improved recycling practices and recovery, association membership growth and engagement, along with enhanced marketing of glass bottles and jars to brands and the consumer as focus areas for 2020. ●

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CFD as an operational tool

Computational Fluid Dynamics (CFD) is an effective tool for the design and operation of glass production furnaces. Before a furnace is built or rebuilt, it is standard practice to evaluate and optimise the design using CFD but CFD is also valuable once a furnace is in operation. Johns Manville produces E-glass, C-glass, T-glass and several specialty glass compositions with a large variety of glass furnaces ranging from combustion-fired to many all-electric furnaces. Aaron Huber, Donn Sederstrom and Narayana Chalasani present the application of CFD to improve the operation of current glass furnaces and provide examples of varied applications to address operational issues.

The design and construction of glass melters is crucial for obtaining the best campaign performance, so it is standard practice to apply computational fluid dynamics (CFD) modeling to evaluate and improve glass furnace designs. However, computer modeling can also provide a valuable tool during the operational life of a glass furnace.

Typical glass furnace life continues to increase, with flat glass furnaces having a campaign life of up to 20 years. Even with the shorter life of a glass fibre furnace campaign, business conditions can change for required throughput and/or product mix. This, as well as such furnace life issues as equipment fails or wears out, provide opportunities to apply computer modeling to optimise the operation and life of expensive glass furnace assets.

Bubbler failures, batch composition changes, electrode failure and maintenance, recovery from power failures, adjustments to the energy input and predicted refractory wear are just some of the areas that computer modeling can be applied to evaluate furnace operations. In addition, with the limited point measurements available during operation from thermocouples and other sensors, the three-dimensional prediction of the process temperatures and flows from computer modeling provide understanding of the operation and impact of process changes. This presentation will overview a variety of ways CFD can be applied to operational and life issues.

Electrode maintenance

Over the campaign of a melter with electrodes, maintenance is needed of the electrical system, which requires turning off the electrical power. A key to minimising the production impact during electrode maintenance is to limit the decrease in glass temperatures exiting the melter, whether for an all-electric melter or a melter with electric boost. Transient computer modeling provides a tool to evaluate different scenarios to limit the decrease in glass temperatures and plan electrical outages.

Figure 1 shows a plot of the predicted glass exit temperature and recovery from a one hour electric boost shutdown. Variations of increasing the glass temperature before shutdown, increasing the combustion flows and higher than normal electric power levels after the shutdown can all be evaluated to minimise the impact on the glass temperature. If long or multiple electrical power shutdowns are needed, computer modeling can help plan the length of outages and time between outages to minimise process upsets and improve recovery.

Electrode failures

When electrodes fail during a campaign, the throughput can be negatively impacted. Options to rewire

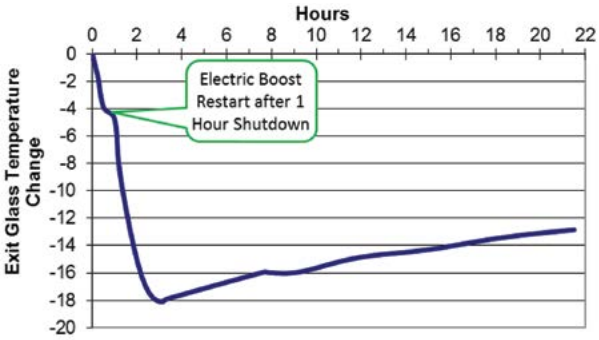

Figure 1: Transient glass exit temperature prediction with electric boost shutdown.

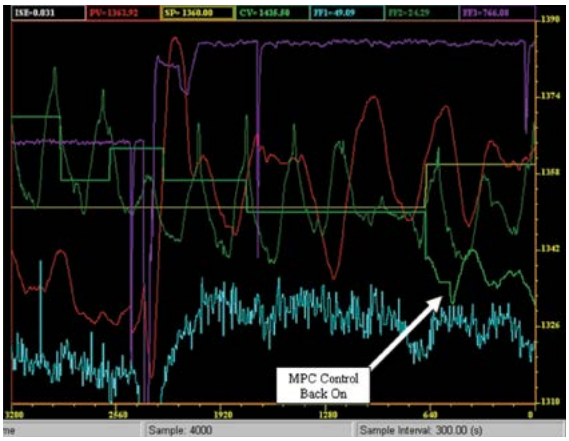

Figure 2: Process data before and after rewiring to compensate for failed electrodes (purple is electric power, red is glass temperature, green is crown temperature and cyan is batch feed).

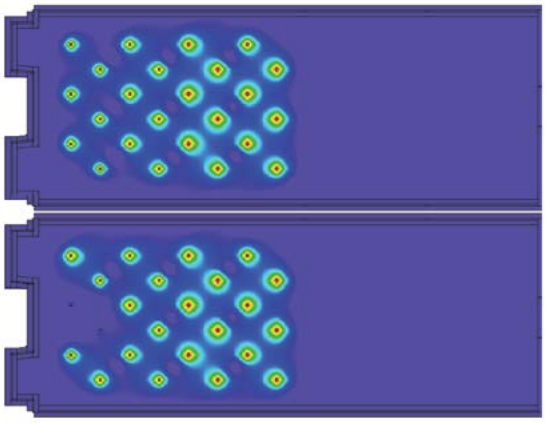

Figure 3: Contours of Joulean heat generation with all electrodes powered (top) and without the two centre electrodes in zone one (bottom).

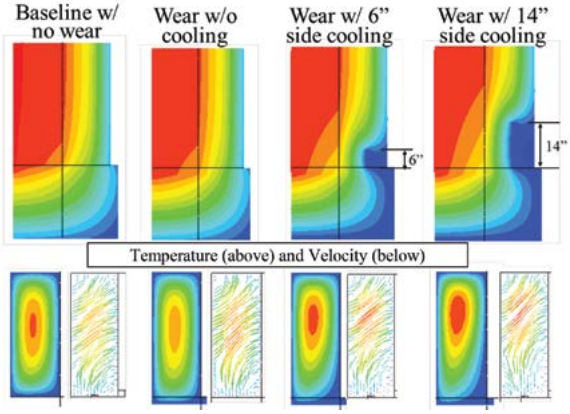

Figure 4: Evaluation of cooling impact on sidewall undercut wear.

electrodes or change zone settings to compensate can be evaluated. Figure 2 shows process data after electrode wiring was changed to compensate for electrode failures during a campaign.

With rewiring, the total available electrical power (purple line) was increased, resulting in recovery of lost throughput and glass temperature, plus the decrease of previously maxed out crown temperatures. It also shows the glass temperature control improvement with model predictive control (MPC) turned back on.

Another example of electrode issues is shown in figure 3. Here, computer modeling is used to evaluate the impact of the loss of the centre two electrodes in the first zone. Figure 3 shows the predicted Joulean heat generation for the two different cases. The computer model can provide insight to how to adjust operational parameters to maintain throughput and quality when electrodes fail during a campaign.

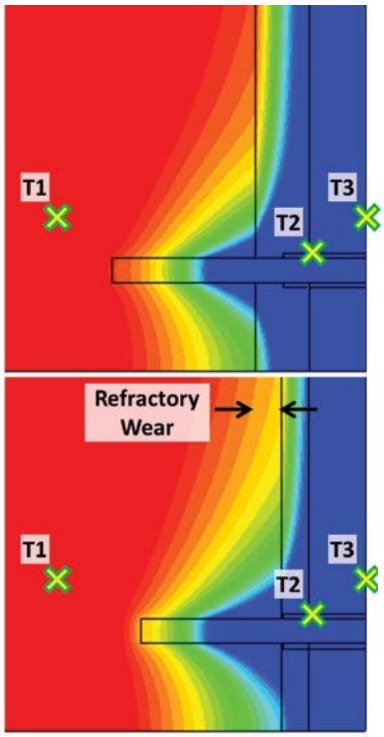

Figure 5: Temperature contour plot with original (top) and worn refractory wall (bottom).

Refractory life extension evaluation

With extended campaigns, refractory wear in non-typical critical areas can be an issue. During a past extended campaign, undercutting of the glass contact sidewall and potential collapse became an issue. Computer modeling was used as a tool to evaluate options to decrease the wear rate and stabilise the sidewall.

Figure 4 plots the predicted impact of removing insulation and adding cooling for focused key sidewall areas. The model predicted that cooling could be effective in lowering the glass temperature below the liquidus temperature in this localised region, enabling devitrification (crystal formation) and stabilising the sidewall.

Cooling was implemented on the melter sidewalls after the CFD evaluation and the campaign was extended without ▸

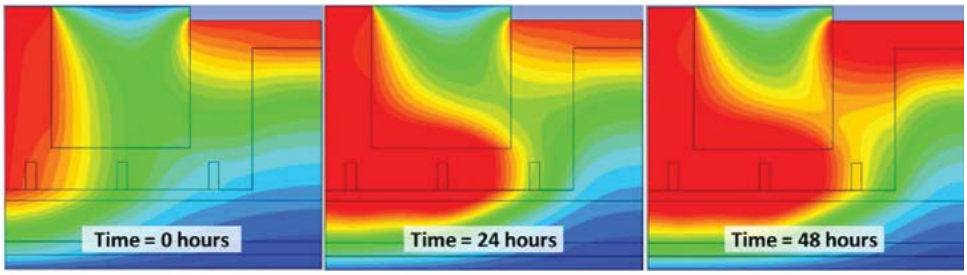

Figure 6: Temperature contour of transient model at time 0, 24 and 48 hours.

sidewall issues. At the drain, the sidewalls were severely undercut and devitrified glass had developed in the undercut region supporting the sidewall. These findings agreed with the model predictions that had been made several years previously.

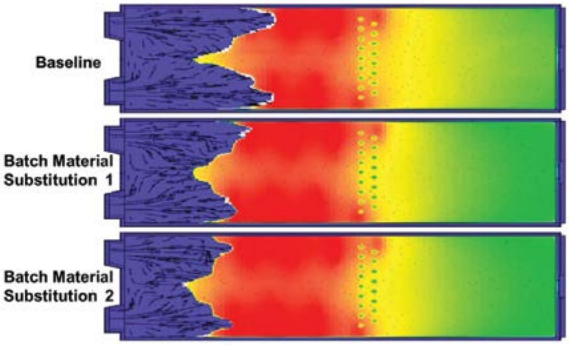

Figure 7: Variation in predicted batch shape with batch material variation.

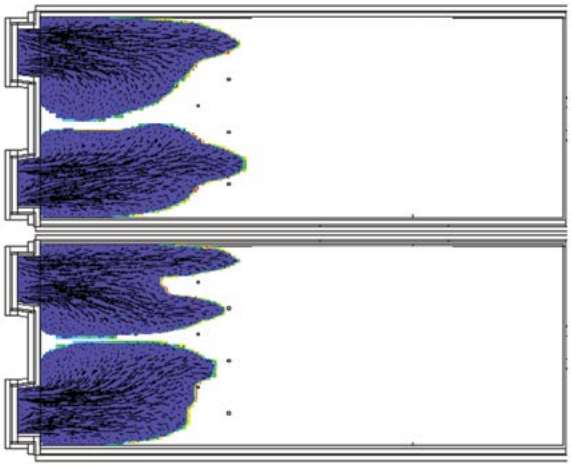

Figure 8: CFD batch shape for different batch charging conditions.

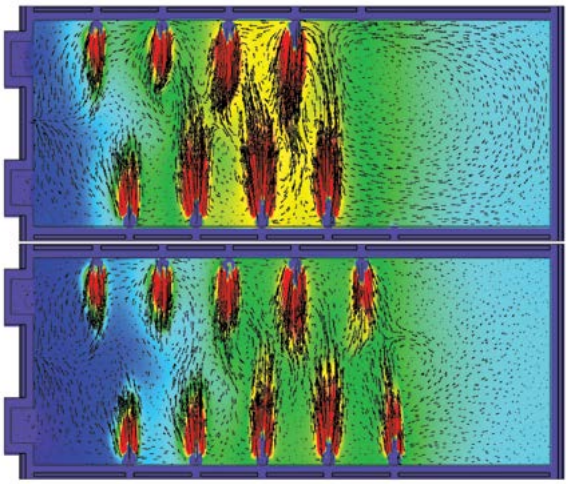

Figure 9: Temperature contour at burner cross-section comparing combustion flow profiles.

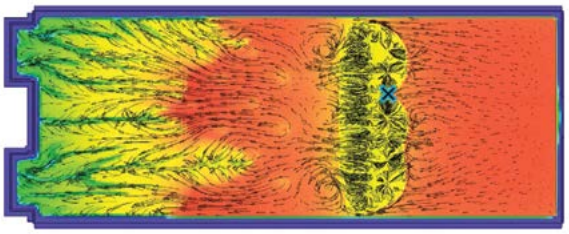

Figure 10: Temperature contour with missing bubbler marked with an 'X'.

Estimating refractory wear

Due to the extreme environment within a glass melter, it is difficult if not impossible to measure or observe the extent of refractory wear in the glass contact regions. In cases where signs of high refractory wear are present, CFD models can be used to estimate the remaining refractory thickness, based on the internal and external temperature measurements (figure 5).

Banked conditions and recovery

During the event of a recovery due to banked conditions required by repairs or a prolonged power failure, modeling can be performed to provide estimates on the time required to heat the glass to a temperature where glass flow will occur and when electrodes can be powered on. In these conditions, transient modeling is required, which greatly increases computational time but provides the information for both design of systems to address these issues and the recovery time.

Figure 6 shows a transient prediction for a 'frozen' throat recovery, with heat from the melter and channel. Once the glass reaches an elevated temperature allowing high enough electricity conductivity, the throat electrodes can begin to provide power and aid in the heating of the glass.

Batch composition and delivery change

Changes in the batch composition or equipment used to deliver batch into the melter can change the batch density and entrained air within the batch. By changing the parameters and setup of the model, the effect of these changes can be observed and the operating condition of the melter adjusted to maintain glass quality and throughputs (figure 7).

During steady operation, it may be desired to alter the batch shape in order to shift it towards the centre or sides of the melter, or improve symmetry if bubblers or electrodes fail. CFD modeling allows for the batch chargers to be biased and the resulting batch shape observed before implementation within the melter (figure 8).

Adjusting energy input

Throughout the campaign of a melter, it may be desired to adjust the energy profile delivered to the glass via the combustion burner profile or electric boost profile. Figure 9 compares two different combustion burner setups.

CFD modeling is used to show the resulting residence time, melt index, energy efficiency, flow patterns and batch shape as the energy profile is changed.

Bubbler operations

During a melter campaign, a bubbler can be damaged, leading to complete blockage of flow. This can result in changes to the melter flow pattern, temperature distribution and glass quality.

For the scenario shown in figure 10, it is important to know if a shortcut will be created in which glass can flow directly out of the melter, greatly reducing the residence time and glass melting quality indexes. These shortcuts can be found by looking at the particle trace with the shortest residence time. In addition, the flow rate of the bubblers can be varied to observe the impact on the furnace performance and predicted glass quality indexes.

Conclusions

In conclusion, there are numerous possible CFD applications to improve the operation and deal with operational issues throughout a campaign. These CFD applications demonstrate that CFD modeling can be used for much more than initial furnace design and can positively affect the operations of a melter after startup.

By using the results of CFD modeling, an accurate prediction of the effect of various changes can be observed and the magnitude of a melter upset can be reduced due to maintenance and operational changes. CFD results can also show a much more detailed picture of internal melter conditions and operation relative to finite temperature measurements. ●

This article is based on a paper presented at the 14th International Seminar on Furnace Design – Operation and Process Simulation, sponsored by Glass Service as.

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Co-ordinated R&D contributes to business growth

Sebastien Donze discusses his role as Research & Development Director at leading tableware specialist Arc and as a member of the GlassTrend advisory board.

Recognised throughout the world as a pioneer in the development of household glassware production technology, Arc was founded in 1825 in northern France. The town of Arques is still home to the group's head office, its Research and Development Division and what is described as the world's largest glass production plant. Today, the group also operates production sites in China, Russia, the United Arab Emirates and the USA. Through its six brands (Luminarc, Arcoroc, Chef&Sommelier, Arcopal, Eclat and Cristal d'Arques Paris), the business aims to make beauty and elegance affordable for everyone.

Sebastien Donze has been R&D Director for Arc Group since 2014.

Chemistry focus

Raised in northern France, Sebastien Donze received a chemistry masters from the University of Lille, before studying for his PhD in chemical process engineering at the Compiègne University of Technology. After completing his studies, Mr Donze joined Arc Group in 2000, spending his first 18 months at the soda-lime production plant as a Production Shift Manager to learn the production methods and organisation. He transferred to the R&D team in 2002 as R&D Project Manager, becoming R&D Manager for decoration and surface treatment applications in 2007, before his appointment as R&D Director for Arc Group in 2014.

The Research and Development Department in Arques employs approximately 60 specialists and supports the group's differentiation strategy by providing competitive advantages in terms of products and processes.

Having been a member of the International Crystal Federation Technical Committee from 2002 to 2007, Sebastien Donze is currently a member of the GlassTrend Advisory Board, a member of Board of 'Matikem' (previously 'Euramaterials') and a member of the USTV Board. He was attracted to a glass industry career by the possibilities provided to explore the scientific nature of glass materials, their inorganic chemistry and structural characteristics, as well as investigating the structure/properties of glass. The diversity of technical challenges posed by the glassmaking process and the expertise required to produce everyday glass items were equally appealing. In addition, the passion and commitment exhibited by fellow Arc employees has been an important and ongoing motivation.

As R&D Director, Mr Donze defines and co-ordinates the Arc Group's research and development strategy, including the preparation of an R&D road map that has to be submitted to the Executive Committee for approval and adoption. His responsibilities embrace the management of all R&D activities, associated budgets and intellectual property rights. This includes the establishment of KPIs and R&D processes for the management of projects, alongside the management of French and European academic and industrial research partnerships, including those in place with CEA, CNRS, CelSian, SSV, glass producers and universities.

"Among the most rewarding aspects of this job are to witness new processes being successfully implemented at the plant and new products introduced that contribute to business growth" Sebastian Donze explains. "In addition, it is satisfying to create a team spirit around an R&D project thanks to the contribution of several people from within the company (combining skills from R&D, study offices and production plants with those from quality, new product development and marketing departments etc) and to support the project team to reach the industrialisation stage."

The greatest challenges faced include accelerating the R&D process from initial trials in the laboratory to industrial validation in order to meet market and industry expectations and to estimate accurately the industrialisation conditions of a new process or product. During his ▸

Current priorities are to develop/re-enforce skills to model glass production processes, from melting and forming to tempering and decoration.

tenure, many successful projects have been undertaken and implemented, however. This includes the development, industrialisation and launch of new glass materials; 'Krysta' crystalline glass in 2017, 'Smartcuisine' cookware opal glass in 2018 and coloured opal glass, also in 2018.

Separately, an innovative approach to glass melting was successfully investigated, patented and implemented on an industrial scale at Arc France in 2017/2018. This process reduces energy consumption and CO_2 emissions, while increasing furnace flexibility (either increasing daily pull rate or extending lifetime).

Delivering competitive advantages

The Research and Development Department in Arques employs approximately 60 specialists and supports the group's differentiation strategy by providing competitive advantages in terms of products and processes. The department's main objectives are the industrialisation of innovative products at costs that are acceptable to the market, the delivery of increased process flexibility/productivity and limiting the industry's environmental impact thanks to reduced emissions and energy consumption.

Current priorities are to develop/re-enforce skills to model glass production processes, from melting and forming to tempering and decoration. "Our goal is to develop a predictive approach to new products/new process developments in order to accelerate and secure the innovation process" says Sebastien Donze.

Separately, the department is engaged in the collection, analysis and storage of key data from glass materials (chemical, structural, thermal and mechanical

characteristics), as well as from processes and produced glass items via the implementation of sensors.

Furthermore, under Mr Donze's management, R&D pilot prototypes are being developed for glass melting, forming, glass-metal contact investigations and tempering, in order to validate proof of concepts and to speed up steps towards industrial implementation.

Influential organisation

As an Advisory Board member at GlassTrend since 2017, Sebastien Donze is available to provide valuable advice to colleagues, counselling on the relevance of projects and routes to address practical issues. He contends that GlassTrend membership provides a valuable opportunity for glassmakers to be part of the wider industry community and become aware of recent technological developments. "It helps us to gain a wider perspective of the glass industry worldwide in terms of the evolution of regulations, customers expectations and requirements, while providing the possibility to join collaborative R&D projects" Mr Donze explains. "Co-operation between glass companies allows the adaptation of glass manufacture to meet market or regulatory requirements."

GlassTrend is particularly influential in the advancement of glass melting processes, raw materials, emissions and energy optimisation. In addition, the organisation's regular seminars and associated visits to research centres and plants are considered especially instructive and interesting.

"In the future, however, GlassTrend needs to concentrate on recruiting more new, international members, who will bring greater expertise to continue the excellent work on its international projects" Sebastien Donze concludes. "The organisation also needs to develop more intensive relationships with such industry organisations as FEVE and EDG to gain additional input and direction for future GlassTrend initiatives."

Sebastien Donze was attracted to a glass industry career by the possibilities provided to explore the scientific nature of glass materials, their inorganic chemistry and structural characteristics, as well as investigating the structure/properties of glass.

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The brownfield €60 million investment at Gironcourt includes the addition of a third furnace and associated lines, geared to the production of beer bottles.

O-I factory upgrades set goals for success in France and Spain

In the past three years, Owens-Illinois has invested more than €250 million in its French glass container production sites. Robert Gachot, Group Executive for South West Europe, discusses some of the projects completed and those in the pipeline, including the relocation of its regional headquarters to purpose-designed premises in Lyon. The company's Spanish activities are also discussed.

France continues to present the glass packaging industry with huge market opportunities, not just because of strong national consumption but also thanks to positive export potential. "As long as the global brands in wine, water and spirits exist, France is a good place to be" Robert Gachot confirms. "The local market is performing well and it's a very interesting time for us right now because we are investing massively in our assets in France."

Mr Gachot has been Country Group Executive, South West Europe, for Owens-Illinois since April 2019, with responsibility for the company's business in France and Spain. Having joined O-I in 2008, he served as Vice President and Corporate Controller at the company's global headquarters in Perrysburg, Ohio, before being named Vice President and Chief Financial Officer for O-I Europe in 2011.

Prior to joining O-I, Robert Gachot worked for 24 years at DuPont, including assignments in several countries at corporate, regional and affiliate operations.

"We have invested a lot in Italy over the last few years and now we are doing the same in France" he confirms. "O-I is renovating plants, increasing capacity and adding new capabilities to make premium products like sophisticated spirits and bottles for wines." The investment programme began three years ago and is now ramping up significantly, with the goal of positioning the business for long-term success. To date, approximately €250 million has been spent at the glassmaker's French operations, including a soon to be completed project at Gironcourt.

Nationwide coverage

Today, O-I operates nine glass container production facilities throughout France, including the Vergèze plant in the south, purchased 10 years ago and sited next to Nestlé's Perrier mineral ▸

Robert Gachot has been Country Group Executive, South West Europe, for Owens-Illinois since April 2019, with responsibility for the company's business in France and Spain.

At the Reims plant in the Champagne region, more than €50 million has been invested on a state-of-the-art furnace and production equipment.

water facility. The other eight factories, in Reims, Gironcourt, Puy-Guillaume, Vayres, Wingles, Béziers, Labégude and Veauche joined the group following O-I's acquisition of BSN Glasspack in 2004. Subsequently, the company's French headquarters have continued to occupy the former BSN premises in Villeurbanne, where a testing laboratory is also located. Later this year, however, the headquarters will move to a new location in nearby Lyon that will fully reflect O-I's brand positioning and where customers will be warmly invited to visit.

The manufacturing operations are conveniently located to serve local wine, water, spirits, food and beer markets.

Increased sales to regional breweries are expected following O-I's Gironcourt investment near Nancy and the addition of a dedicated line at Vergèze. "At Gironcourt, the investment of €60 million is on a different scale" Robert Gachot confirms. This brownfield project includes the addition of a third furnace and associated lines, geared to the production of beer bottles for the local market, as well as key customers in Belgium, Germany and the Netherlands. "It is a major manufacturing expansion and we expect most product will be exported, which makes complete sense from a logistics point of view."

According to Mr Gachot, it has been a long time since O-I added capacity of this magnitude in Europe. "We already have two furnaces at Gironcourt and the third will give significant leveraging capabilities to be more cost-competitive." The structure of the existing facility in north eastern France has been completely renovated and is scheduled to start production in spring 2020. Construction of the new melter is imminent, while advanced production technology has been sourced from proven partners to standardise with other O-I plants and make the business even more efficient.

As a result of this investment, approximately 80 additional people have been recruited at Gironcourt, providing a major boost to the local economy. Hence O-I and the local community are working hand-in-hand. A project manager is in place and he is currently overseeing a significant training process. "Many of our most talented and experienced people that were already at the plant have produced educational material for the new recruits and this is now being put into practice with classes combined with practical training so that everyone will be ready for April."

In addition, a series of employee exchanges have been organised, with personnel sent to O-I's other large beer plant in Leerdam, the Netherlands, for training. The Plant Manager at Gironcourt previously performed the same role at Leerdam and his main objective is to deliver at least the same high level of expertise and productivity at Gironcourt.

Another recent major project involves the Reims plant in the Champagne region, where more than €50 million has been invested on a state-of-the-art furnace and production equipment. Different capabilities have been introduced to increase output levels of still and sparkling wine bottles at this two furnace installation. "This project, while less complex than Gironcourt, required the workforce to be trained to run the new furnace and machines" Robert Gachot confirms. With the latest melter and cold end featuring many automation advances, a considerable amount of time and global resources have been devoted to training.

Elsewhere within the O-I France organisation, additional manufacturing capacity has also been introduced at Puy-Guillaume. This reflects a growing trend throughout Europe towards rosé wines and the market's need for more clear rather than coloured glass bottles. Separately, new forming machines have been introduced at Veauche, O-I's expert plant in France in terms of premiumisation, adding the capability to make even more sophisticated premium ware for the wine and spirit sectors.

Further important investments are planned in the next 12 months, including the renovation of a furnace at Veauche.

Spanish capabilities

Another important part of the company's South West Europe business unit, O-I also operates two plants in Spain; Barcelona was part of the Avir acquisition co-ordinated via Italy and Sevilla was previously owned by BSN Glasspack.

Although the Sevilla glassworks is reported to be operating very successfully, further important developments are anticipated in the future. This plant specialises largely in the production of food jars but is also an important supplier of bottles for olive oil, carbonated beverages etc. Robert Gachot confirms that an improved equipment configuration is under consideration to coincide with the next furnace repair.

The production of still and sparkling wine bottles represents the ▸

O-I's manufacturing operations in France are conveniently located to serve local wine, water, spirits, food and beer markets.

main activity of O-I's Barcelona factory, matching the local wine industry's strategy to bottle increasing volumes of its output locally, prior to exportation. Mr Gachot confirms that this recent strategic change provides an important opportunity for O-I. "We are now engaged in a flint campaign in Barcelona for the Spanish, French and Italian markets and are constantly adapting the way we use this asset… it's an ongoing process."

It continues to be advantageous for O-I to exchange products between France and Spain. Some products made in Barcelona, for example, are shipped to the south of France, while O-I factories in the south of France are successfully shipping output to customers in Spain.

Innovative production technology

In 2019, O-I confirmed the first European installation of MAGMA glassmaking technology at the company's Holzminden site in Germany, where the objective and focus is to generate more data, obtain greater experience and scale up volumes. This innovation will allow for ultra-flexible glass production that can be expanded rapidly and at low capital intensity.

Although there are currently no immediate plans for a MAGMA technology installation in his region, Robert Gachot is excited by the potential possibilities provided in terms of flexibility and productivity. "Apart from the introduction of production machines, there have not been too many inventions over the recent years relating to the furtherance of glass melting but you can only imagine the limits if the MAGMA technology becomes fully operational."

Attracting and retaining young people

On the people side, Mr Gachot is eager to attract and retain young people within the glass industry. "The industry will have to replace an entire generation of people with experience that are close to retirement. Hence there are great opportunities for young people to acquire master-maker skills and have a career in a business that makes the world a better place producing the most sustainable packaging solution on the market."

Thanks to some automation opportunities, he says, the role of new young people that are coming in will be enhanced. "We expect jobs in the future to be even more attractive, building upon expert skills and rewarding the passion for glass and sustainability."

Additional manufacturing capacity at Puy-Guillaume reflects a growing trend throughout Europe towards rosé wines and the market's need for more clear rather than coloured glass bottles.

Consequently, recruitment is an important priority for O-I , with apprenticeship and graduate programmes in place across Europe.

Management structure and priorities

As Group Executive for South West Europe, Robert Gachot is responsible for O-I's business in that region, including manufacturing and sales activities. He reports directly to Vitaliano Torno, President of O-I Europe.

European area executives meet regularly to discuss strategy and exchange ideas and concepts. "Our vast European network means that we have experts everywhere that can resolve issues and from an operational perspective, this network is used widely; there is so much expertise that we can utilise" Mr Gachot confirms.

"We are in the middle of a process to modernise our business in France. This includes projects such as the upgrade of our local headquarters to project the right image. Then we are developing new offerings to the marketplace to match the needs of our customers, addressing the trends of Millenials towards increased beer and rosé consumption, for example. We are modernising our plants and continue the development of premium capabilities, eg in sophisticated spirits and wine bottles for our customers" he adds. "The other aspect relates to flexibility – we are increasing flexibility with new machines and equipment."

In line with the company's strategy throughout Europe, O-I's ongoing investment programmes in France and Spain help reduce emissions by implementing the latest furnace designs, equipment and machines that use less energy than older equipment. "We are also investing significantly in deNOx installations and filters for chimneys, as illustrated by a recently completed €2 million investment in Vergeze" Robert Gachot confirms. "There will be a similar installation in Barcelona soon."

When Mr Gachot first entered the glass industry 11 years ago, there was an industry-wide focus on rationalisation but in the intervening period, the trend has changed because of sustainability. "Customers are now requesting more sustainable products and want to use glass" he concludes. "The future for glass looks very positive!" ●

Additional capabilities have been introduced at Reims to increase output levels of still and sparkling wine bottles at this two furnace installation.

Further information:
web: www.o-i.com

€35 million glass wool line commissioned

Saint-Gobain Isover recently inaugurated a glass wool production line in Chemillé, near Angers, France, to meet growing insulation demand.

The latest Saint-Gobain Isover production line has an annual capacity of 30,000 tonnes and follows an investment of €35 million. Installed in a new building of almost 4500m^2, the line is 220m long and includes an electric furnace that uses more than 40% recycled glass to produce the blowing glass wool.

According to Pierre-André de Chalendar, Chairman and Chief Executive Officer of Saint-Gobain, this investment illustrates the group's commitment to sustainable development with, on the one hand, the aim of reducing the environmental impact of its activities and on the other, the manufacture of solutions that help reduce buildings' energy consumption and carbon emissions. "While roofs are the biggest source of energy loss from homes, when insulated with blowing glass wool, the building's total energy bill is reduced by 30% on average – representing an annual increase of €500 in purchasing power for the households concerned" he commented. "The installation of these 30,000 tonnes of blowing glass wool produced in Chemillé enables 12.5 million tonnes of CO_2 emissions to be avoided over the product life span."

The Chemillé plant – the latest of Saint-Gobain Isover's five plants (Orange, Chalon-sur-Saône, Genouillac and Mably - Isonat) in France – was opened in 2010 and now occupies a surface area of almost 41,500m^2.

In total, it has a maximum annual production capacity of 100,000 tonnes and employs 120 people. Certified to ISO 14 001 (environmental management), ISO 50 001 (energy management) and ISO 9001 (customer satisfaction), the site is considered exemplary for its resource management. ●

Further information:
web: www.saint-gobain.com

Aerial view of the Chemillé plant, near Angers, France.

Inauguration ceremony for the latest Saint-Gobain Isover production line in Chemillé.

Blowing glass wool at Chemillé.

The latest Saint-Gobain Isover production line has an annual capacity of 30,000 tonnes.

The line is 220m long and features an electric furnace.

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PROUD NEW MEMBER OF GRENZEBACH

Lagnieu modernisation signals the way ahead for Verallia

Towards the end of 2019, Verallia completed a €24 million investment at the group's specialist glass food packaging production site in Lagnieu, located some 50km north east of Lyon. A project involving rebuilding one of two furnaces and modernising the associated production lines, this is the latest in a series of important Verallia investments in France, valued collectively at more than €200 million in the past four years.

Verallia is a European leader, the second largest player in Latin America and the world's third largest producer of glass packaging for food and beverages. Employing nearly 10,000 people and serving in excess of 10,000 customers globally, the group maintains a flexible and responsive industrial base, with 32 factories (including seven in France), to produce 16 billion bottles and jars every year. The organisation also has three integrated decoration plants (two in France and one in Poland) and eight waste glass processing centres, two of which are also located in France to transform collected glass into furnace-ready cullet.

Verallia France is highly active in the still and sparkling wine sectors. It is also a major player in the spirits, soft drinks and food markets. Its seven glass factories offer a range of standard and specific products to a diversity of customers, including both small locally-based companies, such as regional wine producers and local breweries, as well as such leading multi-nationals as Pernod Ricard, LVMH, Heineken, Andros and Nestlé.

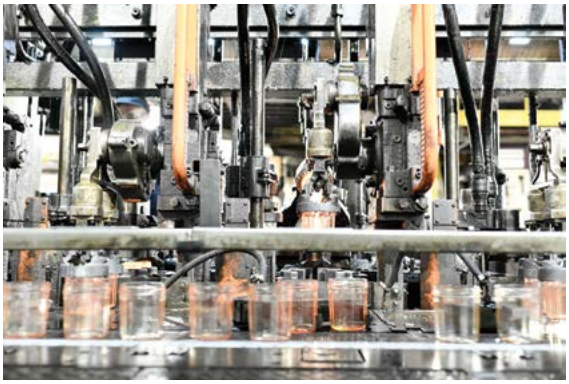
Verallia's Lagnieu glassworks has specialised in the production of food jars since 1976 (all images courtesy of Franck Dunouau).

Constant modernisations

To offer the level of service, quality and competitiveness that markets demand, Verallia constantly maintains and modernises its industrial facilities. Every year, the group invests on a recurring basis and outside exceptional projects, with a target of approximately 8% of annual revenue. Within the past four years, the group has invested more than €1 billion. Some €200 million of this total has been spent in France since 2016 at the Chalon, Cognac, Lagnieu, Oiry, Saint-Romain-le-Puy, Vauxrot and VOA-Verrerie d'Albi glassmaking sites and at the Everglass subsidiary (Rozet-Saint-Albin and Châteaubernard) cullet treatment plants.

The most recent of these projects was completed at the Lagnieu (Ain) glassworks last spring, a facility that has specialised in the production of food jars since 1976. ▸

One of two furnaces has been rebuilt using the latest technologies and materials, making the construction more energy efficient and environmentally-friendly.



The Lagnieu site produces containers in sizes from 2.9cl (miniatures) to 3.1 litres.

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The overhauled cold end at Lagnieu features two new palletisers and pallet stretch hooding machine.

The factory itself dates back to 1924 and is recognised as the first European glassworks where the manufacture of pharmaceutical vials was fully automated using Lynch machines.

Sensors installed throughout the production lines contribute to the regulation of production in real-time.

The Lagnieu plant employs approximately 300 people.

Employing some 300 people, the food container specialist now produces approximately four million jars every day from two furnaces. In particular, heat-sealable, sterilisable and pasteurisable glass jars are made. Two solutions have been developed since 2016, for example, to make heat-sealable glass packaging compatible with the pasteurisation and sterilisation stages at customer sites.

The Lagnieu site produces containers in sizes from 2.9cl (miniatures) to 3.1 litres, its latest launches illustrating the plant's expertise in engravings and complex shapes that require a high level of technical expertise. Customers also choose the products manufactured to offer consumers products that are 100% 'made in France' (content and container). This is the case, for example, for Reitzel Briand with its Le Jardin d'Orante brand, which sells pickles sown, harvested, prepared and packaged in France with French ingredients and packaging. Verallia supplies the brand with a variety of jars and is the exclusive supplier of the 42.5cl format.

Another Verallia customer positioned in this niche is the Breton dessert producer Marie Morin, for whom Verallia manufactures such products as a 20cl glass bottle that evokes the shape of a Champagne bottle (for a custard) and a jar specially designed for Marie Morin, while taking inspiration from the jar shape already used for large portions (the jar for a pack of three small glasses to compose a personalised gourmet coffee dessert).

Located on the Ain plain, in the heart of industrial Europe, the plant's central location allows deliveries throughout France and Western Europe. Customers operate in many food product sub-categories, including jam, honey and fruit products, spreads, dairy products, preserves, condiments, sauces, oils and vinegars.▸

Customers operate in many food product sub-categories, including jam, honey and fruit products, spreads, dairy products, preserves, condiments, sauces, oils and vinegars.

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Verallia is also a supplier of glass jars to the baby food market. And in order to support customers in the expanding snacking market, the group offers a range of heat-sealable jars, such as heat-sealable, sterilisable and pasteurisable glass jars or cassolettes, for prepared dishes, baby food or heat-sealable glass jars with transparent covers for yoghurts, dessert creams and other soluble products that have been sealed with aluminium covers.

The Lagnieu plant also supported Andros in launching the first compote in the refrigerated section of its Bonne Maman brand, available in French supermarket shelves since October 2018. For more than two years, Verallia's teams have been working on this development to meet Andros' expectations. In particular, the Research and Development Department has undertaken considerable work on the heat-sealed cap.

Lagnieu is one of seven glass container plants operated in France by the Verallia Group.

Lagnieu investment details

The latest €24 million Lagnieu plant modernisation involved rebuilding one of the site's two furnaces with the same capacity as its predecessor (approximately two million jars/day). This reconstruction was an opportunity to use the latest technologies and materials, making the construction more energy efficient and environmentally-friendly. The furnace has been equipped with an advanced combustion control system that promotes homogeneity and reduces hot spots. In addition, the furnace control room has been renovated with respect to acoustic insulation, air conditioning and thermal insulation, as well as workstation ergonomics.

Three of the five IS machines were replaced and all machines now integrate servomotors to achieve highly sensitive movement during transfer from the blank mould to the blow mould and subsequent take-out functions. Two annealing lehrs were also replaced. They are better insulated and consume less power than their predecessors.

The cold end was overhauled completely, featuring two new palletisers and pallet stretch hooding machine. In addition, the 4500m^2 cold end roof has been completely renovated.

Sensors installed throughout the production lines contribute to the regulation of production in real-time. This approach is intended to stabilise production and quality, while optimising energy consumption.

Training initiatives

The Lagnieu plant employs approximately 300 people and some 20 temporary workers. In the past four years, in the region of 40 people have been employed in maintenance (electro-mechanical engineering positions) and production (machine operator and quality control positions). This presented an exceptional opportunity to deploy an ambitious training programme, organised on four main areas:

- Profession: Training on modernised machines. A few technicians are trained externally at suppliers' premises, before duplicating this training to the site teams.
- Safety: Gestures and postures, first aiders, specialist firefighters, various authorisations (forklift drivers, electrical authorisations etc).
- Quality: Review and recommendations with respect to control plans, product quality and customer visits.
- Operational excellence: Training in problem-solving methodology used as part of the VIM (Verallia Industrial Management) industrial excellence programme.

In total, more than 190 people were trained over a period of two months, representing more than 1000 hours of training provided.

Long-term strategy

Speaking at a specially organised inauguration ceremony in Lagnieu last October, Michel Giannuzzi, Chairman and CEO of Verallia, commented: "With this new equipment, the Lagnieu plant has a state-of-the-art industrial tool to manufacture glass containers for food, a market in which Verallia believes and invests over the long-term. This modernisation illustrates our sustained investment policy, which allows us to maintain the operational excellence of our production facilities. Furthermore, this project is fully in line with our objective to establish ourselves as the preferred supplier of glass packaging." ●


The refurbished Lagnieu site was officially opened in October 2019.

The Lagnieu plant supported Andros in launching the first compote in the refrigerated section of its Bonne Maman brand.

Further information:
web: www.verallia.com

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On the Spot… Melianthe Leeman

As Director of the Global Innovation Platform, Melianthe Leeman has overseen the introduction of direct-to-glass digital printing technology at O-I Innoval, a French entity of the Owens-Illinois glass group that specialises in adding value to glass packaging. Dedicated to innovation and the creation of decorations, customers from across the world gathered at the Chazelles-sur-Lyon facility last November to witness the first production line of O-I : EXPRESSIONS.

GW: What is the history and current capabilities at O-I Innoval?
O-I Innoval was founded in 1998 and currently has around 50 employees at two production sites in Chazelles-sur-Lyon and Gensac. With over 200 customers across all segments, the Chazelles-sur-Lyon site offers customers various printing techniques, including screen technology, as well as graphic design services and an R&D Department. With the introduction of O-I : EXPRESSIONS, we added digital printing to our capabilities there.

GW: Launched in September 2018, what options has O-I : EXPRESSIONS introduced for glass bottle designs?
Enabled by digital printing, O-I : EXPRESSIONS has created new marketing opportunities for our customers, offering customisation and personalisation by sculpting glass bottles into multi-dimensional works of art. We are addressing the demands for premiumisation and personalisation for glass in a competitive marketplace for packaging. For example, it can now be cost-effective to produce multiple different designs in low volumes and with premiumisation that offers something quite unique to customers. Premium bottles can be personalised with elements from the brand to make it an exclusive offering.

The O-I Innoval site in Chazelles-sur-Lyon features the first production line of O-I : EXPRESSIONS.

GW: Is this opportunity also viable for larger runs?
Yes, it's completely scalable. We can do a low run to produce gift items, all the way up to millions of bottles for advertising. What we need to see in the market is a bit of a mindset shift. ▸

Betto, a Sicilian pastry shop and deli in Milan, worked with 6th agency to design a premium and collectable packaging range for its customers and selected a standard glass jar to be decorated with 26 different illustrations. An elegant, colourful embossing of each letter was realised through O-I : EXPRESSIONS.

Digital printing equipment from Dekron, a subsidiary of the Krones company pre-treats bottles and then completes the printing process.

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Data – the deciding factor

Cantina Gulfi stands not only for three great wines but also for a story of traditions, excellence and territory. The concept of the packaging, created by Coo'ee Italia, refers to the areas of cultivation of the different vineyards and highlights the capabilities of O-I : EXPRESSIONS for extreme customisation and limited edition packaging.

Previously, customers were thinking about one bottle in big volumes with one design but now they can also consider, for example, one million bottles with 100 different designs, printed with mixed colours. There are no limits on colour or detail.

GW: What technology has been adopted to enable such a range of effects and colours?

The Chazelles-sur-Lyon site features screen printing and sleeving systems and more recently, direct-to-glass digital printing technology from Dekron, Krones' subsidiary specialising in direct digital printing on containers for the O-I: EXPRESSIONS personalisation services.

We discovered this digital technology at glasstec 2012 and

H2H agency chose O-I : EXPRESSIONS to create a new packaging concept for a premium engine oil by Mercedes-Benz Italy, a symbol of technological and performance innovation. Logo, brand and product name in RELIEF, joined by the iconic black handprint of a mechanic, give the container a premium touch and feel. Each of the bottles was personalised with every customer's name, providing a superior and individualised experience.

after fully evaluating all opportunities, we invested in two lines in 2014. These are the first two such machines to be produced in the world.

GW: Will this technology be rolled out across O-I on a global scale?
The first line is now operational in Chazelles-sur-Lyon and feedback from customers is very encouraging. We are receiving repeat orders but to serve our customers even better, there can be further developments with this technology, which we expect to implement with the second line that will be ready for operation later in 2020 at O-I in the USA. Further upscaling will be dictated by customer feedback and market demands… but the opportunities are tremendous.

GW: How flexible is O-I : EXPRESSIONS in meeting the needs of individual customers?
O-I : EXPRESSIONS offers a broad range of decoration options and a premium version of the service, O-I : EXPRESSIONS RELIEF offers brands the opportunity to use customised tactile digitally printed effects, such as embossing and coloured embossing.

For example, we have a project with a customer that required a total of 200,000 wine bottles with four different sets of properties – with embossing. Thanks to O-I : EXPRESSIONS RELIEF, we selected one bottle and did all the variations required in the same print campaign but with different designs. Out of the four, the biggest run was 70,000 and the lowest only 4500! These volumes would not previously have been cost-effective in glass…

So we can exploit all the benefits that embossing brings to this level of print and offer customers the true potential to capture value and profitability.

GW: What sectors can provide future growth?
We already have very successful case studies in the wine and food sectors, among others. A key future market could be the spirits sector, where personalisation is very desirable. But we are not limited to any particular sector. There can be an application for everybody and that's a massive opportunity.

O-I : EXPRESSIONS was a perfect answer to the needs of Wither Hills winery, providing a modern and premium way to take the wine from the keg to the table. The personalisation of the bottle allowed thinking outside-the-label, leading to an unconventional yet simple project that quickly gained the interest of customers. The packaging harbours a personalised embossing which, thanks to O-I : EXPRESSIONS RELIEF, was executed faster than with a standard NPD process.

GW: How is O-I : EXPRESSIONS impacting O-I's commitment to sustainability?
Sustainability continues to be front and centre for O-I. Embossing adds no weight to the bottle and we are using organic UV inks, offering further sustainability benefits and advantages for markets such as the USA. Even without the use of heavy metal inks, we can create any colour with our CMYK process and colour matching, instead of having to develop a direct tint to print. ●

Further information:
O-I Innoval, Chazelles-sur-Lyon, France
web: www.discoverexpressions.com

Innovative solutions for a vital process

Carole Grassi discusses SGD Pharma's innovative solutions for implementing aseptic filling with ready-to-use moulded glass vials.

Use of the parenteral route of administration has risen sharply in recent years, with parenteral drugs now representing approximately 32% (by volume) of the global market[1]. Parenteral drug delivery, via injection or infusion, is essential for many biologics but is also commonly used for small molecules, low solubility drugs and delivery of nutritional and vitamin therapies.

These products are commercialised in both liquid or lyophilised forms and are available in a broad range of dosages and containers including vials, bottles, ampoules, cartridges, flexible bags and pre-filled syringes. In all cases, aseptic filling of the container is a key step in the manufacturing process, with significant investment involved in safeguarding the quality and cleanliness of the primary packaging.

There is growing recognition that preparing primary packaging for filling is Capex, Opex and time-intensive and that the first steps of the aseptic filling process, though critical to product quality and safety, are not value-added activities.

Rising demand for parenteral drugs comes at a time of intense pressure to reduce costs, across an industry that is seeing a transformation in its structure. Pharmaceutical companies are scaling back on operational ownership, with a network of contract research organisations (CROs), contract manufacturing organisations (CMOs) and by aquiring biotech start-ups. A new segment of the market shifts from yesterday's blockbuster small molecule drugs, requiring large, dedicated product filling lines, to the manufacture of smaller batches of biotech products, in facilities handling multiple products in different container presentations to treat smaller disease populations.

These changes call for agility and a lower asset base, creating an appetite for standard, transferable solutions for aseptic filling to facilitate a focus on core activities of drug development. One notable trend is the growing usage of ready-to-use (RTU) primary packaging for 'fill and finish' operations. Due to the success of prefilled syringes, RTU primary packaging has become a preferred option in the aseptic manufacturing process to enhance flexible filling and reduce the total cost of ownership to pharma companies. Increasingly, outsourcing the non-core activities of washing and sterilisation is becoming common practice for vials and cartridges. RTU options for small volume vials are largely in place but flexible processing solutions for larger sized containers, in the 50-250ml volume range, are not yet fully established; access to larger moulded vials in RTU format is critical for key applications.

The introduction of Sterinity by SGD Pharma makes the manufacture of RTU moulded glass vials commercially accessible for the first time. Powered by the well-established EZ-fill platform from Ompi, this product extends the commercial and practical benefits of RTU to a wider range of applications.

Understanding aseptic filling

Parenteral drug products are delivered directly from their packaging to the patient, making rigorous preparation of that packaging essential for patient safety. The process of aseptic filling consequently extends from the packaging, through preparation, to filling the drug and securing closure, ready for storage/shipping. A detailed discussion on each of the steps involved lies beyond the scope of this article but they are described briefly below.

Clean, inspected glassware, as received from a supplier, is subject to washing, sterilisation and depyrogenation processes to ensure the removal of:

- Inert particles, which present a risk of thrombotic effects for the patient. These may be airborne or arise during glass production and transport.
- Micro-organisms, which are endemic within the environment and can trigger serious illnesses such as septicaemia.
- Pyrogens, substances that induce a fever in the patient, a prime example being endotoxins produced by dead bacteria. There is extensive regulatory guidance in this area, including FDA guidance detailing Current Good Manufacturing Practice (CGMP)[2] and recently updated (2017) EU GMP documentation[3]. As 21 CFR 211.113 makes clear "appropriate written procedures designed to prevent microbiological contamination of drug products purporting to be sterile, shall be established and followed. Such procedures shall include validation of all aseptic and sterilisation processes." Establishing a new aseptic filling line is an extensive and significant undertaking.

Trays may be the optimal configuration for certain applications but nest and tub offers the flexibility for a single unit to support multiple filling machines using different packaging types.

Washing/rinsing processes are critical steps in the preparation of glassware for aseptic filling. Used primarily to remove inert particles, they also reduce contamination and endotoxin levels. Using water that meets the same quality standards as that injected into the patient – Water for Injection (WFI) – is crucial. Sterilisation processes further reduce micro-organisms - to a defined sterility assurance level - and may include steam heating, dry heating (in an oven or sterilising tunnel), ethylene oxide treatment, the application of radiation (gamma or electron), filtration and/or other techniques. Depyrogenation is typically a higher temperature treatment than sterilisation, carried out for a longer period in a dry oven or (sterilisation) tunnel.

RTU minimises the assets associated with aseptic filling at a specific site and at the same time can offer significant savings in both Capex and OPEX relative to the installation of a bespoke, dedicated system.

The time and money associated with bringing an aseptic line onstream is considerable. Beyond Capex for a washer and dry heat sterilising tunnel, there is substantial ongoing expenditure associated with maintenance, ongoing validation and routine operation. Any manual tasks call for exemplary clean room practice, supported by rigorous training. Against this backdrop, switching to RTU can offer significant advantages, depending on the level of complexity and customisation required.

Choosing parenteral packaging

Pharmaceutical glass packaging is produced in three glass types, as defined by the major pharmacopoeias both USP <660> and EP 3.2.1 specifying performance standards for Type I, Type II and Type III glass containers. Glass containers used for parenteral packaging are differentiated by their chemical composition (Type I, II or III) and with respect to how they are manufactured, with both tubular or moulded products in widespread use. The performance of these containers is quantified in terms of:

- Hydrolytic resistance (a measure of chemical stability).
- Dimensional stability and mechanical resistance.
- Cosmetic quality.

Identifying the most appropriate packaging is therefore an essential element of product development and crucial for safe and cost-effective manufacture.

Type I is the designation assigned to borosilicate glass, which contains significant amounts of boron oxide (~10%) and has a relatively high hydrolytic resistance level. Hydrolytic resistance, as measured by pharmacopoeial tests, is quantified in terms of the amount of alkali released by a glass vial filled with ultra pure water, when tested at elevated temperature[4]. A high level of hydrolytic resistance is associated with low release rates and indicative of high chemical stability. Type I glass also exhibits higher resistance to thermal shock. These attributes make it highly valued within the industry and extremely suitable for parenteral products.

Type III, soda-lime-silica or regular soda lime glass contains significant quantities of both sodium oxide (~15%) and calcium oxide (~10%) and has lower hydrolytic resistance than Type I. It can be used for parenteral products if stability testing specifically confirms suitability, with powder applications being the most common. Hydrolytic resistance can be raised by treating the inner surface of the glass with ammonium sulphate to produce Type II glass, which has a similar hydrolytic resistance to Type I but with lower chemical durability.

When it comes to the impact of manufacturing method, moulded vials offer high mechanical resistance and low risk of breakage, making them particularly suitable for larger volumes - from around 50-3000ml - and for lyophilised products. Moulded products are also often selected for high pH formulations. Tubular vials are most popular in the 1-20ml volume range, offering high cosmetic quality, high dimensional stability and thin walls – a lighter product.

All these factors and others affect the packaging chosen for a specific parenteral drug, which in turn directly impacts the aseptic filling technology selected. A dedicated manufacturing facility for an established, commercialised drug may handle just one type of vial but CRO, CMO or R&D departments need the flexibility to switch easily between packaging types to assess/handle different volume vials. This requirement for flexibility significantly complicates the development of optimised aseptic filling processes.

RTU solution

SGD Pharma's Sterinity offer, through Ompi EZ-fill, provides an off-the-shelf solution for aseptic filling. Sterinity vials are delivered ready for direct introduction into an aseptic fill-finish operation, leveraging the advantages of Ompi EZ-fill secondary packaging, which has already been tested and adopted in a wide range of fill-finish equipment platforms.

Parenteral glass vials are delivered ▸

directly to the process area, which may be at the pharmaceutical manufacturing site or remote, at a centralised or contract facility, serving multiple laboratories and/or production sites. Vials are produced and 100% inspected in a clean room environment at the SGD Pharma plant and then subject to the following processes:

- Washing with WFI followed by drying in a clean room environment.
- Depyrogenation in a pharmaceutical grade tunnel.
- Packaging in a nest and tub or tray configuration.
- Covering with Tyvek sheet.
- Sealing with a Tyvek lid followed by steribag bagging (single or double).
- Sterilisation by ethylene oxide using a process validated in accordance with ISO 11135[5].

RTU glass vials can then be stored with a five year shelf life. The technology decouples the preparatory stages of the aseptic filling process from the final fill and finish process, thereby introducing significant opportunities for outsourcing/process management. Levering this proven solution eliminates the development, design, construction and validation work associated with a bespoke in-house design, accelerating the time required to complete a project.

This is a crucial gain, in both the clinical and industrial settings, whether the goal is a new line or the retrofitting/expansion of existing capacity that can help to speed a product through to commercialisation. Furthermore, off-the-shelf designs are rigorously optimised with respect to ease of operation, automation and maintenance. These advantages allow customers to lower associated Opex significantly.

These options mean that the TCO of an RTU platform - Capex plus Opex across the lifetime of the unit – are often much lower than for in-house solutions. This is particularly the case where there is a requirement for combination lines, aseptic filling lines with the flexibility to handle multiple types of parenteral packaging (cartridges, syringes or vials) without module resetting. This is specially valuable in small batch filling operations.

Beyond cost saving, RTU offers other practical advantages. Firstly, there is the reassurance of high quality that can easily be replicated, from site-to-site, or by external suppliers if the activity is outsourced. Scale-up is straightforward and issues associated with method transfer are reduced. In certain geographies, using an RTU solution will be economically beneficial even for large-scale manufacturing, simply because it alleviates quality concerns associated with services such as electricity and water supply, including maintenance of the quality standards required for WFI. In addition, the use of RTU offers the flexibility to manage the footprint associated with aseptic filling operations – to minimise the amount of equipment at a certain location, for example, which may be critical for some organisations.

Nominal capacity	Design	Neck finish	Type of glass	Type of pack	Number of pcs per pack	For Human Use with 5 years shelf life
20 ml	EasyLyo	20 mm	Type I	Tray	60	Available
25 ml	EasyLyo	20 mm	Type I	Tray	60	Available
50 ml	EasyLyo & ISO	20 mm	Type I	Tray	28	Q4 2019
100 ml	ISO	20 mm	Type I	Tray	/	On going (2020)
20 ml	EasyLyo	20 mm	Type I	N&T	24	2020

Table 1: The Sterinity platform will extend to a portfolio of moulded glass vials answering directly to a wide range of parenteral applications.

RTU moulded glass vials

The Sterinity offering powered by Ompi EZ-fill uses moulded glass vials made from Type I glass of exemplary quality. A steadily expanding portfolio of products in a range of sizes will be commercialised over the next two years, focusing on two core designs: A premium quality ISO design and an optimised EasyLyo product (table 1).

The ISO vials provide a high quality moulded glass RTU option, compliant to ISO 8362-4. The EasyLyo product is a latest generation moulded glass vial that combines chemical and physical strength with superior cosmetic quality, relative to conventional moulded alternatives. The external dimensions of these vials are equivalent to tubular designs of the same volume, while vial weight is around 30% lower than for standard moulded alternatives. Essentially, they combine the strength and resistance to breakage associated with moulded vials with the superior packaging/transport characteristics of a tubular product, advantages that are particularly beneficial for lyophilisation applications. An optimised bottom to aid heat transfer and an ISO 20mm neck finish for secured stoppering answer directly to lyophilisation requirements.

Both types of vials are currently available for use in tray format; nest and tub configurations are currently in development. In a tray format, RTU vials are packaged upside down in trays, with dimensions according to Ompi Ez-fill/R secondary packaging, specified for use with defined filling technology. This configuration offers the benefit of maximising the number of vials in a tray increasing packaging density, thus optimising the throughput of fill and finish operations. Nest and tub is homogenised between all vial formats and with syringes and cartridges to allow adoption of the same handling points in combination lines. Both the tray and nest and tub configurations are designed to completely avoid glass-to-glass contact to preserve the integrity of the product through transportation.

Looking ahead

The growing parenteral market is looking for proven solutions to streamline processing, to focus effort on value added/core activities and to cut production costs, particularly as the structure of the industry changes. With many products now developed and manufactured in collaborative partnership between pharmaceutical companies, biotech start-ups, CROs and CMOs, there is a growing need for flexible processing solutions that facilitate safe and reproducible technology transfer. RTU is a cost-effective, efficient approach for aseptic filling, a safety critical but non-core activity for many organisations with moulded vials essential for many applications. ●

EZ-Fill is a registered trademark of Ompi, Stevanato Group. Sterinity is a brand owned by SGD Pharma.

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De-airing methods compared

An important step in automotive laminated windscreen, sidelite and sunroof production is the de-airing process prior to final autoclave processing. Today, manufacturers can choose between vacuum ring, nipper roller and vacuum bag processes. Serhat Oran describes each of these three processes, including their pros and cons and provides a comparison based on total cost per unit between these methods.

A typical vacuum ring oven comprises three main sections, involving entry conveyors, exit conveyors and the oven (figure 1). The process starts by fitting the vacuum rings on the periphery of the windscreen. These vacuum rings are available in (cheap) silicone and (expensive) EPDM material. The latter have the advantage that they do not leave marks on the windscreen that otherwise need to be cleaned. However, both have a limited lifetime and need to be replaced relatively frequently.

When the windscreen are placed on the conveyor and the vacuum line is connected, vacuum is drawn to pull out the air between the glass panes before the windscreen is heated. The objective is to seal the edges after the air has been removed. It is critical that the edge seal is properly formed before the vacuum is released and that no air is allowed to go back in between the glass panes. Here, the process parameters are very important.

When de-airing has been completed, the windscreen is heated in the oven to approximately 110ºC-120ºC. This softens the PVB and starts the lamination process. This is the time where the critical edge sealing takes place. The vacuum can be released as soon as the windscreen temperature drops below a certain threshold. Release it too soon and air can penetrate between the glass panes, as the PVB will not have had enough time to harden and the edge seal would not have been formed.

Fig 1: Vacuum ring line.

Vacuum ring line strengths

Vacuum ring lines are scaleable. When low volume requirements are required, a short tunnel can be installed. This will save space and some costs compared to a full size line.

One of the most important advantages of this technology is that it is very simple and therefore the initial investment of the line is quite low. Very flexible in terms of what can be produced, vacuum ring ovens can be used with simple shapes and can de-air windscreens, sidelites and sunroofs, with or without connectors and with or without deep bends. There is one caveat with respect to windscreens with connectors, however; it might be necessary to place clips over the rings to ensure that the connectors do not affect the vacuum.

On the other hand, there are quite a few weaknesses:

- These lines are generally manually-operated, with few automation opportunities. Automation is mostly possible at the unloading side. Automation becomes unreliable if clips need to be placed over the rings.
- The cycle time is relatively high, anywhere from 25 to 60 seconds.
- They are labour-intensive.
- Power consumption is high. They are usually powered with electricity and heating is via convection heating elements. It might not be possible to fit rings around complex shapes and connectors might need additional clamping operations.
- A separate set of rings is needed for each shape. The longer the oven, the higher the amount and therefore the investment in rings.
- Whenever a changeover is made from one shape to another, it is necessary to switch the whole set of ring, which means additional downtime and either additional labour or investment in some kind of automated storage devices.
- Operational costs are a weakness of this technology. A combination of relatively high energy consumption, high cost of consumables due to the replacement of the rings and quite a high cost of maintenance, even though the initial out-of-pocket investment was attractive.
- Finally, based on the size of the oven, there will be a more or less big impact during stoppages, as the line will probably need to be emptied to avoid various types of damage to the windscreens in the oven.

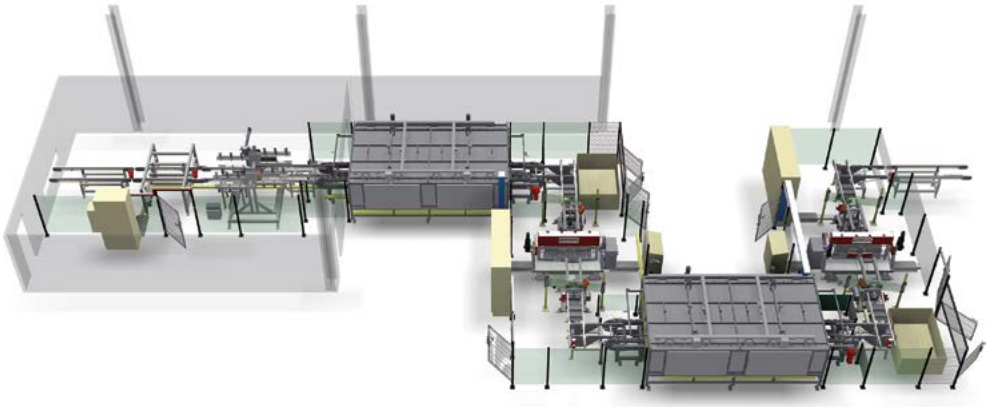
Fig 2: Nipper roller line.

Nipper roller lines

Nipper roller lines (figure 2) are laid out in a typical U-shape configuration to enable change of orientation from leading long edge to short edge of the windscreen between the ovens and the nippers. Windscreens travel through the line with their wings up. This is not usual when it comes to windscreen transfer but relates to the

working principle of the nippers.

Radiation is used rather than convection and conduction. The specific wavelength of these long life lamps directly heats the PVB rather than the glass. Because the PVB does not need to be heated to the same temperatures as in the vacuum ring oven, the PVB does not undergo physical transformation and remains 'milky'. This is not a defect but a differentiation of the processes. It also allows for lower energy consumption.

Each oven is followed by a nipper. Nippers are basically working as rolling pins that mechanically squeeze the air from between the windscreen. To avoid introducing bubble defects, it is recommended to work without mechanical referencing on the line. Mechanical stops will bump the edge of the PVB and introduce defects that will result in bubbles and lower first time yield. This particular model does away with mechanical referencing on the line. Special features are added to the equipment to ensure that the windscreen travel is controlled throughout the process.

There are a total of 10 degrees of freedom that are fully automated on each nipper and its entry and exit conveyors. On the nippers are:

- Automatic smile adjustment to handle the various radii without breakage.
- Tilt that moves the nipper forwards and backwards.
- Side shift.
- Rotation to handle the rotation of the windscreen as it travels through the rollers.

Combined with the rotation, tilt and distance adjustments of the entry and exit conveyors, these features ensure that the optimal de-airing is achieved.

Nipper machine with automatic smile adjustment

The nipper process with automatic smile adjustment (ASA) is a two-stage process (figure 3). The first stage is the de-airing process, where the windscreen glass leaves the first oven at approximately 70ºC and the PVB is softened but the surface structure remains intact. Most of the air is pushed out by the first nipper.

The second step is the tacking process. The windscreen leaves the second oven at approximately 90ºC-100ºC and the PVB is completely softened so that it fully attaches to the glass. The remaining air is pushed out at the second nipper and edge sealing is achieved at this stage. At this point, the windscreen is ready to be sent to the autoclave.

One of the major strengths of the nipper technology is its very short cycle time. The cycle time starts at 13 or 14 seconds for simple shapes and will slightly increase with larger or more complex pieces. Secondly, it is a process that is fully automated. It can run without the need for operators. A single supervisor can run the entire line.

From the point of view of operational costs, it is very frugal; both energy consumption and maintenance costs are very low. The line has high first time yield. Start up after line stoppages is very quick, in spite of lowered power usage to reduce overall power consumption.

When performing on-the-fly changeovers with automated line adjustments, line stoppages have practically no negative impact. Windscreens that were in the ovens can be buffered on the conveyors. When compared to large ovens that contain 150 or up to 300 pieces that need to be emptied or else they are scrapped, this is a notable difference. Some lines have been running close to 30 years and never less than 20 years.

Along with these strong points,however, there are also a few weaknesses. First of all, the initial investment is relatively high. Not as high as the vacuum bag line but higher than a vacuum ring line. However, it ▸

Fig 4: Vacuum bag line.

Fig 5: Cleaning silicone smudges.

is true that when including all ancillary equipment that needs to be purchased together with the vacuum ring line, the price difference is not as great.

The main drawback of nipper lines, however, is that they can only handle windscreens without connectors due to the mechanical pressing. As more and more premium car windscreens have special features that need electrical connectors, this is probably the system's most important weakness. In addition, the footprint is wider than other de-airing lines, even though the total length will generally be shorter.

An operational disadvantage in that operators cannot rely on visual PPIs to judge the quality of the process. This is more of an issue for first time users of nipper lines, as they will need some time to develop their own process indicators.

Vacuum bag lines

The working principle of the vacuum bag line (figure 4) is very similar to vacuum ring technology, involving the same three sections (entry conveyor, oven and exit conveyors). Similar temperature and vacuum parameters are used as in ring technology. The major two differences when compared to the vacuum ring is the set of vacuum bags fixed to the conveyors where the windscreens are placed. These bags are not changed for different shapes and any one or more glass can be placed in the bags for de-airing. The second major difference is that it is possible to automate the complete system. In fact, the system is more often than not run in fully automated mode.

The most important strength of the vacuum bag, aside the fact that it can be run fully automatically, is that it can handle all types of automotive glass, without exception. Fast cycle times can also be achieved, although this increases the initial investment substantially. This technology has the highest first time yield. Finally vacuum bags, like nipper rollers have a quick changeover between shapes, as long as the recipes have been created. Of course, if the oven parameters need to be modified, it is necessary to wait for the heat up or cool down period.

Unfortunately, there are some important weaknesses to this technology. First and foremost, the initial investment is very high. If it was not, none of the other technologies would stand a chance, really.
Of course, this is assuming that customers can afford the high energy and maintenance costs. Generally, vacuum bag lines have a high operational cost, which can only be covered by value added, high priced premium products. There are two additional inconveniences:

- The footprint required is the largest of all three technologies.
- There is a major impact whenever stoppages occur, as the number of windscreens in the oven is usually very high, higher in fast cycle lines.

Fig 3: Nipper machine with automatic smile adjustment (ASA).

Optimal equipment selection

Having looked at all three technologies, how should one go about selecting the optimal equipment? How should investment decisions be taken? What are the traps that need to be avoided?

There are some obvious and well-know parameters that all companies will use to try to make a meaningful cost comparison. These are considerations like cycle time or the capacity of the equipment. There is also the expected lifetime of the equipment. However, there are many costs that can remain unnoticed but are as important to avoid as cost calculation traps.

Will it be necessary to buy or build additional infrastructure to supply the increased power requirements? Keep in mind that vacuum rings and bags require a lot of power.

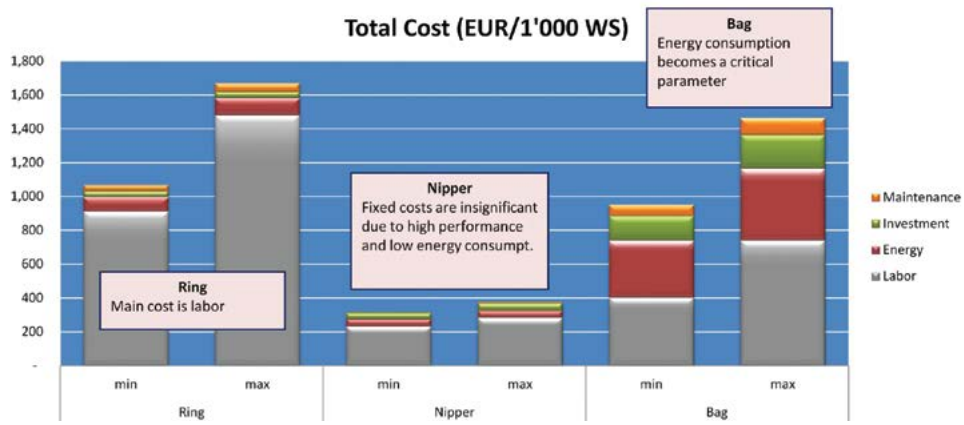

Fig 6: Total cost comparison.

Is there sufficient storage space for the vacuum rings? What about space for unloading windscreens on the line during stoppages?

Is there any additional automation that has to be purchased to ensure the line works according to expectations?

Consider the differences in labour between the different systems. This may not be as obvious as counting the operators and supervisors needed on the line. There are hidden labour costs such as rework due to low first time yield, cleaning smudges left by silicone rings or additional labour when emptying the ovens.

Unfortunately, one customer when working through the selection options had failed to realise that two full-time operators had to be assigned to clean every single windscreen before it went to the sub-part assembly (figure 5). All of the windscreens had marks from the cheaper silicone rings selected. The sub-part assembly line was in a different plant to the vacuum ring line so if this had not been brought up during the equipment startup, the additional labour cost might not have been allocated to the de-airing line and cost comparisons would have been done with the lower cost silicone rings without consideration of the additional labour!

The last factors impacting overall cost will be the other operating expenses such as replacement of rings and bags and the type of material chosen, as well as the overall maintenance costs from year to year.

Figure 6 presents a comparison of total costs. When all costs are added up, there are some conclusions that can be drawn straightaway:

- Labour is the cost parameter that has the biggest impact overall.
- The impact of energy costs is most marked in the vacuum bag line.
- The actual equipment purchase cost is very small for both ring and nipper lines.
- Overall best performance belongs to the nipper.
- In a European labour cost setting, the vacuum bag line, due to its ability to run with full automation, has a better performance than the ring option.

But it is clear that not all investments will take place in Europe and different geographies will have different cost structures. So, how should buyers select which technology to choose? As always, information and correct analysis is the key. In particular, be aware of the current and future product range. A strategy regarding automation requirements is also needed. Are manual operations a realistic possibility and at what stage does it become necessary to start automating processes?

Buyers need to be aware of the relative importance of their cost parameters. Labour, consumables and energy are straightforward but access to financing might be less so. What production targets have been set? Do line constraints require higher or lower cycle times to ensure other, more costly equipment such as press bend furnaces are not underutilised? Ultimately, it is necessary to have a good knowledge of all three technologies, in order to make an informed decision.

Two interactive tools have been created to assist with the decision process. The first is a simplified version and relies on some basic questions, while the second allows users to enter their own data and will calculate a cost comparison based on actual or theoretical parameters such as labour, energy cost, yield, maintenance etc. ●

This article is based on a paper presented at Glass Performance Days (GPD) Finland 2019.

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Le Cristallin. Image: Sergio Grazia.

Double skin facades: Selecting the right glass combination

When designing a double skin facade, it is important to choose the right combination of glass to optimise the benefits in terms of energy management, dynamic selectivity, thermal insulation and enhanced comfort, while minimising potential issues such as condensation, says Ralf Greiner.

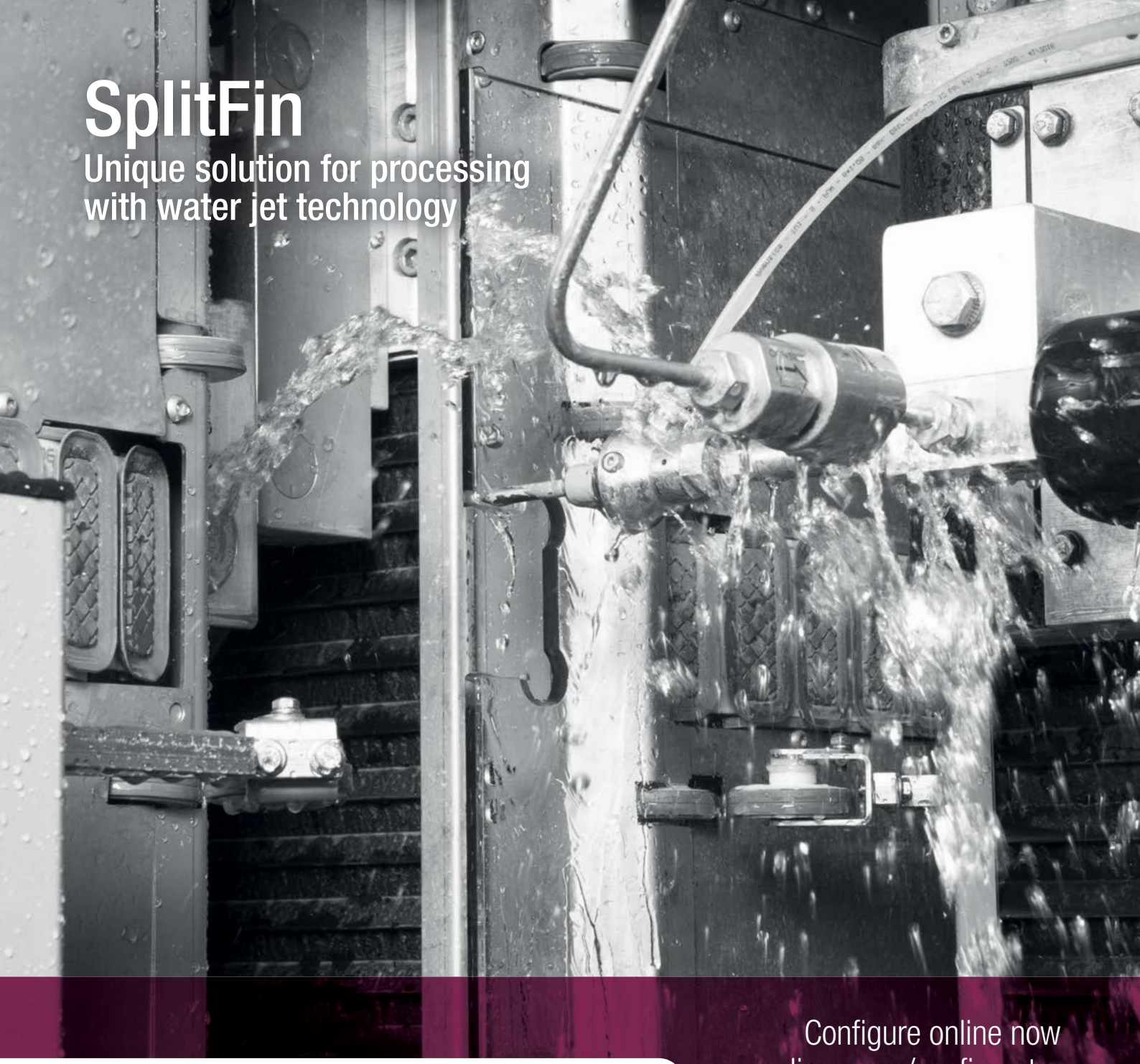
A double skin facade is a traditional facade that has a second cover on the outside that is normally made of glass. The two facades, often called 'skins', are separated by an empty space (air gap), the width of which can vary from a few centimetres to several metres. If mechanical shading systems are installed in the air gap, the outer skin also provides them protection against wind loads and dirt.

A double skin facade can be either mechanically or naturally ventilated, depending on the type of ventilation system used in the air gap. These are known as active and passive (interactive) ventilated facades.

Active systems have an outer skin of airtight insulation glass in front of the ventilated inter space. Air exchange is artificially induced and takes place inside the building via heat exchangers. In winter, this has the advantage that energy required for heating can be saved via heat recovery. Active systems tend to use the more traditional glass types for the external insulating glass skin.

Passive ventilated facades are the more common type in Europe, particularly on commercial buildings. Here, the air exchange takes place between the inter space and the environment. A natural convection is created via defined openings, which are normally located above and below ▸

Double skin facades. Image courtesy of Guardian Glass LLC.



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the outer glass. Suspended glass walls in front of a conventional construction are also possible, as are punctuated facades, as well as box-type windows or compound windows.

Benefits of a double skin facade

Due to increasingly higher standards on protection against heat gain and therefore low solar energy transmission, double skin facades that combine energy-efficient glazing with mechanical shading devices are becoming increasingly popular. Although they have been installed in buildings over the last 20 years or so, glass technology has progressed considerably during this time, which has helped to increase their use. Today, innovative glass products and coatings are available for double skin facades that help provide numerous benefits – but only if the right combination of glass is selected for the external and internal skins.

The number of glazing combinations and possibilities available today are staggering. This provides architects with a full palette of glass performance and aesthetics options to consider; they can choose the most suitable glazing in terms of glass performance, thickness, dimensions, thermal and mechanical resistance (durability), solar protection, colour etc.

Chosen correctly, the glass can provide advantages in terms of improved energy management, sound insulation, thermal insulation, as well as the possibility of enjoying fresh air from the cavity through opened windows and therefore, enhanced comfort for building occupants. Furthermore, additional shading systems can be placed between the outer and inner glazing, providing dynamic selectivity (ie the ratio between maximum daylighting and maximum solar protection).

Solar radiation reflecting coatings in the outer shell can significantly reduce the energy transmission when blinds are fully retracted compared with a conventional solution without coatings. Users can operate the mechanical shading smarter (either open or in intermediate states) and enjoy unobstructed views for longer, without having to fear overheating. It is all about finding the right balance for the building; glazing solutions can help to achieve that near-perfect balance.

Coated solar control glass

Advanced coated solar control glass, for example, can actively optimise the daylighting factor (DF), as well as the building's thermal regulation. The glass can help to make the building more energy-efficient by reducing the need for air conditioning, heating and artificial lighting, which all contribute to a more comfortable working or living environment for building occupants. As a result, these glazing solutions can also be instrumental in helping to achieve environmental certifications such as LEED, BREEAM, HQE, DGNB etc.

In passive ventilated facades, the aim is normally to reflect a part of the short-wave solar energy directly from the outer glass so that the heat build-up in the inner space is reduced and in turn, the thermal load. The use of coatings on the glass is significantly reinforced when combined with additional sun and anti-glare protection in the inner space. Excellent g-values are also achieved when the blinds are operated in a fully retracted or intermediate state. The dynamic selectivity that can be achieved in this way renders the ventilated system particularly attractive.

Another advantage of using coatings in the outer glazing is the possibility to play with various light reflection grades. This allows the architect to design very transparent and apparently 'light' constructions or using higher reflections for creating a uniform appearance and hiding a patchwork of individually adjusted shading devices.

The challenge of durable coatings

While the inner glazing of a passive system is conventional double or triple insulating glass, for the outer single glazing a laminated safety glass (often consisting of heat strengthened glass) is typically used. Its residual load capacity ensures maximum safety in case of breakage.

The challenge when using high performance coated glass is that the coating must be both durable and suitable for using monolithically or laminated facing the interlayer. Most coatings on the market are very sensitive to humidity and external climatic elements, which means they often need to be hermetically sealed, which obviously limits the flexibility.

The combination of high durable solar control coatings for reflecting a share of the solar radiation with special energy absorbing PVB interlayers further improves the energy efficiency. In particular, the spectral selectivity (daylight to solar energy ratio) can be significantly enhanced.

Potential issues

While architects may be familiar with the advantages of double skin facades, there are some potential disadvantages that require careful consideration. Again, it is important to select the correct combination of glass that minimises these potential issues, while optimising the benefits.

A double skin facade with the wrong glass combination may also decrease the amount of natural light entering a building, while increasing the temperature in the air gap (which can lead to shorter operating life of electric motors, heat exchanger systems etc) and creating condensation on the external skin.

Condensation

In passive ventilated facades – depending on the position of the building and adverse climatic conditions – condensation can occur on the inner side of the outer glass pane. Of particular concern are the morning hours in spring and autumn, when potential condensation can significantly disrupt the clear views from inside the building. Again, this does not have to be an issue, as glass solutions are now available to prevent this natural phenomenon from occurring.

Anti-fog coatings for glass are specially designed, extra-durable coatings applied onto the outer glass pane, which significantly reduce the probability of condensation. Tests under real building conditions have shown that these anti-fog coating solutions provide slightly higher surface temperatures compared to an uncoated outer surface. This temperature difference significantly reduces the appearance of condensation. While the uncoated glazing in comparison tests shows condensation over many hours, under the same conditions, the coated glass remains clear and free of water droplets throughout. One word of caution: It is essential to consider the use of anti-fog coated glass at the project planning stage, as the application of such coatings after installation is impossible.

Other potential issues with double skin facades include higher investment and operating expenses. An additional skin around a building places a higher demand (load/weight) on the ground area. This must be taken into account at the project planning stage. There may also be higher sound transmission between neighbouring rooms in the building if windows are left open.

A guiding hand

For advice and guidance on choosing the right combination of glass for a double skin facade, Guardian Glass has a team of experts who can help. The Guardian SunGuard range of coated solar control glass offers a variety of products with attractive aesthetics and technical properties to help optimise the performance of double skin facades and minimise the issues sometimes associated with them. ●

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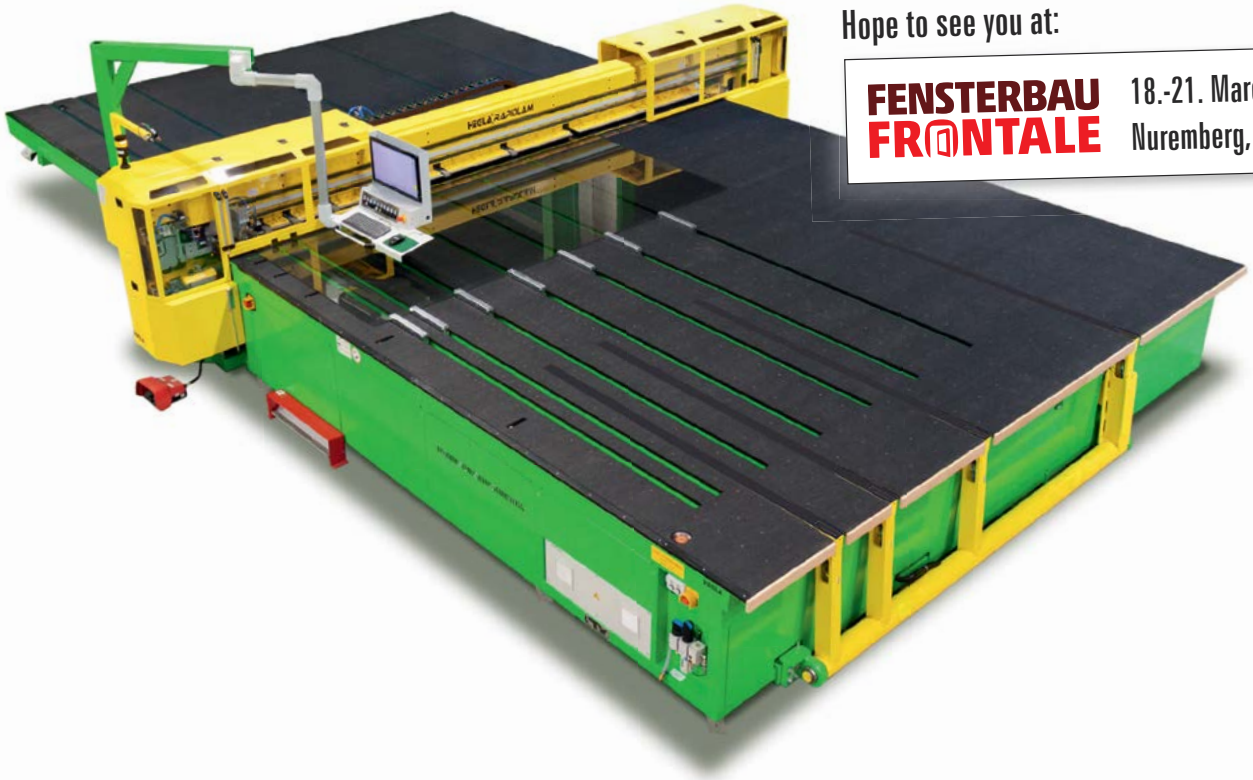

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Virtual reality pushes the boundaries in IS machine training

Tony Pawinski discusses the benefits that are possible by adopting virtual reality technologies in the training of IS machine operators and other glass container plant personnel.

The glass container manufacturing sector faces tremendous pressures to remain successful, not only from legislation but also from other forms of packaging. As these industries develop, it is essential that glassmaking keeps pace with the modern world. In the EU alone, over 180,000 people are employed in the glass container manufacturing sector and the need for ensuring that these people are ready for the challenge has never been greater.

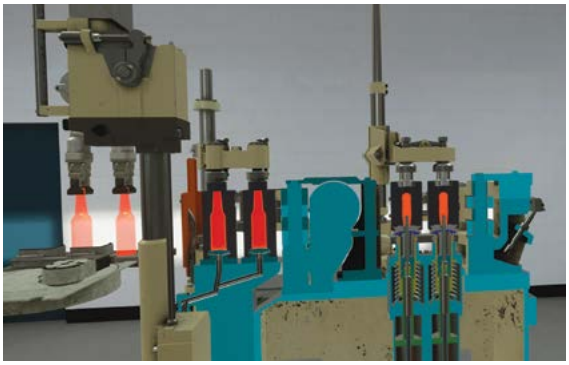
The inherent danger that has always been present in IS machines is known and well controlled but IS machine manufacturers are still rightly working with cutting edge technology to reduce the exposure that people need to interact with the machine. Swabbing robots is one great example. Training has also improved greatly over the years, ranging from worldwide academies to simulation tools and individual company training centres. However, the step from theoretical to actually working on a machine is still a gigantic one, more so if a company does not have the infrastructure. Knowledge of how a glass bottle is manufactured and all the inherent synergies within the machine takes decades to build, with little written evidence to pass on to the future workforce.

Glassmakers can import their own reference videos and standard operating procedures into the system for use in setting an IS machine.

Virtual reality benefits

Many learning studies over the years have all concluded that the most effective way to remember something is to perform the actual task, ie more knowledge is retained if the task can be seen and performed. Virtual reality is a fantastic tool to help people work on equipment as if they were actually working in the factory but without the workplace dangers or loss of factory efficiencies. In the real world, a mistake can be catastrophic on so many levels but in the virtual world, it becomes a recordable learning opportunity to reflect upon and share with others.

Today's world is increasing becoming eco-friendly savvy. Most companies now see the need to reduce their carbon footprint, not just for the environment but for the sustainability of their own place in the market. For most companies, travel and expenses for training courses is a finite resource and often the first cost to be reduced in times of financial pressure. This along with the human cost of the staff and workforce cover suggests that training needs to be easily obtainable, cost-effective and produces effective changes to practice, ie the VR learning experience can be digitally evidenced.



Virtual technology has the ability to show a cross-sectional view of the internal working process of the IS machine.

The VRMT system currently allows up to four people worldwide to join together in the same environment and carry out quality interactive and immersive training without moving from their workplace. For example, one person in Japan can swab one section and then their colleague in the USA can swab another section. They can all observe and practice the technique and discuss the learning outcomes. They can even all be in separate parts of the hot end and still converse. All four people can bring up a propriety reference document such as a standard operating procedure or video and together, they can learn to unjam a section or physically set the 360° drum timing to determine the machine cycle as if they were on an actual IS machine. Importantly, this means not destroying equipment if they retard or advance the invert by too much, for example. The training section can also be cut in half to facilitate the explanation of the NNPB and blow/blow process in a way that has never been possible before.

Naturally there are many health and safety benefits by learning in the virtual world but the VRMT system also has safety features that recognise and inform users if they enter a dangerous zone, for example putting their hand too close to the IS machine or trying to pick up a hot bottle. The machine can even be set on fire to train people how to put a fire out safely and correctly.

VRMT's aim is to demystify the world of glass bottle manufacturing. The virtual reality system will eventually be incorporated into the workings of a full glass plant, starting from raw materials processes to the end goal of pallets of finished products out of the door. A safe environment has been created that allows users to train and document achievements in their own language and against their own training records, ensuring language and communication is not a barrier to learning.

As well as participating at key glass industry events in Germany and Mexico later this year to showcase its virtual reality technology, VRMT is now partnering with Tiama, with the majority of its hot end equipment embedded in the VRMT software. ●

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Mould design services

Dominique Vassaux explains in a series of articles the importance of mould cooling, its influence on the performance of the IS process and on container quality.

To ensure best cooling performance of the mould equipment and consequently, to ensure the required heat removal from glass, cooling fans need to provide the correct air requirements to the forming machine in regards to air pressure versus volume. At the blow side, the design of blow heads will have a direct impact on how soft the glass of a newly formed container is when leaving the blow mould.

The latest computerised simulation software will help designers to predict the various cooling and forming processes on a forming machine, to decrease time from concept to final produced containers.

Cooling fan specification

To achieve optimal mould cooling performance on the forming machine, cooling air must be correctly supplied from the cooling fan(s) to the forming machine. In that sense, the cooling fan specification must always suit the cooling requirements of the moulds, not the other way around. Very often, people think that more air volume (bigger fan size) will give better mould cooling results. This is not always the case.

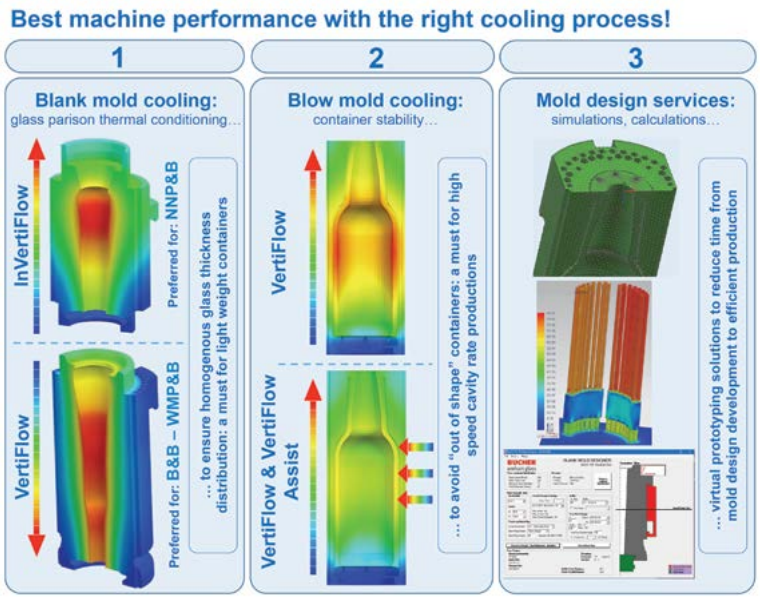
It is important to size the fan correctly in both pressure and volume, according to the latest BEG cooling air requirements specification. Volume undersized cooling fans will lead to mould cooling problems on the forming machine. However, oversized fans will also create severe issues to mould cooling. Not only will an over specified cooling fan heat up the cooling air (surges of pressure, which can even damage the fan installation), so that hot air with temperatures up to 70°C is supplied to the machine to cool down the moulds but the total air pressure also drops at the forming machine inlet. This leads to reduced air velocities inside the vertical cooling holes of the moulds, resulting in reduced heat transfer coefficients and consequently, poor cooling efficiencies of the moulds.

Oversized cooling fans generate much higher operating energy costs. Considering a 10-section triple gob machine, a cooling fan for a radial stack cooling machine (IS type) will consume approximately 250kW, whereas a cooling fan for a 'full VertiFlow' machine (AIS/NIS type) will consume approximately 90-120kW. Using VertiFlow cooling enables an energy cost reduction of at least 100-130kW, which corresponds to an annual saving of around €100,000 per cooling fan (based on an average cost of €0.1/kWh). In that sense, a cooling fan designed for a stack cooling machine must not be used on a 'full VertiFlow' forming machine (AIS/NIS) for energy reasons, as well as for poor cooling efficiency reasons that can strongly affect production performances on the machine.

For best mould cooling performance and energy cost reduction, BEG recommends that glass plants invest in cooling fans of variable speed drive type and rotary vane control, following the company's latest cooling air requirements specification.

Importance of blow head design

Blow head design is very often misunderstood, leading to certain glass cooling restrictions when inappropriate designs are used. The blow head arm supplies compressed air to the blow head's tube, having a specific inner bore diameter. This air usually exhausts via two holes having another specific inner diameter. The relationship between the inlet and outlet areas on the blow head design is very important, because it will directly influence the resulting internal pressure inside the container during the final blow process, as well as the mass flow volume of final blow air. These two aspects play an important role in removing heat from the recently formed container at the blow side and therefore need to be taken carefully into account to ensure high quality containers.



Optimum machine performance with the correct forming process.

For a typical 28mm diameter finish design, for example, good results are achieved when using an inner tube diameter of 8mm, with two exhaust holes of 5mm diameter. Considering an inlet pressure of 1.6 bar at the blow head arm infeed, the resulting internal pressure inside the newly formed container will be approximately 1.2 bar (see accompanying images). This pressure is required to push the glass wall thickness against the blow mould cavity, in order to extract heat from glass to the blow mould.

By increasing the two exhaust holes from 5mm to 6mm, the total exhaust area will accordingly be increased (keeping an internal tube diameter of 8mm). However, this will result in a reduced internal pressure of 0.9 bar during the final blow process, instead of 1.2 bar as previously. Consequently, the glass wall is pushed less against the mould cavity, exchanging less heat to the mould, so that glass remains softer when leaving the blow mould. This can lead to dimensional defects (leaners, out-of-round), as the newly formed container can deform.

The ratio between blow head infeed and exhaust is an important parameter to control, in order to ensure correct heat removal from glass at the blow side.

It is important to note that the length of the blow head's tube will also influence glass cooling at the blow side, as it can influence the air velocity distribution inside the newly formed container during the final blow process. The ideal length of the tube depends primarily on the container shape (long neck or high shoulder container), as well as on the maximum straight stroke given by the blow head mechanism on a machine. Forming machines with longer straight stroke (NIS/AIS) will allow the use of 80mm long tubes, which is a real asset to position the tube at the shoulder 'entrance radius' on long neck containers. In comparison with the

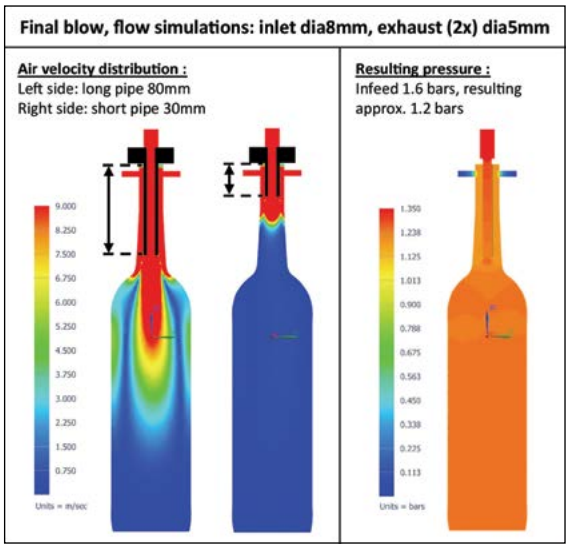
use of a short tube, this will generate additional convection cooling in the shoulder and top body part of the container and consequently, extract additional heat from the glass during the final blow process (see images).

The use of blow side vacuum will also help maximise cooling efficiencies at the blow side. Not only does the vacuum process enable faster contact between glass and blow mould cavity, leading in an increased heat removal from glass to mould (because longer contact time equals longer heat removal from glass) but it actually helps to ensure that no air is entrapped in the blow mould cavity, in particular in the gap between the mould cavity and the glass wall. Having the correct resulting internal pressure inside the container during the final blow process, a perfect contact between the glass wall and the blow mould cavity is key to remove heat efficiently from the glass.

Future of mould design: Modelling and simulation

In the future, mould designers should evolve to become true process engineers, not only designing curves on CAD software but also fully understanding the IS process and being capable to better interact with production staff on the forming machines. This evolution in mentalities is key in order to increase production efficiencies, especially to reduce the development time from concept to final produced glass containers.

To facilitate that evolution, new software solutions and packages will need to be developed and correctly introduced to glass plants. Computerised designs provide for precise and predictable applications of mould cooling, blow head designs, cooling tube designs, as well as the glass forming process to predict theoretical glass thickness distribution. This virtual prototyping process is certainly a long-term development process. Each glass plant will experience a learning curve that depends mainly on the willingness of mould designers and IS operators to accept a new technology, which does not work against them but instead, helps those reaching faster, higher efficiencies on forming machines. ●



Final blow flow simulations; inlet diameter 8mm, exhaust (2x) diameter 5mm.

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Keep pace, save money: The retrofit option for inspection machines

Obsolete inspection equipment can be upgraded to the latest certification and safety levels without the need for new acquisitions. The retrofitting of existing machines is often a good alternative to buying new kit. Heye International offers several retrofit packages to match customer needs, as Petra Heumann explains.

Safety is a paramount concern for everyone. And when it comes to end users consuming food and beverages from glass containers, the requirement for maximum safety is mandatory. Without question!

In times of growing awareness for sustainable materials, glass is becoming increasingly popular. To meet consumer expectations, ultimately glass packaging has to maintain its reputation for being environmentally-friendly and 'safe'. Furthermore, safety and quality are what glass manufacturers demand from their inspection lines at the cold end. Reliable inspection machines and technologies deliver the standard in many glass plants.

Retrofit solutions for every budget

To maintain or upgrade standards, the modernisation of inspection equipment is necessary from time to time. However, the retrofitting of existing equipment represents an economic alternative to buying a new machine. Existing inspection modules and tooling can often be used further, while the machine control unit is replaced by the latest control system, combining unbeatable reliability with ease of use.

Sophisticated retrofitting measures reduce mechanical maintenance work and downtime.

Main drive refurbishment.

Glassmakers can select from different refurbishment packages according to their specific requirements and budget. This can include a straightforward surface overhaul of the frame, base plate, mechanical parts etc as the basic package. An upgrade of employee safety and HACCP is achieved by the inclusion of housing and door solutions. The next level range of services comprises a simple mechanical refurbishment, as well as an electrical and electronic overhaul or a combination of different packages.

Benefits

Without having to invest in new equipment, the glassmaker takes delivery of a properly overhauled and updated inspection machine. The positive result is evident: Increased safety, quality and productivity.

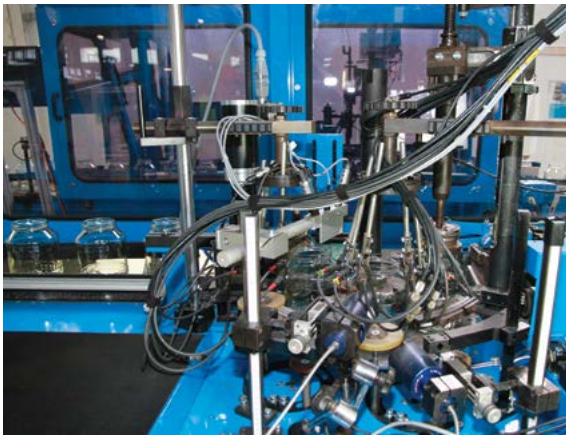
A new machine control unit makes inspection work more flexible, as job change times are reduced and spare parts availability is guaranteed for at least 10 years. Heye delivers original spare parts only, with no reproductions provided. Thus, the glassmaker benefits from a sustainable spare parts condition, which similarly guarantees delivery reliability on his part.

Sophisticated retrofitting measures reduce mechanical maintenance work and downtime. The inspection machine works reliably, while no time is lost to breakdowns due to obsolete components, electronics or control units. Servo components, inline etc let the inspection modules work precisely and accurately.

According to the current wave of digital industrialisation, remote maintenance via Ethernet is possible with the appropriate retrofit package.

Experts at work

Heye's team of experts can provide advice and consultation with respect to appropriate retrofit work. This can vary significantly, depending on the current status of the inspection equipment and relevant market requirements. Located in Nienburg, Germany, Heye's cold end specialists have comprehensive experience with many variants of starwheel machines and ensure the correct implementation of work undertaken. All inspection modules are prepared according to the glassmaker's needs (eg wall thickness measurement). After a start-up check, the retrofitted machine can easily be commissioned in the cold end area by plug-and-play installation. ●



Heye has been responsible for more than 500 refurbishments to date.

Example of a retrofitted inspection machine.

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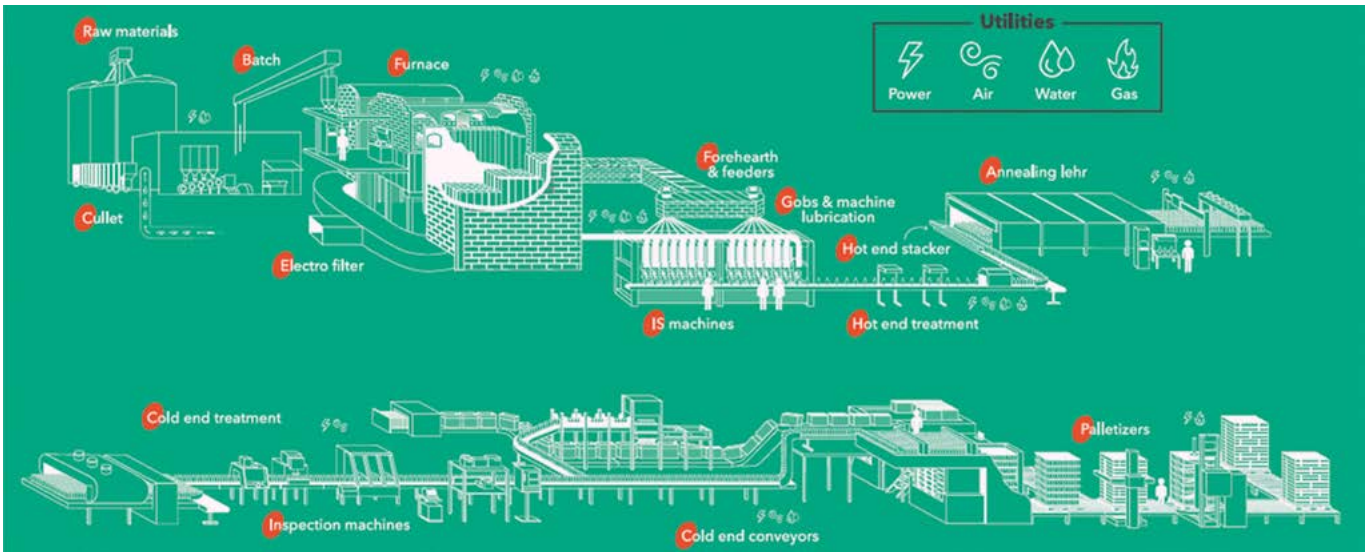

Figure 1: SIL4.0 collects data everywhere in the glass plant where sensors can be connected. Red points correspond to places where SIL is already connected in some plants.

Innovation and supervision system solutions

According to Ulas Topal, technological innovation through Industry 4.0 is essential for the glass industry to overcome ongoing technical, economic and ecological challenges. To date, more than 150 production lines in Asia have been equipped with Vertech's SIL supervision system.

It is necessary for glassmakers to find answers to many key questions: How to produce the strongest and lightest articles? How to produce articles with the maximum quantity of cullet? How to reduce the carbon footprint in glassmaking?

Ulas Topal presents SIL4.0 at the 43rd ASEAN Glass Conference in Cebu in October 2019.

Indeed, in modern society, industries are expected to produce even faster, while being even more effective and producing even higher quality articles. In recent decades and in particular since COP21 in 2015, additional objectives must also be taken into account in order for manufacturers to reduce their carbon footprint.

Glassmakers throughout the world are affected by these technical, economic and ecological issues. There is no exception. These subjects are at the heart of senior managers' discussions within glass companies and only a good balance between them will lead to success and sustainability. Nevertheless, the perfect balance is difficult to find, a lot of data is required to conduct analyses on the past and to anticipate the future. But glassmakers are not alone on this path. Vertech' accompanies them at every step in the search for the perfect balance between technical, economic and environmental parameters.

Going beyond current development frontiers

The theme adopted for the 43rd ASEAN Glass Conference, 'Going beyond current frontiers of development', was in full accordance with Vertech's vision of Industry 4.0. With more than 650 lines equipped in 29 countries, Vertech' is the leading company in manufacturing execution systems for the glass container industry and keeps looking for innovative solutions to meet customers' needs. The French company invests more than 25% of turnover in R&D and

Figure 2: KPIs displayed on fully customisable dashboards.

ASEAN FEDERATION OF GLASS MANUFACTURERS

This article is based on a paper presented at the 43rd ASEAN Glass Conference in Cebu, Philippines in October 2019. **www.aseanglass.org**

Glass Worldwide is the official journal of AFGM

stays up-to-date on the latest innovations to offer state-of-the-art solutions. The company can also count on reliable relationships with partners and trustful collaborations with clients to develop the most consistent system.

As a result of these initiatives, Vertech' has been working for the past few years on its latest product: SIL4.0, which is the company's answer to the challenges currently faced by glassmakers.

The concept

SIL4.0 is not just a software product; it is a concept and a vision. For more than 20 years, SIL has been acquiring data on production lines. Digitalisation of the production process is not new. It has been the core business of Vertech' since its creation in 1995.

The big difference of SIL4.0 is the number of places where data is collected, in as many places as there are sensors along the line, even before at the batch. As long as SIL can connect to sensors or machines, it is able to collect data. All in all, SIL4.0 is everywhere in the glass plant. The client chooses the information required and SIL connects and collects the data (see figure 1).

Communication protocols

As a data acquisition system provider, Vertech' has already worked with many different communication protocols: Webservices, OPC-UA, Profibus etc. And as a totally independent company, Vertech' develops further protocols whenever necessary. Furthermore, advice and support are brought to clients who wish to develop their own protocols.

In SIL, communication was previously one-way. Data was collected from machines and sensors, before being sent to SIL. But in SIL4.0, communication can also be bi-directional, as the system is now able to send information to machines. This may be the case for settings to IS machine or temperature to the lehr.

KPIs and dashboards

The second step in the philosophy of SIL4.0 consists of displaying the acquired information on fully customisable dashboards. It is up to glassmakers to decide which KPIs they wish to display and how they wants to organise information.

Collected data can be of very different types. Stocks of raw materials, daily CO_2 emissions, the temperature curve in the lehr or belt speed are typical examples. It is worth noting that multi-plant dashboards can be created, making benchmarks between several plants within the same group much easier. Figure 2 shows examples of KPIs displayed on fully customisable dashboards.

Analysis and anticipation combined

The next two steps in the Vertech' vision of Industry 4.0 involve analysing the past, in order to anticipate production events. Many correlations are to be found in all collected data, thus leading to algorithms, allowing predictability. Vertech' has already generated some interesting results and is working in close co-operation with data scientists and research institutes on this ambitious area.

Innovation never ends. SIL4.0 is a state-of-the-art software system in constant evolution. Results to come will be very promising for the glass community as a whole. ●

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Richard Katz at the Installation Dinner with fellow liverymen Frazer Campbell, Dave Dalton, Barbara Beadman and Dave Fordham.

Industry stalwart installed as 275th Master Glass Seller

Richard Katz was installed Master of the Worshipful Company of Glass Sellers of London on 10 December 2019 at a well-attended Common Hall & Installation Dinner, staged at the Stationers' Hall in London.

With a long career in the glass industry, Richard Katz is the founding director of Glass Futures, the proposed global centre of excellence for glass in R&D, innovation and training. He has also held both executive and non-executive roles including Managing Director and owner of Epsom Glass Industries, a highly profitable niche glass manufacturing company within the pharmaceutical, lighting and electronics markets, Chairman of Royal Brierley Crystal and a board member of British Glass.

"I really am thrilled to find myself in this position. It is a humbling experience to be installed as the 275th Master of this livery company". Outlining his plans for the coming 12 months, Mr Katz continued: "I have spent my life in the glass industry and the theme for the coming year is very straightforward: 'The Wonderful World of Glass' and making our livery even more relevant to the glass industry, encouraging and supporting the industry with its own aims, including removing as much carbon as possible from the manufacturing process."

Addressing members of the court, liverymen, freemen and guests in attendance, Dave Dalton, Chief Executive of British Glass added: "Richard is an extraordinary individual that feels he needs to put something back into an industry that has served him throughout his life. He is a great

From left to right: Richard Katz, Past Master Leigh Baildham and Paul Wenham, Clerk.

Richard Katz outlining his plans for 2020.

Maria Chanmugam, an advisory board member of Glass Futures, will act as Master's Assistant.

champion of British manufacturing and all things British."

Richard Katz praised immediate past Master Leigh Baildham and Paul Wenham, Clerk, acknowledging how they have "dramatically raised the Glass Sellers profile in the City in the past 12 months."

"I am delighted that it is Richard I am handing the baton to and I know the Company is in good hands. There is a wonderful future for this organisation and it is with the greatest fondest that I will remember my year. Thank you for all the support" Mr Baildham concluded.

Among the other appointments during proceedings, Maria Chanmugam, also an advisory board member of Glass Futures, was appointed Master's Assistant and with a long and varied career in the glass industry, Barbara Beadman was appointed Renter Warden.

The Worshipful Company of Glass Sellers of London received its Charter in 1664. Initially founded to regulate the Glass Selling and Pot-Making industries within the City of London, the role of the livery company today is to maintain cordial relationships within the Company, the City and the wider glass industry; stimulate interest in glass in all its aspects; carry out charitable works, with special emphasis on education; maintain the Company's traditions, values and customs; provide pastoral care for members in distress and support the Lord Mayor and the Corporation of the City of London.

Barbara Beadman was appointed Renter Warden.

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Winners of the 2019 Glass Focus Awards.

Glass Focus 2019 winners revealed

British Glass' annual showcase of the UK glass industry, the Glass Focus Awards, took place last November, with companies from across the glass supply chain celebrating their achievements over the past year. Held at the Mercure St Paul's Hotel in Sheffield, the best of what the UK glass sector has to offer was on show, from groundbreaking innovation and the fresh faces of the industry already making a difference.

Saint-Gobain Glass UK was the big winner of the night, taking home three awards, while Encirc also claimed two prizes and Knottingley-based Allied Glass was crowned company of the year following judging by a panel of industry experts.

"Each year, the entries we receive for the Glass Focus Awards showcase excellent examples of what our industry can do, from serving our customers, investing in our workforce, reducing our environmental impact and beyond" commented Dave Dalton, CEO, British Glass. "While the last year has been incredibly uncertain for businesses across the UK, it is testament to our industry that it can consistently produce forward thinking innovations, such as the swabbing robots and use of virtual reality, extend its influence into the communities surrounding the factories and produce beautiful designs that wouldn't be possible in any other material than glass. British Glass is proud of the achievements of all those who entered the awards and of course, our winners and we look forward to seeing what the industry is capable of in the next 12 months."

The full list of winners at Glass Focus 2019 were as follows:

- Design of the Year – container (sponsored by Packaging Collective): The Ardagh Group with the Glenfiddich whisky bottle.
- Design of the Year – flat (sponsored by Glass Technology Services): Saint-Gobain Glass UK for its work on the Macallan Distillery and visitor centre.
- Innovative Solution (sponsored by LIMAB): Encric's state-of-the-art virtual reality training room.
- Health and Safety Action (sponsored by Arco): Joint winners - Encirc and Socabelec for their hot end swabbing robots.
- Sustainable Practice (sponsored by Associated Furnace Technology): Saint-Gobain Glass UK with its 'Glass Forever' post-consumer flat glass recovery and recycling initiative.
- Strengthening Business Through People (sponsored by Glass Futures): O-I's 'Career Ready' community programme.
- Apprentice of the Year (sponsored by the Worshipful Co of Glass Sellers of London): Joe Boyd of Saint-Gobain Glass UK.
- Company of the Year (sponsored by British Glass): Allied Glass.

Steve Severs, Managing Director of Saint-Gobain Glass UK and President of British Glass addresses attendees at the 2019 Glass Focis Awards.

O-I's 'Career Ready' community programme won the Strengthening Business Through People Award.

Joint winners of the Health and Safety Action Award were Encirc and Socabelec.

Glass Focus conference

Preceding the awards ceremony, the future of the glass industry was under the microscope at the Glass Focus conference, as speakers tackled diversity, innovation and the challenges facing the sector.

Representatives from across the glass industry and its supply chain were present to hear from a wide range of speakers, including Glass Person of the Year 2019 Professor Alicia Durán, founder of the Packaging Collective Sanjay Patel and Glass Technology Services' Martyn Marshall, tackling the pressing issues of the sector.

"We were delighted to attract such a varied array of speakers for our ninth annual Glass Focus conference to represent our diverse and ever-evolving sector" Dave Dalton confirmed. "This year, we wanted not only to focus on the future of our industry but also to reflect on the industry as a whole and what more we could be doing to solve the problems we're facing. Glass Focus presents ▸

2019 Phoenix Award winner, Professor Alicia Durán addresses conference delegates.

The Sustainable Practice Award was won by Saint-Gobain Glass UK for its 'Glass Forever' post-consumer flat glass recovery and recycling initiative.

Saint-Gobain Glass UK won Design of the Year – flat for its work on the Macallan Distillery and visitor centre.

Joe Boyd of Saint-Gobain Glass UK was named Apprentice of the Year.

Allied Glass was named Company of the Year.

an opportunity for members of the supply chain not only to celebrate and showcase their achievements but to learn from each other and we hope delegates did just that this year."

Manufacturing Lead at the CBI, Andy Williams kicked off the day by addressing the issues and challenges currently affecting the glass industry, such as the looming skills gap due to an ageing workforce and the resources and waste strategy.

Another challenge facing the modern glass industry is diversity and gender equality, which was tackled by President of the International Commission on Glass, Alicia Durán. Professor Durán highlighted the existing gender pay gap in scientific research and development, as well as the lack of women in high ranking jobs within the industry as whole, citing powerful metaphors to describe the situation – the glass ceiling, the difficulty women face to progress and the sticky floor where women are caught in the lowest ranks.

The focus of the conference shifted towards the industry's future, with talks from Glass Technology Services' Melting and R&D Lead Martyn Marshall and Chair of Glass Futures Brian McMillan. Mr Marshall's presentation first took delegates back into the history of glassmaking to see why the industry did what it did and how it got to where it is now. Looking into the developments on glass forming and composition, new raw materials and glass strength and how past technologies and techniques might be considered again to advance glassmaking for the future.

Glass Futures then took centre stage with an update on the project's progress, the various funding streams being courted by the scheme and the benefits of the project to the glass industry.

The container and flat glass sectors were represented in the final two presentations of the day, with founder of the Packaging Collective Sanjay Patel focusing on the purpose and 'five ps' of packaging (protect, present, promote, position and provide), before British Glass' Aston Fuller highlighted the potential for a circular economy of flat glass through the FISSAC project.

Finally, the day was concluded with a panel discussion, with British Glass CEO Dave Dalton, Glass Technology Services' Martyn Marshall, Green Puffin Consultancy's Emma Bowers and Encirc's Fiacre O'Donnell fielding questions from the audience.

"A highly valuable conference, providing good opportunities to connect with key stakeholders across the UK glass industry" was the conclusion drawn by panel member, Emma Bowers. "The speakers discussed topics that were relevant to the UK industry, as well as topics that remind us to think how we connect with the end consumer of our products and services. It was pleasing to see many questions coming from the audience, highlighting the importance of attracting and retaining future talent to the industry, as well as discussing thoughts behind how we keep innovating and moving the industry forwards, especial

Green Puffin Consultancy's Emma Bowers, Glass Technology Services' Martyn Marshall, British Glass CEO Dave Dalton and Encirc's Fiacre O'Donnell fielded questions during the conference panel discussion.

Encric's state-of-the-art virtual reality training room won the Innovative Solutions Award for Encirc.

Glass Technology Services' Melting and R&D Lead Martyn Marshall took delegates back into the history of glassmaking to see why the industry did what it did and how it got to where it is now.

in light of sustainability and net carbon zero targets."

A wide range of topics were covered by panel experts, including how the industry could attract younger people, future innovations, decarbonisation and glass compared to other packaging materials, to bring an end to an informative day.

Managing Director of Saint-Gobain Glass UK and British Glass President Steve Severs commented: "A range of thought-provoking papers were delivered that offered glimpses into the future of glass manufacturing and processing in the UK, which offered challenge around best practise and developing accepted wisdom to allow UK players to face the competitive environment head-on with the tools to survive and excel."

In addition to *Glass Worldwide*, sponsors of Glass Focus 2019 included Arco, CutPRO, Glass Futures, *Glass International,* Glass Technology Services, LIMAB and The Worshipful Company of Glass Sellers of London.

Brian McMillan, Chair of Glass Futures updated delegates of the project's progress.

Winner of the Design of the Year – container was the Ardagh Group for the Glenfiddich whisky bottle.

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The international glass decoration community gathered in Düsseldorf last November.

GlassPrint 2019: Strongest ever technical line-up

The international glass decoration community came together last November at GlassPrint 2019 to discuss the latest trends and developments for decorating all types of glass.

Staged for the eighth time and powered by glasstec, an international audience travelled to Düsseldorf, Germany from 24 different countries to attend GlassPrint 2019. They came not only from throughout mainland Europe and the UK but also from long distance destinations such as Australia, Canada, India, Peru, South Africa, United Arab Emirates and the USA.

Key stakeholders represented included glassmakers, decorators, end users, brand owners, OEMs and suppliers, including AGC, Arc, BA Glass, Heinz Glas, LAV/Gürallar, O-I, Piramal, Saint-Gobain, Saverglass, Schott, Steklarna Hrastnik, Vetropack and William Grant & Sons.

Expanded programme

GlassPrint 2019 provided delegates with the opportunity to discover the latest innovative advances in screen printing, dynamic strides in digital print technology and such innovative techniques as direct-to-shape or container printing via a two day programme of conference and networking sessions.

Featuring an expanded technical programme, experts working for various companies in the glass decoration sector then delivered a series of ▸

In a keynote presentation covering the flat glass sector, Luca Oggianu of Glass for Europe looked at energy savings and CO_2 emission reduction.

Tabletop exhibitors promoted the latest developments in inks, pre-press technology, printing equipment and supplies.

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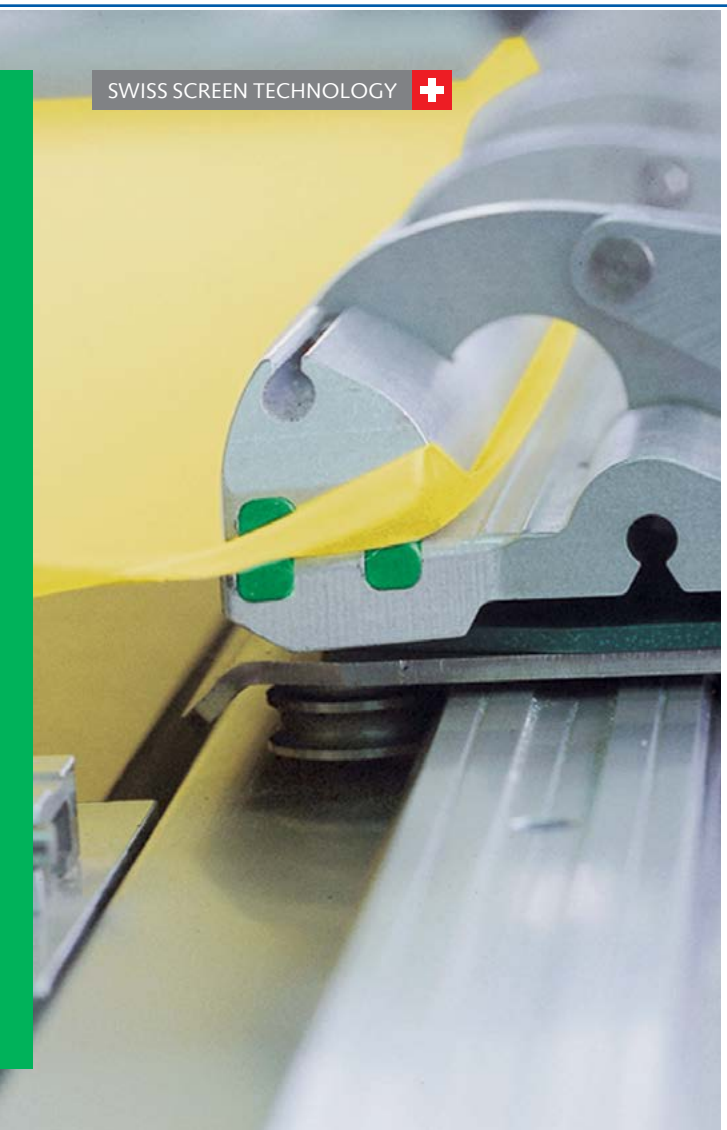

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Expert presenters included Debbie Thorp, Chair of ESMA and Business Development Director at Global Inkjet Systems (GIS).

presentations that demonstrated processes and ideas to add extra value to the end product, cut production costs and make processes more efficient. Presentations included:

- Adhesion of inkjet inks on glass by ChemStream.
- Will it be screen or digital printing on glass bottles? by Curvink.
- Sol-gel inkjet printing for transparent conductors on glass by COMATEC-LANS.
- Making a lasting impression: Image quality, colour management and industrial digital printing by the ESMA Expert Team.
- Digital printing on hollow glass by Fermac.
- Adding value for hollow glass decoration by Ferro.
- Inkjet coating and decoration of flat, container and industrial glass by Global Inkjet Systems.
- Simplifying glass printing with screen and CtS technology by Grünig/SignTronic.
- Direct-to-cylinder: Digital printing on glassware by InkCups.
- High performance CTP system for digital preparation of silk screen forms and pad printing plates by Lüscher.
- Labels are out! Ink challenges and opportunities in direct to container glass inkjet printing by Marabu.
- Screen print 2.0 from plastic dial to digital glass display by Marabu.
- Developing dedicated mesh for screenprinting on glass by Sefar.

GlassPrint 2019 attracted an international audience from 24 different countries.

- Automation and control for screen printing on small size flat glass by SPS Technoscreen.
- Surface pre-treatment to enhance adhesion and coverage of organic inks to hollow glass by Tecno5, an affiliate of Cerve.
- Industrial solution for digital printing of windscreens and sidelites by Thieme.

Additional keynote addresses were made covering the flat and hollow sectors. Michael Delle Selve, Senior Communications Manager at FEVE, examined the container glass industry vision to capitalise on sustainability, while Luca Oggianu, Advocacy and Communication Advisor at Glass for Europe, looked at energy savings and CO_2 emission reduction in the glazing sector.

Later, Dr Johann Overath, Director General of Bundesverband Glasindustrie eV, evaluated the current situation and trends in the German glass industry and an update of glasstec 2020 was provided by Birgit Horn, Project Director at Messe Düsseldorf.

Anyone who missed GlassPrint 2019 and would benefit from viewing the proceedings can visit www.esma.com/shop/glassprint to purchase the presentations. ▸

GlassPrint 2019 was powered by glasstec and Project Director Birgit Horn provided an overview of plans for the 2020 event.

Representing the container glass sector, FEVE's Michael Delle Selve was a keynote speaker.

Attendees benefited from networking with their peers and suppliers.

Dr Johann Overath, Director General of Bundesverband Glasindustrie eV, evaluated the current situation and trends in the German glass industry.

Networking opportunities

The conference programme was supported by intervals dedicated to the accompanying tabletop exhibition area and at the end of the first day, delegates benefited from networking with their peers and suppliers during an evening dinner. Exhibitors who displayed the latest developments in inks, pre-press technology, printing equipment and supplies included: AROJA XORFEX, Cerinnov, ChemStream, Curvink, Encres Dubuit, Fenzi, Fermac, Ferro, glasstec/ Messe Düsseldorf, Glass Global, Glass Processing Bernroitner, Global Inkjet Systems, Grünig-Interscreen, Inkcups, ISIMAT, Kissel + Wolf, Koenig & Bauer Kammann, Laboratory of Applied NanoSciences COMATEC-LANS (HEIG-VD/HES-SO), Lüscher, Marabu, PVF, RKS, Saati, Sefar, SIAK Transfers, SignTronic, SPS TechnoScreen, Sun Chemical, Tecno5 (Cerve) and Thieme.

The latest innovative advances in screen printing were presented, in addition to a showcase of digital print technology.

Attendee feedback

Feedback from delegates and exhibitors from GlassPrint 2019 included:

"GlassPrint 2019 showed the importance in the development of digital printing as major trend in glass decoration." *Oliver Dangmann, O-I*

"It was very useful to understand advantages and drawbacks of different technologies and meet providers and new key future partners." *Jorge Ramos, AGP Peru*

"GlassPrint 2019 was a good opportunity to understand the 'world climate' for decoration." *Nuno Rocha, BA Glass*

"GlassPrint 2019 allowed me to be informed and learn more about the current technologies in the market." *Mathieu Schweitzer, SCHOTT*

"Interesting seminar with some new and challenging areas to consider." *Joseph Kelly, William Grant & Sons*

"An excellent, well organised show that far exceeded my expectations. Worthwhile to anyone in fields relating to glass printing/manufacturing." *Jim Denoon, Frontier Drinks*

"Very interesting conference." *Agron Sejdiji, Steklarna Hrastnik*

"An essential event for us in terms of the quality of the conference, access to latest innovations and networking." *Univerre Pro Uva SA*

"Very focused event and a great opportunity to interact with the speakers and suppliers." *Dubravko Stuhne, Vetropack*

"Really enjoyed the whole experience and managed to discuss with industry experts the challenges we are facing. Hope this leads future collaborations with the teams we met." *Allan Docherty, William Grant & Sons*

"GlassPrint 2019 brought together actors from the whole value chain for printing on glass. A very interesting and useful event." *Prof Dr Silvia Schintke, Laboratory of Applied NanoSciences COMATEC-LANS (HEIG-VD/HES-SO)*

Sponsors and organisers

GlassPrint was jointly organised by Chameleon Business Media, publisher of *Glass Worldwide* and ESMA, a European association for specialist printing manufacturers of screen, digital and flexo technology. As well as being powered by glasstec, GlassPrint 2019 was sponsored by Glass Global.

After reaffirming its importance on the global glass events calendar, the organisers are already planning the next edition of GlassPrint; details of the location and dates will appear in future issues of *Glass Worldwide* and interested parties can register their interest at www.glassprint.org. In the meantime, the March/April 2020 issue of *Glass Worldwide* will include the Annual ESMA Glass Publication 2020, a specialist guide to glass decoration. Members of ESMA will also showcase the best in functional and decorative glass printing in a dedicated pavilion at glasstec 2020. ●

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Glasstech Asia 2019

Glasstech Asia 2019 was staged in Jakarta last November, attracting 3500 visitors and conference delegates from 16 different countries. The event was officially opened by guest of honour, Mr Dody Widodo, Senior Advisor to the Minister for Deepening, Strengthening and Spreading of Industry, Ministry of Industry, Republic of Indonesia.

Yustinus Gunawan, Chairman of the Indonesia Flat & Safety Glass Association, addresses delegates in Jakarta. Image: Conference & Exhibition Management Services Pte Ltd.

The three day international glass showcase for the South East Asian architecture and building industries spanned over a gross exhibition area of 10,000m^2 at the Indonesia Convention Exhibition (ICE) and saw the participation of 124 exhibitors from 14 countries including Bottero, Glaston, HarbisonWalker International, HEGLA, Ihara Furnace, Jeffer Engineering & Technology, LiSEC, Muliaglass, Saint-Gobain, Vesuvius and WALTEC. The showcase was jointly organised by Conference & Exhibition Management Services (CEMS) and Singapore Glass Association (SGA). The event was hosted by Indonesia Flat & Safety Glass Association (AKLP) and locally partnered with Royalindo Convention International.

Glasstech Asia 2019, which was held concurrently with Fenestration Asia 2019, played an important role as a learning hub when it hosted two conferences for delegates who represented all areas of the architectural glass industry - The Living Glass Conference 2019 by Indonesia Flat & Safety Glass Association and the soft launching of Greenship NETZERO conference by the Green Building Council Indonesia.

The conferences presented topics pertaining to the growth outlook for the construction and flat glass industries in Indonesia and ASEAN, the applicability of glass in Indonesian and ASEAN architecture, as well as a forum to discuss achieving sustainability for building facades. Both conferences were attended by prominent glass associations from around the region, leading architects and experts from the construction and glass manufacturing sectors.

For the first time, the Glasstech Asia event featured a Glass Installation Competition bearing the theme 'Fabricated Transparency'. A total of five glass exhibitors - Toko Wahyu Abadi, PT Himalaya Jaya Abadi, PT Glassindo Adimukti Abadi, PT Fantasi Aneka Gelas International and Simpati Kaca took part in the competition, where they were given the challenge to perfectly install glass panels on window steel frames within an allotted period of time, in the presence of a panel of judges and audience. Toko Wahyu Abadi won the competition as the Gold trophy winner, Simpati Kaca and PT Himalaya Jaya Abadi were awarded the Silver and Bronze trophies respectively at an award presentation ceremony.

The event was supported by the Association of the German Trade Fair Industry, Australian Glass & Glazing Federation, Flat Glass Alliance of the Philippines Inc, Glass and Glazing Federation, Green Building Council Indonesia, Malaysia Glass Association, Malaysian Institute of Architects, National Glass Association, Philippine Chamber of Glass & Aluminium Industry Inc, Safety Glass Processors Association of Malaysia, Taipei Glass Commercial Association, Taiwan Association of Machinery Industry, Thai Plate Glass Industry Association, United Architects of the Philippines Singapore Chapter and Vietnam Glass Association. ●

Further information:
web: www.glasstechasia.com.sg

Coating lab opened during Coating Competence Days

During the first Grenzebach Coating Competence Days, the company opened a specialist coating laboratory, which is geared to the requirements of glass coating. According to Dr Jens Ellrich, the lab can process glass widths of up to 3.4m and is equipped with state-of-the-art coating technology from strategic partners Solares Advanced Coatings (Belgium) and Advanced Energy Industries (USA).

Staged at Grenzebach headquarters in Hamlar, Bavaria, the Coating Competence Days event brought together experts from all over the world to discuss glass coating for the present and the future. Participants discussed new technology requirements and learnt how revision times for production lines can be designed more efficiently with digital capabilities.

A jumbo glass coater is available at the Hamlar site for research and development as well as for other laboratory-driven tasks. The coating laboratory is ready to handle jumbo size glass substrate widths for all major application areas and the relevant coatings for high end products. Starting with dielectrics (eg Si_3N_4 or TiO_2), ultra-thin metal and barrier coatings (eg Ag and NiCr), up to coatings for special applications in the display and solar industry, as well as transparent conductive coatings (ITO, ZnO, ZnMgO). The Coating-Lab, type GB 3300 for jumbo size glass offers all properties of a production plant and is equipped with leading edge technology of today's large area coating industry.

Renato Luck, CEO of the Grenzebach Group, welcomes participants to last October's Coating Competence Days "With the new Coating-Lab, we emphasise the strategic meaning of the coating sector to our company. With the application of the most recent technologies and ongoing development, we continuously strengthen our leading position within the flat glass sector."

Strengthening position within coating sector

"With the new Coating-Lab, we emphasise the strategic meaning of the coating sector for our company" commented Renato Luck, Grenzebach Group CEO. "With the application of the most recent technologies and ongoing development, we continuously strengthen our leading position within the flat glass sector. Our experts in the Coating-Lab are available to our partners and customers to answer difficult questions, as well as to provide training. With Soleras Advanced Coatings with its headquarters in Belgium and Advanced Energy Industries with its headquarters in the US state of Colorado, we have strategic partners with extensive experience and technology knowhow to drive forward innovative technologies on an international level."

Strong participation

During the Coating Competence Days last October, 30 industry visitors took a closer look at the potential of the

The team around Dr Jens Ellrich, Head of Coating Technology at Grenzebach, demonstrates the immense influence of efficient revision procedures and the shortest possible maintenance times on the efficiency of coater lines.

The Coating-Lab, type GB 3300 for jumbo size glass offers all properties of a production plant and is equipped with state-of-the-art coating technology from strategic partners Solares Advanced Coatings (Belgium) and Advanced Energy Industries (USA).

lab coater, discovering how large area coating can be further optimised and how the latest innovations can be implemented for energy conservation purposes.

Testing advanced hardware components can be undertaken on the equipment, as well as samplings. Furthermore, Grenzebach offers a professional training environment for all who are interested. "Together with Soleras Advanced Coatings and Advanced Energy, we can utilise our new lab to look into coating technologies of tomorrow", says Egbert Wenninger, Senior Vice President Business Unit Glass.

During Coating Competence Days last October, 30 industry visitors took a closer look at the Coating-Lab's potential.

Use revision times even more efficiently

The team around Dr Jens Ellrich, Head of Coating Technology at Grenzebach, demonstrates the immense influence of efficient revision procedures and shortest possible maintenance times on the efficiency of coater lines. SERICY, the digitisation platform developed at Grenzebach, opens more avenues. Furthermore, with the use of digital instruments, the performance of coating lines with regards to quality and quantity can be developed further.

Into the factory of tomorrow

With SERICY, Grenzebach has developed a platform that allows digital solutions and advanced features with tangible added value for customers; solid steps towards the factory of the future. Via the IIoT platform, all sequences in production, the warehouse and the shipping department can be controlled; equipment parts and devices from numerous manufacturers can be integrated.

Data management and analysis enable users to continuously develop production based on their own information. The integration of data of the coating line provides extensive process control, which in the future will also allow almost complete automation within the field of coating technology and set standards in economics. Only the implementation of the most recent methods for data logging, saving and analysis allows this quantum leap. Grenzebach experts indicated how digital technology helps to improve the process performance of coaters in the chambers and coating stations.

With apps that rung on the SERICY platform, a series of assistance systems for employees to use in the coating sector are possible. The spectrum extends from the Maintenance Manager for planned system maintenance to the Settings Manager saving machine settings and providing a time stamp.

Upgrades and handling technology

The fully automated PVD coating equipment from Grenzebach allows the production of all demanding coatings required by today's market for large area glass products - from sun protection applications to high quality insulating glasses (low-e coatings).

For global customers, Grenzebach experts continuously push developments within the field of PVD coating and take care of the installation, commissioning and production start of new coating lines. Aside from the core of the equipment, the coater, Grenzebach implements conveyor, cutting and handling technology. Needless to say, comprehensive upgrades for existing systems are also part of the company's portfolio. ●

The jumbo glass coater is available for research and development as well as for associated laboratory tasks. The equipment is ready to handle jumbo size glass substrate widths for all major application areas and the relevant coatings for high end products.

The Coating-Lab at Grenzebach headquarters in Hamlar.

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The UK Suppliers Alliance Seminar attracted a cross-section of attendees from the UK glass manufacturing community.

2019 UK Suppliers Alliance Seminar

The second UK Suppliers Alliance Seminar attracted an impressive cross-section of people from the UK glass manufacturing community to Barnsley last November.

Fruitful discussions on the Fives and Glassworks Hounsell tabletops.

Attendees benefitted from 18 presentations covering the activities of member companies of the UK Suppliers Alliance.

Staged by a collection of leading suppliers to the international glass industry including DSF Refractories & Minerals, Fives, Glassworks Hounsell, Graphoidal Developments, Heat-Up, Pennine Industrial Equipment, Pro-Sight Vision, Rondot GB and Sheppee International, 18 presentations provided glassmakers in attendance from various sectors with the opportunity to learn more about the host companies and improve their manufacturing processes via well-established technologies that were detailed alongside recent product launches.

Company and technical presentations

Representing DSF, a major supplier of bonded refractories to the glass industry with customers in over 60 countries in the different sectors, Paul Hutchinson briefed attendees on an extensive product range that includes DSF Frimul FX, a fused mullite product; Chemcast CAZ20, an ethyl silicate bonded cast AZS product; and DSF Calex TBR, using calcium aluminate. Having partnered with Fosbel to develop a different way of building regenerators from large interlocking blocks, the Reblock innovation was also introduced.

A leading manufacturer of silent inverted tooth conveyor chain and sprockets that are used in the transportation and handing of container glass, tableware and stemware, Pennine's Graham Womersley detailed the Calibre two pin chain designed for high speed, as well as recent developments including Pennlock, a rapid connecting system, the Steel Head Protector and the Swift Link head protector for single pin operation. The company has released a number of special designs to meet the ever-changing demands of the glass industry.

Stephen Sherlock and Sergio Silva of Fives Stein, part of the Fives Glass Division and a leading equipment supplier for high quality melting and conditioning for all types of glass, emphasised the company's commitment to innovation, research and development and its strategy for sustainability (lowering CO_2 emissions for larger scale glass melting

furnaces). Looking to the future with a roadmap towards industrial implementation, opportunities for the Eco-Flex hybrid furnace were described.

As a market leader in the development and supply of innovative hot ware handling solutions, Sheppee International's Andy Ross and Roy Clarkson explained to attendees that the critical role of ware handling has never been more prevalent and that integrated systems can enhance and increase production, as well as eliminate human error during set-up. Recent innovations were presented such as the CCA-1250 cross conveyor with open belt return and the TRI-FLEX 7 axis ware handling system with lehr belt tracking to eliminate associated base defects.

Lincoln Brown of Pro-Sight, designer and manufacturer of an innovative range of small, flexible and mobile glass container inspection machines with a complementary series of cold end ware handling systems, detailed the success of the company's Tuck Under Measurement System and introduced the Full Finish Inspection Machine for highly accurate dimensional measurements. Other innovations covered included the Production Efficiency Monitoring System with its mobile app for real-time production line monitoring and the recently introduced 'Slo-Mo' industrial CCTV video capturing system with slow motion playback, along with examples of custom-designed machines such as a pneumatic stacker for decorating lehrs, a lehr unloader and refurbishments of old North American ramp pressure testers.

Clive Ward from Heat Up looked at future developments for furnace cameras and image analysis to deliver refractory movements. Opportunities for a blow head camera and blow mould monitoring were also explored. Having built many combustions systems for forehearths and regularly made special adaptations to systems, Heat Up specialises in combustion engineering and camera systems.

Rondot GB was founded in 2010 to serve the UK market. Jordan Chappelow covered the company's latest range of IS inspection equipment with added functionality and benefits, including the Speedgob 3, Handy 6 pyrometer and TOMCAT hot end coating thickness tester. Delivery equipment and hot end consumables made for increased performance were also described. For Sonicam, the latest generation of machines in areas such as vibration gauging, container volume inspection and automatic scanning were introduced, as well as RGB's extensive range of IS variable equipment and state-of-the-art digital printing technology from Fermac.

On behalf of Graphoidal Developments, specialising in lubrication and coating products for the container and tableware sectors, Mark Johnston and Richard Pike ▸

Graphoidal, Rondot GB and Sheppee are all members of the UK Suppliers Alliance.

DSF exhibited as the UK's largest manufacturer of shaped refractories.

Pro-Sight used the event to launch its Full Finish Inspection Machine.

Lincoln Brown (LB) and Graham Womersley (GW) outline the history, activities and future goals of the UK Suppliers Alliance.

What are the origins of the UK Suppliers Alliance?
GW: The concept started about eight years ago when a select group of UK suppliers considered the options of working together to leverage influence with exhibition organisers. The initial idea was to consider sharing stands and costs by having increased buying power as a group. Strangely enough, there has not yet been an example of us all exhibiting together as such a group but we continue to evaluate all options.
LB: Where an individual member can't justify the expenditure for a certain show, it could be that presence on a group stand would be beneficial… we certainly remain open to all future opportunities.

What initiatives has the alliance undertaken in that time?
LB: The original idea morphed into working out latterly that we could co-operate together as a group when beneficial to all concerned. For example, the alliance offers to co-ordinate visits to the UK of existing and potential overseas clients from the container, flat and fibre sectors, providing transportation and logistical assistance for visits to some or all members. When a customer is already visiting one member, we can help them maximise their trip.
GW: There have been many successful examples of this and when international customers have visited, we have been able to present them with other opportunities from throughout our group.

How pleased are you with the progress from the inaugural seminar to the second event last November in Barnsley?
LB: Very pleased. The first seminar went well but the second event grew significantly and attracted approximately double the number of customers. There is a technical emphasis on content for the seminar and we hope that everyone who attended learnt things they didn't know previously. New technology and new innovation is what it's all about.
GW: Many of the visitors and hosts really enjoyed the carefully planned format of combining presentations with coffee and lunch breaks that provided the chance to network in the tabletop exhibition area and to touch and feel what was seen during the presentations. It worked really well.

What is the target audience for the seminars?
LB: We were really pleased to see quite a few graduate engineers in the audience, because that was a key goal for our original concept. Although senior personnel would benefit from attending too, the vast majority of information presented at the seminar would have been new to graduate engineers. In the future, the technology from alliance members will be at the forefront of their minds when they are shaping the future of glass production… Pro-Sight received at least three interesting enquiries initiated by the seminar.
GW: There were hot and cold end personnel at the seminar, with eight factories represented, not just from the hollow sector but from other areas like glass fibre manufacturing too. As well as our core customers, the seminar provided Pennine with an opportunity to have potentially very interesting discussions with attendees that wouldn't necessarily normally be considered our main target customers. Members of the alliance involved in melting technology are also interested in flat glass attendees of course and in terms of sectors attracted by our initiatives, we want to cross boundaries even further.

Graham Womersley, Sales Director at Pennine.

Lincoln Brown, Managing Director of Pro-Sight.

detailed innovations including the Smart Gob 3D camera, the latest addition to its range of products. Benefits described include weight reduction, job change time reduction and stabilisation of the gob cutting process. Successful installations in France were referenced.

William Brinkman of Glassworks Hounsell explained how charger and charging improvements lead to a more scientific understanding of material behaviour and distribution within the furnace, as well as the overall effects and impacts that charging has on melting, glass quality equipment performance, furnace life and capital investment. Glassworks Hounsell is a global supplier of all types of batch charging and feeding equipment for furnaces of all shapes, sizes and glasses. The company is also renowned for tin oxide (SnO_2) electrode and connector systems for use in the electric melting of special glasses.

Networking

Many fruitful discussions were also conducted at an associated tabletop exhibition area and during accompanying lunch and dinner events. The next seminar is provisionally scheduled for 2021. ●

Pennine exhibited conveyor chains for hot end glass handling.

Further information:

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Pro-Sight Vision
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web: www.pro-sight-vision.com

Rondot Graphoidal Britain Ltd
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web: www.risegroup.io/rise-group-companies/rgb/

Sheppee International Ltd
email: sales@sheppee.com
web: www.sheppee.com

Forthcoming events

FEBRUARY 2020

4-5 February: CelSian training course 'Introduction to glass melting' (Manchester, UK)

18 February: CelSian training course 'Introduction to heat transfer in glass melting furnaces' (Eindhoven, the Netherlands)

19-20 February: CelSian training course 'Introduction to energy efficiency and CO_2 emissions' (Eindhoven, the Netherlands)

25-26 February: Glassman Asia (Seoul, South Korea)

MARCH 2020

10-11 March: CelSian training course 'Introduction to raw materials and melting' (Eindhoven, the Netherlands)

12-13 March: CelSian Expert training 'Redox, fining and glass quality' (Eindhoven, the Netherlands)

17-18 March: CelSian training course 'Introduction to combustion and emissions' (Sheffield, UK)

23-26 March: ICCG13 (Braunschweig, Germany)

30 March: CelSian training course 'Introduction to glass defect diagnosis' (Eindhoven, the Netherlands)

31 March – 2 April: GlassTrend seminar on innovative raw materials and processing technologies for sustainable glass production (Antwerp, Belgium)

APRIL 2020

13 April: GPD China (Shanghai, China)

14-17 April: China Glass (Shanghai, China)

18-19 April: Deco '20 (Cleveland, USA)

MAY 2020

7-13 May: interpack 2020 (Düsseldorf, Germany)

13-14 May: Glassman Latin America (Monterrey, Mexico)

JUNE 2020

1-5 June: CelSian Glass Technology Course (Toledo, USA)

3-4 June: Furnace Solutions Conference 15 and training day (Stoke-on-Trent, UK)

3-6 June: Glass South America (Sao Paulo, Brazil)

4 June: GPD South America 2020 (Sao Paulo, Brazil)

8-11 June: Mir Stekla 2020 (Moscow, Russia)

15-19 June: Joint USTV/DGG annual meeting (Orléans, France)

17-19 June: Intersolar Europe (Munich, Germany)

24-26 June: ATIV International Conference (Parma, Italy)

SEPTEMBER 2020

2-4 September: Society of Glass Technology Annual Conference 'Challenges & Changes' (Cambridge, UK)

15-17 September: GlassBuild America 2020 (Las Vegas, USA)

20-24 September: ICG/ESG Annual Meeting (Krakow, Poland)

OCTOBER 2020

5-9 October: CelSian Glass Technology Course (Eindhoven, Netherlands)

20-23 October: glasstec 2020 (Düsseldorf, Germany)

26-29 October: 81st Conference on Glass Problems (Columbus, USA)

29-30 October: CelSian Expert training 'Redox, fining and glass quality' (Detroit, USA)

NOVEMBER 2020

10-11 November: CelSian training course 'Introduction to glass container forming' (Eindhoven, the Netherlands)

17-18 November: CelSian training course 'Introduction to flat glass forming' (Eindhoven, the Netherlands)

glasspex INDIA 2019 and glasspro INDIA 2019

The sixth glasspex INDIA exhibition, organised by Messe Dusseldorf India and the third glasspro INDIA event, also organised by Messe Dusseldorf India in conjunction with *Glass Bulletin* took place from 10 to 12 October 2019 at Bombay Convention and Exhibition Centre, Mumbai.

Last October's combined event provided a global platform for India's key glass players from the flat, container and tableware sectors to discuss industry trends, challenges and market insights, including the Indian regulatory framework. Both trade shows presented product launches and innovations via an exhibition, associated conference and awards ceremony. glasspex INDIA and glasspro INDIA featured 195 companies from 14 countries, bringing together 5547 trade visitors and 150 conference delegates.

The event brought together many key dignitaries, including Mr R K Mittal, President of AIGMF; Sanjay Somany, former President of AIGMF; Gyan Madani, Chairman of Mumbai Chapter, Builders Association of India (BAI); Birgit Horn, Director and Global Head, Occupational Safety & Health and Glass Technologies at Messe Düsseldorf GmbH; Lakhan Singh, Editor and Publisher of *Glass Bulletin*; and Dave Fordham, Publisher of *Glass Worldwide*.

Speaking at the opening ceremony, Birgit Horn commented:

glasspex INDIA and glasspro INDIA attracted 5547 trade visitors.

"It is an honour for me to welcome you as the Director of glasstec - the globally leading event for the glass industry - and as the representative of Messe Duesseldorf. Thanks to the exceptional work done by our team of Messe Duesseldorf India and with the support of our esteemed partners, we are able to present the complete value chain of the glass industry under one roof. glasspex INDIA has developed into the Indian glass industry's leading event. It is the meeting point for exchanging ideas, contact making and business deals. glasspro INDIA has set up a strong vision with *Glass Bulletin*.

"Both shows provide the most efficient platform to support the technological development and the business trade in the Indian glass market. We thank our partner associations for their great support and co-operation. Through these combined efforts, we are able to put together this exhibition."

glasspex INDIA was officially opened by Anand Nair (Messe Duesseldorf India), Lakhan Singh *(Glass Bulletin)*, Thomas Schlitt (Messe Dusseldorf India), Gesine Bergmann (VDMA), Sanjay Somany (HNG / AIGMF), Birgit Horn (Messe Duesseldorf) and Dave Fordham *(Glass Worldwide)*.

AIGMF dignitaries in attendance included current President Raj Kumar Mittal (right) and former President Sanjay Somany.

The AIGMF International Conference was officially opened by a selection of Indian and international VIPs.

Industry 4.0 conference focus

A highlight of glasspex INDIA was the 'Glass Industry 4.0' conference, the 13th International Conference of the AIGMF (All India Glass Manufacturers' Federation), which was supported by *Glass Worldwide* and powered by VDMA and Messe Dusseldorf India. Chaired by *Glass Worldwide's* Dave Fordham, with additional moderation from Dr Devendra Kumar and Dr K Annapurna from Central Glass and Ceramic Research Institute (CGCRI), the conference programme included various industry discussions, the latest insights pertaining to the sector and best practices. The conference presentations included:

- Furnace optimisation and NOx reduction (AMETEK Land).
- Aesthetics and functionality through glass (Central Public Works Department (CPWD), Ministry of Housing and Urban Affairs, Government of India).
- Industry 4.0: A pragmatic approach (Eurotherm by Schneider Electric).
- Glass recycling – Potentials for Indian glass manufacturers (EME).
- Fully automatic lines for chemical strengthening of glass (Glamaco).
- Sophisticated glass handling and processing in the era of Industry 4.0 (Grenzebach).
- National Building Code: Glass and glazing aspects (Federation of Safety Glass (FOSG); GSC Glass Ltd; and Glass, Glassware and Laboratoryware, Technical Committee of Bureau of Indian Standards).
- Glass marking - When traceability becomes an obligation (HEGLA).
- Energy savings in glassmaking: Importance of correct vacuum setting (Pneumofore).
- Refractory materials challenges in soda lime glass feeders (Saint-Gobain SEFPRO). ▸

The conference programme featured panel discussions.

The AIGMF International Conference brought together glass industry stakeholders for the exchange of ideas.

As preferred partners, AIGMF and *Glass Worldwide* jointly exhibited at glasspex INDIA.

Mascot celebrates golden anniversary

Mascot Engineering Co used the occasion of glasspex INDIA to commemorate the company's 50th anniversary, staging a dinner and cocktail reception that was well attended by a cross-section of the Indian glass industry and Mascot's European principals.

Founded in 1969 by its Chairman, Mohan Lalvani, Mascot Engineering is among a select group of organisations representing leading international equipment and materials suppliers to the Indian and Sri Lankan glass manufacturing industry. Today, the company represents many leading suppliers from Germany and other European countries including Accuramech, Ambeg, EME, Guangzhou LING NAN REFRACTORY Co Ltd, IMACA, Pennekamp, Optical Inspection System, PD-Refractories, Rosario c2c and SORG.

www.mascot.in ●

- SORG forehearth systems: The SORG 340S+ forehearth and the SORG colouring forehearth system (SORG)
- Modern automation systems in batch plants and cullet recycling plants (ZIPPE).

The two day AIGMF International Conference hosted 15 papers and three additional Q&A sessions that brought industry stakeholders together on a single platform, allowing the exchange of ideas that added value to the Indian glass ecosystem at large. Several special events included the unveiling of the AIGMF's 'Adopt a Glass Bottle for Healthy Environment'.

Awards platform

A key attraction of glasspro INDIA was the 4th *Glass Bulletin* Awards, organised by *Glass Bulletin* and supported by Messe Dusseldorf India. This event honoured personalities and stakeholders for their outstanding contributions and achievements to the local flat glass industry. Twenty nine prizewinners were recognised (in 12 prize categories) for their contribution to industry growth.

The main trade show received support from leading industry associations, including AIGMF, CCPS, Builders Association of India, The Madras Glass and Plywood Merchants Association, Chhattisgarh Glass Association, Ludhiana Glass Dealers Association and Noida Glass Traders Association, RGMA and Glazing Society. ●

The 13th International Conference of the AIGMF was supported by *Glass Worldwide* and powered by VDMA and Messe Dusseldorf India.

Further information:
web: www.glasspex.com

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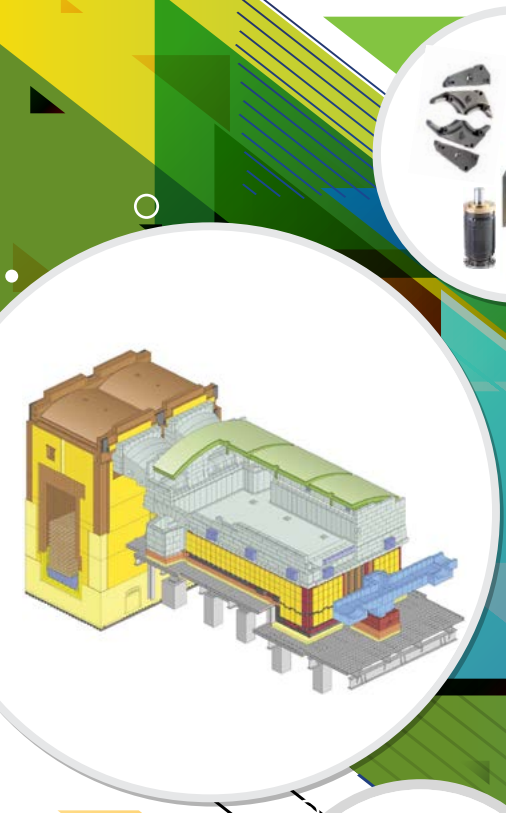





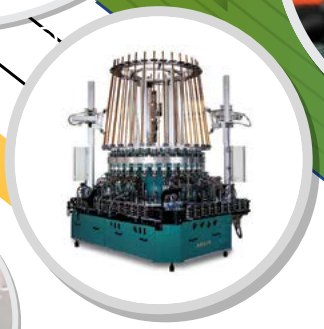


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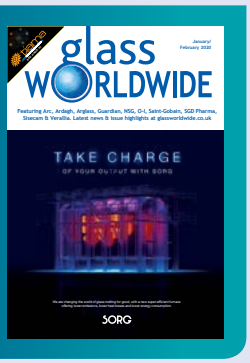

Boosting EU glass recycling to 90% by 2030

FEVE
The European Container Glass Federation

The European glass packaging industry has set in motion 'Close the Glass Loop', a major stewardship programme to boost glass 'collection for recycling' rates to 90% by 2030 in the EU. The move comes as a proactive response to EU rules to increase net recycling targets for glass packaging to 75% by 2030.

Michel Giannuzzi, Predident of FEVE.

Today, over 76% of glass packaging placed in the European market is collected for 'bottle to bottle' recycling, already putting the circularity of glass in a league of its own.

Industry CEOs have unanimously agreed to set up the 'Close the Glass Loop' programme, with the common ambition to achieve an EU-wide 90% collection for recycling target for glass packaging by 2030. The programme will be shaped in the coming months with value chain partners, with initial discussions on collaboration already underway. The official platform launch is planned for June 2020.

"Our goal is to keep increasing the sustainability credentials of the glass packaging solutions we provide to our customers and consumers" stated FEVE President Michel Giannuzzi. "We are proud to lead 'Close the Glass Loop', an industry-wide initiative that will have real benefits for the market and our planet alike. It is our call for action to deliver an ambitious Circular Economy Action Plan for glass."

This initiative will bring together the different stakeholders of the glass collection and recycling loop under a common European platform, with a two-fold objective of closing the collection gap and improving the quality of recycled glass, so that resources remain productive in a bottle-to-bottle manufacturing loop. More availability of good quality cullet means a more resource-efficient production process, providing a premium level, safe and truly recycled packaging material.

It all starts with collection. The 'Close the Glass Loop' programme will boost collection and involve the many committed European and national partners, from municipalities, to glass processors and industry customers, including the Extended Producer Responsibility schemes operating across EU Member States. "To be successful, we need to work locally in every EU Member State, while sharing best practices and raising ambitions via a European platform" Michel Giannuzzi stressed. "We don't believe in a single European model for glass collection but we do believe in a single ambition."

"We are very proud to have been able to set the foundations for such an ambitious programme, which has very strong support inside the membership and perfectly matches the objectives of both the UN Sustainable Development Goals (SDGs) and the European Green Deal of the new European Commission" Adeline Farrelly, Secretary General of FEVE added. ●

Further information:
FEVE – The European Container Glass Federation, Brussels, Belgium
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web: www.feve.org

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