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glass WORLDWIDE

September/
October 2019

Featuring Johns Manville, O-I, Siam Glass, Sisecam & Verallia + technology & events. Latest news & highlights from this issue at glassworldwide.co.uk

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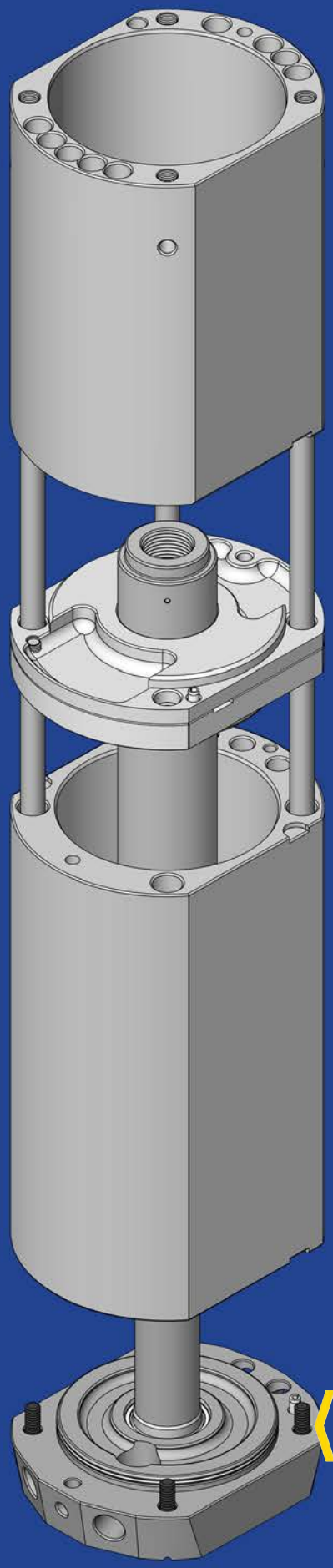

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Welcome

The glass industry's search for effective CO_2 neutral glass production solutions is increasingly focusing the minds and finances of international glassmakers and their technology suppliers, as well as leading members of the global academic community. Similarly, sustainability is now placed either at the top of the glassmaker's future strategic agenda, or at least close to its zenith.

Increasingly, both subjects dominate the editorial pages of the industry's leading publications, as advocates of electro-heat, hydrogen and other innovative technologies discuss their respective potential benefits. The latest issue of *Glass Worldwide* sits at the heart of the debate, with the first of a two part Buyers Guide devoted to advances and opportunities in glass melting technology, including seven specially prepared contributions. Part two of this feature will be published in the November/December 2019 issue.

Also in the latest issue are two specially compiled Spotlight features that address key aspects of the industry's current priorities. This includes an assessment of Verallia's recently strengthened environmental strategy and how it fits within the group's broader approach to corporate social responsibility. Readers will also discover a series of articles devoted to the prospects and opportunities for the proposed Glass Futures centre of excellence in research and development, innovation and training. Dave Dalton, CEO of British Glass, describes the project as "a colossal opportunity for the glass sector", while O-I's Ludovic Valette contends that the Glass Futures concept "sets a new precedent in safeguarding both an industry and those that will manage it by supporting an ethos of collective capability in problem solving."

The O-I glass container factory in Estonia is the subject of an exclusive Factory Spotlight feature, as is the fourth Siam Glass Industry bottle manufacturing facility in Thailand. Separately, Aaron Huber, Senior Research Manager at Johns Manville, GMIC board member and Chairman of the ICG's TC21 technical committee, is the subject of this issue's exclusive Personality Profile interview, while Verallia Group Chairman and CEO Michel Giannuzzi is On the Spot, having recently been named President of the European Container Glass Federation.

Specially compiled Focus Brazil and Italy features are included, alongside a series of Supplier Focus interviews and Technology reports, contributed by some of the glass industry's leading vendors, as well as previews and reports from key conferences and exhibitions. In this respect, prospective delegates are invited to register for the GlassPrint 2019 conference, which takes place in Düsseldorf, Germany on 27-28 November. This event is organised by ESMA, in association with Chameleon Business Media, publisher of *Glass Worldwide*.

We hope you enjoy reading your latest issue.

John Wallis, Editorial Consultant
johnwallis@glassworldwide.co.uk

For latest industry news and highlights from this issue, visit **www.glassworldwide.co.uk**

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HOT TOPICS

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ATIV Associazione Tecnici Italiani del Vetro
Official journal of ATIV
www.ativ.eu

FEVE The European Container Glass Federation
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www.feve.org

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

Calls for an International Year of Glass

Over the past 60 years, the General Assembly of the United Nations has recognised important global initiatives and their contributions to society, with declarations of United Nations International Years. Against this background, an international groundswell has developed to pursue a United Nations International Year of Glass for 2022 that will underline the technological, scientific and economic importance of glass. With its unparalleled versatility and technical capabilities, glass has fostered numerous cultural and scientific advancements in communications, optics, energy and medicine.

The concept of a United Nations International Year of Glass was first introduced at the 2018 annual meeting of the ICG in Yokohama, Japan. Encouragement received at this meeting gave rise to renewed effort to secure a United Nations International Year of Glass for 2022. This would coincide with ICG's International Congress on Glass in Berlin, Germany during the 100th anniversary of the German Society of Glass Technology.

Extensive planning is now underway on an international level to make possible a UN Year of Glass. Part of this planning process is to reach out to both art and scientific glass-themed societies and museums and share this concept with them. Formal endorsements will be requested to permit arriving to a successful resolution at the UN General Assembly in July 2020.

www.icglass.org ●

Bolivian container project inaugurated

Bolivian President, Evo Morales recently participated in the inauguration of the country's first glass container plant in Zudanez, Chuquisaca. The 130 tonnes/day Envibol regenerative, end-fired furnace has been constructed as a turnkey project by Italy's BDF Industries.

An innovative electric boost system has been employed, while all mechanical and electrical equipment was developed by BDF's Automation Department.

www.bdfindustriesgroup.com ●

Oscar Sandy and Nélida Sifuentes start the furnace heat up at Envibol.

Sisecam float furnace rebuilt in Bulgaria

Sisecam has completed a €42 million furnace rebuild at the group's Targovishte float plant in Bulgaria. Europe's largest flat glass producer, Sisecam operates two float lines in the country, plus extensive capabilities to make coated, laminated and silvered glass, as well as specialist facilities for the manufacture of automotive and domestic appliance materials. In addition, two furnaces are operated in Bulgaria to make household glassware.

"We will continue our investments in modernisation and capacity increases at our Bulgarian manufacturing facilities" Sisecam Group Vice Chairman and CEO Professor Ahmet Kirman confirmed. "In addition to these investments, we contribute to the Bulgarian economy with the employment of about 3250 people as a result of our operations and aim to increase the labour force with new projects."

The group's investments in Bulgaria have reached €600 million in total to date.

www.sisecam.com.tr ●

Continued European production growth

Primary industry data gathered through FEVE shows European glass container production continued to grow in 2018, confirming positive trends of previous years, although at a slower pace which is line with prevailing sluggish macro economic trends.

Glass container production among FEVE members grew by 217,000 tonnes from 2017 levels (1%), while unit production remained unchanged. Overall production now stands at 21,755,000 tonnes and 78,662 million units, 10% and 9.8% increases relative to 2012 levels respectively.

Glass is recognised more than ever as the leading packaging material for spirits, wines and beer, while it is increasingly gaining share in the food, water and dairy sectors. It is the second leading packaging material in Europe in terms of volume.

www.feve.org ●

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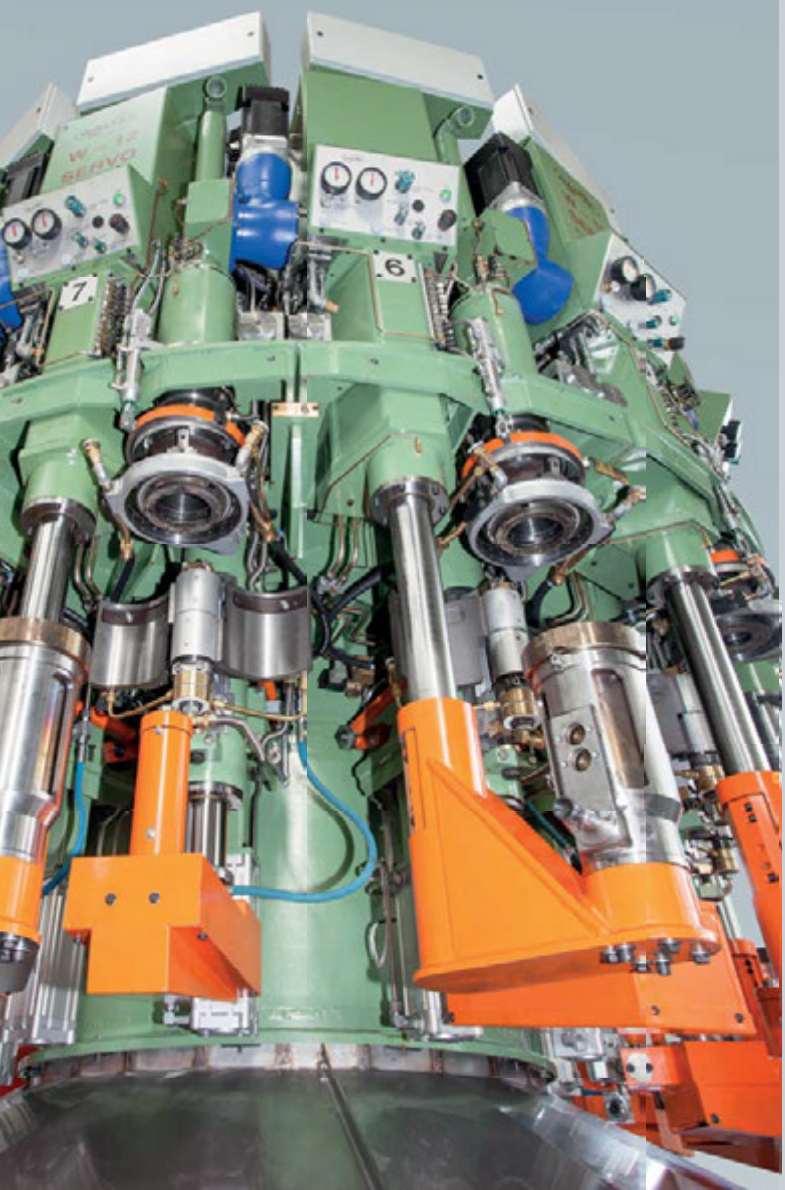

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Joint investment in USA natural soda ash production

Two of Turkey's leading industrial conglomerates, each with important glassmaking and raw materials production interests, have announced a partnership agreement to produce natural soda ash in the USA's Green River, Wyoming area. Sisecam Group, already one of the world's leading players in synthetic soda via its Soda Sanayii AS subsidiary, is to make the investment with Ciner Group, who maintains significant knowhow in natural soda production.

Sisecam Group is one of the world's top seven synthetic soda ash producers, with an annual production capacity of 2.4 million tons. This involves 1.4 million tons at the Mersin soda plant in eastern Turkey, 585,000 tons at Lukavac in Bosnia and Herzegovina and 375,000 tons in Bulgaria, where the group operates a production partnership with Solvay.

Ciner Group is the world's largest natural soda producer, thanks to its total production capacity of seven million tons/year. This comprises 2.7 million tons in Kazan and 1.8 million tons at Eti Soda from solution mining operations in Turkey and 2.5 million tons in the USA via conventional mining.

Operations are expected to start in 2024, following acquisition of the necessary operating permits and licenses.

www.sisecam.com.tr ●

Mountain Valley Spring Water has signed a long-term supply agreement with Ardagh Group, Glass – North America.

Packaging agreement for glass water bottles

Ardagh Group, Glass – North America has signed a long-term supply agreement to be the exclusive supplier of glass bottles for Mountain Valley Spring Water. Bottling spring water since 1871, Mountain Valley was the first to deliver bottled water coast to coast for US consumers.

Using water that rises naturally from a spring in the Ouachita mountains, Mountain Valley chooses to bottle its award-winning premium spring and sparkling waters in glass to preserve the quality and taste. Ardagh Group manufactures Mountain Valley Spring Water's green glass water bottles for its Spring Water, Sparkling Water and Sparkling Essence varieties in 333ml, 500ml, 750ml and one litre sizes.

www.ardaghgroup.com ●

Exhibitor registration opens for glasstec 2020

On-line exhibitor registration has opened for next year's glasstec exhibition in Düsseldorf, Germany. Staged on 20-23 October 2020, glasstec is again expected to attract more than 40,000 visitors from some 120 countries and in excess of 1200 exhibitors from over 50 nations. Exhibitors can register using the direct link www.glasstec-online.com/2330. Companies that participated in 2018 can use already pre-completed and editable forms. The allocation of stand space will start after the registration deadline of 1 December 2019.

www.glasstec-online.com ●

Tiama and Ermi agreement finalised

Two of the international glass container industry's leading suppliers of inspection and process control technology have finalised a co-operation agreement. Specialist French supplier Ermi has become a Tiama entity, after Ermi encountered financial difficulties. Bringing together the complementary skills of Tiama and Ermi is expected to guarantee the continuity of customer support, with Tiama taking over all sales activities.

www.tiama.com ●

Brazilian float project features German raw materials handling technology

ZIPPE Industrieanlagen GmbH recently commissioned a turnkey batch plant installation for AGC at the glassmaker's second float line in Guaratingueta, Brazil. Apart from the batch plant, the contract included cullet return equipment, as well as steelwork.

In addition, the specialist German company was responsible for delivering advanced batch charging technology, supplying its float charger type EO 2525 TH equipment, with a charging capacity of 280 tonnes/day per machine. In total, four machines feed the 850 tonnes/day furnace.

The associated plant control system features modern automation technology with a highly reliable architecture. A redundant SPS control system and two SCADA servers guarantee safe plant operation.

www.zippe.de ●

The ZIPPE batch plant installation at AGC in Guaratingueta, Brazil.

Long-term relationship reinforced with leading Russian glassworks

The establishment of close working relationships between IRIS Inspection machines and its customers throughout the world has been critical to the development and long-term success of Evolution inspection solutions for hollow glassware. Today, Evolution inspection equipment is operated by many of the international glass container industry's key players, with installations throughout Europe, Asia, the Middle East and the Americas.

It was in 2005 that Russian glass packaging specialist 'LLC Glass Factory January 9' acquired its first Evolution 12 machine from IRIS Inspection machines. In the subsequent 14 years, a strong relationship has developed between the two companies, with eight camera-based cold end inspection machines having been installed at the Vyshniy Volochek glassworks, located between Moscow and Leningrad. This includes both Evolution 12 and Evolution 5 systems for sidewall/sidewall stress and base/finish/base stress inspection respectively.

Recently, the decision was taken to modernise this equipment. The hardware and software for all eight machines has been upgraded and converted to the latest Evolution NEO technology, making it capable of operating like brand new, smart inspection equipment. The Evolution NEO's ability to discriminate intelligently between saleable and non-saleable containers has been widely appreciated by customers, together with its simplified adjustment procedures and reproducibility features. In addition, glassmakers benefit from the equipment's Industry 4.0 readiness, with the availability of intelligent data for process improvements.

'LLC Glass Factory January 9' was established in 1892 and over the decades, has built up considerable experience in the design, development and manufacture of high quality bottles and jars for the alcoholic and non-alcoholic beverage and food sectors. Based at Vyshniy Volochek in Russia's Tver region, the flint ware specialist operates advanced manufacturing technologies that have been sourced from some of Europe's leading suppliers.

The longstanding partnership between the January 9 management team and IRIS Inspection machines has benefited all parties. Based on mutual trust and a belief in the benefits of business co-operation, this successful relationship is expected to continue long into the foreseeable future.

www.iris-im.com ●

Celebrating 15 years of successful partnership between 'LLC Glass Factory January 9' and IRIS Inspection machines.

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TESTIMONIALS FROM PREVIOUS ATTENDEES:

Previous GlassPrint participants include ABInBev, AGC, Apple, ARC, Ardagh, Corning, Deco Glas, Diageo, Guardian, Heinz, Libbey, Nokia, Nestlé, NSG/Pilkington, O-I, Saint- Gobain, Schott, Sisecam, The Absolut Company, Verallia and many more!

"GlassPrint event gives the real opportunity to get in a short time the latest updated information regarding printing on glass. Very valuable." **O-I**

"A lot of important information." **AGC Glass Group**

"Meeting in one place all the major players in glass printing was very valuable for our business." **Nestlé**

"Good venue and good facilitating combined with interesting speakers made for a good conference." **Ardagh Group**

"The presentations as well as the exhibition were very useful to learn about new technologies and products in the glass printing industry." **Schott**

"Small but very interesting conference, as most of the actors of glass decoration are present." **Saint-Gobain**

"A very interesting conference allowing for a great deal of networking. Really good presentations that covered a wide range of topics…" **Allied Glass**

"GlassPrint was an interesting event." **NSG Pilkington**

"Every two years there is an event where we meet the 'who's who' of the glass decoration industry." **Rastal**

"Very interesting presentations covering many interesting business areas in combination with personal meetings." **The Absolut Company**

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	TIME	PRESENTATION	PRESENTER
DAY 1 (27 NOVEMBER)	10:00	Arrival, registration and table top exhibition	
	11:00	Introduction and welcome.	Chameleon / ESMA
	11:15	KEYNOTE PRESENTATION	FEVE
	11:45	Digital printing on hollow glass	Fermac
	12:15	Screen print 2.0 from plastic dial to digital glass display	Marabu
	12:45	Lunch and table top exhibition	
	14:00	Inkjet coating and decoration of flat, container and industrial glass	Global Inkjet Systems
	14:30	Adding value for hollow glass decoration	Ferro
	15:00	Adhesion of inkjet inks on glass	ChemStream
	15:30	Coffee break and table top exhibition	
	16:00	Simplifying glass printing with screen and CtS technology	Grünig/SignTronic
	16:30	Direct-to-cylinder: Digital printing on glassware	InkCups
	17:00	KEYNOTE PRESENTATION: German Glass Industry – Situation and Trends.	BV Glas (Bundesverband Glasindustrie)
		KEYNOTE PRESENTATION: glasstec 2020 – current status and future outlook.	glasstec / Messe Düsseldorf
	18:00	Table top exhibition	
	19:00	Networking buffet dinner and table top exhibition	
	21:00	Close	
DAY 2 (28 NOVEMBER)	08:00	Table top exhibition	
	08:55	Welcome to day two	Chameleon / ESMA
	09:00	KEYNOTE PRESENTATION	Glass for Europe
	09:30	Surface pre-treatment to enhance adhesion and coverage of organic inks to hollow glass	Tecno5, an affiliate of Cerve
	10:00	High performance CTP system for digital preparation of silk screen forms and pad printing plates	Lüscher
	10:30	Coffee break and table top exhibition	
	11:00	Developing dedicated mesh for screenprinting on glass	Sefar
	11:30	Will it be screen or digital printing on glass bottles?	Curvink
	12:00	Industrial solution for digital printing of windshields and sidelights	THIEME
	12:30	Lunch and table top exhibition	
	13:30	Making a lasting impression: Ink adhesion to glass	Oliver Kammann, ESMA Expert
	14:00	Automation and control for screen printing on small size flat glass	SPS Technoscreen
	14:30	Labels are out! Ink challenges and opportunities in direct to container glass inkjet printing	Marabu
	15:00	Sol-gel inkjet printing for transparent conductors on glass	COMATEC-LANS
	15:30	Table top exhibtion	
	16:30	Close	

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Focus on high volume automotive interior glass parts

Corning Inc recently conducted the opening ceremony for its Automotive Glass Solutions facility in the Hefei Xinzhan Hi-Tech Industrial Development Zone in Anhui Province, China. This high volume manufacturing facility will enable the company to deliver AutoGrade Gorilla Glass parts for automotive interiors directly to automakers around the world as they incorporate more displays and technical glass into their vehicle designs.

Introduced earlier this year, AutoGrade cover glass parts widen the window to reliably and economically enabled next generation automotive designs, led by consumer demand for more in-vehicle connectivity and immersive driving environments. This milestone builds on the company's decades-long leadership in the display, mobile consumer electronics and automotive markets.

With designs evolving to incorporate larger, curved and higher resolution automotive displays, there is increased demand for technical glass developed to withstand rigorous automotive industry standards, while delivering smartphone sophistication.

www.corning.com ●

Sisecam container production capacity reaches 1.3 million tons in Turkey

Sisecam has commissioned an $18.2 million furnace at the group's Mersin glass packaging plant, raising the group's total production capacity in Turkey to 1.3 million tons. The 80,000 tons annual production capacity furnace is equipped with the latest Industry 4.0-compliant technology.

Today, Sisecam is the world's fifth largest glass packaging manufacturer, with 10 production sites in four different countries. In Turkey, where the group operates 12 furnaces and plants at Bursa, Eskisehir and Mersin, manufacturing capacity has been increased by 30% in the past three years.

www.sisecam.com.tr ●

Sisecam has commissioned an $18.2 million furnace at the group's Mersin glass packaging plant.

Emhart acquires Symplex vision systems business

Munich-based Symplex Vision Systems has been acquired by Bucher Emhart Glass. The innovative German equipment supplier will be integrated into Bucher Emhart Glass, while assembly and engineering remain in Munich.

Bucher Emhart Glass will continue to sell and support the existing Symplex product portfolio, involving inline inspection systems and hot end process monitoring sensors, alongside the Emhart FleXinspect machine portfolio. These offerings complement each other and address different markets and customer needs.

"With this acquisition, we have become even stronger and our range of products and services is enhanced" says Martin Jetter, President of Bucher Emhart Glass. "With the purchase of Symplex Vision Systems, we have acquired products and expertise in the field of inspection and sensor technologies for today and for the future, supporting our End to End vision. This is a further milestone to support our customers with their tasks and challenges."

www.emhartglass.com ●

Regenerative end-fired furnace success

Germany's SORG was responsible for designing the major furnace conversion recently commissioned at Heinz Glas Dzialdowo in Poland. An existing recuperative installation, with a melting capacity of 70 tonnes/day for cosmetics glass, has been replaced by a state-of-the-art end-fired furnace, with a melting capacity of 150 tonnes/day. This capacity is expandable up to 180 tonnes/day via the use of electric boosting.

The SORG end-fired furnace with STW working end is connected to six STF production lines, two of which are equipped as colouring forehearths. The equipment for melting end and forehearths with SCADA system, including integrated cooling systems, corresponds to the latest technical standards. Regarding safety technology, the highest level according to DIN/EN 746-2 was implemented with redundant SORG gas supply and safety control for melting end and forehearths. The latest WSH burner holders and modular stirrers are featured, as well as the SORG Conti-Drain.

Conversion of the furnace from a recuperative to a regenerative design required a technology change. The completely different concept necessitated extensive construction measures, as well as an intervention in the existing structure. It represented a challenging exercise for everyone involved but since the start of production, the glass quality has met the high demands of Heinz Glas and the total energy consumption is lower than specified.

www.sorg.de / www.heinz-glas.com ●

The latest Heinz Glas Dzialdowo investment project in Poland includes a 12-section production line.

The SORG furnace at Heinz Glas Dzialdowo in Poland.

Italian furnace rebuild project

Italy's Vetrerie Riunite started important furnace construction work at the end of July. Since demolishing the old furnace, foundations for its replacement have been laid by a project team led by Plant Director Giuseppe Velli and the construction company Bertoli Costruzioni.

www.vetrerieunite.it ●

Pilkington invests to increase structural glazing capacity

Pilkington UK Ltd has invested more than £3 million to meet growing market demand for its Pilkington Planar structural glazing system. The glass manufacturer has acquired a state-of-the-art toughening furnace, an increased capability heat soak oven and a glass measuring device.

Scheduled to be operational by August, the toughening furnace will be located at the Pilkington Architectural site in St Helens. The investment increases the size capability of the toughening furnace and heat soak oven to 6000mm x 3000mm, while the recently developed measuring device will enhance the manufacturer's quality control systems and processes for the benefit of customers.

www.pilkington.com ●

Pilkington UK Ltd has acquired a state-of-the-art toughening furnace, an increased capability heat soak oven and a glass measuring device to meet growing market demand for its Pilkington Planar structural glazing system.

Gladbeck float glass line renovated

NSG Group has spent approximately €30 million on the modernisation of a float line in Gladbeck, Germany. At the end of April, the GL2 production line, which produces flat glass primarily for the automotive industry, was taken out of service for a planned cold repair. As a result, a 20% improvement in furnace energy efficiency is expected.

The furnace's emission control systems and dust filters have been modernised as part of this project. In addition, the latest cutting tables and cutting technology for stacking uncut glass sheets have been installed at the cold end.

www.pilkington.com ●

Website relaunched

UK-based Glass Technology Services has completed its rebranding process with the relaunch of its website. Built with a responsive layout, the website ensures a consistent cross-device user experience, as well as improved navigation and enquiry processes, making it easier for visitors to access the information they need and contact the company for technical support. The rebuild includes a refresh of the free 'glass weight estimator' and 'effective U-value' calculators.

www.glass-ts.com ●

Flat glass washing solutions

The recently created enterprise Yalos Bavelloni srl specialises in the design and manufacture of high end machinery for flat glass washing. Majority-owned by Bavelloni SpA, the company was created in partnership with Claudio Cigoli and Paolo Pezzoli to develop the widest range of solutions for flat glass washing and drying.

The company's product range includes both standard models, such as horizontal and vertical washing machines, available in all sizes and configurations, as well as customised solutions and special applications to meet all market needs.

Danilo Cigoli, Managing Director, will lead Yalos Bavelloni, with the aim of developing the company internationally, thanks to the synergies with Bavelloni and with its sales network.

www.bavelloni.com ●

Italian recycling specialist acquired

Minerals group Sibelco has acquired Italian glass recycling specialist Macoglass srl. The company's plants cover an area of over 50,000m², with advanced technologies for the authorised processing of 210,000 tons/year of various kinds of cullet. The acquisition complements Sibelco's existing presence in the Venice area, enhancing its position in the recycling sector, while improving its ability to partner with local customers to support future growth.

www.sibelco.com ●

Recycling tops the class for 150,000 UK children

A national education campaign organised by glass manufacturers in the UK has seen 150,000 children and more than 1000 primary schools in all regions pledge to recycle glass to help save the environment. The 'Glass Guardians' campaign used Maths, English, Sciences and PSE activities to help children aged 5-11 understand why recycling glass is important and how to carry on doing it long-term.

The children, including those at 80 schools in Scotland, promised to carry on recycling and 300 schools entered a competition to show how much they meant it. One school entered from as far afield as Accra in Ghana. The judges looked for creative, original pledges that showed effort and an understanding of the issues surrounding recycling and environmental impact.

The best pledge made was won by Fetterangus school in Aberdeenshire, with the Scottish primary school receiving an Amazon Fire 7 tablet and £500 worth of equipment vouchers. Their pledge took the form of a video, with the children singing an adapted version of 'Ten green bottles'.

www.britglass.org.uk ●

Machine vision specialist completes headquarters expansion

Applied Vision Corp has completed its most recent building expansion, which significantly enhances its ability to serve a rapidly growing global customer base. This extra space allows Applied Vision to expand its research and development and manufacturing capabilities, while continuing to focus on sustainability by maintaining surrounding vibrant green space.

"Following our record breaking fiscal year in 2018, we want to continue to invest back into our business, providing the best products and service possible to our customers, while also providing employees with the best facilities and work environment" commented Manijeh Novini, Applied Vision's Chief Financial Officer.

www.appliedvision.com ●

Extra space has allowed Applied Vision to expand its research and development and manufacturing capabilities.

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Long-term bottle supply agreement for leading vodka brand

Ardagh Group's Limmared plant in Sweden has finalised a 10 year agreement with The Absolut Company to supply glass bottles for its Absolut Vodka brand. At its core, the partnership will focus on sustainability, innovation and future growth. Both companies are committed to keeping their environmental impact as low as possible and the agreement will ensure that carbon emissions are further reduced in the production of the iconic glass bottles.

Owned by Pernod Ricard, The Absolut Company is Sweden's single largest exporter in the food sector, accounting for approximately 10% of its food exports. Sustainability is at the core of the company's operations and its Ahus distillery is carbon neutral, with the residue product, stillage, reused for animal feed.

Ardagh's production facility in Limmared has been the leading supplier of the Absolut Vodka bottle since the brand's launch 40 years ago. More than 100 million Absolut Vodka bottles are produced every year in Sweden's oldest operating glassworks, founded in 1740. The bottles are produced using more than 40% recycled glass. In fact, 60% of all Swedish recycled clear glass is used in the production of Absolut Vodka bottles.

The agreement lasts until 2029 and is The Absolut Company's largest supplier agreement. It not only secures capacity for future growth but will also provide access to world class innovation and quality.

www.ardaghgroup.com ●

Ardagh Group's Limmared plant in Sweden has finalised a 10 year agreement with The Absolut Company to supply glass bottles for its Absolut Vodka brand.

Solar installation to power NSG Group's European Technical Centre

NSG Group and Lightsource BP have opened a 2.29MWp solar installation at the glassmaker's European Technical Centre in Lathom, UK. The project, which is fully funded by Lightsource BP, is hard-wired into the private electricity network at Lathom. It is expected to provide some 30% of the site's annual electricity demand and reduce carbon emissions by 848 tonnes per year.

The project is especially significant for NSG Group, as the installation showcases solar modules from First Solar, one of NSG Group's largest global customers. The glass within the solar modules was manufactured by NSG Group and the research and development for the glass was conducted at the European Technical Centre itself.

www.nsg.com ●

Gold Starpack Award for engineering innovation

The Starpack Industry Awards panel has presented a gold award for engineering innovation to O-I: EXPRESSIONS, a service conceived to build brand engagement, consumer satisfaction and loyalty, as well as demonstrating premium value. Now in its 60th year, Starpack is the premier annual awards scheme recognising innovation in packaging design and technology. As well as a focus on design excellence, Starpack also recognises the challenges that have been overcome and developments in packaging creation.

Paul McLavin of O-I UK receives the Starpack Award.

O-I: EXPRESSIONS enables late-stage design, combining the integral benefits and heritage of glass with an agile, marketing-focused capability. Brands use the technology to create personalised and customised glass packaging at flexible volume, industrial speeds and affordable value, with an unprecedented range of colour and design possibilities, compared to traditional decoration solutions.

O-I: EXPRESSIONS RELIEF will also offer brands the opportunity to use customised tactile digitally printed effects, such as embossing and coloured embossing, by printing 3D designs directly onto glass. The judges also recognised improved sustainability. Organic inks are used that do not impact the recyclability of glass and help reduce waste through lower inventories.

www.o-i.com ●

Seminar set to address process automation and 'big data'

Recognising that progressing automation and utilisation of 'big data' can offer major opportunities to increase production efficiency in the glass manufacturing industry, GlassTrend will stage a 'Process automation and big data' seminar in Munich, Germany on 17-19 September 2019.

The seminar will be hosted by Linde AG, a member of the GlassTrend organisation that is a consortium of worldwide operating companies working in the field of glass and glass production, comprising glass producers and suppliers of raw materials, refractories, sensors, furnaces and process automation.

Including representatives from Linde, Siemens, Owens Corning and Sisecam, knowledgeable speakers from inside and outside the glass industry will present their views on Industry 4.0 and sensors and control systems to GlassTrend members and invitees.

www.glasstrend.nl/events ●

Targeting relevant themes, GlassTrend seminars are attended by engineering and R&D leaders from the international glass industry.

Refractories training course scheduled

Lucideon is running a two day training course focused on 'Refractories for the glass industry' in Stoke-on-Trent, UK on 9 and 10 October 2019. The module will cover glass furnaces on day one and regenerators on day two, looking at the parts, conditions, requirements and refractory types required. The course content covers the applications, constraints and characteristics, critical properties and interactions between refractory and glass that can cause glass defects.

www.lucideon.com ●

People & posts

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

Owens Corning management appointment

Todd Fister has been named President, Insulation, at Owens Corning, succeeding Julian Francis, who has stepped down to become President and Chief Executive Officer of Beacon Roofing Supply.

Mr Fister, who reports directly to President and Chief Executive Officer Brian Chambers, was previously Vice President, Global Insulation and Strategy. Prior to this role, he served as Vice President and Managing Director for European Insulation and Global Foamglass.

www.owenscorning.com

GPI President named

Scott DeFife.

The Glass Packaging Institute has announced the appointment of Scott DeFife as its next President, effective 19 August. Assisted for the past 11 months by Joseph Cattaneo, the GPI Board of Trustees and its executive leadership team worked diligently to find the right fit for the organisation and its members.

Mr DeFife will spearhead the association, as the US glass container industry continues to develop and sharpen its focus in the areas of marketing, advocacy, sustainability and other issues of importance. Among his many accomplishments, Scott DeFife most recently served as Vice President of Government Affairs for the Plastics Industry Association, where he worked to advance the organisation's sustainability advocacy work, including upgrading the USA domestic recycling infrastructure. Prior to that, he led federal and state government affairs, as well as communications activity for the National Restaurant Association.

www.gpi.org

Training and R&D focus

Corinne Claireaux.

Corinne Claireaux recently joined Netherlands-based CelSian Glass & Solar from Saint-Gobain Research.

Having studied a PhD in material science at the University of Pierre and Marie Curie and a Master degree from University of Rennes, she started working for Saint-Gobain Research in 2015 as an R&D Engineer and was promoted to R&D Project Leader in 2017. Her last role focused on formulation and optimisation of various glass compositions including mineral wool.

Corinne Claireaux joins CelSian as a glass scientist and will support the company's future growth, with a focus on training and R&D projects.

www.celsian.nl

Architectural glass marketing specialist

Nathan McKenna.

Nathan McKenna has been appointed Segment Marketing Manager at Vitro Architectural Glass, USA. In this role, he will provide marketing support for the company's residential, commercial and specialty divisions. He will also oversee the company's marketing plans and support its architectural teams throughout the USA and Canada.

Mr McKenna joined Vitro Glass in 2015 as a National Architectural Manager. He had previously worked at Columbia Commercial Building Products, Dallas, where he served as Glass Division Manager.

www.vitroglazings.com

North America flat glass machinery focus

Marco Schiavon has been appointed CEO of Forel North America, overseeing the company's operations in St Paul, Minnesota and Toronto, Ontario. Mr Schiavon has been employed at Forel for over 30 years and has gained extensive experience in the glass industry.

During his career, Marco Schiavon has held various positions of responsibility within the organisation and has extensive experience within the North American market.

www.forelspa.com

Batch plant construction partnership

European batch plant specialists ZIPPE Industrieanlagen GmbH and Lahti Glass Technology Oy have confirmed the appointment of Henry F Teichmann Inc as exclusive sales agent and construction partner for the USA and Canada. The partnership aims to add value to North American glassmakers, providing them with technology from two experienced and well known raw material handling companies, coupled with HFT's local expertise, experience and support.

This collaboration provides clients with a single point of contact and responsibility for the turnkey supply of ZIPPE and Lahti equipment, improving communication and removing risk from projects. The partnership will also allow the group to better support existing operations and equipment through after-sales service and parts support.

ZIPPE and Lahti offer accuracy and quality in all areas of raw materials handling and related technology; from material receipt, through storage, weighing, dosing/mixing, transport, preheating, batch charging and glass recycling.

Pittsburgh, USA-based engineering and construction company HFT has over 70 years' experience in managing and executing glass industry projects, with a successful track record. The company provides glassmakers throughout the world with engineering, procurement, construction, startup/commissioning and support.

www.zippe.de

Packaging creation at the forefront of virtual reality

The latest version of Verallia's Virtual Glass packaging creation tool is helping customers to obtain realistic renderings of their projects in record time. The result of a significant R&D effort, this digital tool makes it possible to create and visualise glass packaging filled, labelled and encapsulated with a realism never previously achieved.

At the forefront of virtual reality and 3D computing technologies, Virtual Glass is said to generate hyper-realistic renderings of unprecedented quality in terms of image definition. These renderings include up to six models and can be used for communication purposes (online catalogue, promotional visuals etc).

Accessible from Verallia's customer portal, it only takes a few clicks to generate a realistic look and feel for a complete package. After choosing a bottle from the catalogue, customers can add the content and/or a cap of their choice and import their own labels. They then visualise their product project, placing it in a neutral or realistic scene and can compare it with another project or an existing product.

Launched in France, Italy, Spain and Portugal, Virtual Glass will soon be available in all countries where Verallia is present.

www.verallia.com


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The O-I glass container plant in Järvakandi, Estonia specialises in the production of bottles for premium spirits brands.

Business success for Estonian container glass specialist

Following a €25 million upgrade in 2015, the O-I glass container plant in Järvakandi, Estonia has specialised in the production of bottles for premium spirits brands. Kaido Turro, Plant Manager, discussed the plant's current performance and priorities with John Wallis.

This year, O-I's plant in central Estonia celebrates its 140th anniversary of continuous glass production. Earlier in its history, the Järvakandi site manufactured sheet glass and fabricated architectural windows but it is now a specialist manufacturer of flint and extra flint bottles and jars for the premium spirits, food and non-alcoholic beverage sectors.

The factory was converted completely to glass packaging production in 1991, when owned by Finland's Ahlstrom Corp. Ahlstrom (now Ahlstrom-Munksjö Oyj) also operated two container glassworks in Finland at that time.

The Estonian glassworks became part of the global Owens-Illinois network in 1995 and is now one of 10 manufacturing plants in the North/Central Europe region, managed by Michael Prechtl. The site's experienced Plant Manager is Kaido Turro. Other regional glassworks are strategically located in Dubi and Nove Sedlo (both Czech Republic), Bernsdorf, Holzminden and Rinteln (all Germany), Leerdam and Maastricht (both Netherlands) and Jaroslaw and Poznan (both Poland) to provide extensive market coverage (continued on page 24).▸

Plant Manager Kaido Turro and his team are pleased that a significant investment has been made at Järvakandi in recent years.

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Business growth

Located on a six hectares site, the Järvakandi factory provides employment for 160 people and is one of the largest employers in this rural area of central Estonia, approximately 80km south of Tallinn. Two decades ago, some 280 people worked at the site but a gradual process of improved productivity and enhanced automation have seen numbers stabilise at the current level, whereas total output has increased significantly in the intervening period.

A major refurbishment four years ago enabled a reassessment of the glassworks' capabilities, its customer focus, quality levels and performance. The investment was an important part of O-I's growth programme in Europe and succeeded in optimising efficiency, enhancing capabilities and better serving the changing needs of customers.

Flint bottles produced at Järvakandi.

Although the glassworks moved from two furnaces down to one, total daily output was increased to 270 tonnes, serving four production lines. Central to the project were the installation of a highly efficient oxy-fuel furnace, an oxygen production facility and a proprietary cullet preheating system. Furthermore, O-I has plans to supply recovered heat to the local community for district heating.

Currently, the plant's flint and extra flint output satisfies not only local needs but also significant demand from Finland, Scandinavia and neighbouring Baltic nations. Furthermore, prior to the latest economic downturn, Russia also represented a valuable market opportunity, with lucrative orders generated from brewers and other customers in nearby St Petersburg. "We are really pleased that such a significant investment was made at Järvakandi" Kaido Turro confirms. "The furnace has performed very well since commissioning and we have been operating at very high levels ever since."

A recent annual inspection confirmed that the furnace is holding up well and Mr Turro's team is confident that its expected life will be met, if not exceeded.

The Järvakandi production shop features two 10-section double gob IS machines, together with two 6-section double gob machines to cater for the spread of job runs demanded by customers. This setup leaves room to grow in the future and optimise production capacity further. In addition, the management team is considering the merits and viability of adopting multiple jobs on the same machines. "It is not a complicated investment to conduct production in this way but we need to be certain that sufficient small run business can be identified to make it viable" Kaido Turro confirms.

Elsewhere in the factory, significant investments have been made at the cold end, assisting the glassmaker to undertake the latest sophisticated inspection techniques.

Export priority

Kaido Turro is quick to point out that the development of strong export orders has always been critical to the

Amber Gold flint premium bottle produced at Järvakandi.

success of the O-I operation. With a population of just 1.3 million, a glass factory in Estonia has the capacity to serve export markets as well. Direct exports currently represent approximately 75% of sales, while many of the orders generated from Estonian customers are also destined for international markets. A comprehensive ware range is produced, extending from capacities of 8cl miniatures to 1.75 litre. In total, some 200 million bottles are produced every year.

Prior to 2015, the process of frequent colour changes on two old furnaces had been very time-consuming, so O-I's decision to concentrate the Estonian plant on flint has brought about many important benefits. There is negligible local demand for coloured glasses and other O-I plants in the North/Central Europe region are better suited to service such orders. And if necessary, the Järvakandi factory always has the capability to employ forehearth colouring on one of its four production lines.

Similarly, Järvakandi is sometimes called upon by other O-I operations to fulfil specialist extra flint orders, as part of a co-ordinated regional strategy.

Family celebration

As the Järvakandi plant celebrates its 140th anniversary, a series of events have been organised throughout the year to mark this special occasion. The glassworks sits at the heart of a glassmaking area with a rich tradition, with its own high quality sand reserves some 200km away – in fact there are examples of family members having been employed by the plant over several generations. Now, the glassworks has become a successful part of the global O-I family over the past 23 years. Significant technological investments have been made to cater even better to the requirements of its target audience and a positive future is anticipated for this customer-centric operation. ●

Further information:
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tel: +372 48 92 204
web: www.o-i.com

Influencing the future of furnace innovation

As Senior Research Manager at Johns Manville, Aaron Huber is responsible for designing glass furnaces and developing innovative technologies associated with the glass fibre manufacturing process. Dr Huber spoke exclusively to *Glass Worldwide* about his career history and present-day responsibilities, as well as his role as a GMIC board member and Chairman of the ICG's TC21 technical committee.

Dr Aaron Huber, Senior Research Manager for Glass Melting at Johns Manville.

Dr Aaron Huber has been closely associated with the North American glass industry for the past three decades, working for two of the industry's leading players. A passion for research has featured throughout, with his early years at the Ford Motor Co's Glass Division, followed by an ongoing 20 year career at the glass fibre producer Johns Manville.

As Senior Manager for Glass Melting at Johns Manville, he is responsible for technology innovation, furnace design, conducting furnace post mortems and the CFD modelling of processes. This includes monitoring and forecasting furnace campaign life, thereby affording adequate time to prepare for rebuilds. Historical knowledge gained from furnace campaign post mortems and production histories, along with CFD modelling tools, are employed to develop the best design for a location and business need.

Premium insulation specialist

Johns Manville is a Berkshire Hathaway company and leading supplier of premium quality products for building insulation, mechanical insulation, commercial roofing and roof insulation, as well as fibres and non-wovens for commercial, industrial and residential applications. E-glass, C-glass and several specialty glass compositions are produced.

Target markets include aerospace, automotive and transportation, air handling, appliance, HVAC, pipe and equipment, filtration, waterproofing, building, flooring, interiors and wind energy. In business since 1858, the Denver-based company has annual sales of more than $3 billion and holds leadership positions in all key markets served.

Forty two manufacturing facilities are operated in North America, Europe and China, more than a third of which are glass fibre manufacturing plants. According to Aaron Huber, every glass melting process is designed to meet or exceed business needs and regulatory requirements and depending on product and location, designs vary to meet specific objectives.

Passion for research

Aaron Huber's father had been a professor at Purdue University and in his youth, Aaron enjoyed assisting with research projects and building customised equipment for agriculture research plots. This passion for research and building led him to pursue a degree in mechanical engineering. Although planning to attend Purdue University for a master's degree focusing on composite materials, he was offered the opportunity to complete a master's degree project at the USA National Science Foundation sponsored Advanced Combustion Engineering Research Center, located at Brigham Young University. Accepting the combustion research project provided exposure to computational fluid dynamics (CFD) and the thermal sciences, while designing and constructing a pilot reactor to conduct experiments.

Following this experience, his focus of attention switched from composite materials to heat and mass transfer and in 1993, earned a doctoral degree in mechanical engineering from Purdue University with Dr Raymond Viskanta. Dr Viskanta was one of the early developers of glass furnace modelling.

Aaron Huber's main doctoral work was in the area of heat and mass transfer, with a focus on impingement heat transfer. To provide financial support in graduate school, in 1989 he also started working on glass manufacturing projects. This included spectral remote sensing of the temperature distribution in flat glass (infrared temperature sensors) and the tempering of glass, while also participating in reviews of CFD modelling work for the Ford Motor Co's Glass Division. And on completion of his doctoral degree, this led to a position as a Technical Specialist in the Glass Division at Ford Motor Co.

At Ford, Aaron Huber worked on process design and development, the development and implementation of ▸

The Johns Manville Technical Center in Littleton, Colorado, USA.

Aaron Huber presented a paper at the 17th International Seminar on Furnace Design and Operation.

infrared sensors for process control and optimisation, advanced controls and computer modelling (CFD). "Ford Motor Co and my manager at the Glass Division encouraged publications and participation in conferences" he recalls, a philosophy that provided valuable exposure to the glass industry. "When the US Department of Energy decided to target the top energy-intensive industries with workshops and research funding, I was able to participate in the glass industry meetings."

In 1995, he was invited to draft the USDoE Glass Technology Roadmap for the flat glass sector, which was subsequently combined with the other glass segments into the 1996 published roadmap Glass: A Clear Vision for a Bright Future. This work was the precursor to the formation of the Glass Manufacturing Industry Council (GMIC).

It was in 1999 that Ford Motor Co decided to close/sell off its Glass Division facilities. Via one of the glass industry contacts made through the USDoE-sponsored workshops (Foster Harding, Senior Scientist at Johns Manville), a technical position was offered at the Littleton Colorado Technical Center. Aaron Huber has been working at Johns Manville ever since.

His initial focus was on developing computer modelling capabilities and implementing advanced control for glass manufacturing processes in the Advanced Manufacturing group. This group evolved into the Process Research and Development group and then into the present-day Process Technology group. "I serve as Senior Manager for Glass Melting and have responsibility for new technology, furnace design and the CFD modelling of glass melting processes."

Key achievements

According to Aaron Huber, seeing the results from developing and implementing infrared temperature scanners for advanced control on float and tempering lines was one of several highlights realised at Ford Glass. And implementing advanced supervisory controls and measuring the production improvements from 1999 to 2004 at Johns Manville was another. "In addition, the opportunity to use CFD modelling as a tool to evaluate new furnace designs and potential improvements, implement and then measure the very large impact over the past 20 years of furnace operation at Johns Manville has been very rewarding.

"The opportunity to interact with other glass industry professionals has also been a highlight. Those contacts have delivered opportunities to hold technical exchanges with many different glass companies to expand our knowledge base beyond Johns Manville" Dr Huber adds.

"Being involved with the creation and operation of the GMIC over the past 25 years is another achievement. I continue to serve on the GMIC board of directors and served terms as Vice President in 2005 and President in 2006, besides leading the search committee from 2008 to 2010 to hire the current GMIC Executive Director, Robert Lipetz in October 2010."

In addition, Aaron Huber has served as a member of the International Commission on Glass (ICG) TC15 (sensors and controls) and TC21 (modelling of glass furnaces) technical committees since his time at Ford Motor Co and currently serves as Chairman of the recently combined TC21 and TC15 committee, 'Furnace Design and Operation'. He has published more than 25 papers, holds more than 25 patents and has written over 100 corporate archival reports. And in 2017, he was awarded the 7th GS Modelling Award for noteworthy contribution to the glass industry in the field of mathematical modelling.

Innovative technologies explored

The Johns Manville Glass Melting Group strives constantly to produce high quality materials that add value for its customers. This involves addressing furnace campaign life along with production and energy efficiency, while dealing with such constraints as space (footprint) or downstream limitations. Innovative technologies or designs are explored to continually improve with trials and CFD modelling.

CFD modelling is recognised as an important tool to evaluate the latest technologies and designs, as well as trouble shooting operational issues. It is used for a variety of applications including design and operational support of glass furnaces, glass forming and collection processes, as well as fibre glass mat production.

"Trials with burners or batch materials can be conducted but for many important factors, trials are impossible" says Aaron Huber. "Thus, CFD modelling is the most effective tool to evaluate the impact of a furnace design change, such as bubbler or electrode locations or furnace geometry. While it still takes expertise to use the tool properly, the use of CFD modelling has significantly improved glass production during the past quarter of a century."

Carbon footprint reduction emphasis

The first complete glass furnace conversion to oxygen firing conducted by Johns Manville took place in 1989 and was rapidly implemented on other melters. In 1997, the company's first oxygen/natural gas-fired forehearth was also commissioned.

In addition to combustion-fired melters, many all-electric furnaces are also operated by Johns Manville, continuous improvements having led to significant carbon footprint reductions over the past two decades. In May 2019, Aaron Huber presented a paper at the 15th International Seminar ▸

Lighting off forehearth burners.

on Furnace Design, Operation and Process Simulation that provided a general overview of the impact of technology options on CO_2 emissions. He believes there are several existing technology options that can enable the CO_2 reductions required to achieve the 2030 EU requirements and development options to reach the 2050 EU requirements.

In the area of traditional glass melting technologies, Dr Huber hopes to see constant improvement in terms of campaign life, throughput, energy, emissions and cost over the next 20 years. "However, an obstacle for major breakthrough technologies is the lack of funding and support for development" he warns. "Most companies are reluctant to spend funds now for something that will not have a payback in less than two years. This limits possible large technology advances. But the 2030 and 2050 EU regulations on greenhouse gas emission reductions will be an additional driver for larger and more rapid technology improvements. Increased electric boost and reduced combustion input (whether hydrogen or natural gas) will be the trend."

The 80th Conference on Glass Problems on 28-31 October 2019 in Columbus, Ohio will provide 35 hours of technical education through expert lectures, panel discussions and focused courses on many topics, including glass melting, refractories, process control, emissions and raw materials (see pages 168-175).

Building industry relationships

Aaron Huber recognises the benefits to his team and company of maintaining a close involvement with such organisations as GMIC and ICG, which provide valuable opportunities to develop relationships with others in the glass industry and expand the view beyond that of a single company.

"GMIC, for example, supports the industry by promoting the use of glass, representing the industry and providing opportunities for information exchange and interaction" he says. "GMIC membership is beneficial due to the opportunity to interact with other members of the glass industry, to obtain information and help direct promotion and improvement efforts. Hosting workshops, supporting the annual Conference on Glass Problems, disseminating information and exploring development opportunities are all valuable activities." Furthermore, a broader approach to the GMIC's strategic thinking is delivered via the involvement of technology suppliers, as well as glassmakers on its board of officers and trustees.

Among the organisation's many successful innovations has been its preparation and publication of the Glass Manufacturing Industry Report, which provides important information to understand the industry and evaluate individual status. The GMIC also jointly organises the annual Conference on Glass Problems (GPC) together with Alfred University. "The GPC allows many from the North American glass industry the opportunity to see what is occurring globally and expand viewpoints" Dr Huber contends. "Without the GPC, there would be a large void for many of the technical people who are unable to attend global conferences outside North America and see what is occurring with other companies, while interacting with suppliers and observing available technologies and developments."

Delivering furnace improvements

Similarly, Aaron Huber is a longstanding supporter of the International Commission on Glass and an advocate of its technical committees. "The ICG provides the global framework to exchange knowledge" he emphasises.

As mentioned earlier, Dr Huber has been Chairman of TC21 (Furnace Design and Operation) since 2016, its overriding objective being to promote improved glass furnace design and operation with sophisticated tools such as computer modelling, advanced sensors and intelligent controls. This is achieved by hosting conference sessions and meetings that allow for presentations and discussions about innovative furnace and control concepts to improve energy efficiency and increase glass quality, as well as technical approaches.

Round robin tests (RRTs) represent another valuable tool and currently, TC21 is conducting RRT number 6 phase 1, computer modeling of a small cold top electric melter. This initiative allows committee members to model and discuss issues, while accurately predicting the performance of this selected simplified glass furnace. Following the initial work, possible design and operation improvements will be discussed and evaluated.

Aaron Huber's personal, long-term commitment to advancing the research and development of glass melting technology matches the aspirations of like-minded individuals within such organisations as GMIC and ICG, while delivering critical improvements on behalf of Johns Manville. "The more glass industry manufacturers, suppliers and researchers participate, the better the glass industry will be able to address future challenges and continue to improve" he concludes. ●

As a board member of GMIC, joint organiser of GPC, Aaron Huber believes the conference is very important to the North American glass industry, providing valuable interaction and exchange.

Further information:
Johns Manville, Denver, Colorado, USA
tel: +1 303 978 2000
web: www.jm.com

Glass Manufacturing Industry Council
web: www.gmic.org

International Commission on Glass
web: www.icglass.org

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Brazil glass industry at a crossroads

According to recent statements from leading producers and analysts, the Brazilian glass sector faces the prospect of stagnation within the next couple of years, due to a predicted decline in demand from some major consuming industries. Despite these concerns, key players in the industry continue to invest positively and exploit opportunities for business expansion. Freelance correspondent Eugene Gerden reports.

The existing fears of producers and industry analysts are based partially on a recent report issued by the Brazil Central Bank. This report suggests that the national economy may seriously decline this year, in line with prevailing business activities in the country. According to some major economists, such a decline may have a negative effect on the majority of Brazil's industrial infrastructure, including the glass sector.

In fact, the Brazilian glass industry has achieved important progress in its development since the beginning of 2000s. This was reflected mainly by a significant increase in both domestic production and consumption, triggered by rapid economic development during the period. It is confirmed by statistics published by the Brazil Ministry of Economy, as well as leading local industry associations (particularly Abravidro), in accordance to which per capita glass consumption in Brazil has grown from 11kg in 2003 to almost 27kg in 2018.

One of the major reasons for this was a significant growth of investments in the country's glass sector in the last 15 years. According to data made available by the Brazil Instituto Observatorio Social, since 2007 the volume of funds invested in the industry has amounted to more than US$2 billion.

As a rule, most of Brazil's glass output has traditionally been supplied to the domestic market, although some production has been exported, especially to neighbouring states. In recent years, however, the volume of glass imports to Brazil has significantly increased, the list of major importers including China and the USA.

Glass packaging success story

Still, despite analysts' predictions of stagnation in the Brazil glass sector this year, most domestic producers and global majors operating in the market still consider it very promising for their further development in the years to come. This is reflected by the recent announcements of some global producers expanding their local glassmaking facilities.

This March for example, Verallia commissioned its latest container glassmaking plant in Jacutinga, a municipality in the state of Minas Gerais. According to the company, the new plant will act as a replacement for its Agua Branca, Sao Paulo city site.

Verallia remains one of the largest players in the Brazil market, operating three plants, all of which are located in the south west of the country: in Campon Bom, Rio Grande do Sul state, Porto Ferreira, Sao Paulo state and now Jacutinga in Minas Gerais state. It is anticipated that most output from the latest greenfield plant will be supplied to Brazil's winemakers.

According to experts at the Brazil Ministry of Economy, currently the glass container sector remains one of the most promising in terms of further growth in the entire Brazil glass market.

That can be explained mainly by the ever-growing volumes of production and consumption of beer and spirits in glass packaging in Brazil. In addition, more and more glass is currently used for the packaging of food and soft drinks.

With regard to glass packaging, according to data sourced from various industry associations and the Brazil Ministry of Economy, the sector's current value is estimated at about US$ 1.6 billion. Analysts predict it will continue to grow in years to come, with annual rates of at least +3% until 2024 or even higher. Such growth will be triggered mainly by the ever-increasing investments in the food and beverage sector, which will ensure stable demand for glass packaging in the local market.

In the meantime, this is not the

only sector expected to demonstrate high growth rates this year. Important growth of both production and consumption is also expected in the pharmaceutical glass business. According to data sourced from the Brazil Instituto Observatorio Social, in recent years demand for glass in the Brazil pharmaceutical industry has significantly increased and continues to grow. This is due primarily to a rapidly expanding domestic pharmaceutical sector building large-scale drug making facilities in recent years. This has stimulated demand for pharmaceutical glass and created conditions for the attraction of additional investments.

In recent years, several global glass producers have announced plans to establish production facilities in the country, with the aim of gearing future output for the needs of the local pharmaceutical sector. This includes Schott, who recently announced investments of about BRL 50 million ($9.7 million) in its pharmaceutical tubing production in Rio de Janeiro. According to the company, the investment programme is planned for the next two years. Under the terms of the project, funds are to be invested in the perfeXion on-line inspection system process, as well as implementing modern production technology in glass melting furnaces.

Float glass expansion

There is also growing investor interest in Brazil's float glass market, a trend that can be explained mainly by relatively high growth rates in the local construction and automotive industries, both traditional consumers of float glass in the country.

A couple of years ago, AGC Asahi Glass announced plans to invest approximately €147 million (JPY 18 billion) in the construction of its second float glass production plant in Brazil.

According to predictions provided by experts at the Brazil Ministry of Economy, annual flat glass growth rates will be in the range of 7%-8%, thanks primarily to expanding automotive production. In addition, growth is also anticipated in Brazil's advanced glass business. A recent report prepared by Global Market Insights suggests that the global advanced glass market will exceed over $110 billion by 2024, with a substantial part of this value accounted for by the Brazil market. Demand growth in Brazil will be triggered by higher aesthetics in the construction of commercial and residential buildings, along with growing infrastructure investments.

Further growth potential

Experts at the Brazil Ministry of Economy believe that despite the pessimistic forecasts provided by Brazil Central Bank and some local experts, the country's glass sector will continue to grow in the years to come, although at rates that will be much lower than those observed in the past 15 years.

Further industry growth will be supported by low labour costs, high profit margins and the overall growth of private consumption in the country. Over the past 10 years, an estimated 50 million people in Brazil have succeeded in moving out of poverty status and into a larger and growing consumer class, with an accompanying disposable income. Currently, Brazil has the largest economically active population of all the BRIC nations at 68.6%, compared to China at 53.6% and India and Russia's 53%.

Traditionally, the majority of glassmaking facilities in Brazil have been concentrated in the south and south east of the country. The north east is traditionally the poorest part of Brazil but this region is also starting to attract investments, including projects in its glass sector. ●

About the author:
Eugene Gerden is a freelance correspondent.

Challenge, the motivation for future success

According to Lucien Belmonte, it is not especially unusual that Brazil is going through a period close to boiling point. The historical challenges of the Brazilian business environment add to an economic slowdown, unemployment and a consequent reduction in consumption, in a vicious circle prejudicial to entire economic chains. The glass industry is not immune to this scenario. But the potential of the national consumer market, the installed productive capacity and changes in economic management provide the industry with optimism for the future. Mr Belmonte believes it will be possible to reverse the negative trend, helping the industry to contribute in an effective way with the economic recovery expected for the coming years.

Lucien Belmonte, Superintendent of Abividro.

The current situation indicates that after the economic collapse in 2015-2016, the peak of pre-crisis industrial activity is unlikely to be reached again until 2021. The construction sector, an area that suffered most from the crisis, corroborates this perspective. To give readers an idea of the scale involved, performance recorded in 2018 represented a gross value lower than that of 2012, after five consecutive years of decline. The Union of Civil Construction Industry of the State of Sao Paulo (SindusCon-SP) expects more robust recovery for the sector nationally only after 2021.

In parallel, another key market for glass, the automotive industry, is currently operating at 43% production capacity. Furthermore, the obstacles to achieving a consistent recovery in the domestic market are compounded by a fall in exports to Argentina.

Despite this critical scenario, however, it should not be forgotten that the Brazilian industrial infrastructure in the glass arena is among the world's largest and most modern, featuring global companies from the flat glass, packaging and special glass sectors.

Significant players in the flat glass category are AGC, Guardian, NSG and Saint-Gobain, while Owens-Illinois and Verallia produce packaging and Owens Corning operates in the glass fibre market. Schott, Vidraria Anchieta, Vivix and Vidroporto complete the market mix, as well as the leading industrial enterprises Nadir Figueiredo and Wheaton.

It is appropriate to mention that with more than a century of activities, Nadir Figueiredo dominates national household glassware sales and is active in more than 120 different countries, while Wheaton leads the national packaging market for fragrances, cosmetics and pharmaceutical glass packaging, operating one of the world's five largest specialist facilities in this sector. In addition, this successful group of businesses operates in an important market of almost 210 million consumers. Despite the current economic recession and levels of unemployment, the Brazilian economy is still among the largest in the world.

Long-term plans on track

Irrespective the country's economic difficulties, current glass supply levels are in line with the long-term objectives set by Abividro member companies. In the last 10 years, Brazil has more than doubled its production capacity for flat glass, for example.

At the same time, the collapse of the European market - with the closure of several factories - and in the face of China's dumping practices, Brazil imposed anti-dumping measures in the same way as those used by South Africa, South Korea, India and Australia. This measure ensured survival of Brazil's local flat glass industry, despite the prevailing difficult economic environment.

In parallel, Brazil is a country in the midst of transformation from an economic perspective. The pension reforms under discussion and the prospect of adjustments on the tax and labour fronts also favour significant changes in relation to investment and capital costs. It is undeniable that such initiatives will favour the transformation of Brazil into a country that is more investment-friendly, simplifying a business environment that can sometimes be suffocating.▸

A combination of international bellwethers and local producers operate successfully in the glass packaging business.

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Brazil's glassmakers operate in an important market of almost 210 million consumers.

Moreover, the prospects with respect to energy are positive. Finally, the government is facing up to the Petrobras monopoly in the natural gas sector, with a key initiative to reduce prices. To give an idea, while the Brazilian glass industry pays approximately $15 per million BTU, its competitors buy gas in the range of $5-$7. Reducing this cost difference will allow Brazilian glassmakers to compete globally again.

Opportunities and challenges

Sectoral opportunities and challenges are also linked to changes in the consumption profile and the environmental agenda. In the case of flat glass, this evolution is guided by the increasing use of safety glass, with solar control and acoustic protection, as well as the possibility of supplying the material for solar energy generation systems, whose production in the country still 'crawls', despite Brazil's abundant sun levels.

In the packaging sector, in turn, the expansion of productive capacity failed to materialise at the same intensity as in the rest of the market. At the same time, changes in consumer behaviour led to a consistent expansion of demand. The result is that only with new units and factory capacity increases will full market conditions be realised, reversing situations such as the importation of bottles from Argentina, which in the first five months of 2019 were substantial.

Finally, safety and environmental standards can be added to the glass industry's current challenges. The rules of the NR12 call are different from Europe, North America and Japan, creating additional obstacles in the cost of plant modernisation. Another hurdle has been the severity of emission standards and pollution controls - in some cases higher than those used in competing countries. This situation also hinders the achievement of production expansion targets.

Brazil is 'boiling' and in a very complicated context. The economic and technical challenges are numerous and difficult to cope with. Fortunately, the government has shown good will in the field of reform and coping with the cost of natural gas. And on behalf of the local glass industry, the Brazilian Association of Glass Industries (Abividro) will work to improve the sector environment and ensure that glassmakers can contribute effectively to the recovery. It is the challenge that will drive the glass industry into the future. ●

About the author:
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Latest investment supports business expansion for Siam Glass

A fourth Siam Glass Industry bottle manufacturing facility was commissioned in Thailand this August. Viwat Supatham, General Manager, discussed this project, which reinforces the glassmaker's continued success.

Viwat Supatham is General Manager at Siam Glass Industry Co Ltd and a former Chairman of the Glass Manufacturers Industry Club at the Federation of Thai Industries (GMFTI).

Siam Glass Industry Co Ltd is Thailand's third largest glass container producer.

Established in 1977, Siam Glass Industry Co Ltd is Thailand's third largest glass container producer, with four factories and a daily output of approximately 1500 tonnes in flint and amber colours. Glass bottles are produced on 11 production lines and in sizes from 15ml to 750ml. The glassmaker's recent expansion initiatives have closely followed those of parent beverage company Osotspa Co Ltd, South East Asia's leading energy drinks producer.

The origins of the family-owned Osotspa Group date back to 1891 in Bangkok's Chinatown and today, the company is well known globally for its energy, sports and non-alcoholic drinks, as well as a ready-to-drink coffee brand. Osotspa is successfully growing its brands in Thailand and internationally, implementing targeted approaches to ensure their popularity by reflecting consumption behaviour and meeting constantly changing consumer needs. Its main international markets are neighbouring Myanmar, Cambodia and Laos, followed by Indonesia and Vietnam. In addition, distributors are located in 25 different countries worldwide, including a strong presence in Asia, Africa, Eastern Europe, North and South America. ▸

Daily production capacity stands at approximately 1500 tonnes in flint and amber colours.

Siam Glass Industry maintains four high productivity glass container plants in Thailand.

"There are opportunities for us to reduce bottle weights further" says Viwat Supatham.

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Six glass melting furnaces are operated at production sites in Rojana, Samutprakarn and Ayutthaya.

Glass bottles are produced on 11 production lines and in sizes from 15ml to 750ml.

Advanced capabilities

Devoted first and foremost to the advanced manufacture of glass packaging to support this fast expanding beverage business, the Siam Glass Industry subsidiary operates a total of six glass melting furnaces at production sites in Rojana, Samutprakarn and Ayutthaya. These factories are equipped with NNPB production and fully automated inspection system capabilities. A technical collaboration agreement is in place with Japan's Nihon Yamamura Glass Co Ltd to support the company's quality goals.

This includes the recent completion of a second facility at Rojana, which has been designed to produce an additional 2.5 million bottles every day to keep pace with Osotspa demand. According to Viwat Supatham, General Manager, the Rojana 2 brownfield project in Ayutthaya Province features some of the international glass container industry's latest manufacturing technologies, including a highly energy-efficient, 310 tonnes/day natural gas-fired melting furnace. Together with forehearths, this represents the glassmaker's first experience of operating SORG melting technology.

Other international suppliers involved in this important project include Antonini, Bottero, EMS Group (Emmeti), Tiama, XPAR Vision and ZIPPE. "Collectively, these world class suppliers have provided the latest technology platform for the implementation of Industry 4.0" Viwat Supatham confirmed.

Mr Viwat also stressed that his company's strategic investments in such advanced manufacturing technologies have been instrumental in Siam Glass maintaining

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An improvement to the carbon footprint of every glassworks is among the company's current priorities.

The Rojana 2 project has been designed to produce an additional 2.5 million bottles every day.

All four factories are equipped with advanced NNPB production equipment.

strong staff retention rates. Currently, the glassmaker provides employment for approximately 1000 people.

In addition to this year's major investment in Rojana, the glassmaker has continued to implement furnace cold repair projects at the Samutprakarn and Ayutthaya sites. In Ayutthaya, for example, one of two melters was rebuilt in 2018, while the other is scheduled for repair next year. These projects are helping Siam Glass Industry to deliver enhanced levels of service to OEM customers from both sites.

Fully automated inspection system capabilities are operated.

An improvement to the carbon footprint of every glassworks is among the company's current priorities, where a zero landfill waste policy is adopted, in compliance with local environmental regulations.

Cullet recovery from customers and users is another key initiative, where significant investments have been undertaken. Earlier this year, for example, affiliate company Siam Cullet Co Ltd installed the latest cullet treatment technology, sourced from ZIPPE.

Throughout its glassmaking business, however, Viwat Supatham emphasised the importance of identifying opportunities to build increasingly more advanced facilities, while minimising or reducing costs wherever possible. "There are opportunities for us to reduce bottle weights further" he confirmed "but new plant designs need to be even more efficient in terms of raw materials, energy and labour costs." ●

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Speakers, partners and members of the Glass Futures advisory board and project management team included (from left to right) Nick Kirk, Brian McMillan, Richard Katz, Aston Fuller, Dave Dalton, Mike Palin, Richard Hulme and William Boakes.

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Global centre of excellence in R&D, innovation and training

Over 100 leading names from across the UK glass industry and supply chain, academia as well as local and national government, attended the Glass Futures Industry Conference at the Totally Wicked Rugby League Stadium in St Helens, Merseyside this July. The following series of articles outline the initiative's plans to connect the glass industry and academia to create an industry cluster to ensure increased productivity and sustainability in the sector.

The Glass Futures event outlined plans to create two centres of glass excellence, hot glass at St Helens and cold end research at the University of Leeds. These two multi-million pound international research and testing facilities have been planned to shape the way forward for the glass sector. Among other aims, the hot glass facility is aiming to eliminate CO_2 from the manufacturing process.

Attendees learnt how they can influence and benefit from the planned research into clean fuels and innovation to boost manufacturing productivity and so set the agenda for how the £1.6 billion UK glass sector and its supply chain can benefit from the initiative. Glass Futures is currently pursuing UK government funding streams worth in the region of £60 million from BEIS and Innovate UK, part of UK Research and Innovation.

Opening the day, Cllr David Baines, Leader of St Helens Council, said the council was committed to providing the design and planning work needed to launch Glass Futures - a positive project in a future positive for St Helens.

Cllr Richard McCauley, St Helens Cabinet member for Economic Regeneration and Housing, who worked in the glass industry for 45 years, added: "We want St Helens to be at the heart of global innovation. "There's nowhere else like St Helens. It's a glass town and we want it to stay that way. That's why we as a council are committed to ensuring that Glass Futures happens here."

Also pledging support, Steve Rotheram, the Metro Mayor for the Liverpool City Region, said: "The Local Economic Partnership supports this fantastic project all the way. Glass Futures offers tremendous social, economic and environmental value and will benefit areas far beyond the city region. I hope you will all get behind it!"

Adrian Curry called for the industry to stand together to take the lead on decarbonising manufacturing.

Speakers included representatives from the glass industry, supply chain and academia, as well as local and national government.

Siemens, a partner of Glass Futures, was represented by Brian Holliday.

Additional local support came from Mike Palin, St Helens Chief Executive, who announced St Helens had agreed to provide up to £900,000 support to cover pre-planning and planning costs.

There was also tremendous support from contributing companies who include Encirc and Siemens. Adrian Curry, Managing Director of Encirc, saw Glass Futures as a huge and necessary investment in looking at the problem of future proofing, which manufacturers could not solve on their own. He believed the St Helens site could be a global exemplar.

Brian Holliday, Managing Director of Siemens Digital Industries, said that connectivity was vital in the manufacturing of the future and Glass Futures was "tremendously important" in providing support not only for the glass sector but for wider industry needs. "I want to throw our weight behind this project" he added.

Led by some of the world's largest glass manufacturers, supply chain partners and leading UK university research groups, Glass Futures' aim is to create two centres of excellence:

- A multi-fuelled 'hot' glass pilot facility in St Helen's, Merseyside.
- A high tech 'cold' glass research centre at the University of Leeds.

Glass Futures is keen to hear from businesses across the industry and supply chain who would like to be involved and benefit from the initiative.

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A colossal opportunity for the glass sector

Dave Dalton addressed the audience in St Helens about the proposed global centre of excellence in glass for R&D, innovation and training.

Dave Dalton.

“ I and my co-founders of Glass Futures, Richard Katz and Brian McMillan, were delighted to see such a distinguished audience and the huge range of expert speakers at the Glass Futures industry conference. This shows how far Glass Futures has come. We have high level Government funding, we have the regional, local economic authorities, key manufacturers and supply chain on board and we have been joined today by Network Space, the developer of our site. The container, float and glass fibre sectors are involved.

Glass Futures is now truly well on the way to becoming a physical entity.

At the conference, we were privileged to hear about the amazing opportunities that are out there for this industry. Government has designed funding that we can use. Our challenge is the creation of a low carbon, economically prosperous manufacturing sector, while ensuring reduced carbon emission and greater environmental protection.

Today we want you, all of you, to tell us what the next steps need to be. We are at a critical point. We have the funding in place, we have backing, we have the confidence this project will thrive and flourish. Now we need your input. What is it you want? How do you see the future of the glass industry and what are our next steps?

We currently face national political and economic uncertainty and massive global climate considerations. In terms of Glass Futures, we can establish a firm economic basis and underpin the dynamic work of this region and local authority. In terms of the climate, we can lead the way with the foundation industries to help the world cut down on its carbon emissions.

Glass Futures is the manifestation and visible ambition of the glass industry’s drive to help the environment. Growing the economy in a way that simultaneously tackles carbon emissions and energy requirements is the key to rescuing our endangered environment. Glass Futures embodies the way forward through intelligent, collaborative academic research, industrial expertise and true partnership between all those who have a commercial, practical and progressive approach to production.

We see this in the ‘Strength in Places Fund’ which, working alongside UK universities, will allow all regions of the country to tap into world class research and innovation. The fund brings together research organisations, businesses and local leadership on projects that will lead to significant economic impact, high value job creation and regional growth.

Strength in Places is a large element of the vision of Glass Futures, translating research ideas into real solutions for the problems of the future. By harnessing the best of industry and academia and investing in research and development, we really can help the industry grow and bring major benefits to the UK economy.

So, a little more detail about the entity we are calling ‘Glass Futures’:

- It will provide a global innovation, technology, training and research centre connecting industry and academia.
- It will bring together/partner with other centres for glass research across the EU and beyond.
- It will allow business and researchers to meet to develop new products and processes… on an industrial scale, deliver the British Glass Decarbonisation 2050 roadmap, remove barriers to development and implementation and reduce innovation time to market and limit risks.
- Create a louder ‘voice’ (backed up by technical results) to influence government policy.
- Develop the next generation of glassmakers and entrepreneurs.

Simultaneously, plans are being developed for a Leeds University site to focus on research in the ‘cold’ or downstream elements of the manufacturing process, including coatings, structure and bio-medical glasses.

Meanwhile, the St Helens centre will concentrate on the ‘hot’ side of glass production and will feature an experimental glass furnace, one of the core purposes being to look into reducing carbon emissions to ‘net zero’ through research into raw

Calling for industry collaboration, Dave Dalton informed the audience that Glass Futures is at a critical point.

materials and alternative energy sources.

There will be a 30 tons/day pilot facility here in St Helens and although this will be at the heart of GF, it will be supported by other R&D and test facilities around the UK and beyond. There will also be a research centre(s), featuring a full range of 'best in class' laboratories, covering a broad range of capabilities (eg raw materials, coatings and automated manufacturing), spread across the UK, expanding existing facilities as well as a new site in Leeds. In addition, there will be accredited training in glass specific business skills and a networking centre that will be expanded as new opportunities are identified.

We must not forget to look to the future in terms of our young people. The glass industry needs to think increasingly about training and education, as the sector moves into faster and more technological production. The ageing workforce in the glass industry is a problem that we all must start to address and so we must work to attract a much needed younger demographic into our industry. A dynamic Glass Futures will help to provide that training and education and inspire the next generation of highly skilled workers.

Glass is a truly amazing material – and modern life would be unimaginable without it.

Our proud heritage in the UK in innovative glass provides a strong foundation from which we are now developing novel glass compositions and treatments for high-tech applications in fields such as medicine and dentistry, photonics and power generation. Meanwhile, the manufacture of mainstream products continues to underpin the UK's supply chain in the food, beverage, cosmetics, pharmaceutical, construction and automotive sectors. UK glass manufacturers operate using world class environmental, social and quality standards. Glass products, including energy-efficient glazing and wind turbines, save energy and CO_2 and glass remains infinitely recyclable.

The way forward now for our glass industry is to be bold, innovative and fast-moving. The Glass Futures centre in St Helens will have the only test furnace in the world capable of driving experiments into cleaner fuels, encouraging new test work and helping the UK meet our carbon targets. It will be absolutely unique. We know that positive collaboration is key to finding powerful and practical solutions. The glass industry, policy makers, consultants, academics and others need to work together to solve these environmental challenges and GF provides the platform for this.

This is a critical point for the whole project – so please join us to help drive the sector forward.

We know we have won and will have access to the funding this project needs. We have further significant funding opportunities for the coming months and we need you to join us in deciding where to take that funding to provide the best advantage for glass.

It may not be a comfortable journey. But what happens if we don't make it? The greatest risk is in doing nothing. If we do nothing, there will be a huge negative impact on our industry and nothing will happen about climate change. Glass is in the driving seat to do something about it.

Glass Futures is a lifeline for our industry and for the world's environment. Let's all join together and get that lifeline out there. We can do it. We have brilliant ideas and brilliant people and as demonstrated in St Helens, brilliant support from the community.

Let's do it together!"

About the author:
Dave Dalton is Principal Coordinator on the Advisory Board of Glass Futures and CEO of British Glass

Global industry and the future

During the conference, Dave Dalton also delivered a speech on behalf of Ludovic Valette, a member of the Glass Futures advisory board.

Ludovic Valette.

"As the global lead on innovation and R&D for O-I, the world's largest glass container manufacturer, I know the value of appropriate focus and investment needed to stay ahead and forge new ground. The global glass industry has lacked a common platform upon which validation of ideas, proof of principle testing and outright challenging of convention can easily be carried out at a scale where the results are meaningful to the 'real world' glassmaker and can be translated effectively to true manufacturing dimensions. It's true that some of us have the capacity to develop and operate pilot plants but seldom is this available for the range of experimentation that is needed and too often, it is dictated by a need to improve the immediate scale of manufacturing, rather than testing the technologies of tomorrow and much further into the future.

The future is something we need to collaborate on to make the most of our capabilities and to share ambition, apply talent and train and develop the next generation of glassmakers. Of all materials, glass with its purity and sustainability, has the most to offer in terms of untapped potential.

Glass Futures is unique in its offer of a truly open platform, on which the global community and its supply chain can collaborate, sharing the burden, the cost and the intellect upon which the future will be built. It is very opportune given the UK's Industrial Strategy and specifically its focus on heavy or 'foundation' industries as it is being termed, along with the UK's substantive targets on CO_2 reduction. The vision and investment provides the global glass community a place to develop, build and operate with an ongoing 'thematic programme'. This will ensure a stable and sensible pathway to build the necessary relationships, fund the creation of the infrastructure, buildings and equipment and then provide the seed money for operational costs. Through broad-ranging projects, we will collectively be able to search for clean and economically sustainable solutions that will preserve glassmaking and embed it into the fabric of future manufacturing for generations to come.

Initially, we need to develop our relationships and share the load on common targets like 'industrial fuel switching', which will require us to research replacing high carbon natural gas with a range of fuels the industry has at its disposal in the short, medium and longer term. How can we factor our technologies to work with these fuels, whether it be hydrogen, bio-fuels or sustainably generated green electricity or a hybrid? We'll need to prove the technology and scale – Glass Futures allows us to collaborate on this.

Common problems like low grade/low temperature heat recovery accounts for significant energy wastage at present. Collaboration will help us find solutions that work for our size and scale. Similarly, reducing carbon-bearing raw materials like limestone and soda ash and replacing them with more cullet and novel precursor materials will further make the sector sustainable but again, collaboration is vital to delivering this too.

Examining the world of 'digital technologies', 'the internet of things', Industry 4.0 and developing the next generation of leaders for our industry are all things that need addressing and this venture allows global companies to meet on a common platform and work towards that goal.

It is inspiring to see that the UK government has been forward-thinking enough to recognise these global areas of opportunities with heavy industry and has been driven to an inclusive venture, encouraging glassmakers from all over the world to join forces and collaborate in an attempt to be more effective and more expedient in solving these important issues.

From concept to product, from raw material to process and from man to machine, the concept of Glass Futures sets a new precedent in safeguarding both an industry and those that will manage it by supporting an ethos of collective capability in problem solving. Here in St Helens, a fantastic facility is being fashioned to carry out the hot end requirement for the delivery of this future. Over in Leeds and developed in close collaboration with the university, a 'cold-side facility' will be constructed to look at the performance of the product and the technologies applied in coatings, facade assemblies, with surface treatments and post-melting technologies. Glass Futures will also target bringing glass products to the vanguard of competing materials in everything from containers and food/beverage packaging to products in the built environment, bio-medical applications, laser photonic materials and communication media.

Glass is anything but ordinary. It is strong and delicate. Elegant and simple. Modern and authentic. Glass is relevant today and in the future. Glass Futures with the participation of the global glass community will ensure this remains the case for generations to come.

O-I is committed to helping transform the industry and is supportive of Glass Futures' efforts. In line with our own business objectives and those of the industry, we are actively participating in the design and development process of this unique facility and intend to continue our involvement for years to come. Let's work together to support this initiative moving forward!" ●

Dave Dalton delivered a speech on behalf of Ludovic Valette during the conference in St Helens this July.

About the author:
Ludovic Valette is Vice President, Global Research and Development and Technology Strategy and Integration at O-I

Past meets future in St Helens

Part of Community Interest Company 'The Friends of Cannington Shaw', John F Tabern reflects on the history of the Glass Futures site in St Helens and its longstanding association with the UK glass industry. Mr Tabern was among those in attendance at the recent Glass Futures Industry Conference.

John F Tabern.

"Being a bit of a science fan, the vagrancies of time travel fascinate me and in particular paradoxes, this being the business of an individual going back in time and meeting him or her. The plethora of outcomes from such an occurrence are mind-boggling and mostly not very favourable. However, this theme of past meeting future was on my mind while attending the Glass Futures conference on 23 July 2019 at the Totally Wicked Stadium in St Helens. The stadium is the home of St Helens Rugby League Football Club, which was quite a fitting venue really, being one of the other big things St Helens is famous for, other than the subject of the conference – glass. The material in question was certainly on show in this state-of-the art facility, with panoramic views of the playing arena right across one side of our conference suite.

With the usual grimaces following pre-conference coffee vanished, speakers from academia and industry followed one after the other to the podium. Their subject was the incredible Glass Futures project, starting to take shape and unfold in this one time centre of the glassmaking world. This remarkable vision by British Glass has found its home in St Helens, due to the active lobbying by St Helens Council and their proactive involvement in convincing the decision makers that this was the place it should be built.

The project will see a 30 tons furnace built on the site of the old United Glass works. Indeed, with no sense of irony, it will sit on the very spot previously occupied by a 400 tons and a 350 tons furnace. The ghosts of these mighty melting arsenals may dwarf the potential new arrival but what it lacks in size, it more than makes up for in what it will achieve.

The facility will be built and purposed to carry out hot end experimental work in all manner of areas. In particular, the hunt for a fuel source capable of melting the tonnage the industry requires yet meet the exacting targets set for net carbon emissions by the UK Government. Indeed, Liverpool Metro Mayor, Steve Rotheram informed delegates that the Liverpool City Region has committed to a net zero carbon target by 2040.

Other speakers pointed out that failure to meet these sorts of ambitions could result in heavy taxation for the glass industry. While one might be forgiven for thinking that this Holy Grail alone would be worth the investment, it is worthy of note that this cutting edge plant will not be a 'one trick pony.' The audience was informed that Glass Futures will be made available to the glass industry in general for collaborative and private research and will tackle a procession of British Glass and Glass Technology Services projects, designed to broaden the horizons and push back the frontiers of the known 'glass universe'.

Way back when, my world was young, my universe consisted of the very same United Glass site on which this ground-breaking facility will be built. As Chief Executive of St Helens Council, Mike Palin lined us all up at the windows and talked us through where exactly Glass Futures will be sited. I couldn't help wandering off to another time. My mind visualising the old 91 and 92 furnaces, the sounds, the smells and the characters who populated our mini city of glass. All sadly gone but not completely… something still remains, a tangible piece of an age long before my time.

A supermarket car park will separate Glass Futures from what can be termed its equally revolutionary and ground breaking great forbear. Sitting silently, looking on as shoppers come and go for their weekly essentials, the remains of one of the first Siemens regenerative tank furnaces to be built for the production of glass containers, provides a stark and noble reminder to the pioneering and entrepreneurial spirit of St Helens. The regenerative furnace was an invention and eventually autonomous business of Friedrich Siemens. During his research into heat technology, Friedrich had come up with the idea of applying the regenerative principle of the Scottish clergyman Robert Stirling to industrial furnaces, obtaining an English patent for this in 1856. The revolutionary aspect of this idea was that Friedrich could achieve unprecedented combustion temperatures by using waste heat in the combustion process. He introduced the idea in South Wales, eventually building a steelworks to prove his technology.

However, our story concerns St Helens and a bottle shop called No 7, which was opened in 1886. The whole site, where the stadium and Tesco now stand and where Glass Futures will stand was the property of the then largest bottle producing factory in the world, Cannington Shaw, the forerunner of United Glass. Cannington Shaw was owned by brothers John and Edwin Cannington and John Shaw. While the Cannington's were businessmen, John Shaw was the glass technologist of his day. Having concluded an earlier arrangement with Pilkington for access to furnace technology knowhow, he followed in their footsteps, they having built a regenerative furnace for flat glass production in 1873.

The Cannington Shaw tank itself is long gone and what remains is the building structure with its oval architectural cone, a feature of early tank furnace shops, being a ▸

Attendees were able to view the proposed site for the 30 tons/day multi-function hot glass pilot plant in St Helens, adjacent to a mothballed Pilkington line.

hangover from cone furnace/crucible batch operations of earlier times. The gracefully curved working end is present and beneath the building, some of the regenerators and the flue tunnel systems which operated the reversing of air flow through the regenerators and channelled the producer gas, remain intact. On some of the tunnel entrances, cast iron flap doors are present, which presumably were manually opened and closed to reverse the air flow through the regenerators. It is a fascinating time capsule to explore, if one has a stomach for the eerie.

As far as glass heritage is concerned, St Helens is blessed by the fact that Cannington Shaw and the Pilkington structures survive to this day. However, while the Pilkington building is stabilised, the Cannington Shaw No 7 bottle shop is not and it is to this end that I am part of a small dedicated group of people, who have formed themselves into a Community Interest Company called 'The Friends of Cannington Shaw.'

The national and international significance of the site is reflected in its designation as a Scheduled Monument and a Grade II listed building. Having survived the 1982 site clearance of the old UG Sherdley Works, it has been described as 'the only remaining example of a regenerative gas fired tank furnace with its underground workings intact, left in Britain and possibly in the world.'

Clearly the importance of such a structure cannot be overestimated, its preservation not just of significance to St Helens but the glassmaking world and beyond to future generations. It is fair to say that if John Shaw walked in to the melting and forming operations of a modern day glass container plant, he would immediately recognise and understand what was happening. While improvements in scale and technology have been made to the process, the principles upon which glass is produced have remained the same for 150 years.

Glass Futures is about the next step change, about the next quantum leap to propel this most fundamental of materials into the next age of manufacture. I have no doubt that this brave concept will succeed. It is after all what the glass industry needs, more than it probably knows. Furthermore, it is only fitting that this meeting of past and future should take place in the spiritual home of glass, though I feel the consequences of this glass paradox will be nothing but amazing.”

The structural remains of Cannington Shaw's No 7 bottle shop in St Helens are considered of international significance.

About the author:
John F Tabern is a glass industry consultant and part of a Community Interest Company called 'The Friends of Cannington Shaw'

Headline sponsorship for Glass Focus 2019

Glass Futures, the multi-million pound research centre that will shape the way forward for the industry over the next century, has been announced as the headline sponsor for the annual Glass Focus Conference and Awards.

The not-for-profit company will take top billing on 21 November at the Mercure Hotel, Sheffield, drawing the following comment from British Glass CEO Dave Dalton: “We're delighted to have Glass Futures joining us at this year's event and we believe they're the perfect partner for Glass Focus.

“Glass Futures encapsulates all the aspirations that the awards represent – innovation, design talent, a determination to ensure the glass industry will flourish. I'm looking forward to welcoming all our sponsors to a wonderful event, which brings all the key figures in the glass sector together and it's a pleasure to have Glass Futures alongside us.”

Glass Futures Board Director Richard Katz, who presented the Sustainable Practice Award to the Ardagh Group at last year's ceremony, said: “We're honoured and privileged to continue our association with Glass Focus, this time as the headline sponsor and be a key part of this showcase for our industry.

“Glass Futures was established to take our industry into new territory by driving changes in technology and culture to facilitate growth and create a sustainable future for the glass industry. Therefore, it is fitting that while we celebrate the present at Glass Focus, we also look to the future through the Glass Futures partnership.”

Entries are now open for Glass Focus 2019, which will include a 'Design of the Year – Flat Glass' award. This will acknowledge the most creative and innovative designs in the flat glass sector and its supply chain.

Other sponsors of the Glass Focus Conference and Awards include Arco, *Glass International,* Glass Technology Services, *Glass Worldwide.* and The Worshipful Company of Glass Sellers.

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On the Spot... Michel Giannuzzi

Chairman and Chief Executive Officer of the Verallia Group since 2017, Michel Giannuzzi was recently elected President of FEVE, the European Container Glass Federation. Representing 60 corporate members belonging to approximately 20 independent corporate groups with manufacturing plants located across 23 European States, Mr Giannuzzi outlined FEVE's objectives to *Glass Worldwide,* preferred journal of FEVE, as well as describing prevailing market conditions in Europe.

GW: How relevant is FEVE now and in the future as the voice of European container glass manufacturers?
In the globalised context in which we operate, it is fundamental to have a common and strong European voice for our industry towards EU institutions and all stakeholders along the whole value chain. We strongly rely on FEVE to federate members under a common industry vision, which is a major and very challenging task. Besides the political and legislative mandate, it is already 10 years that FEVE has been leading the industry platform Friends of Glass to engage with consumers and promote glass packaging assets in the marketplace. As members, we want to continue to invest in FEVE as our European industry representative.

GW: During your involvement prior to becoming President, how has FEVE evolved?
I am quite new within FEVE but for sure, I can say that there is a strong industry will to progress, driven by the Board and enabled by the FEVE team. The priority is to innovate and to position glass as the packaging of the future, the sustainably-sound solution to many issues that food and beverage markets are facing in terms of packaging. I have also noted a renewed dynamism driven by the producers of flacons for the cosmetics, perfumery and pharmaceutical sectors, who are eager to position their knowhow and added value towards their European and global customers.

GW: On which areas will you focus in the short, medium and long term during your presidency?
Today, there is no option than to radically change the way we move towards a dematerialisation and decarbonisation of production and consumption. Business models, including ours, are under scrutiny for their environmental credentials and entire value chains are under threat if they are not able to adapt.

Our priority is to turn these challenges into opportunities. On one side, through FEVE we are focusing on how to decarbonise production and design the furnace of the future. We have built a working group at FEVE to examine all technical solutions and partner with the supply chain to bring these solutions to reality.

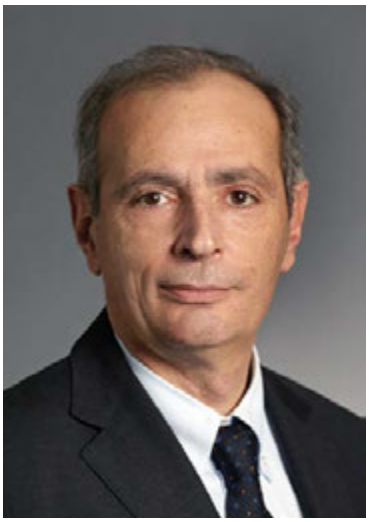
On the other side, we want to get the most from the environmental and economic benefits of glass recycling and we want to increase the quantity and quality of recycled glass available for production. Today, 74% of glass put on the market is collected for recycling*, we want to fill the gap and bring substantially all glass packaging back in the loop. We are federating forces and resources around this common objective. We want to continue to communicate about glass as a sustainable material and packaging solution and enhance our industry's reputation towards all stakeholders.

In my role, I would like to see national and European priorities aligned to work better together. We all have a deep interest in playing our role in supporting each other to build a strong, sustainable and competitive glass packaging sector for food and beverages, as well as pharmaceutical, perfumery and cosmetics industries in Europe.

Michel Giannuzzi, President of FEVE and Chairman and Chief Executive Officer of the Verallia Group

GW: How important will the contribution be of Vitaliano Torno, FEVE Vice-President and other members of the executive team to achieving FEVE's goals in the next two years?
My role of President can't be separated from that of Vitaliano, as we work as a team. Vitaliano is a ▸

** Source: https://feve.org/recyclingstatistics2016/.*



Vitaliano Torno.

glass man with huge and long-dated experience in the industry. He is an exceptional resource for me and for the whole industry.

But not only Vitaliano, the whole FEVE Board has a fundamental role in driving a common industry vision, bringing forward ideas and enabling their enforcement at an industry level.

GW: What legacy does your predecessor, Johan Gorter leave behind from his time as FEVE President?

Johan left me with already well-shaped projects and strong support behind them. He has been able to lead FEVE in an assertive but consensus-based way, allowing for debate and reflection but driving decisions when needed. Johan was an example of leadership and commitment and my role in replacing him will be very demanding.

GW: In your opinion, how important is Friends of Glass and will the campaign continue to be a priority during your term?

For some years now, Friends of Glass has witnessed growing success in positioning glass packaging as a sustainably sound choice among consumers to help the planet. Through the Endless Ocean campaign, the industry continues to promote glass as a positive solution to plastic pollution.

A first for the industry, Friends of Glass is securing partnerships with globally recognised NGOs like Surfrider Europe, Spain and France, Legambiente in Italy and the Marine Aquatic Museum in the UK. Over 100 key influencers are engaged to 'amplify' the reach of our campaign.

This year, a viral campaign centred on a series of candid cameras, capturing the reactions of unsuspecting shoppers, as they found themselves face-to-face with a pod of dolphins who thanked them for choosing products packaged in glass. In one month, over 11 million social media users were reached and 4.1 million people viewed the video, proving that when it comes to making the ocean-friendly choice, glass packaging continues to resonate with consumers. Most astonishing is the number of positive reactions and engagements the campaign is sparking. A sign that today, sustainability is no longer a buzzword but truly a priority for consumers. We have a lot of opportunities there we must seize.

GW: In general, how is the container glass industry currently performing in the European countries covered by FEVE members?

Signals from the market are positive. FEVE market data recorded consistent growth in 2018, confirming the positive trends of previous years. Overall production now stands at 21,755,000 tonnes and 78,662 million units, 10% and 9.8% increases relative to 2012 levels respectively. Glass is more than ever the leading packaging material for spirits, wines and beer, while it is increasingly gaining share in the food, water and dairy sectors. It the second leading packaging material in Europe in terms of volume.

GW: In the long-term, does Europe still represent a cost-effective manufacturing hub for hollow glass production?

Europe is the world's second leading economy and it is pioneering a transition to a future decarbonised and circular economy. Currently, it is a very challenging period for Europe. It is also a relatively mature market. However, glass packaging is gaining a renewed traction in several segments, due to the issues encountered by plastics and other packaging materials.

I also think there will be many opportunities in European and global markets once we have managed to design the industry of the future and decarbonise production. Therefore, I believe, Europe will continue to be a competitive and privileged manufacturing hub for production and reference in terms of quality.

GW: *Glass Worldwide* acts as FEVE's preferred journal and is the only magazine to be an official partner of Friends of Glass. How has this co-operation benefited the industry?

Glass Worldwide is a major source of information for the industry. It is very useful to have such a comprehensive snapshot of what is happening in the glass industry in terms of research, innovation and market. It provides a useful insight to all aspects of glass manufacturing and is an important international reference point for our industry.

The co-operation with *Glass Worldwide* is of great benefit to FEVE as one of the main communications tools to address the industry audience and share with them the latest news and developments of the European container glass industry. *Glass Worldwide* is an important and preferred source of information for many people in our company. ●

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Generating a climate of mutual co-operation

glass WORLDWIDE
Preferred Journal of Assovetro

The Italian glass industry comprises more than 1000 companies and 23,000 employees, 96.2% of whom are on permanent contracts. These were among the facts highlighted at a recent meeting of the National Monitoring Centre for the glass industry's National Collective Employment Contract, as the following contribution from Assovetro explains.

Graziano Marcovecchio, President of Assovetro.

The Italian glass industry is highly important both economically and socially and one that has long made the circular economy its brand. This is the 'Made in Italy' glass industry, which overall accounts for over 1000 companies, 23,000 employees and almost uniquely in Italy, has 96.2% of employees on permanent contracts. According to ISTAT, the average for Italian manufacturing industry is 86.5%.

This identikit for the Italian glass industry was spelt out in the course of the normal meeting of the National Monitoring Centre, an important opportunity for sharing the glass industry's economic and social situation and attended by Assovetro, the Italian industry's umbrella organisation; representatives of national, regional and provincial trade unions (Filctem-CGIL, Femca-CISL and Uiltec-UIL); companies working in every field of glass; and this year as guest of honour, Edo Ronchi, former Minister for the Environment and current Chairman of the Foundation for Sustainable Development.

"This high percentage of employees on permanent contracts" – as highlighted by Graziano Marcovecchio, the Chairman of Assovetro – "although on one hand an indicator of the stability of our industrial sector, is on the other an expression of the need for consolidated professionalism in running our production processes; further evidence of our entrepreneurs' commitment to the most harmonious industrial relations with our partners in work. A stable working relationship, which raises the quality of work and further strengthens that through training, is in fact a key prerequisite to achieving the necessary climate of mutual co-operation within companies."

Looking in detail at the sector overall, it is apparent that of the companies, 32 are involved in the production sector with over 13,500 employees, while 1000 companies are involved in processing glass, accounting for more than 8500 employees.

In his speech, Edo Ronchi emphasised the circular nature of the glass container business – a durable material that can be infinitely recycled, is economically beneficial through saving not only virgin raw materials but also energy and is capable of producing containers of the same quality as those properly recycled through segregated collection. There is one issue, however: The quality of segregated collection is not taking off, mainly because in some regions the increased quantities collected resulted in rejects rising from 7% in 2013 to 12% in 2017.

"Re-use and recycling chains", explained Edo Ronchi "that will align with the new targets set by European directives could generate major economic and employment benefits in the next five years: a 20.1million increase in output, added value of 6.6 million and 171,000 new jobs over the five year period."

On reaching its 15th anniversary, the National Monitoring Centre - provided for in the National Collective Employment Contract - has as its goal the sustaining and strengthening of responsible and highly developed social dialogue within companies, a strong point in the tradition of industrial relations in the glass industry. ●

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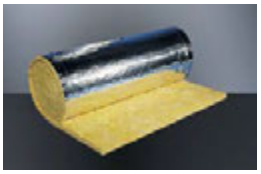

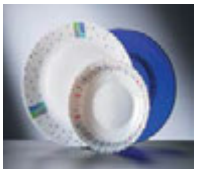

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Continued business growth for Italian equipment suppliers in 2018

Italy's glass machinery industry continued to grow in 2018. Data from its latest industry report was officially presented at the Gimav annual meeting.

At its recent 2019 meeting, Gimav – the association that represents Italian manufacturers of glass processing machinery, systems, special products and accessories – reported 2018 financial year data, analysed by its Study Centre, which showed an overall 3.75% increase in sales compared to the previous fiscal year.

Breaking out the data for the two macro-specialisations, there was a 2.08% increase in flat glass sales, confirming robust growth in the domestic market (+8.54%) and a 1.04% rise in exports. Hollow glass recorded a 5.57% upswing in overall sales, thanks to the driving influence of exports (+6.69%), which compensated for a slight drop in domestic sales (-0.6%), partly influenced by uncertainties about the continuation of the Industry 4.0 Plan.

The sector's trade balance experienced a 1.2% gain and topped the billion Euro mark last year. The latest accounting period also demonstrated modest but steady growth in employment numbers (+2.82%), an improvement that, in light of Italy's current economic situation, reaffirms the sector's positive state of health.

"Once again, the sizeable share of exports confirms that the quality and reputation for excellence of Italian technological solutions are sought after qualities, valued around the world" commented Gimav President, Michele Gusti. "The proof is in exports, a 78.13% share of the industry's overall sales, which peaked at 85% in the hollow glass sector."

The European continent continued to be ranked as the number one market for Italy's production, claiming 45% of sales. Of this share, 37.44% was exported to EU countries. The USA was the leading country client for Italian-made industry products, registering an 11% share of global sales, followed by Poland, Mexico, Germany and China.

Laura Biason, Gimav Director.

Michele Gusti, Gimav President.

EU performance focus

Exploring the data more closely, the European continent was the most significant market for flat glass, with more than 50% of the total, although there was a reduction in exports to non-EU markets. Again, geographically, the USA stands out as the leading customer, with a 15.98% share, followed by Poland, Germany, Brazil and France.

Similarly for hollow glass, EU-Europe was still the main destination. There was also a significant increase in purchases from African countries.

Thanks to incentives provided for by the Industry 4.0 Plan, sales in the Italian market grew by 8.49%. Flat glass experienced the biggest growth increase, up 9.57%, while hollow glass held steady at +6.83%.

This edition of the report again looked beyond 2018 to the Gimav Study Centre analysis of manufacturers' perspectives on performance in 2019. There were widespread expectations that the economic situation would improve, with 83% of the respondents projecting an increase in overall sales. Specifically, more than 80% of companies expressed optimism in the performance of exports. However, ▸

Gimav represents Italian manufacturers of glass processing machinery, systems, special products and accessories.

Gimav members achieved an overall 3.75% increase in sales last year, compared to 2017.

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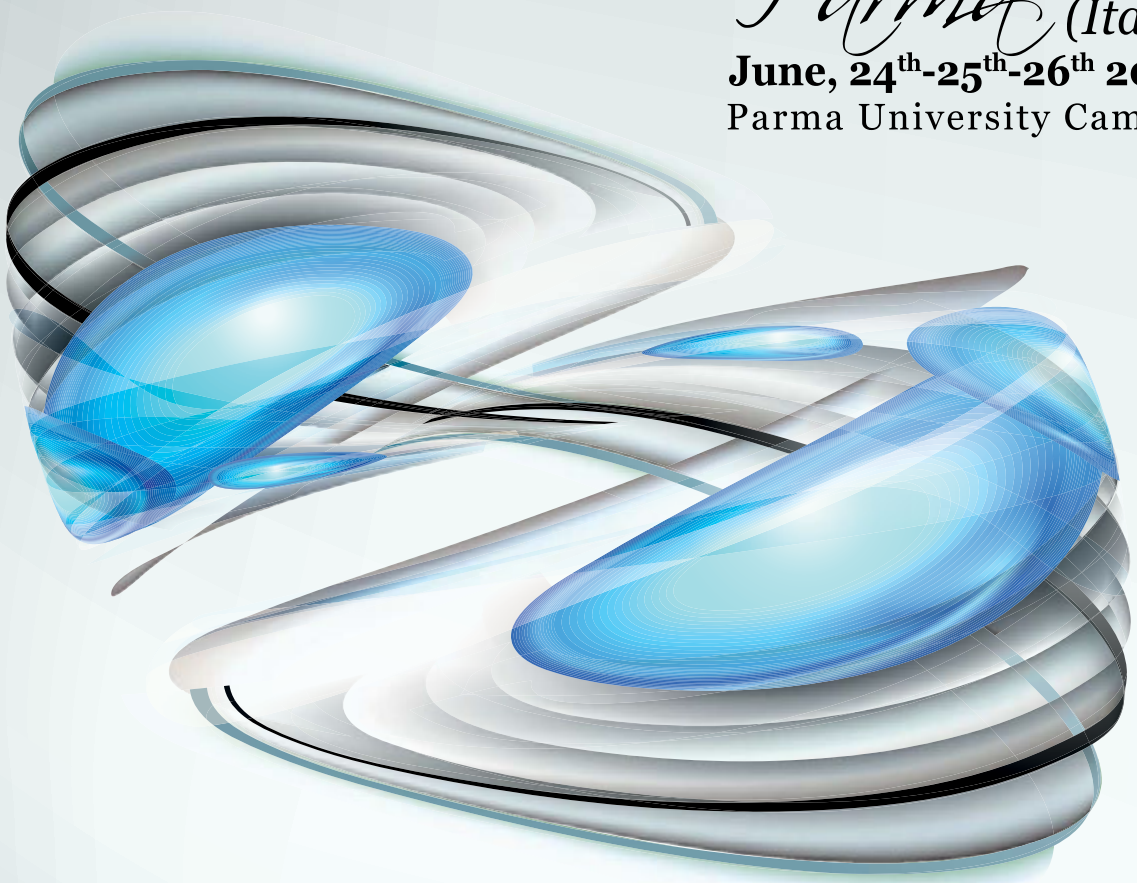

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Gimav members in focus

Gimav is the Association of Italian manufacturers and suppliers of machinery, equipment and special products for glass processing.The sales volume of member companies accounts for approximately 80% of the industry's total turnover and for 77% of total exports by Italian manufacturers of machinery, accessories and special products for glass processing.

Current members include:

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due to uncertainties about the Industry 4.0 Plan, only 50% had the same feeling about Italy's domestic market.

"In light of these forecasts, it becomes even clearer just how strategically important a well-structured and longstanding Industry 4.0 Plan can be for Italian businesses" Michele Gusti concluded. "Process innovation requires lots of time and certainty if businesses are to plan for sustainable, effective investments. It is crucial that a strong message is sent regarding the Industry 4.0 Plan's long-term continuity that takes into account not only tangible and intangible goods but also the ongoing training of human resources."

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ATIV future events focus

Alessandro Bandini discusses the specialist events planned by ATIV in 2019 and 2020.

Alessandro Bandini, ATIV President.

For more than 35 years, ATIV has been a focus point for Italian glass technicians, glass producers, raw material producers and sellers, producers of melting furnaces, machinery and equipment, on the national as well as the international stage.

Every year, special training courses are organised on topics related to hollow and flat glass. This includes courses on mould design, glass defects and adequate refractory material to be used in the design of different types of furnaces for different types of glass.

This year, in association with the Experimental Station of Glass, a technical day has been arranged, dedicated to the critical subject of industrial emissions and relevant directives. Entitled 'Industrial Emission Directive (IED): European legislation, state-of-the-art of best practices for emission reduction and monitoring and combustion optimisation', this joint meeting takes place on 8 November.

At the same time, ATIV is working hard to continue spreading scientific knowledge in the glass sector to members and to all operators in the sector. To this end, the XXXIV International ATIV Conference has been scheduled on the occasion of Parma 2020 Capital of Italian Culture. With *Glass Worldwide* as exclusive official journal, the 'Where glass science, art and technology meet together' conference will take place at the Technological Centre of the University of Parma from 24 to 26 June 2020. Themes covered will include:

Glass technology and machinery and equipment for the glass industry will be among the themes covered at the XXXIV International ATIV Conference in June 2020.

- Applied glass science.
- Glass technology.
- Machinery and equipment for the glass industry.
- Glass for architecture.
- Glass in the automotive, railway, naval and aerospace sectors.
- Special glasses and glass ceramics.
- Sol gel glasses.
- Glass processing (hollow and flat glass).
- Glass decoration.
- Physical-chemical properties of glass and its regulations.

Alessandro Bandini with fellow ATIV dignitaries.

ATIV spreads scientific knowledge in the glass sector to members and all operators in the sector.

The XXXIV International ATIV Conference will take place on the occasion of Parma 2020 Capital of Italian Culture.

ATIV conferences traditionally attract industry experts as speakers.

Topics at previous ATIV events have included the design of different types of furnaces.

- Characteristics and measures.
- History of glass.
- Glass and the environment.

A detailed programme of the three working days will be available on the dedicated ATIV 2020 web site: www.ativ2020.it.

This event will not only be an occasion for a cultural and scientific meeting among researchers, technicians and operators in the glass sector but it will also represent an opportunity to get to know the culture and history of Parma. An exhibition showing historical artefacts of Parmesan glass production, bottles and vials will be organised at the Glauco Lombardi Museum.

During the conference, participants can watch live the production of glass objects by master glassmakers.

Besides visiting the historical and artistic sites of Parma, registered delegates and their partners will also have the possibility to join thematic visits to learn about the productive realities of the territory, from food producers (pasta, prosciutto and salami, Parmigiano cheese and other specialities of the area), to pharmaceuticals and cosmetics companies and producers at home to the motor valley. ●

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Glass world representatives meet in Venice

The 3rd International Convention of Glass Associations took place in Venice this July, with 17 associations and 14 technical journals representing 17 different countries. The event was supported by the ITA (Italian Trade Agency) and Vitrum.

Presentations by the guest associations occupied much of the intensive two day programme. The four delegations present for the first time at a business session – Achival (Chile), Bouwend Nederland, vakgroep Glas - GBO (the Netherlands), Chinese Ceramic Society (China) and Glass Society (UK) – introduced their associations to the other members during the first part of the session. Then, all associations explained activities developed during the second half of 2018 and the first few months of 2019, with a special focus on seminars, technical meetings, lobbying and other areas of common interest that could potentially be replicated.

The second work day took an in-depth look at some of the topics already introduced on the first day. Specifically, various proposals were made for projects that require the support of the greatest number of members possible.

Attendees visited from Australia, Belgium, Brazil, Chile, China, Finland, France, Germany, Italy, the Netherlands, Poland, Russia, Slovakia, Spain, Switzerland, the UK and USA.

On conclusion of the day's session, master bead-stringer Marisa Convento held everyone's attention as she spoke about the history and art of creating and stringing the glass beads typical of Murano and Venice. During her heartfelt presentation, Ms Convento delved into the special and lesser known aspects of an artistic cultural business that is admired around the world for it tremendous artistic value but is now considered a 'niche', due to the limited number of 'impiraresse' (bead stringers) capable of carrying on the tradition. In light of the application for stewardship and assistance in support of a tradition that must not be lost, Ms Convento provided information about a proposal before UNESCO to designate the art of glass bead making and stringing an Intangible Cultural Heritage of Humanity.

"The annual convention again proved itself a key event for the world of glass" commented Dino Zandonella Necca, President of Vitrum and Chairman of the work sessions. "The associations can compare notes in a unique, private setting, where exchange is encouraged and growth is collective. The individual case studies are a priceless asset in terms of ideas and potential for development – from manufacturing to historical, cultural and artistic research – and benefit all delegations from the world of glass.▸

ATIV was represented by Alberto Biavati.

The next meeting is scheduled to take place during Vitrum 2019, the international exhibition specialising in machinery, equipment and systems for flat and hollow glass and in glass and processed products for industry that will take place in Milan, on 1-4 October 2019.

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Coming soon on your screen

Dino Zandonella Necca, President of Vitrum, with Laura Biason, Director of GIMAV.

Glass Worldwide's Frazer Campbell was in attendance.

"The next meeting is scheduled to take place during Vitrum 2019" Mr Zandonella Necca continued, "an exhibition that has become a veritable 'Home of the Associations', thanks in part to the outstanding partnership with ITA (Italian Trade Agency).

"However, I like to think that the sharing of ideas and development of the projects discussed will continue over the months between now and Vitrum, thanks to the digital platforms, website and social media at the community's disposal. The sense of community among those in attendance continues to strengthen and this is an excellent sign that the projects will bear fruit. The shared vision of growth and development is palpable, as is the commitment of everyone involved and I have no doubt that the results will soon be tangible as well."

Associations in attendance at this July's Venice meeting were Abravidro, ACHIVAL, AIHV, ATIV, Bouwend Nederland, vakgroep Glas – GBO, Chinese Ceramic Society, Finnish Association of Flat Glass, GGF, Gimav, GLAAS Inc, Glass for Europe, Glass Society, ICOM, International Commission on Glass, NGA – GANA, Slovak Glass Society and Steklosouz. ●

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Verallia's commitment to corporate social responsibility

International glass container producer Verallia recently strengthened its environmental strategy and partnered with PUR Projet in a carbon offset programme to plant more than 500,000 trees in Latin America. The following report identifies the key aspects of this programme and how it fits within Verallia's broader corporate social responsibility strategy.

Michel Giannuzzi, Chairman and CEO, Verallia Group (image: Franck Dunouau).

"Committed for several years to reducing its environmental footprint, the Verallia Group - a world leader in glass packaging for food and beverages - has signed a partnership agreement with PUR Projet to set up a carbon offset programme. It is based on two distinct mechanisms: A climate programme in Latin America and a programme for the environmental integration of Verallia's production sites. The climate programme will offset 1% of the group's emissions each year and plant more than 100,000 trees per year for five years.

This carbon offsetting of 1% of CO_2 emissions complements but does not replace the objective of reducing Verallia's CO_2 emissions by 1% per year. Compensation is based on the purchase of ex-ante carbon credits, validated by third party auditors who are accredited by the Verified Carbon Standard/Gold Standard. The official withdrawal of carbon credits from the official Markit register is planned between 2020 and 2030. The volume offset in 2019 corresponds to 1% of the direct and indirect carbon footprint in 2018.

This initiative reinforces a broader corporate social responsibility (CSR) policy that Verallia has been pursuing for several years and which is structured around three main areas: Helping to preserve the environment, acting for the safety and development of teams and contributing to the development of communities. In particular, Verallia has set itself a target of reducing its emissions by 1% per year by improving the energy performance of its production facilities and increasing its use of cullet. To reduce the carbon footprint of its bottles and jars, customers are offered an eco-designed range that is lightweight and has been developed to maximise the number of items per pallet.

In Italy, investments of approximately €1.5 million have improved the processing of household recycled glass in the two Ecoglass centres in Lonigo and Dego.

Sustainable development goals

Verallia is one of the world's largest manufacturers of glass containers for food and beverages, with approximately 10,000 employees, 32 glass production facilities in 11 different countries and five technical centres. Some 16 billion glass bottles and jars were produced in 2018, with revenues of €2.4 billion reported.

In 2018, the group's sustainable development achievements were assessed on the Ecovadis platform, receiving 'gold medal' certification, with a score of 63/100. Ecovadis is a platform for rating the social and environmental performance of global supply chains.

Verallia's CSR commitments are structured around four focal areas (care for customers; respect for people, laws and the environment; empowerment and accountability; and teamwork). As a member of United Nations Global Compact, the group has identified five sustainable development goals (SDGs) to which it contributes in particular:

- Ensure sustainable consumption and production patterns.
- Take urgent action to combat climate change and its impacts.
- Protect, restore and promote the sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation and halt biodiversity loss. ▸

Verallia delivers its bottles on pallets, often packed with PP (cellular polypropylene) sheets. In 2018, pallets delivered abroad were recovered, representing nearly 500,000 PP sheets. The sheets could thus be recycled without any additional logistical impact.

- Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.
- Strengthen the means of implementation and revitalise the global partnership for sustainable development.

"Actions to reduce our environmental impact are intensifying and we will associate a carbon offsetting project with PUR Projet over the long term" commented Laëtitia Fabre, Verallia's Head of CSR. "We are enthusiastic about this project for its crosscutting environmental and societal impacts. We are making progress every year and our ambition is to participate in real environmental change!"

In 2018, the furnace at Verallia's Vauxrot plant in France was completely rebuilt and equipped with the latest generation end-fired furnace technology. This investment has reduced the site's energy consumption and CO_2 emissions by more than 15%.

Carbon offsetting

The carbon offset programme designed by Verallia and PUR Projet includes:

- A reforestation and agro forestry project in Latin America (Peru, Honduras, Colombia and Brazil) to which Verallia has committed for an initial five year period and which will offset 1% of the group's total emissions each year and plant more than 100,000 trees per year. This project also promotes the socio-economic development of disadvantaged communities, while preserving local ecosystems.
- A project to integrate the Verallia group's production sites into their environment and territory, through concrete initiatives such as reforestation of sites, market gardening, support for producers and support for local initiatives.

Founded in 2008 by Tristan Lecomte, creator of the Alter Eco fair trade brand and Pierric Jammes, PUR Projet helps companies restore and preserve the ecosystems on which they depend, while enabling local communities to improve their living conditions as part of long-term projects. As a social enterprise, PUR Projet reinvests its profits in the development of these innovative projects, encouraging local entrepreneurial initiatives for a responsible, positive and virtuous economy. PUR Projet is active in about 50 different countries.

Driving force in cullet use

Another important Verallia objective is to use all available cullet and to contribute to increasing collection, while respecting national specifications. In 2018, all material collected and made available to the group was recycled in Verallia's furnaces.

In order to improve the cullet treatment process and increase recycling, the group is investing long-term in its seven treatment centres. The 32 Verallia glass factories are also developing various initiatives to integrate all fractions from cullet processing.

According to the group, Verallia has the industrial capacity to integrate larger volumes of cullet. Today, however, the limitation lies in its availability.

Improve energy efficiency

Improving energy efficiency and reducing CO_2 are priorities for Verallia. As energy is consumed mainly during glass melting, each new furnace construction is considered an opportunity to improve the group's performance in these areas.

Throughout their campaign life, furnaces are also the subject of improvements to reduce their consumption. This includes sealing and thermal insulation, optimisation of glass temperature, combustion adjustments and adjustment of combustion air volumes.

Commenting on the recent signing of the partnership with PUR Projet, Michel Giannuzzi, Chairman and CEO of Verallia, said: "We are pleased to partner with PUR Projet, a company renowned for its expertise in climate issues and its approach based on creating shared value. Our priority at Verallia remains the reduction of emissions from our installations, for which we are constantly striving but with this carbon offsetting programme, we wish to go further in our contribution to the fight against climate change, while supporting the socio-economic development of local communities." ●

In front of the Argentine factory, in agreement with the municipality of Mendoza, Verallia rehabilitated a lagoon located near the raw materials unloading area. This tree barrier reduces the noise impact of operations on raw materials. By creating a green lung, it also improves air quality.

Further information:
web: verallia.com

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Acquisitions support innovation and market penetration

Andre Noppe and Phil Maitland discuss how Ferro is building a global champion for organic coatings.

Thanks largely to the company's strong operational presence in Latin America, established during the 1930s and 1940s, Ferro was an early entrant to the glass enamels market for containers. This was driven initially by demand from such brands as Pepsi and Coca-Cola for durable decorations, resistant to strong acids and alkalis, that would be suitable for returnable, multi-trip soft drinks glass bottles. Subsequently, this technology was adopted widely by many famous brand labels for cosmetic and beverage glass packaging such as Corona beer and Absolut vodka and Ferro became a global leader in the supply of colours for this market.

For many years, the technology was based around systems that contained heavy metals such as lead and cadmium. However, in the 1980s and 1990's, following increasing concerns about the adverse environmental and health and safety issues caused by the use of heavy metals in glass, legislation was enacted that led to their replacement by lead-free enamels. Ferro was a pioneer in the development of the technology required to create durable glass enamels without lead, which were fully commercialised by the mid-1990s. The company continues to enjoy market leading positions in this market.

Coloured lamps.

Organic coatings and inks

A further consequence of this need for more environment-friendly decorations was an increasing trend towards the adoption of organic coatings and inks, especially for certain segments of the cosmetic and beverage glass packaging markets and also for glass tableware. In response to this trend, Ferro developed a line of organic coatings and inks that, compared to glass enamels, have the potential to significantly enhance the available range of bright, vibrant colour tones and effects (especially reds and oranges), while also reducing energy consumption during the production process.

Today, the company has embarked on an ambitious path to become a global champion in the decoration of glass containers using organic coatings, through a programme of targeted strategic acquisitions, designed to enhance both product technology and global reach.

Since 2016, three specialist organic coatings companies have been added to the Ferro family. Pinturas Benicarlo, based in Benicarlo, near Valencia in south east Spain was acquired in June 2016. Founded in 1992, Pinturas Benicarlo is a privately held company with market leading positions in Spain, Portugal and other Spanish and Portuguese speaking countries in Central and South America. The company serves the highly demanding market segment of perfume and cosmetics, where colours need to be matched within 24 hours and three day lead times are the standard. Pinturas Benicarlo brings to Ferro an extensive range of high quality, water-based coatings and serves some of the largest international glass manufacturers and processers.

Blue cosmetic flacon.

Delta Laboratories, with production in Ocala, Florida, USA, was added in March 2018. Like Benicarlo, Delta has localised production facilities and its products are leading the way with ▸

Red glass bowl.

Set of tumblers.

Red glass plate.

significant glass container and tableware players in North America. In particular, it well known for state-of-the-art, green technologies, including low VOC and BPA-free organic coatings. In the USA, Delta's main market segment is the candle industry.

Most recently, Ferro completed the acquisition of Diegel Creative Coatings, a German, family-owned enterprise, founded in 1870, based in Alsfeld. With a rich history, Diegel manufactures industrial printing inks and coatings for decorative and functional applications. The company brings to Ferro a broad, high quality product range that covers UV and solvent-based inks for screen printing, water-borne coatings, automotive coatings for exterior and interior applications, laser etch paints and plastics coatings for optical lenses.

Diegel was the first company to develop organic coatings specifically for application on glass. Today, these coatings are widely used across Europe and internationally, for glass tableware, beverage and cosmetic packaging, lighting and other decorative applications. The company's modern, environment-friendly processing plant at Alsfeld, together with application-oriented R&D will add to Ferro's already high emphasis on innovation and customer service. Diegel's product portfolio contains special effects that are known from Brazil to Japan and anywhere in between.

Specialised solutions

Customers in this market demand fast response and service from their suppliers to provide highly formulated products and technical solutions. All three acquisitions share these attributes, providing specialised product solutions, formulated specifically for customers' production methods and desired finishes. With localised production facilities in different parts of the world, all three expand Ferro's ability to provide fast service and response close to the market.

As the organisation works towards fully integrating these acquisitions into the PCG business, further opportunities are anticipated to exchange product knowledge and formulations across the globe, assuring that the highest quality products are available as close to the market a possible. This further supports Ferro's desire to deliver the best products, with fast colour matching and service, to all regions around the world.

Adding Ferro's global reach and unmatched service capacity, market knowledge and long established connections with glass customers built over many decades, to the excellent coatings expertise and technical leadership provided by each of the recently added Ferro companies offers opportunities beyond anything that is available today on the market. ●

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Plunger and cooler specialist celebrates 50th anniversary

Leading manufacturer of plungers and coolers for the glass container industry, Hunprenco Ltd celebrates its 50th anniversary in 2019. Having recently been awarded an MBE for Rural Economy in North Yorkshire - Services to export(s), the UK company's founder and Chairman, Eddie Neesom explains Hunprenco's origins and subsequent international success.

GW: How did your early career in engineering begin?
Having left school in 1947, I started a five year apprenticeship with English Electric Co in Bradford, which proved to be an excellent grounding. And following two years' national military service with the Royal Engineers, I returned to English Electric. After a fitter inspection post that involved stripping down components and inspecting them, I progressed to a methods engineer at the company's aircraft division – a fantastic job. I then moved into the steel industry, working for a couple of the leading steel companies at that time.

GW: How did you get into the glass industry?
I was still a technical sales representative in the steel industry but in my spare time, a hobby was machining and engineering in a disused stable. A chance meeting with representatives from Rockware Glass (now part of the Ardagh Group) led to a conversation that the company had a major challenge in the sourcing of good quality plungers. In the first instance, they were keen for me to refurbish their plungers, which were not standing up to their requirements; it was a real problem for them. Although my engineering and machining expertise was of a high standard by then, my knowledge of the glass industry was very limited… but they gave me only 48 hours to come up with a solution!

There were mould manufacturing companies that were supplying plungers as part of their portfolio but without being focused on plungers. In those days, it was a case of taking the coating off the plunger and respraying manually; it was somewhat antiquated and we started to make templates to finish off and machine the parts. I have always been one to take a calculated risk and we invested heavily in people and machinery. These weren't new techniques as such but there was a real need for a dedicated company to refurbish a range of plungers to a high standard. We could immediately save the customer significant costs.

GW: How quickly did the company expand to meet the needs of your customers?
When founded in 1969, the company was called Hunmanby Precision Engineering Co… but that was quite a mouthful, so I abbreviated it down to Hunprenco. There was a gradual increase in staff numbers and two engineering experts from within the glass industry soon joined the team.

It was a constant challenge to find skilled engineers to meet our standards, however. In the early days, I was training them in-house on conventional rather than computerised machinery. I started on my own and when the orders started pouring in, we had to expand quickly. And today, we are recognised as the world's largest plunger and cooler manufacturer for the glass container industry.

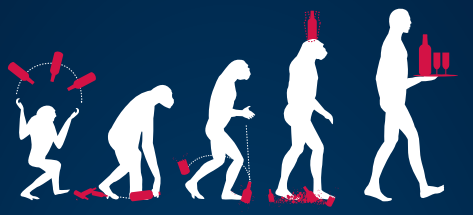
Eddie Neesom MBE developed different methods to manufacture a plunger and has consistently invested in new machines and technology over the past 50 years to maintain Hunprenco's market leading position.

GW: How quickly did the customer base grow?
We quickly established a good name for supplying good quality plungers at the right price, gaining other UK-based customers such as Beatson Clark and the business started to grow. Working overseas was the next big step and brought with it many challenges and opportunities. All opportunities were evaluated and members of the team started visiting potential customers that were identified in Europe.

Orders were secured from PLM (also now part of the Ardagh Group) and word started to spread about our solutions. But success did not come overnight and there were many repeat visits to the same factories; some customers were very long-term missions for us but right from the start, we were able to show the quality we could offer and the business continued to grow gradually as customers became aware and convinced by our solutions.▸

Across two manufacturing facilities that occupy a total area of 6200m^2, a 115-strong workforce includes skilled machinists and metallurgists with vast knowledge of production methods in glass container manufacture.

Hot glass handling is evolving



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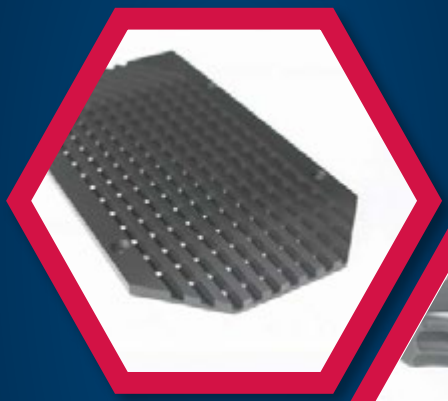

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In the early days, it was too much of a risk to send anything by air and all of our technology was despatched to Europe by road. In many respects, delivery demands then were not as strict as they are now but today, with 25% of business from Europe and 75% in other parts of the world, customers can still rely absolutely on Hunprenco to supply quality on time.

GW: When did the business expand beyond Europe?
There were many success stories and our expansion into Europe provided a platform to sell further afield. We secured business with a company in Japan then progressed into Australia and the Middle East, continuing to sell based on quality, while keeping an eye on price and delivery.

GW: How did your engineering methods evolve as the portfolio and business grew?
From the very beginning through to today, I have never hesitated to invest in new machines and technology; all opportunities are evaluated and if they are to our advantage, we have invested accordingly. Embracing the latest methods and technologies has been the correct thing to do and those principles are a main reason why the company is where it is today and why it is so well positioned for the future.

We've introduced new methods of machining with the latest technology so that our process works faster and more efficiently than with previous machines. This includes many different types of spraying materials, machinery and cutting tools, always looking to work faster at better quality to keep ahead of the competition. Many cutting edge processes are used in production, including inspection, CNC technology, CNC engraving, honing and polishing, CNC micro-drilling and swaging.

But even 50 years ago, quality products were made when hand spraying and fusing the plungers. When NNPB was introduced in the late 1970s, more plungers were needed with better bonding of the coating to the base material. Continuing to move in that direction, I was subsequently convinced after trials at O-I that we should go robotic and after an initial investment that showed no porosity in the plungers, today Hunprenco has six robots. No plunger is hand sprayed today. They are all HVOF (high velocity oxy-fuel) sprayed to the highest standard.

Many years ago, honing machines were designed in-house to our exact requirements. Today, the business still operates a number of machines of this design to ensure surface finishing of the highest standard. These precise machines are special to Hunprenco and help set us apart as an industry leader.

With machining and engineering originally a hobby to Eddie Neesom MBE in a disused stable, the company was soon able to refurbish a range of plungers to a high standard and offer customers in the glass industry significant costs reductions.

The company's main activities are now centred on the plunger and cooler division for NNPB, PB and BB operations. We also manufacture a vast range of precision-engineered components to customer requirements.

GW: What is the company's approach to future investments?
Over the years, we have been very astute at doing the right things at the right times… it is always necessary to continue looking forward, that's how we've been able to keep progressing over the years. We will always continue to invest when it makes sense but not exclusively in technology. Hunprenco has recently invested heavily in an enterprise resource planning (ERP) system to be an integrated management tool in its processes - collecting, storing, managing and interpreting data from activities throughout the business. It's a major investment but it's necessary to manage that side of the business even more efficiently in today's environment.

GW: And how does Hunprenco invest in its staff?
Our company motto is 'You have to take care of people'. This refers not just to customers but also to employees. The secret is to get to know people and investments into our team is at the core of everything we do.

Technology moves on so rapidly that to some degree, there is less knowhow… but you can't easily replace the skill of machining something. The secret is to have the right people and the correct machines. Hunprenco is very proud of the people that work for us and the technology introduced.

As the largest employer in the vicinity, we currently employee approximately 115 people, including skilled machinists, metallurgists and a workforce with vast knowledge of production methods in glass container manufacture.

Hunprenco is family-owned and at 87, I am still actively involved in the business alongside my wife Marilyn. Including expert agents in central and South America as well as Asia, the team's expertise is second to none and the company is well placed to continue moving forward. It is necessary to keep investing in the next generation, however, because they represent the future. We are successfully recruiting apprentices every couple of years, although I believe there should be greater incentives to do so from the national government and glass association. I am very passionate about apprenticeship schemes and for the good of the glass industry, I strongly encourage everyone in the industry to come together and make it more attractive for companies like Hunprenco to start apprenticeships.


Alongside his wife Marilyn, Eddie Neesom MBE is still actively involved in the family-owned business.

GW: How do you hope to see the company develop further in the future?
In recent years, Hunprenco has overseen a major expansion of its Filey site. After increasing the capacity of the plungers and coolers division in 2016, we then expanded the precision engineering division of the business.

A state-of-the-art thermal spray division was installed, including the HVOF and plasma spray equipment, along with conventional flame spraying plant. This allows the company to offer a multitude of high-tech coatings from carbines to oxides, along with metallic to other sectors of industry, where wear and corrosion are a major factor in the life of components. To complement this facility, a full-scale laboratory has been commissioned to test and approve all coatings for mechanical, structural and chemical properties.

The company now consists of two manufacturing facilities that are situated very close to one another and occupy a total area of 6200m^2. Additional buildings were acquired to accommodate the expansion and enable us to reorganise to maximise efficiency. There is still more land available and there are many initiatives that can be undertaken in the future.

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Setting standards for furnace health management

Having worked for one of the glass industry's leading furnace contractors for more than 30 years, Fred Aker was recently confirmed as Vice President of Sales and Marketing at PaneraTech Inc. He joins a passionate and innovative team that is becoming increasingly influential in the management and optimisation of glass melting furnaces throughout the world.

It took just one visit to the PaneraTech offices in Virginia to convince Fred Aker to accept an invitation to join the innovative provider of furnace life optimisation solutions. "They have a young, passionate team and everyone was excited about what they were doing" he explains.

In recent years during his role as Sales Director at SORG, Fred Aker had heard PaneraTech CEO, Dr Yakup Bayram make a series of enlightening conference presentations about SmartMelter technology and was fascinated by the results achieved on behalf of leading international glassmakers.

PaneraTech CEO, Dr Yakup Bayram (right) and Fred Aker, the company's recently appointed Vice President of Sales and Marketing.

Furnace health management focus

PaneraTech was established almost a decade ago to provide deterministic furnace health information based on SmartMelter radar technology. The business started with the support of Libbey and O-I, along with the US National Science Foundation to fund the development of a radar solution with multi-million dollar backing. This radar-based furnace health assessment solution has been commercialised and used for the last 2.5 years for furnace risk management and repair/rebuild optimisation.

According to Yakup Bayram, the company is basically identifying any required maintenance or potential furnace failure between one and three years before the human eye or any thermal technology can see the extent of deterioration. As the business grew globally, it became apparent that customers expected PaneraTech to aim even higher and offer enhanced services along the lines of furnace health management.

In particular, they wanted something that not only uses radar but also incorporates information from audits, visual, thermal and endoscopy inspections and production data to assess the health of the furnace objectively. And as Dr Bayram emphasises, this type of system will offer the best objective advice to customers in terms of repairs and maintenance planning. "What differentiates us from everyone else in the industry is that we do not own a repair service and we never plan to" he says. "This provides us a platform where we can objectively tell customers what repairs they truly need, without any conflict of interest."

Under the leadership of Yakup Bayram, PaneraTech has invested strongly in the creation of a dynamic management team to deliver effective solutions that optimise the life of glass melting furnaces.

Fred Aker brings a detailed knowledge of furnaces to the organisation, together with considerable experience of lifecycle processes and a thorough understanding of how customers think and plan for major capital investments. "Just as importantly, Fred also brings a good network of relationships that can support the adoption of SmartMelter as the new industry standard in furnace health management."

In a similar vein, Fred Aker believes that partnerships will be important in the future. "Furnace designers need to be engaged about the best practices

to allow easy SmartMelter inspections" he suggests. We need to talk to repair companies so that their overcoating materials and back-up gratings allow for ongoing inspections. We also want to talk to repair companies about using SmartMelter as a platform to better serve our common customers."

Building management strengths

Under the leadership of Yakup Bayram, USA-based PaneraTech has invested strongly in the creation of a dynamic management team to deliver effective solutions that optimise the life of glass melting furnaces. "There are two things that are common among our team leaders" Dr Bayram contends. "They have a passion for what they are doing and they have the attitude of 'whatever it takes to get it done'. When you combine passion with such a self-driven attitude, anything becomes possible in a short period of time."

Dr Alex Ruege, for example, leads the company's Data Analysis and Reporting team. Every radar inspection goes through a process that traces every single radar measurement and documents every process the data goes through to ensure that accurate reporting is delivered to the customer. It is basically the same process used by major hospitals to deliver a final health report to patients based on their MRI, X-ray, PET or CAT scans. In the last two years, Alex Ruege has spent a significant amount of time building the infrastructure to establish a process that delivers a furnace health report to customers.

To build advanced analytics on the data collected from many different furnaces across the globe, Dr Vladimir Ivanov was recently recruited to lead PaneraTech's Data Automation and Analytics team. Essentially, he is supporting the existing process to ensure its efficiency, as well as laying the foundation for machine learning and artificial intelligence for the predictive maintenance of furnaces.

In addition, the company is expanding its software footprint with the upcoming SmartMelter XSight Furnace Health Management platform. This product is rapidly growing the software team under the leadership of Umut Akdemir, who was responsible for establishing agile software development practices that allow PaneraTech to respond quickly to customer needs, while ensuring quality. "Umut has established an amazing culture that replicates the best practices from Google and Facebook for high performance software development" says Yakup Bayram.

Bearing in mind that an important aspect of the company's work involves using SmartMelter sensors to perform furnace inspections, multiple sensors are being introduced this year, based on customer requests. This product development and equipment maintenance work is led by Michael Tsui, who has introduced a critical process to trace and track every sensor used in the field to ensure they are properly maintained and any shortcomings are quickly addressed. "In the last two years, Mike has developed a process to maintain and improve quality management of our sensors so that we can quickly scale our equipment in regional offices in Asia and the EU, without sacrificing service quality" Dr Bayram explains.

"The one person who I don't think I could thank enough on our team is Kristin Rohrer" he continues. "She joined us to co-ordinate our inspections but went above and beyond in establishing an infrastructure that tracks all of our projects and provides automation in managing multiple projects to the satisfaction of customers."

Sales and marketing focus

It was at the beginning of July 2019 that Fred Aker officially joined the organisation as Vice President of Sales and Marketing. Arguably, his first task has been to relieve Yakup Bayram of direct sales management responsibility, the CEO having personally sold inspections to clients in 40 different countries, while building a team and providing the necessary vision for product development. "It is amazing what he has done but there are limits!" ▸

SmartMelter inspection on a glass melting furnace.

SmartMelter radar technology is employed to provide deterministic furnace health information.

PaneraTech is a very process-oriented company and while it still feels like a start up in many respects, the team has already negotiated many of the associated 'growing pains'. "The sales process is still in version 1.0" Fred Aker suggests. "My immediate goal is to build a sales organisation. This team will be a combination of direct employees and regional agents where necessary. PaneraTech now has the processes and infrastructure in place to grow. Now we need to scale up sales to match this." In addition to planning maintenance, data has been used to postpone rebuilds without introducing additional risk. This has an important influence on the environmental impact of glass manufacturing, as well profitability.

Mr Aker will continue to be located at the heart of Europe at Lohr am Main, Germany, one hour east of Frankfurt Airport. And as PaneraTech expands its offerings, he will be travelling extensively to explain the additional value propositions to new and existing customers.

Regional offices are located in the USA, Turkey and Japan, with additional offices planned for Germany and India. "As we grow closer to our customers, the presence of local support is becoming more important to this vision" Dr Bayram confirms.

"Recently, a major flat glass producer reached out to us to perform a SmartMelter radar inspection on a furnace that has between one and two years left before rebuild. They wanted to use SmartMelter to identify any design issues that may have led to weak spots in the furnace that they were not aware of. This would help them avoid this issue in a new furnace design."

Fred Aker (right) has taken over direct sales management responsibility at PaneraTech, allowing Yakup Bayram, CEO to concentrate on delivering the vision required for new product development.

Broader service objectives

Until now, PaneraTech has been more akin to a radiology service provider but strategies are in place to turn its furnace health service into the glass industry equivalent to that provided by a specialist family doctor. To accomplish this goal, the company is learning more about furnaces, treating them instead like its patients, engaging customers more in addressing specific concerns and offering advice on how to care for their furnaces. "We never see ourselves becoming surgeons, like repair specialists who perform hot and cold repairs" says Yakup Bayram. "We are positioning ourselves as the objective voice in the room, whose only goal is to make sure our patient, the furnace, does well and makes it safely and soundly to its rebuild with minimal cost and risk to glass manufacturers."

To accomplish this objective, PaneraTech is adding experts to the team and improving its existing process. "We are following the best practices in operations from human health management services to offer furnace health management services" Dr Bayram explains. "Major service programmes will be released in 2020, including zero glass leak guarantee programmes, a full furnace health management programme and a second expert opinion programme. These are new offerings that will move the industry in a very favourable positive direction for better furnace health management."

Positive partnerships

The PaneraTech team is now witnessing a movement among furnace design and repair companies to engage in SmartMelter-friendly design offerings. "We are extremely happy with this because they are already embracing the future and recognising that this technology is destined to become the de-facto industry standard in managing furnace health" Yakup Bayram concludes. "This is turning out to be a win-win for everyone in the industry."

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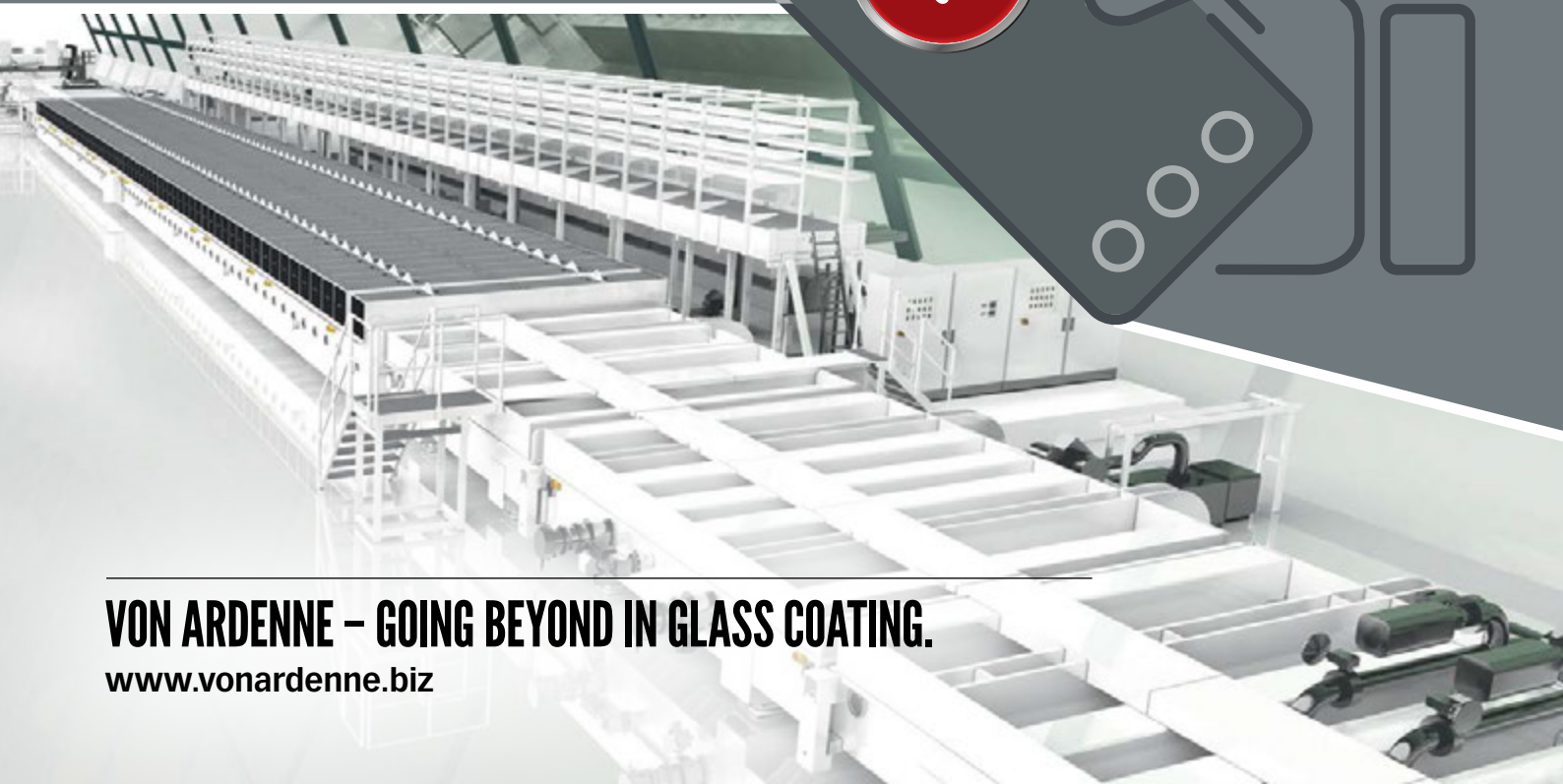

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Optimum design concept for energy-efficient furnaces

Xuqing Xie discusses the AGCC approach to furnace design to reduce energy costs and CO_2 emissions.

It was in July 2018 that Asahi Glass changed its name to AGC Inc. The group's wholly-owned AGC Ceramics (AGCC) subsidiary started making refractories in 1916 and provides products and services in the fields of glass, aluminium, cement and incineration etc.

Dating from 1976, the AGCC engineering business has built various glass furnace types, including recuperative, side-port, end-port and oxy-fuel combustion furnaces for container, tableware and sodium silicate glasses. Reducing fuel consumption is becoming increasingly important to protect the global environment. The AGCC design concept contributes to the management of these issues.

Energy saving design

Fossil fuel is used as the main energy source to melt containers, tableware and sodium silicate. To reduce fuel consumption, it is necessary to improve the insulation and heat recovery efficiency. These improvements should be realised while considering the balance with glass quality and furnace life. AGCC has addressed this issue for many years and has achieved several successes.

Ecolead is the name of the AGCC design. Figure 1 shows actual energy consumption results for furnaces, when comparing side-port, general end-port and Ecolead furnace designs without electric boosting. The X axis is the furnace pull, while the Y axis shows the unit consumption. As a general rule, the unit consumption of an end-port furnace is better than from a side-port design. Ecolead is better than the general end-port. For example, for a pull of 200 tonnes/day, the unit consumption of the end-port design is over 10% less than a side-port. But the unit consumption of Ecolead is +5% less than the end-port.

Efficiency and cost of electric boost

Electric boosters can heat glass effectively and are widely used. Since the glass is directly heated by electricity, it is efficient and can easily realise pull and glass quality improvements.

The blue line in figure 2 shows the change of total energy consumption against the amount of electricity in a 250 tonnes/day furnace that uses gas combustion and electric boost. Energy consumption is improved by increasing electrical power, because electricity is directly applied to the glass.

On the other hand, the red line in figure 2 shows the change of total energy cost for gas and electricity calculated by equation 1. Gas and electricity costs are calculated using prices in Japan. As the power of the electric boost increases, the amount of gas used can be reduced but the total energy cost increases. This is due to the fact that the efficiency of electrical energy is better than gas combustion and the price of electricity is more expensive than gas. In the Japanese market, therefore, fossil fuel is used as the main energy source and electricity is used as necessary.

CO_2 emissions comparison

Fossil fuels emit CO_2 as shown in equation 2, so the CO_2 emission of

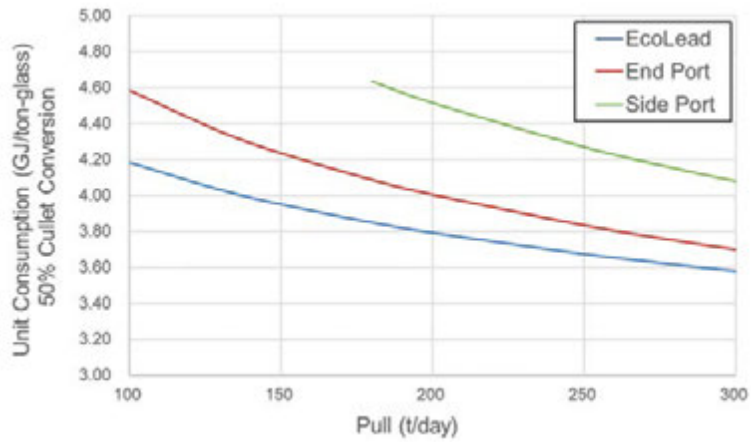

Figure 1: Unit consumption comparison of glass furnaces (without electric boost).

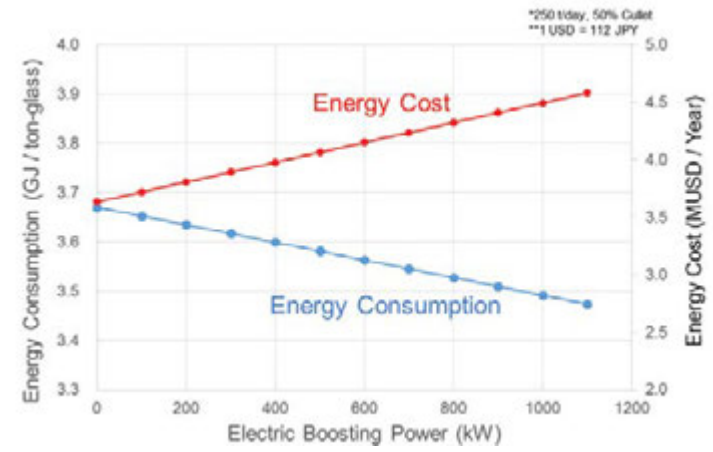

Figure 2: Relationship between energy consumption and cost in Japan.

Equation 1: Cost calculation equation.

ASEAN FEDERATION OF GLASS MANUFACTURERS

This article is based on a paper presented by Xuqing Xie at the 42nd ASEAN Glass Conference in Yogyakarta, Indonesia, held in September 2018. **www.aseanglass.org**

Glass Worldwide is the official journal of AFGM

Xuqing Xie addresses the 42nd ASEAN Glass Conference in Yogyakarta, Indonesia, in September 2018.

each energy source should be considered:

$C_xH_y + (x+y/2)\ O_2 \rightarrow x\ CO_2 + y/2\ H_2O$ ... equation 2

Table 1 shows the comparison results of CO_2 generation of each energy source in Japan. The CO_2 emission factor in table 1 is a value indicating the average CO_2 emission from city gas, fuel oil C and electricity in Japan. Results of the three summarised cases show that city gas is the lowest CO_2 generator, while electricity and fuel oil C are almost the same. This means that using electricity does not necessarily lead to CO_2 emission reduction in Japan.

Because most power generation in Japan uses fossil fuel, there is CO_2 emission at the power plant. The loss of electrical transmission gives the effect to energy efficiency. In fact, it must be considered on a case-by-case basis, depending on the country and location where the furnace is constructed.

Electricity has low CO_2 emissions in the furnace. However, it cannot remove CO_2 emissions totally because the fossil fuel is also the energy source for power generation. So, CO_2 is generated in power generation plants and sending loss from the power plant to the furnace increases CO_2 emissions.

Energy source for power generation in Japan and ASEAN

Figure 3 shows the energy source for power generation in Japan and ASEAN. In Japan, almost 75% of power generation is generated from fossil fuel. For Indonesia, the Philippines and Thailand, fossil fuel is also the main energy source for power generation; Indonesia is over 85%, the Philippines is nearly 70% and Thailand is also over 85%. In these countries, the CO_2 emission factor and energy cost appear very similar.

As a general rule, the life of a glass furnace is very long, sometimes more than 15 years. Figure 4 provides a perspective of the world's electricity demand. Energy demand is expected to increase in the future but fossil fuels will still be the main energy source for power generation, at more than 50%. Under this trend, the use of energy saving furnaces is very important. AGCC will continue to create a value through ceramics technology to protect the global environment.

Insulation material and design

AGCC's key material for insulation is called THERMOTECT (TMT). In 2015, this material received the grand prize for excellent energy solutions in Japan. It has many excellent properties such as high thermal insulation at high temperatures, low ageing degradation and human body-friendly (non-refractory ceramic fibre).

AGCC uses TMT for ports, regenerator walls, breast walls and crowns, as shown in figure 5. The material has already been adopted in many furnaces. Customer feedback is that TMT exhibits no degradation compared with conventional insulation materials, as in the example of figure 6 (continued on page 92).


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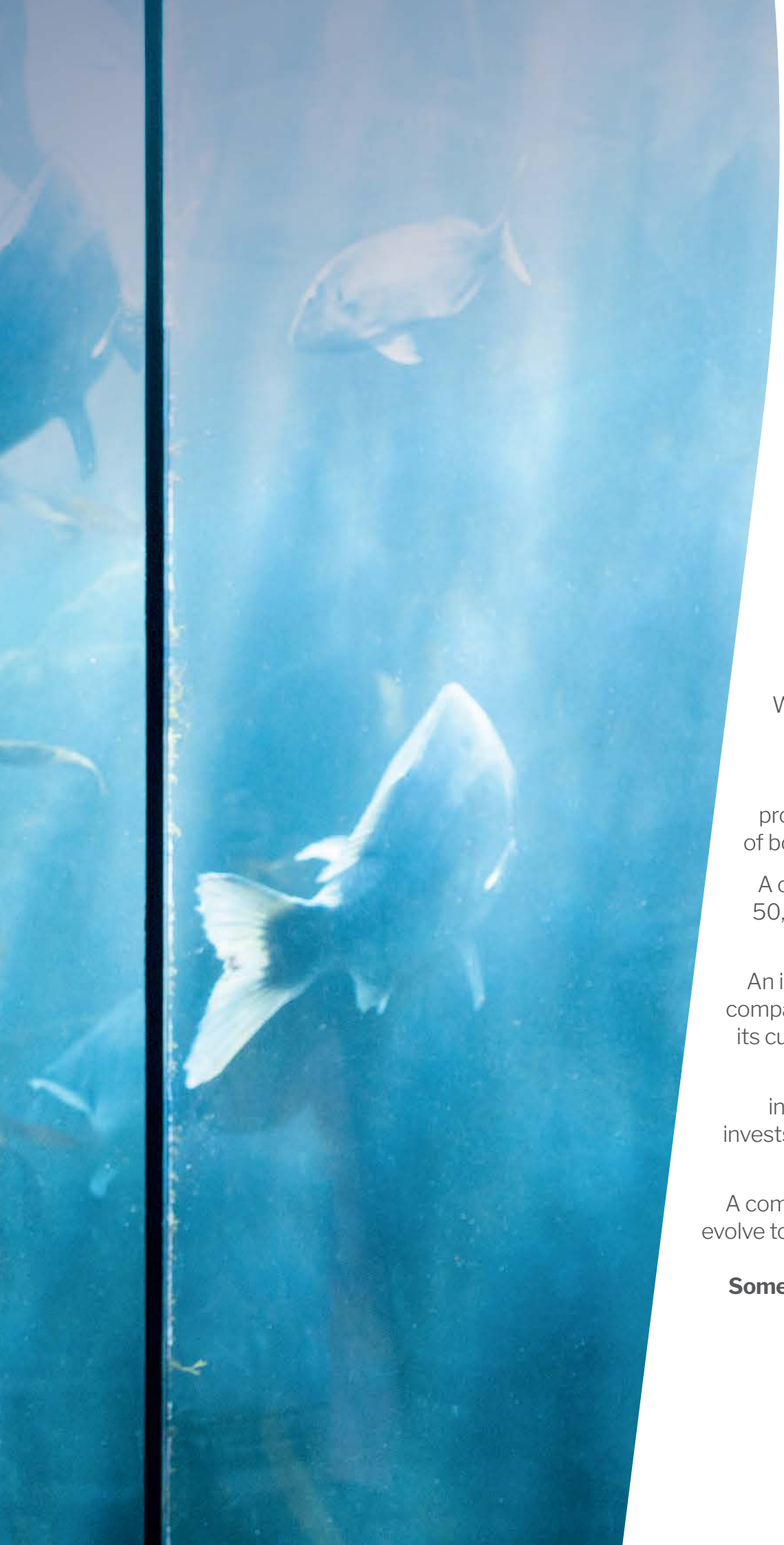

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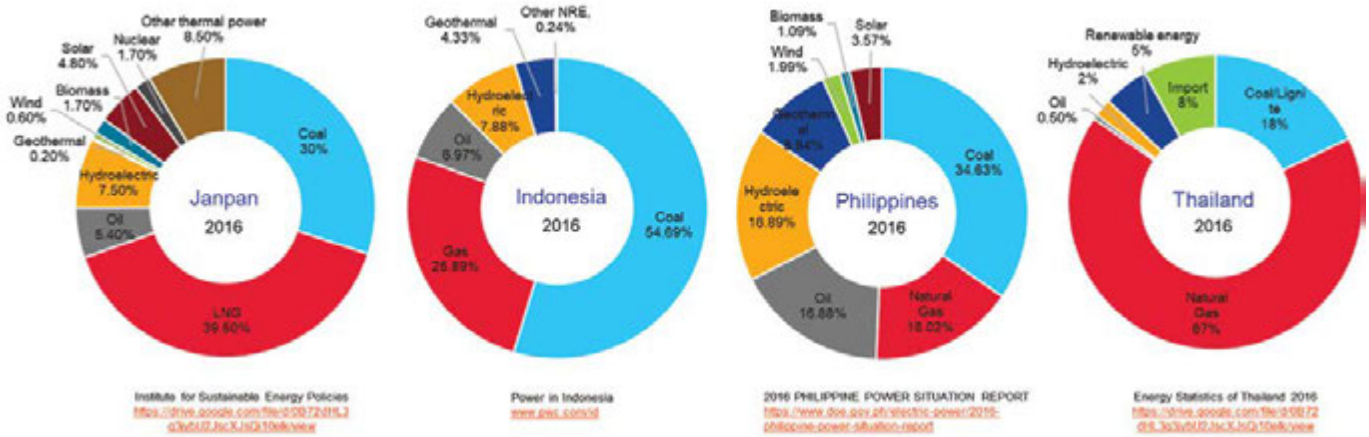

Figure 3: Energy sources for power generation in Japan and ASEAN.

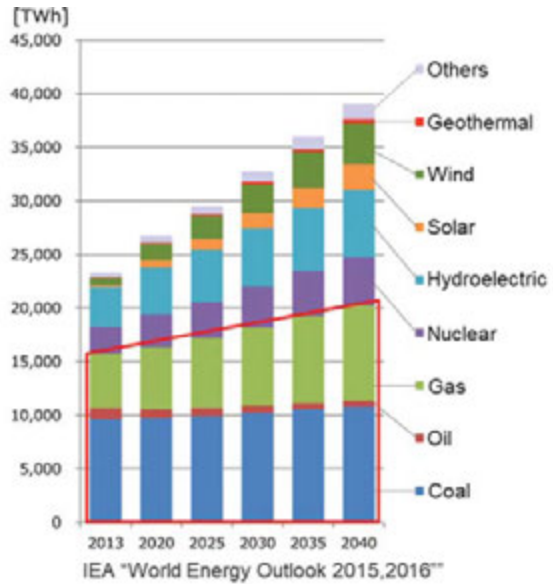

Figure 4: Global electricity demand.

	CO_2 Emission Factor (t-CO2/GJ)	Energy Efficiency	CO_2 Generation (t-CO2/GJ)
City Gas	0.050	40%	0.13
Fuel Oil C	0.072	40%	0.18
Electricity	0.144	85%	0.17

CO_2 Emission Factor / Energy Efficiency = CO_2 Generation

Table 1: CO_2 generation comparison for each energy source in Japan.

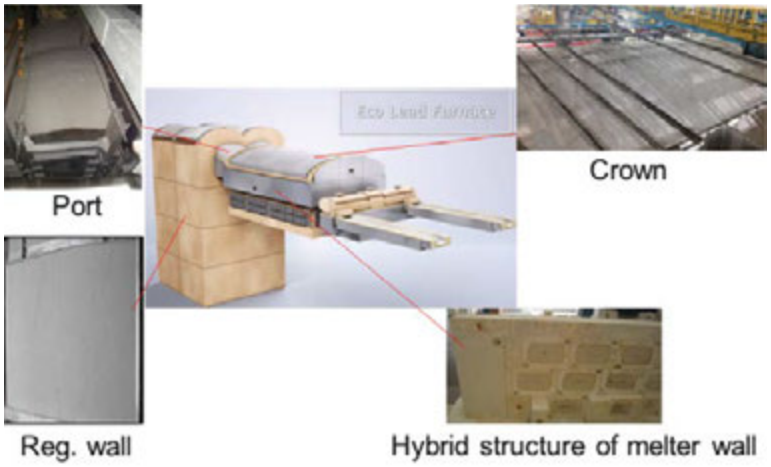

Figure 5: THERMOTECT application for glass furnaces.

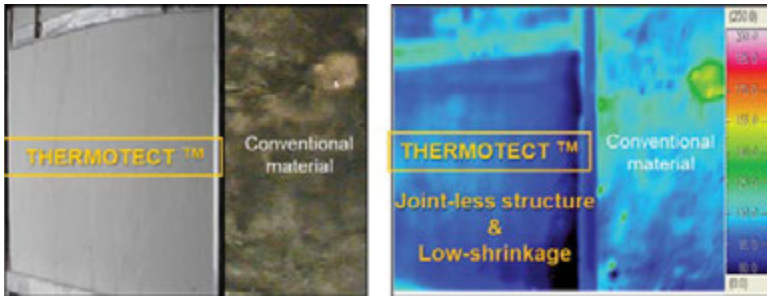

Figure 6: Thermo viewer imager comparison between TMT and conventional insulation materials after 2.5 years' use.

Conclusions

In order to reduce energy costs and CO_2 emissions, it is important to combine optimal energy sources, depending on conditions in every country and location. Reducing fuel consumption is becoming increasingly important to protect the global environment.

In addition, the combination of materials and design technologies must be balanced and energy saving needs must be addressed in the future. ●

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Decarbonising the glass industry

Volker Scharnagl reviews the prospects for CO_2-free glass melting and the economic implications of decarbonising the glass industry.

Glass melting is linked with carbon dioxide emission in respect of the energy input, as well as the decomposing carbonates bound in raw materials. A glass production totally free of CO_2 emissions is quite hard to imagine, especially when one is honest enough to realise that for CO_2-free raw material, the gas is emitted somewhere else in the production chain, ie at the raw material supplier making hydroxides out of carbonates. The same is valid for all-electric melting: When the electric power supplied is not clean, how can the postponed process be believed to be clean?

The author attempts to show the current state-of-the-art and what is possible to facilitate in order to decarbonise the process from the furnace supplier's side. The problems are not only in the glass melting process itself but also temporary electric power and local availability. In this context, hydrogen generation is considered a storage and transport solution.

Direct hydrogen firing is not considered in this article, because its overall firing efficiency is only approximately 50%. This is due to a generation efficiency of 80%, relation of net and gross calorific value of 85% (methane: 90%) and firing efficiency of 70%-80% (flue losses, depend on heat recovery system). Possibly it is sensible to apply hydrogen firing as an oxy fuel solution in a hybrid furnace, since oxygen is produced simultaneously in hydrolysis. Probably there is some synergy. But in the end, the efficiency is significantly lower than that of direct electric melting, even when using an H_2/O_2 power cell for electric power generation. Furthermore, effects on glass chemistry are not evaluated yet. It is known that water vapour is in concurrence with spaces occupied by sulphur. So most probably, foaming will occur very strongly, especially in the case of oxy fuel firing. Furthermore, colour generation in the case of amber glass might be a problem.

The current state-of-the-art solution for a CO_2-free melting energy supply is an all-electric cold top furnace. The problem of this kind of furnace is the lack of flexibility, which is increasingly needed, since most bottle users try to have a unique bottle for branding reasons. Because of this fact, new solutions need to be identified.

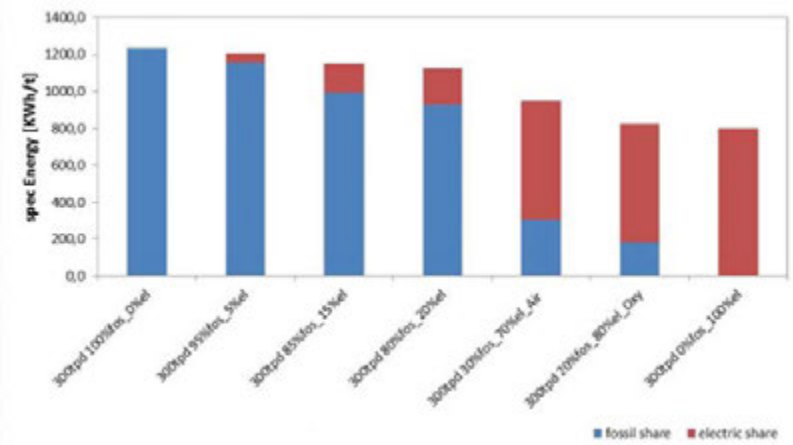

Figure 1: Energy consumption of furnaces with different electric power share.

Current state-of-the-art

A conventional container furnace melts 250-350 tons per day with a cullet content between 20% and 90%, depending on glass colour, quality requirements and availability. The electric energy share is usually between 5% and 10%. There are some exceptions, with less electric energy in countries with low fossil fuel prices and high electric energy costs like Russia and Mexico. On the other hand, there are also countries with relatively cheap electric energy in comparison with fossil fuel prices due to the absence of natural gas, like in Ethiopia and Bolivia. Glass producers in these countries try to apply as much electric power as possible. But most furnaces are hybrid designs, with a focus on fossil power supply.

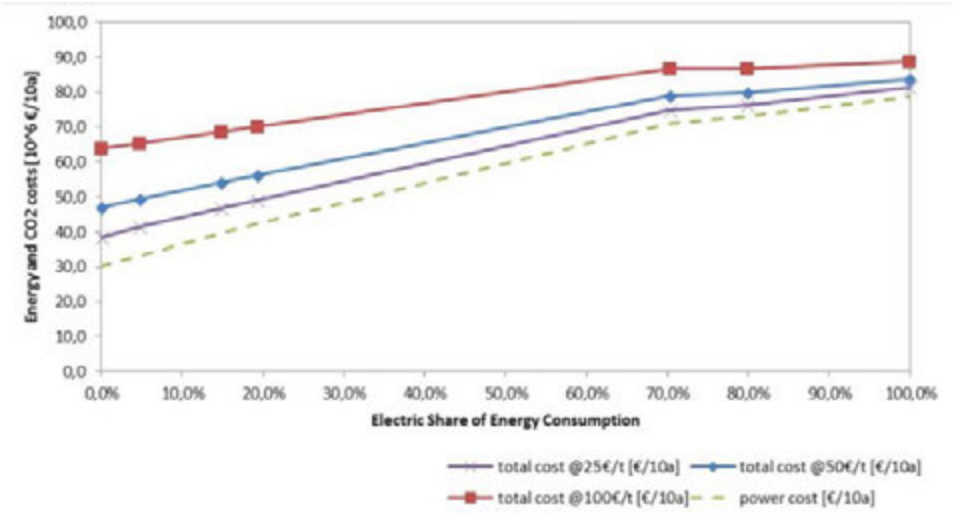

Figure 2: Energy cost and CO_2 allowance for 0.25 Euro/Nm³ natural gas and 0.09 Euro/KWh electric power.

Towards the best furnace concept

In the course of finding a solution, price development for power and CO_2 emissions will be crucial. Energy consumption and costs have been calculated, as well as CO_2 allowances for different furnace concepts, considering two still sensible, extremely cheap and expensive price pairs for natural gas and electricity. So two border conditions have been derived. Values are given starting from all fossil firing over some electric boosting share, with a main focus on fossil firing (ie 15%-20% of the applied energy), hybrid furnaces with a focus on electric power with an electric share of 70% for air firing and 80% for oxy firing, while the fossil energy input is identical but looks different due to the higher efficiency of oxy firing and a vertical all-electric melter.

The limitations for hybrid furnaces result from the thought that one energy source should be dominant for the sake of controllability. The all-electric horizontal melting furnace is a concept HORN is currently working on. This all-electric solution is capable of overcoming the flexibility problem of the usual cold top vertical melter.

Energy consumptions of all calculated furnaces are shown in figure 1. All values have been calculated for 300 tons/day, 50% cullet and flint glass. It can be seen that energy consumption depends basically on electric share of power supply. The energy shares are seen in the denomination of the datapoint, ▸

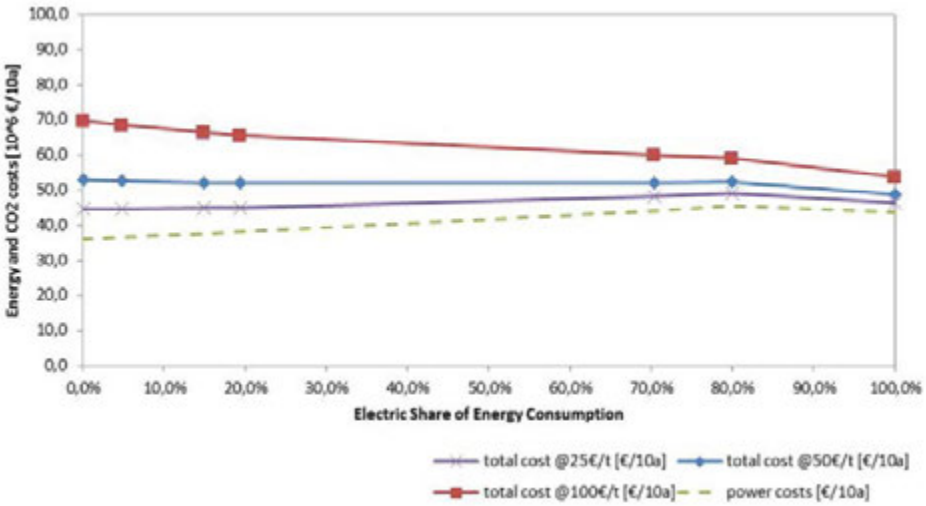

Figure 3: Energy cost and CO_2 allowance for 0.30 Euro/Nm³ natural gas and 0.05 Euro/KWh electric power.

ie xx%fos is the percentage of fossil fuel input related to net calorific heating value, while xx%el is the electric energy share. The only special thing about this diagram is the hybrid furnace. The fossil energy input is the same due to different efficiency.

Basically, every company is not interested in energy consumption but rather in costs. Whether a process is economically sensible is decided by running costs and pack-to-melt ratio, considering the legislative circumstances like NO_x emissions and public relations. The melting costs result from investments, maintenance, raw materials, power costs and CO_2 allowances.

Since differences in investment costs for furnaces are relatively small compared to running costs and raw material costs are always the same, figures 2 and 3 show the cost for fossil fuel, electric power and also including CO_2 allowances (total) for 10 years at 300 tons/day, 50% cullet and flint glass over electric energy share.

The scenario for figure 2 is considered a natural gas price of 0.25€/Nm³ (@ 0°C and 1013.25 hPa) and an electric power price of 0.09€/KWh respectively. This is a rather low price for fossil fuel and a rather high price for electricity.

Figure 3 shows a relatively high natural gas price of 0.30€/Nm³ and a low price for electricity of 0.05€/KWh. Oxygen costs are assumed in both cases with 0.13€/Nm³. These prices are in a sensible range and show significantly different results in melting cost. In both cases, CO_2 allowances of 25.50 and 100€/ton is considered. Currently the price is at 25€/ton but it is likely that this will increase to whatever value since politicians want to support decarbonisation of the industry.

What can be seen in figure 2, calculated with low natural gas prices and high prices for electricity, is an increase of total cost, with increasing electric power share mostly due to power costs. Expensive CO_2 allowances reduce the effect but are too low to compensate. The break even of this is a CO_2 allowance of 145 Euro/ton. Interestingly the total cost of the oxy-hybrid melter decreases in comparison with the air fuel-hybrid in case of increasing CO_2 allowance prices. So CO_2 emission is starting from a certain cost for CO_2 emission more expensive than oxygen consumption and combustion efficiency is solely the leading number for cost.

This picture turns totally the other way round if high prices for natural gas and low prices for electric power are used. The power cost still increases with growing electric power share but starting from 50€/ton, the CO_2 allowance is the dominant factor for total cost. The break even of influence of CO_2 allowance is at 23 Euro/ton. In this scenario, the increasing combustion efficiency of oxy fuel compared with air fuel firing is even more dominant. So in general, the power cost for natural gas and electric power determine how powerful the CO_2 allowance really is.

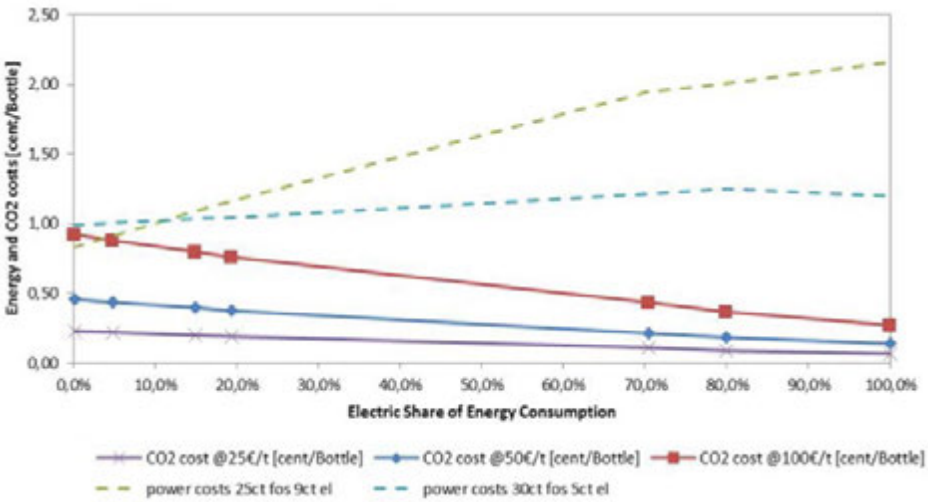

Figure 4: Theoretical energy and CO_2 cost for a 300g bottle.

Influence of CO_2 allowance on ware price

Ultimately, someone has to pay an increased price for the bottle. The energy and CO_2 cost for a bottle are shown in figure 4. Prices and circumstances are considered as above. So the CO_2 allowance might be responsible for one cent of each beer bottle and two cents of every wine bottle in case it would be four times higher than today. This is valid for a single use container. If a multi-use container is considered (50 refills), the price for CO_2 is totally neglible.

Conclusion

Furnace suppliers will have to develop new furnaces in order to achieve CO_2-free melting. HORN is convinced that every concept shown above will work, although those with high electric power share will still need some development resources. From a technological point of view, a hybrid furnace with an electric focus is preferred, because it is versatile and unnecessary to rely totally on one power source. In case of electricity, this power is additionally difficult to store. Furthermore, hybrid furnaces still have a flame, calming current furnace operators and keeping the technology if not the same still similar. On the other hand, they possess huge electric boosting to reduce CO_2 emissions drastically. From an economic perspective, every furnace has to be assessed separately, because fuel prices are very different in every country, as well as within single countries. ●

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OPTIMELT™ regenerative heat recovery for oxy-fuel glass furnaces

Melting glass with oxy-fuel combustion has been practiced for more than three decades at commercial production scales. In addition to lowering NO_x emissions, oxy-fuel melting reduces energy consumption and carbon footprint. However, at current energy prices, the fuel savings are not compelling enough to convert air regenerative furnaces to oxy-fuel operation. A step-change in performance of oxy-fuel furnaces is needed to broaden the appeal of oxy-fuel combustion for glass melting. Stefan Laux, Sho Kobayashi, Shrikar Chakravarti, Frank Schuurmans and Marco van Valburg report.

To address this need Praxair Inc, a Linde company, has developed and commercialised the OPTIMELT™ regenerative Thermo-Chemical Regenerator (TCR) technology, which combines oxy-fuel combustion with regenerative heat recovery. The TCR system significantly lowers melting energy consumption by storing waste heat from hot oxy-fuel flue gas in regenerator beds and using this energy to heat and thermally reform a mixture of natural gas and recirculated flue gas to produce a hot syngas.

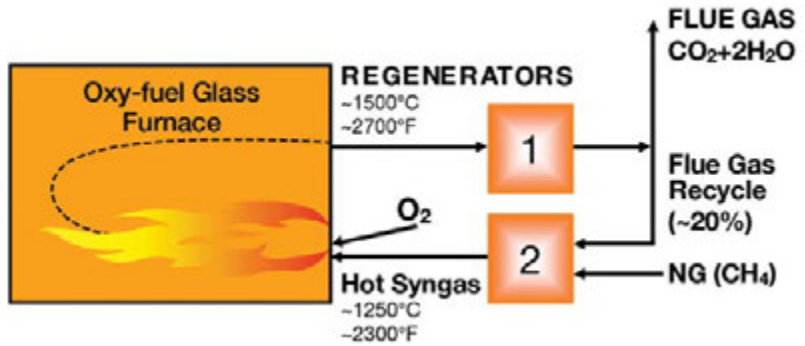

Figure 1: Praxair's OPTIMELT Thermochemical Regenerator (TCR) system process.

Figure 2: Libbey Leerdam furnace L1, with OPTIMELT system.

No catalysts are required for reforming due to the high regenerator temperature. The syngas is subsequently combusted with oxygen in the furnace. The flue gas cycle in regenerator one (see figure 1) is similar to the conventional regenerator heating cycle in which flue gas waste heat is transferred to and stored in the regenerator checker.

The unique feature of the TCR process occurs during the reforming cycle, where some recycled flue gas is mixed with natural gas at the bottom of a preheated regenerator and heated by the hot checker. When the gas mixture is heated above a certain temperature, various endothermic chemical reactions occur to convert the hydrocarbons in natural gas to CO and H_2 (syngas) using the CO_2 and H_2O in the recirculated flue gas.

The TCR system is integrated into the oxy-fuel combustion system and the furnace can be operated either in oxy-fuel firing, or TCR firing mode. For a large-scale commercial furnace, the OPTIMELT technology is expected to provide fuel savings of as much as 20% versus oxy-fuel and 25 to 30% versus air-regenerator furnaces[1-3]. The regenerators are similar in design to those used for conventional air heating but require only one third of the checker volume, making the retrofit or rebuild an economically attractive option. The OPTIMELT technology was first successfully demonstrated on a 50 tpd container glass furnace in Mexico.

OPTIMELT installation on the tableware furnace at Libbey Leerdam

In support of their sustainability strategy and alignment with the European carbon reduction roadmap, Libbey's L1 project goals were to install best-in-class furnace technology at the historic Leerdam production site for improved productivity, lower energy consumption and reduced emissions. Startup of the OPTIMELT system (see figure 2) at Leerdam was the last step of a comprehensive project to modernise and increase Libbey's tableware production.

The overall project included replacement of two recuperative furnaces with a single oxy-fuel furnace. The new L1 furnace started production with oxy-fuel combustion in Spring 2017. TCR startup followed in November 2017. Operating experience has been very positive[2, 3, 4, 5]. With the TCR system in operation, Libbey has been successfully meeting its glass production and quality targets. NO_x, SO_x and dust emissions have been significantly reduced.

Self-cleaning mechanism in the OPTIMELT system

Air regenerators used for glass melting furnaces are prone to plugging due to formation of salt deposits in the checker channels. Alkali vapours in the flue gas such as NaOH and $NaBO_2$ react with SO_2 and oxygen upon cooling and form Na_2SO_4 (sodium sulphate) and other species, which condense and form liquid and solid deposits on heat exchanger surfaces. Even with periodic cleaning, the plugging tendency remains and heat recovery performance deteriorates significantly.

However, with OPTIMELT thermochemical regenerators, little deposit accumulation has been observed after multiple years of operation. Recent inspection of regenerator refractory at Libbey's L1 furnace showed no degradation of the material due to reducing conditions that are present during the reforming cycle. In fact, these conditions seem to have a positive effect.

Sodium sulphate deposited during the heating cycle is being vapourised during the reforming cycle. Chemical equilibrium analysis identified stable salt species under both oxidising and reducing conditions. However, an evaporation rate of Na_2SO_4 was determined to be faster than its deposition rate under simulated regenerator conditions[6]. This 'self-cleaning' mechanism is consistent with observations from commercial operation and offers the long-term potential of lower maintenance requirements relative to conventional regenerators.

Closing remarks

Linde continues to actively evaluate OPTIMELT opportunities on a global basis, while advancing the technology for better performance and lower cost. Other benefits of the technology not discussed here include:

- Reduction in foam relative to oxy-fuel furnaces.
- Ability to maintain pull rate, while reducing level of electric boost.
- Smoother crown temperature profile, enabling increase in pull rate.

The support of the European Union for the implementation of OPTIMELT at Libbey Holland is gratefully acknowledged. ●

LIFE15 CCM/NL/000121 – LIFE OPTIMELT

References

1. A Gonzalez and E Solorzano et al, 'Operating Experience with OPTIMELT™ Regenrative Thermo-Chemical Heat Recovery for Oxy-fuel Glass Furnaces', 76th Conference on Glass Problems, 2-5 November 2015, pp 113-120.
2. M van Valburg, E Sperry, S Laux et al, 'Design and Implementation of OPTIMELT™ Heat Recovery for an Oxy-fuel Furnace at Libbey Leerdam', 78th Conference on Glass Problems, 6-9 November 2017, pp 89-97.
3. M van Valburg, F Schuurmans et al, 'Operating Experience with the OPTIMELT™ Heat Recovery Technology on a Tableware Glass Furnace', 79th Conference on Glass Problems, 5-7 November 2018.
4. http://lifeoptimelt.com/
5. LIFE OPTIMELT - Demonstration of thermochemical reforming of natural gas for reducing GHG emissions in Energy Intensive Industries - LIFE15 CCM/NL/000121, http://ec.europa.eu/environment/life/project/Projects/index.cfm?fuseaction=search.dspPage&n_proj_id=5684
6. P Orawannukul, H Kobayashi, O Verheijen, M van Kersbergen, A Zheng, 'Deposition and Evaporation of Condensible Vapors in Thermochemical Regenerators: Self-Cleaning Mechanisms in the OPTIMELTTM System', 25th International Congress on Glass, 9-14 January 2019.

Optimising emissions monitoring in glass melting furnaces

Neil Simpson considers how glass producers can optimise emissions using portable gas analysers in glass melting furnaces.

Neil Simpson, consultant at Simpson Combustion & Energy.

Why did you first decide to use gas analysers?

For the whole of my professional career, I have been using electronic-based gas analysers. I was shown how to use 'Orsat type' chemical instruments but found them unreliable and not that user-friendly. The first instruments I used regularly were to analyse oxygen and CO, which are the most important for safety and combustion efficiency. That is still the case today, however oxides of nitrogen and sulphur are now also important from an emissions perspective.

The first gas analyser that I had with $\%O_2$, ppm CO, ppm NO, ppm NO_2 and ppm SO_2 was over 25 years ago and although slightly smaller, cost the same as a small family car. As part of a company equipment standardisation, I was actually given this instrument and it still actually works, although it is too old to be used credibly. Thankfully, today's instruments are now less expensive and much more compact.

In 2016, I started working alongside AMETEK Land using the company's Near Infrared Borescope (NIR B) in-furnace thermal imaging system for real-time temperature monitoring inside glass melting furnaces. However, we identified, using AMETEK Land's Lancom 4 gas analyser, that there was a direct correlation between peak flame intensity and formation of NO_x. Since it is difficult to ascertain the emissivity of a flame, it is not desirable to state the temperature. Based on the physicist Zeldovich's theory, any parts of a flame that are above 1600°C will form more thermal NO_x.

What advice would you give anyone wanting to transport and work with a gas analyser safely?

For the last two years, I have used AMETEK Land's Lancom 4 extensively as part of furnace optimisation for energy and emission reduction projects. When transporting the instrument and specifically when flying, the battery connections should be removed. At a recent glasstec exhibition, AMETEK Land's Lancom operated for eight hours on battery, which is exceptional for any transportable emissions measurement device.

Unless you are working on a low temperature lehr, it is not practical to use the standard stainless steel probe due to the extreme temperatures. For short-term and rapid measurements over several ports, a consumable ceramic probe is appropriate. If you are working on a glass melting furnace, you should ideally have access to a water-cooled sampling jacket/probe. Otherwise, depending on the glass type, sample location, probe thickness/material and furnace operating conditions, you may consume quite a few probes.

How do you use the Lancom specifically in your day-to-day work?

Typically, I look at a glass melting furnace when there is a suspected emission or production (pull or quality) issue that could impact revenue. To make comparisons to the medical field, a portable infrared pyrometer like AMETEK Land's Cyclops is like a nurse's thermometer, the Lancom 4 a doctor's stethoscope and the NIR-B Glass a hospital's CT scanner. With the Lancom 4, I check for the breathing (air/exhaust) and the heart (combustion), typically measuring at the regenerator target wall, the port neck and the base of the regenerator, which is a good measure of air leakage. Sometimes I have to climb the chimney stack too!

What are the considerations when selecting a probe?

When selecting the material, it is worth considering the glass type. Assuming the correct grade, mullite can be a good material due to its high temperature thermal shock resistance. Interestingly, tubes are often manufactured as thermocouple sheaths, which have one sealed end that are cost-effective if you cut it off yourself.

While the Lancom 4 comes with a water catch pot, ▸

AMETEK Land's Lancom4 with probe.

external filter, external dehydrator and an internal flying saucer micro-filter, these should realistically be considered as instrument protection when working on a glass furnace. It is highly recommended that an additional filter system and gas preparation system are utilised. Any additional protection will help extend the life of the analyser and increase its reliability. You want it to work when you need it the most!

At AMETEK Land's factory in Dronfield, UK - and at other locations globally - the company has the ability to calibrate the Lancom 4 utilising calibration or 'span' reference gases. It can also be calibrated on-site if the necessary gases are retained but typically, this is an exception.

Why is annual calibration necessary?

While an annual calibration is recommended, whenever a stack testing team is on-site there is normally a chance to use their calibration gases to check your instrument. As a 'force majeure', the exhaust from a car can be used as a proof of cell operation for $\%O_2$, CO and NO_x.

One of the unusual but beneficial features of the Lancom 4 is the ability to use quick-release hose barbs on the measured inlet and exhaust. It is worth keeping a spare hose barb available in order to let the instrument purge with air between samples. It is probably most important to use this before going out to the furnace following calibration. The barb can be used with a finger to prove suction on the analyser. Depending on the furnace atmosphere and the instrument location, it may be desirable to have a hose connected to the exhaust and vent to a remote area.

In many instruments that I have used previously, the segment was domestic gas heating. When the CO reaches +7000 ppm, the system identifies a potential danger and shuts down the whole instrument. The Lancom 4 typically has a low and high range CO sensor. On furnaces with failing regenerators, I have witnessed CO values in excess of 70,000 ppm.

What advice can you give on measuring emissions from a furnace?

When working on an oxy-fuelled furnace, it is important to consider that at stoichiometric conditions, there is in theory 66% water vapour. The reality is that it will be less than this but it still has the potential to literally flood the instrument. When measuring the emissions from an oxy furnace, I advise trying to get as close to the furnace as possible, since there can be strange flows in the flue system specifically when more than one port is used. The benefit of oxy-fuel is that conditions are typically steady-state and there is no need to wait for a full firing cycle on a regenerative furnace. The exhaust port is typically negative pressure, so it is important to seal the probe with fibre to reduce parasitic air.

When working on an end-fired furnace, the port neck is the best location from an emissions perspective but is likely to be more difficult to reach from a health and safety perspective due to height and access. The target wall is often used since there are almost always access platforms. This point is close to the potential location of a Lambda or oxygen probe sensor. It is important to remember that these permanent static probes measure oxygen in an atmosphere where the water vapour is still present and that the regenerator oxygen concentration is measured on a wet basis. As a result, in part of the sample conditioning, the oxygen in a Lancom 4 is a % dry basis. The reversal period is usually 20 minutes and there are typically transient variations as the fuel flow and air ratio stabilises, which then leads to a reduction in air preheat temperature. Depending on the furnace and control system, you may wish to wait five minutes before recording data or disregard during the analysis.

Cross-fired furnaces typically have three to nine ports to measure, with 20-30 minutes per reversal. This creates a chronological dilemma. If you were to measure every port for 20 minutes as in an end-fired, then it could take up to six hours!

As a first step, it is suggested that an attempt is made to measure every port during one reversal. If you follow this process, it is essential that you test the same ports in the same order, since then you will measure at similar phases of the firing cycle. From a safety and heat exhaustion perspective, I suggest starting at the last port first. This port will typically have the highest excess O_2 and so the measurement will stabilise faster.

Position the analyser mid-way between the sample points and as soon as the measurement is stable, record and move the probe to the next measurement point. Then, move the analyser and ideally briefly retire to a lower temperature area as a new sample comes through. The length of the tube is a compromise since the shorter the tube, the faster the response time but it means there is more risk of damaging a probe. A longer hose is easier to move but has a slower response. By starting at the furthest point, psychologically you are working 'homewards' to the cool control room and a glass of water!

Portability and accuracy

Lancom 4 is a portable flue gas analyser that is integrated into a compact battery-powered unit and is able to measure up to eight gases simultaneously with nine separate sensors (high and low CO).

Simple to set up and easy to operate, Lancom 4 enables highly accurate spot and semi-continuous gas testing, adaptable to a wide variety of applications and ensuring a plant maintains full compliance with safety and emissions requirements.

Customisable to specific gas measurements and process stream conditions, a resilient stainless steel probe extracts the gas sample, while advanced real-time processing techniques produce the highly accurate combustion and emissions calculations needed. A ceramic probe is available for high temperature applications such as those in the glass industry.

Lancom 4 is simple to set up and offers low maintenance. It is therefore the ideal choice for industries burning coal, natural gas, oil or biomass, including applications in glass, power generation, hydrocarbon processing, natural gas compressor stations, minerals and industrial boilers.

Leading global supplier

AMETEK Land is a business unit of AMETEK Inc, a leading global manufacturer of electronic instruments and electromechanical devices. The company designs and manufactures a wide range of instruments for industrial non-contact temperature measurement, combustion efficiency and environmental monitoring. ●

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Forehearth performance database

The choice of furnace and forming machine supplier and technology are primary concerns when planning a glass container production facility. Despite the fact that forehearths play a crucial role in both the forming process and plant productivity, they are often regarded as of secondary importance… merely a physical link between the two key players. Forehearth selection is therefore a somewhat arbitrary process that usually conflates convenience with cost. According to John McMinn, Forehearth Services performance audits have shown that a great reputation in furnace design is not necessarily a guarantee of greatness in forehearth design. Yet single source furnace and forehearth combinations are common throughout the industry, predicated on sourcing convenience rather than critical technology assessment.

For over 10 years Forehearth Services has carried out extensive performance audits on almost every conceivable forehearth design in glass plants across four continents. The company has now collated the results into a database that provides a quantitively based insight to the advantages and disadvantages of the various forehearth systems in use today.

Among the key points to have been learnt so far are the following:

Not all forehearths are equal

A diverse range of forehearth technology is available, each attempting to achieve the same goals with different technology but with widely varying levels of success. Although some forehearth designs are underpinned by technical competence and experience, others show imagination rather than a technical understanding of the thermal processes within a forehearth that is necessary for thermal conditioning and forehearth performance.

Forehearth Services performance audits have identified a design hierarchy in terms of thermal conditioning, fuel efficiency, maintenance requirements and glass defect potential.

In-house forehearth designs

Many glass plants believe their in-house designs are less expensive and technically equivalent to those offered by dedicated forehearth suppliers. In this, they are normally 50% correct and provided the overriding concern is the reduction in initial capital expenditure, they should not be disappointed.

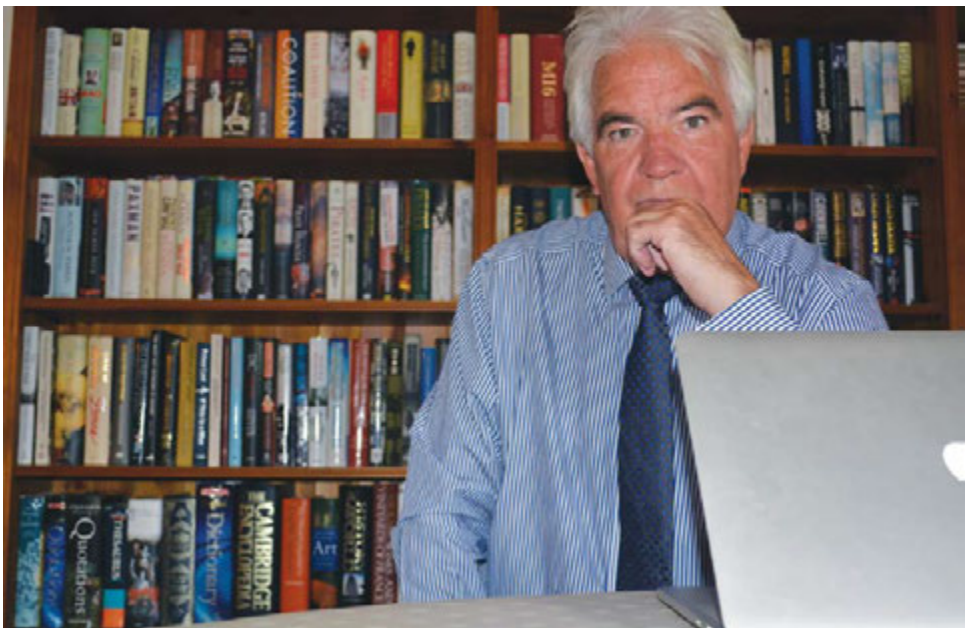
The top-tier forehearth system suppliers have a wealth of experience, with diversely qualified personnel and on-going development programmes that maintain their position as premier suppliers and experts in the field. This requires a level of commitment and expertise not available to the majority of glass plants.

In virtually all cases, externally sourced technology, from a top-tier supplier, provides superior glass conditioning and forehearth performance.

Common furnace/ forehearth sourcing

Other than convenience, common sourcing of furnace and forehearth reduces the line of supplier responsibility. This is obviously an attractive option for a glass plant. However, while some furnace suppliers do provide top-tier forehearth and distributor designs, there are those, whom the audit results show, provide less efficient systems.

Consequently, convenience of supply can compromise the performance of the production. The decision on which system to select should be based on technical evaluations of the available designs.



John McMinn.

'Love me, love my dog'

The cooling system and superstructure configuration essentially define and differentiate the various forehearth designs. The Forehearth Services audit results show that the efficiency of a particular cooling configuration largely - but not solely - determines a forehearth's position in the efficiency league tables.

With a few exceptions, forehearth suppliers use different combustion system technology. This is partly to further differentiate their system relative to others. The audit results show significant disparities in terms of operation and maintenance requirements between rival combustion systems. Consequently, the chosen forehearth may be equipped with the ideal cooling system but with a less desirable combustion system.

Unless bespoke control software

is used to provide advanced control strategies, audits show there is little to differentiate between the available control systems, since the control hardware and underlying control software are derived from a small number of third party suppliers. The SCADA screens may be more informative, or aesthetically pleasing but the control differences are relatively small.

From a glass plant perspective, the choice seems to be select the design feature that appeals and tolerate the other components that make it a whole – love me, love my dog!

Not all good systems are always good

Recently, a Forehearth Services audit identified the worst performing forehearth system since the campaign to audit the world's forehearths began. The design was old but audits on similar forehearths obtained substantially better results. The audit identified that not one single element of the entire system was functioning correctly due to de-calibration, absence of any maintenance and technical shortcomings of the operating personnel.

The vast majority of top-tier forehearth designs audited are commonly found to be operating sub-optimally. In fact, no audit has ever found a perfectly performing forehearth; newly commissioned forehearths are rarely audited.

For the vast majority of top-tier forehearth systems, this is not the fault of the forehearth design but is due to operational problems occurring post-commissioning. The recurring reasons for underperformance are system calibration and inappropriate operator interaction.

Analysis of the audit results database clearly shows that different forehearth systems have distinct calibration and maintenance requirements and within the top-tier systems in particular, require varying degrees of technical sophistication from those responsible for operating and maintaining the systems. This has important implications for the glass plant. It may not be the best solution, for example, to choose the forehearth supplier based on the superior theoretical performance or fuel efficiency of the combustion system if the system requires more frequent calibration or calibration procedures over timescales that negatively affect production.

Lack of training

The audit database shows that lack of training is an important and recurring element in forehearth performance dysfunction and occurs across the spectrum of glass facilities, irrespective of the perceived technical sophistication of the plant. Lack of personnel training adversely affects productivity. This can be addressed by the five day Forehearth Services theoretical and practical training course.

The best conditioning and performing forehearths are generally the most expensive. Spread out over the predicted lifetime of the installation, however, the cost difference between a top-tier forehearth system and lower tier systems can be mitigated by superior long-term performance.

The database shows categorically that the performance one obtains from any system is dependent on regular calibration, maintenance and the skill of the operator. Top-tier systems are great but they do not yet calibrate themselves. ●

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Precision temperature measurement in glass conditioning

Glass conditioning plays an important role in producing high quality glass. Here, Mr V P Rathi and Basant Rathi review the importance of precise temperature measurement in the glass conditioning process.

The glass conditioning process takes place in the working end (distributor), as well as in the forehearth and is mainly a thermal process, which reduces the temperature of glass from distributor to feeder. The heat is removed from molten glass by conduction across the channel walls. The glass temperature must be measured and controlled within 1-2°C from a range of 1100-1250°C in order to produce acceptable glass in the forming machine.

A careful study of hollow glassware defects shows that the majority relate to thermal homogeneity of the gob. The precise temperature control system is the main tool for ensuring glass thermal homogeneity.

The temperature control system consists of PID or adoptive control, which enables a correct response to changes in thermal regime in distributor and forehearth channels. The inputs to the control system are provided by temperature measuring sensors.

Pyrometers for forehearth installation.

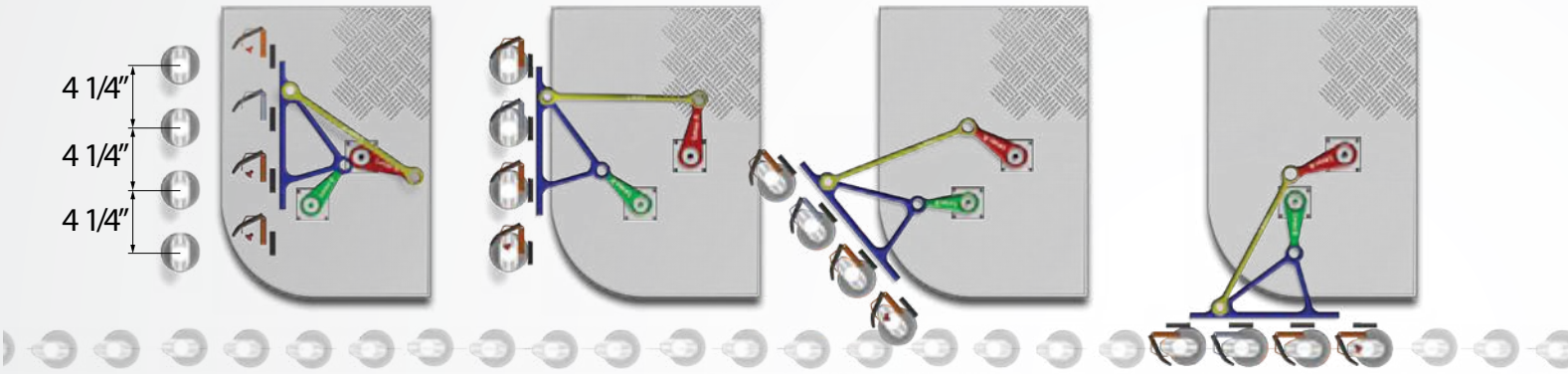
Temperature measurement in forehearths

Any change in the temperature can affect glass quality and temperature is a key parameter to measure and then control the combustion system, which means energy consumption savings. Variations in glass temperature directly affect glass viscosity. It is very important that thermocouple output and the controller's calibration are accurate, reliable and repeatable, so precise temperature measurement sensors are needed.

The temperature in the forehearth is measured by thermocouples or fibre optic pyrometers. ▸

Triplex thermocouple installation.

Thermocouples at one of the Tempsens facilities.



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Thermocouples

Thermocouples for measuring the temperature in forehearths are available in types 'S' and 'B', which are defined according the percentage of rhodium and platinum in thermocouple legs and their universal outputs in mV. It must be ensured that the thermocouple elements used are with Class 1 accuracy (±0.6ºC of 0.1% of measured value) to ensure the precise measurement of temperature in all zones of the forehearth.

Temperature measurement by thermocouples in forehearths is performed in two different methods: Temperature measured directly in contact with molten glass (platinum thimble immersion thermocouples) or by the thermocouples installation in the atmosphere of forehearth measuring the atmosphere temperatures (ceramic tube thermocouples).

Platinum thimble thermocouples

Measurements with thermocouples with a platinum thimble immersed in the molten glass are the most precise and accurate temperature measurement of the molten glass. The accuracy of temperature measured by platinum thimble thermocouples enables glassmakers to know exactly the real temperature of molten glass. Also, platinum thimbles are used to improve the service life of thermocouples.

For ensuring a long service life of immersed thimble thermocouples, the choice of thimble material should be carefully considered. For amber borosilicate glasses, for example, it is recommended to use pure platinum hardened thimbles, with no rhodium content. The reason is that rhodium can be chemically attacked by components in the glass batch, ie Si, Fe, Pb etc and may give reduced service life.

Tri-level thermocouples

Before using triplex thermocouples, the only way to recognise the homogeneity of glass was to look at the glass gob emerging from the orifice ring, where the direction of its curl would determine if there was a need to modify the temperature in the forehearth entrance or in the equalising zone.

Today, three triplex thermocouples are used with the aim of obtaining consistent and reliable information of the temperature distribution in the cross-section of the last part of the equalising zone in the bottom, middle and top parts of a section.

The bottom point of a triplex thermocouple is around 25mm from the forehearth channel block, the middle point is around 50mm higher and the top point is a further 50mm higher than the middle point. In this way, the temperature is measured for all bottom, middle and upper glass layers.

It is also recommended to install one triplex thermocouple at the forehearth entrance.

Ceramic tube thermocouples

Ceramic tube thermocouples that measure the atmosphere temperature are also a good solution to control the temperature of forehearths. However, when compared to platinum thimble thermocouples, they are less precise. This is due to the fact that the temperature of the forehearth atmosphere can be affected easily by the power of burners, especially when the flame touches the thermocouple tip, while the real temperature of molten glass will be somehow different from the atmosphere.

For ceramic tubes in these thermocouples, recrystallised alumina > 99.7% content of Al_2O_3 is highly recommended for improving the strength of ceramic tubes. For special applications like furnace crowns, dual protection or heavy wall thickness ceramic sheaths can be used. This leads to better thermocouple service life.

Pyrometers

Tempsens fibre optic pyrometers are specially designed for glass industry applications and provide high performance with low maintenance. The sensor part and other electronics are connected through a fibre optic cable. This allows the electronic assembly to be kept away from the high temperature.

The precise and robust design and compatibility with different installation locations are considered and all required accessories including purge units and flanges are available to deliver complete solutions for all glass plants applications. The measuring ranges of pyrometers are programmable.

Tempsens Instruments is one of the largest providers of temperature sensor solutions for all process industries including the glass industry. The company was established in 1976 and is headquartered in India, with additional manufacturing facilities in Germany and Indonesia.

This year, Tempsens established offices in the UAE and USA to serve customers in the Middle East and North America. ●

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Where next for energy efficiency and low carbon glassmaking?

Richard Stormont discusses opportunities for all-electric melting technologies in an increasingly energy efficient and low carbon glassmaking industry.

Glass production is a highly energy-intensive process. In broad terms, a net energy input of some 660 kilowatt-hours, or 570,000 kilocalories, is required to produce one tonne of molten glass from typical raw materials. Heat losses from conventional fuel-fired glass melting processes mean that the gross energy input in respect of the overwhelming majority of the world's glass production is more than double these figures.

Thermal efficiency

Design advances mean that the thermal efficiency of fuel-fired glass melting furnaces has improved over the years. However, even the most efficient struggle to exceed about 45% thermal efficiency. Typical figures for smaller and medium-sized furnaces are shown in figure 1.

The effect of reduced output

A further consideration is that whatever a fuel-fired furnace's thermal efficiency may be at full rated output, that efficiency falls rapidly when output is reduced. This is simply because even though output may be reduced, the heat losses which account for the majority of the energy used, remain more or less constant, irrespective of pull rate.

Few furnaces are operated at full rated output at all times, meaning that the actual average operating thermal efficiency of even a relatively large fuel-fired furnace may fall to 40%, 35% or less.

The challenge

As the large majority of the world's glass melting energy is derived from oil or gas, it is not hard to see why glass melting is a prime target in the drive for energy efficiency and associated emissions reduction.

Existing alternative technologies

All-electric melting, referring to cold top vertical process melters, has long been a preferred technology choice for specialist sectors of the glass industry – for volatile fluoride opal, borosilicate and lead crystal glasses and for low capacity and/or high quality, high value products. Electric melting in such cases offers high glass quality, minimal emissions and environmental impact and high energy efficiency, even in low capacity melters. The large majority of electric melters for such applications have been within the 10 tonnes/day to about 60 tonnes/day range.

The cold top electric melting process is inherently far more energy efficient than fuel-fired melting. Electric currents passing between immersed electrodes release heat energy directly into the glass itself, in contrast to the indirect mostly radiant heat transfer from flames and heated superstructure materials of a fuel-fired furnace. The glass surface is covered with an insulating layer of batch, resulting in minimal heat loss to the superstructure and the environment.

A well-designed electric melter of just 10 tonnes/day capacity can have a thermal efficiency of approximately 70%, reaching 85% in a large all-electric melter of 250 tonnes/day capacity (see figure 1).

Adopting and adapting

With this huge difference in energy efficiency between fuel-fired and electric melting, the elimination of combustion gas emissions and the pressure the industry is under to address these issues, it is no surprise that the container glass industry in particular is looking to relatively large electric melters as a key way forward in a sector historically dominated by fuel-fired melting.

Electric melters of say 200 tonnes/day capacity and more can be considered large in relation to industry experience and relatively few have been designed and built. However, the 85% thermal efficiency figure quoted above is from an actual 250 tonnes/day electric melter producing container glass and concept designs are well advanced for larger units in the 300 to 350 tonnes/day range.

Technical challenges

There are particular design challenges that have not always been properly understood or addressed in large electric melters. Successful cold top melting requires a full and detailed understanding of the heat release and glass temperature distribution created by different electrode arrangements. Batch charging and spreading equipment design is crucial; cold top melting of the chemically reduced glass compositions required by much of the container market requires great care in system design but can and has been successfully achieved for years. The production photographed in figure 2 is one example.

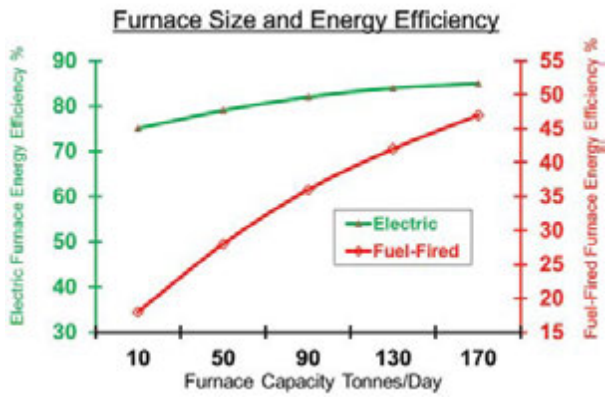

Figure 1: Typical energy efficiency of small and medium sized furnaces.

Alternative approaches

A large furnace with multiple forehearths and forming machines is of course not the only approach to bringing electric melting into widespread use in the container glass industry. Given the much wider experience and acceptance of more modest electric furnace capacities, an alternative approach might be a series of smaller furnaces, perhaps each with a single forehearth and machine, dedicated to a particular colour for example. This may be uneconomic for fuel-fired melting but as a 100 tonnes/day electric melter is only a few percent less energy efficient than a 300 tonnes/day electric unit and as there are both capital cost and operating cost savings in not heating long distributor channels, it can be an economic as well as practical proposition.

Distributor and forehearths energy saving opportunities

The melting furnace accounts for the large majority of the energy used in glassmaking but a typical distributor and three or four forehearths in a container glass plant may add another 10% to the furnace gas consumption. Electrically-heated distributors and forehearths are not new - the author was involved in their design and supply over 30 years ago - but what is new is the rapidly growing acceptance of the major energy and energy cost savings that changing from gas-fired to well-designed electric heating frequently brings. Some 60% to over 90% energy cost savings are common, coupled with ease of control, negligible maintenance and long operational life.

The way ahead

The realisation of the environmental harm that plastics have done and are doing is spreading rapidly, inevitably raising the profile of glass as the preferred packaging material. It is now up to the glassmaking industry to adapt its practices and adopt manufacturing technologies that match the environmentally acceptable image of glass as a product. ●

Figure 2: Amber bottle production from a large electric melter.

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Technologies for glass melting process optimisation

Pyrometers, thermal imagers and SCR power controllers provide efficient process control for glass melting furnaces and forehearths, as the following contribution from Erhard Niessner explains.

Today's industrial processes require precise measuring systems, especially for applications where high ambient temperatures have a substantial influence on the accuracy and duty cycle of the system components involved. LumaSense Technologies GmbH, an Advanced Energy company, offers a selection of pyrometers and thermal imagers to optimally control the glass melting process and constantly adjust the energy flow by means of SCR power controllers during electric heating.

The powerful combination of SCR power controllers developed by Advanced Energy, together with the LumaSense line of Impac pyrometers and Mikron thermal imagers, enable the user to implement a fully automated measurement and control system that meets the requirements of Industry 4.0 standards.

Impac IS 50-LO/GL pyrometer with Inconel tube for glass applications.

Portable Impac pyrometer Series 8 pro.

Glass melting tank

Because of the high temperatures and corrosive molten glass associated with melting furnaces, protecting the expensive bottom refractory from excessive temperature is essential for longevity. Monitoring the temperatures of the bridge wall and port arch can also provide information on furnace condition.

Temperature measurement is also directly related to glass quality, as well as prolonging the life of critical assets such as refractory walls and the melting tank itself. System solutions involving non-contact thermal imaging combined with pyrometry can help increase production efficiency and reduce waste.

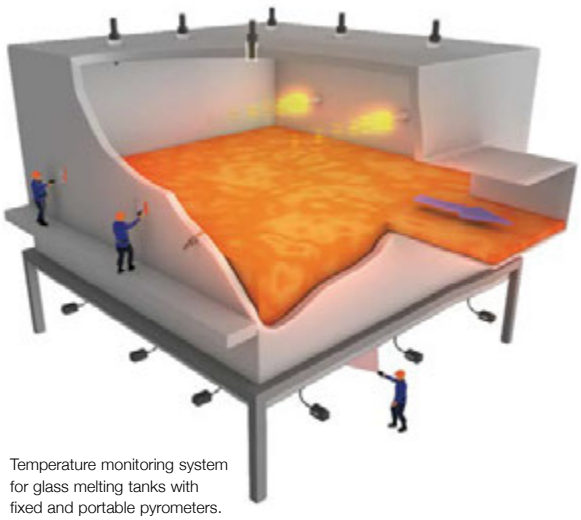
Fixed pyrometer solutions

The Impac IS 50-LO / GL is a special two wire digital pyrometer with fibre optics head and 4-20mA analogue output, designed for glass melting tanks, forehearth and feeder applications. The spectral range in the near infrared is especially suited to a fibre optic pyrometer. In addition, it achieves high measurement accuracy, while minimising dependency on emissivity. The digital technology of such a pyrometer achieves a reproducibility of 0.1%.

The design of this instrument was specially developed for glass melting furnaces and feeder areas. It is usually applied to a glass furnace or batch system with 15m of glass fibre, or alternatively, with 5m of fibre leading to the forehearth. The optical fibre itself can be fitted with protective tubes made of Inconel or aluminium oxide ceramics, for trouble-free, direct replacement on-site.

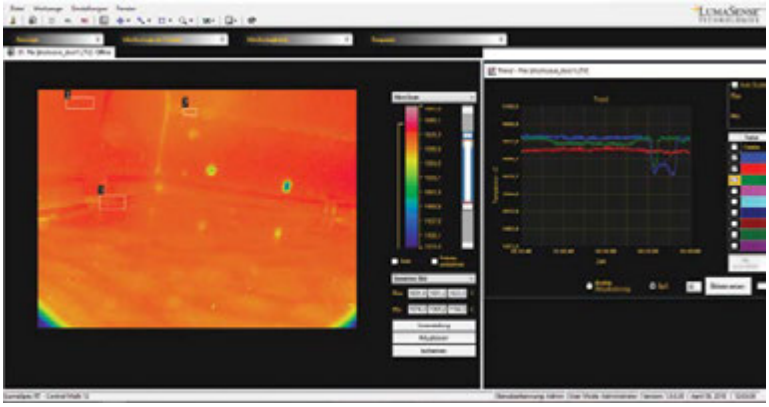
User benefits

The IS 50-LO/GL pyrometer using fibre optics is able to provide consistently accurate measurement results over many years, without the ageing and drifting phenomena experienced by thermocouples, thus reducing downtime and replacement costs. ▸



Temperature monitoring system for glass melting tanks with fixed and portable pyrometers.

FurnaceSpection system, including MCS640 thermal camera and software.



Thermal image of melting tank wall temperatures with ROIs via LumaSpec RT control software.

An exchange of existing sensors is easy to perform, as the physical dimensions of the pyrometer match those of the incumbent thermocouple. In addition, the service life of the sight tubes is considerably prolonged by overpressure inside the measuring tube.

By utilising Advanced Energy's SCR power controller on electrically heated preheaters or feeders, very precise temperature control can be achieved, resulting in considerable energy savings.

Portable pyrometer solutions

For measurement comparison and control of the furnace temperature, eg burner brick measurement or tank end wall temperatures, portable pyrometers can give early indications of potential refractory failures. For these applications, LumaSense offers robust, hand-held instruments with through-the-lens sighting for direct readings, high grade optics for detection of contours and ultra-small measuring spots.

These portable Impac Series 8 pro pyrometers enable users to store measurement data on-board for recall at the touch of a button. The spectral range of the IS 8 pro is chosen to match the stationary pyrometer IS50-LO. With the IGA 8 pro, which has a slightly longer wavelength, glass mould temperatures from 250°C can also be measured.

User benefits include flexible inspection capabilities to monitor critical areas and prevent dangerous refractory failures at the melting tank end wall.

Temperature measurement inside glass furnaces

The FurnaceSpection thermal imaging system has been designed and developed for continuous temperature measurement inside high temperature furnaces, which are used especially for glass production.

Available in a portable or stationary version, this is a shortwave infrared camera system with built-in flame filter, which reduces the influence of furnace chamber flame, as well as the CO_2 atmosphere. This system provides users with a real-time tool for quickly and accurately identifying process abnormalities before they develop into problems that can lead to unplanned outages. This radiometrically calibrated imager accurately measures the temperature of product, refractory and heat transfer surfaces inside natural gas-fired furnaces. The user is also able to monitor flame condition, thereby reducing the production of NO_X pollution, resulting in less environmental impact, while maximising furnace lifetime.

The latest generation of this high grade imaging system is equipped with a Vortex cooler and special borescope optics, which enables monitoring of the temperature distribution inside melting furnaces through the furnace wall, for example. By utilising high quality optics, a resolution of more than 300,000 pixels can be achieved and the borescope lens system is available in a number of different lengths to suit virtually any application and need.

With the addition of special spectral filters, the negative influences caused by burner firing can be avoided. Alternatively, a different set-up of the camera with another spectral filter can be implemented, whereby the flame image is visible.

With the FurnaceSpection system, multiple measuring points on the furnace ceiling, end wall and side wall can be independently monitored by adding measuring regions of interest. The measured values can be used for monitoring and regulation. Furthermore, the batch melting process can be monitored.

By adding temperature limits, which can be defined via the regions of interest, the entire reflow process can be closed loop-controlled using just the FurnaceSpection. This ultimately reduces the number of individual measurement points, thereby reducing maintenance and replacement costs.

FurnaceSpection helps operators monitor and control process temperature uniformity through streaming images documented by a powerful software for analysis and historical trending, outputs to automation and DCS and a real-time web server to broadcast images on the plant's local network. At a cost of several thousand dollars per furnace and re-tubing costs in the millions, a significant amount of capital can be lost if a furnace failure goes unnoticed or if the refractory linings are retired too early or too late.

Control software

Powerful LumaSpec RT control software is available for visualisation and closed-loop control. The thermal images can be displayed on the computer screen and can be viewed with different colour options. The measuring points or measurement areas can be freely defined. These values can also be output via I/O modules in analogue or digital values. In addition, threshold values can be defined by the software.

Should the melting furnace have electrical heating, the control output ROIs can be integrated into the control loop of the SCR power controllers, supplied by Advanced Energy.

Conclusion

The combined product offerings of LumaSense Technologies and Advanced Energy provide a tailor-made measurement and control system for the glass industry, designed to enable seamless production flow at minimum energy consumption, while reducing maintenance and installation costs and increasing plant availability. ●

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Is there a solution to anisotropy?

Anisotropy is the term used in physics to characterise a phenomenon that reflects variations on properties such as elasticity, temperature, conductivity, light propagation velocity and tensile strength when analysed in different directions. Herbert Jung considers the background and possible solutions to overcome this phenomenon.

Prior to 2015, architects in general did not consider anisotropy as a defect, it being deemed inherent to tempered glass. Nowadays, at least 20% of customers specify reduced anisotropy values for their final products. This steadily increasing global demand for anisotropy-free glass is a fact that is truly challenging manufacturers.

Figure 1: Examples of anisotropy.

Why does anisotropy emerge?

Anisotropy is also referred to as 'quench marks' or 'zebra marks' (Neugebauer, Kasumovic, Blazevic, 2017, pp117). Although 'quench mark' indicates the source of the problem to be in the quenching zone of a tempering furnace, a significant impact and the main reason for anisotropy emerges in the heating zone. Here, uneven heat distribution can emerge, resulting in an uneven stress situation within the glass (see figure 2) that leads to anisotropy.

During the tempering process, different parameters can affect optical quality, such as convection profile, oscillation speed, the number of activated heaters or the amount of glass on the loading table. However, four reasons have been identified that have a major and significant impact on anisotropy:

Uneven heat distribution

A modern but traditional furnace introduces energy into the glass in three ways (see figure 3), which are:

- Radiation.
- Forced convection.
- Conduction.

All of the above show different types of energy transfers have a different impact on the glass surface and on the heating of the glass. The ceramic rollers have a different temperature, even if only subtle, compared to the air bowed through the forced convection on the glass surface and this also counts for the radiation. Having different heating impacts on the glass surface leads to different stress directions and distributions within the glass – the basic foundation for anisotropy.

Volume on the loading table

As a rule of thumb, the more glass sheets there are on a loading table, the worse the glass quality and also the worse the anisotropy will become (see figure 4).

It is already well known that reducing the number of glass sheets on a loading table will significantly increase glass quality. This improvement has to do not only with greater oscillation of the glass sheets, which is possible due to more space on the loading table but also research indicates that this also has a significant impact on anisotropy because glass sheets that lie side by side reduce energy from the adjacent glass sheet (see figure 4).

This is why a high number of glass sheets on the loading table significantly disturb even heat distribution within the heating zone.

Defect heating

A well known problem with traditional tempering technology is a defect relating to upper or lower heating elements. This point is also strongly linked to uneven heat distribution. If a heating element is defective, the level of radiation in this area is different, hence it provides inhomogeneous heat distribution, which further increases the level of anisotropy.

Unfortunately, to achieve a stable process and to achieve a certain output, a furnace cannot be shut down if the heating element is broken. It is changed during the cold maintenance cycle, generally performed every three to four months. Until this time, heat distribution is inhomogeneous, which has a negative impact on anisotropy – and for a longer time.

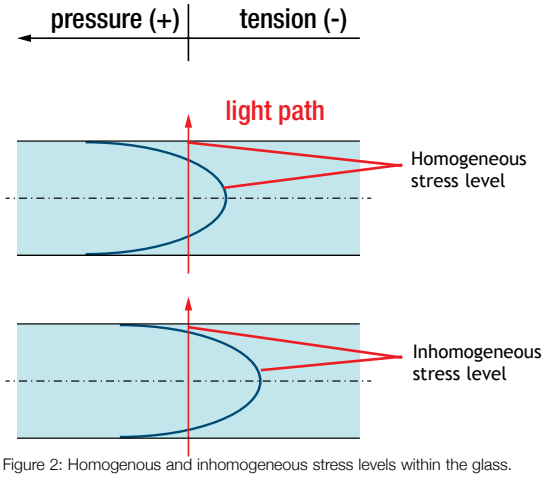

Figure 2: Homogenous and inhomogeneous stress levels within the glass.

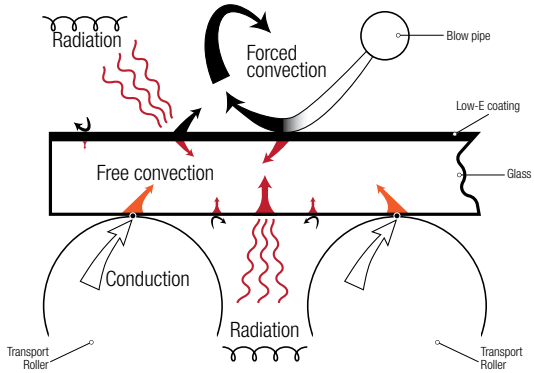

Figure 3: Heating transfer with traditional tempering technology.

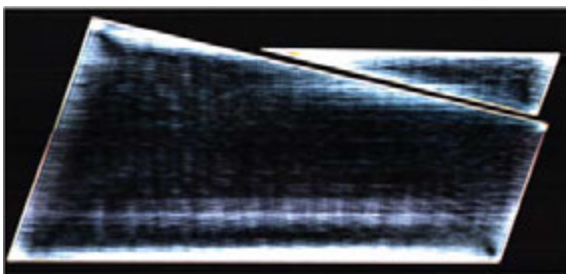

Figure 4: The impact of one glass sheet on the other during heat treatment on the consequent appearance of anisotropy from R Decourcelle, G Kaminski and F Serruys (2017), pp160.

Transport rollers in the heating zone

One result from a study conducted by J Neugebauer, I Kasumovic and I Blazevic in 2017 indicates that transport with rollers in the heating zone also introduces anisotropy (figure 5). The findings from this research explain the previously mentioned 'zebra pattern'.

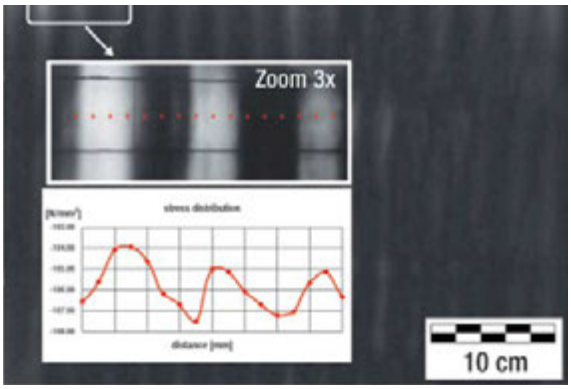

Figure 5: Distribution of residual stress of fully tempered glass from GPD (2017), pp117.

Although this study was used to show the connection between residual strength and bending strength, it also showed that transport within the heating zone with rollers leads not only to roller waves but also to an inhomogeneous stress level in the glass surface, which also supports anisotropy (Neugebauer et al, 2017).

How to identify/reduce anisotropy levels

The 'iridescence' value is defined as the percentage of isotropy, which means high percentages of isotropy create lower anisotropy levels. The traditional process is already certified for tempered quality and for low distortion but not for a glass with a low level of anisotropy.

Figure 6 shows on the left side a glass sheet produced with Aeroflat air cushion tempering technology and on the right, glass produced with a traditional roller tempering furnace. Although both samples comply with the distortion and stress criteria level according to international standards, the Aeroflat sample shows a clearly reduced short-wave distortion in the centre of the glass (see figure 7), which has a significant impact on the reduction of anisotropy.

The impact of heat distribution and the short-wave distortion for anisotropy is shown in figures 8 and 9. Figure 8 has been produced with traditional roller furnace technology. As shown, it reflects 68% isotropy for a 10mm fully tempered glass (low-e 0.3 emissivity). The red marks from the scanner show critical areas due to high anisotropy levels. These marks usually become visible under specific light conditions. The non-critical areas are identified with blue and green colours in the scanner system.

Figure 8 highlights the positive impact of an air cushion furnace, with critical areas for anisotropy reduced to a minimum. ▸

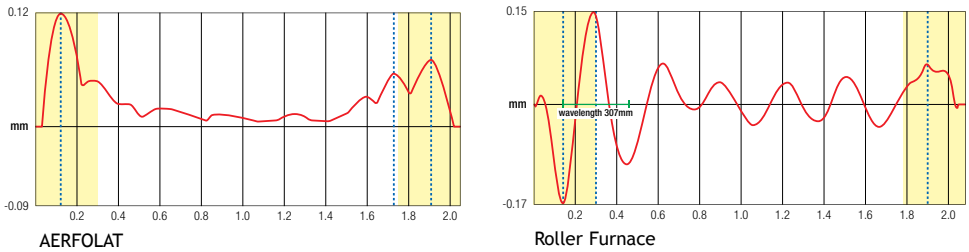

Figure 6: Test run for Aeroflat air cushion tempering technology versus traditional roller tempering technology, 2018.

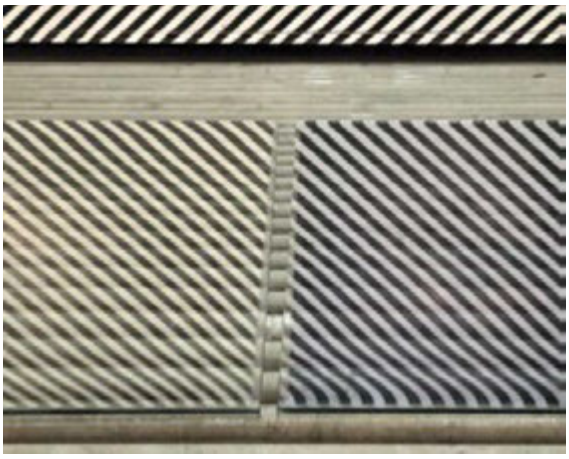

Figure 7: 6mm fully tempered with low-e (emissivity 0.3).

As mentioned in the introduction, some parameters in a traditional tempering furnace such as oscillating speed, reduced amount of glass on the loading table etc lead to increased anisotropy and can be controlled to a limited degree only.

On top of that, the mechanical technology, such as transport with rollers in the heating zone or defect heaters has a heavy – negative - impact on anisotropy, the possibilities for improvement of which are also limited.

Is there a way to produce anisotropy-free glass?

The answer here is clear - no. And the same answer must be given for the question if it is possible to temper glass that remains as flat as a table. It is vital to understand that the tempering treatment and cooling process of glass is complex and always leads to a certain kind of distortion within the glass.

Aeroflat air cushion technology solves many problems and allows users to provide the best glass quality, which has an impact on anisotropy.

As shown in figures 10 and 11, the air cushion technology has no transport rollers and the glass floats on the air cushion, which does lead to a very even energy transfer into the glass. No contact with rollers, impact of defect heaters or radiation allows the best results to be achieved.

Aeroflat technology also has its benefits on the level of operational knowhow and training. Traditional tempering technology requires high process and operator knowledge in order for the operator to be able to set certain tempering parameters, which have an impact on anisotropy. The operation of an Aeroflat tempering furnace is much easier.

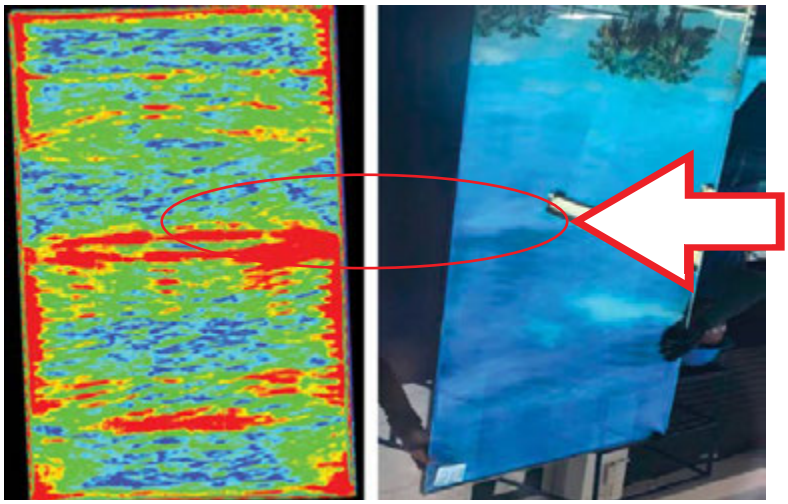

Figure 8: Scanner and day light check of 10mm fully tempered (0.3 low-e) produced in a roller furnace.

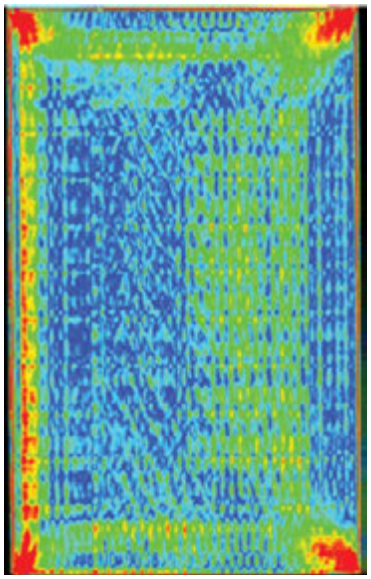

Figure: 9: Scanner check of 10mm fully tempered (0.3 low-e) produced in an air cushion furnace.

The technology does not need this high level of knowledge to achieve a high glass quality and a stable process. Only basic furnace operation training is required.

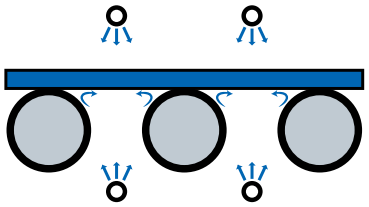

Figure 10: Roller furnace technology.

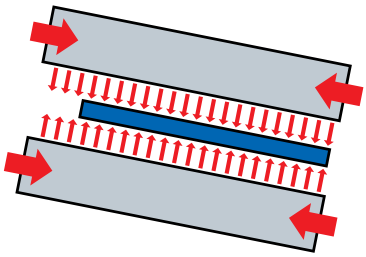

Figure 11: LiSEC Aeroflat technology.

However, this technology allows the production of glass with a minimum level of anisotropy, as the comparison in figure 12 shows perfectly. The glasses tested have been scanned with a different scanner to prove the benefit of an Aeroflat air cushion system.

Glass sheets showing this level of quality are required not only for high quality architectural projects but also for products that will become more important in the future, including display and smart glasses or glasses with complex coatings. ●

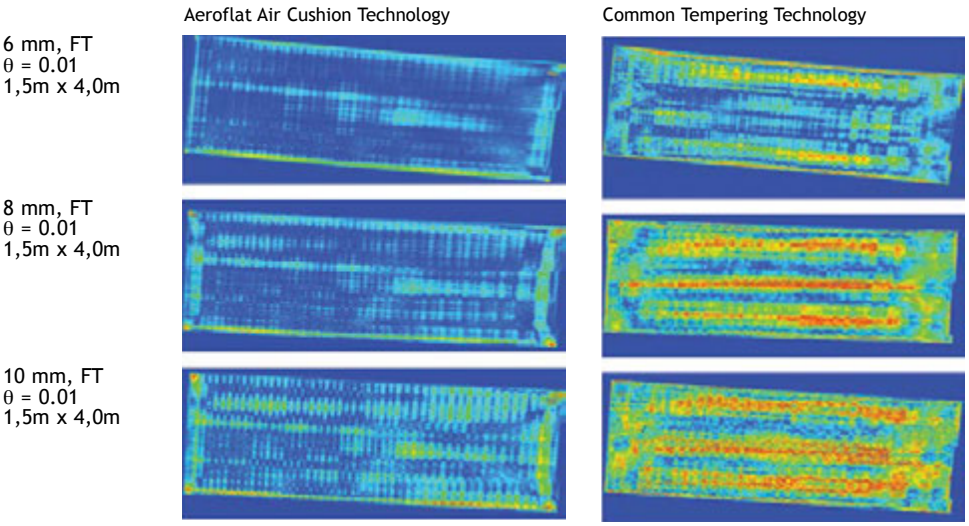

Figure 12: Aeroflat air cushion tempering technology (left) versus traditional roller furnace tempering technology.

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Pneumatic blender test with high cullet percentage

Lahti Glass Technology has further developed its pneumatic blender-transport unit to fulfill batch homogeneity requirements in glass production. Jarmo Näppi reports.

Blender, big bag for mixed batch, dust filter and ducting.

Loading unmixed batch to the blender.

Pneumatic blending has been the conventional way to mix raw materials in batch plants for glass fibre production, where a large proportion of batch is usually cullet. It is a versatile method, when raw materials are dry, with fine powders and where particle size distribution is not too great. The benefits are obvious compared to using mechanical mixers. It is a completely enclosed process, there is no dust or material leakage, it is simple to maintain, there are no large moving parts and no drive units etc.

Lahti Glass Technology carried out full-scale testing of the blender for C-glass fibre production recently with one of its customers. Unmixed batch for insulation wool production contained a large quantity of cullet, up to 80%. It is obvious that the larger glass fragments (approximately ½in) do not mix evenly with fine batch components. The test was to identify if pneumatic blending was somehow affected due to the large coarse cullet portion, to determine final homogeneity of batch and how it develops when the number of cycles is changed.

The testing facility contained the following main equipment: Unmixed batch container, which was moveable via a forklift, inlet cone at the blender top, pneumatic blender unit (approximately 1.5m^3) with blending cone assembly, dust filter unit, control box and laptop PC. The key factor is the arrangement of the blending nozzles, material selection and control of the nozzles to create an effective burst of air bubbles, forcing material to mix evenly.

The test was carried out with various different blending cycles. An optimum number of cycles can be determined. There is no value in blending too much because after a certain number of cycles, homogeneity of the batch no longer improves. In fact, too many cycles can deteriorate homogeneity.

In practice, the minimum number of blending cycles is a critical sizing factor, since the blender also transports batch to the mixed batch silo of the furnace. Therefore, the total cycle time depends on the sum of blending plus transport time. Another way to solve the cycle time problem is to split the cycle to blending and transport by having two separate vessels. In fact, that was the case in the test. Then blending and transport can take place at the same time.

The transport of batch is typically organised via an air-assisted pipeline in dense phase form to maintain good batch homogeneity up to the mixed batch silo. A low velocity also reduces wear rate of the pipe. A high Al_2O_3 content lining for large radius curves is recommended for the transfer pipeline.

The test results were encouraging – the batch quality determined in melting tests also showed acceptable results with minimum blending cycle amounts. That gives more time for transport or allows downsizing of the unit. This full industrial-scale test proved that the pneumatic blender could be used in various applications, not limited to reinforcement fibre production but in all type of glass production, when dry batch is preferred. ●

Unmixed batch and cullet.

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Reducing energy consumption via predictive power strategies

Several years ago, Eurotherm by Schneider Electric worked with leading glass manufacturers to develop the EPower controller, an intelligent electrical power management control solution. This SCR device is still very popular, both as a product and as part of Eurotherm power control system solutions, as René Meuleman and Amber Watkin explain.

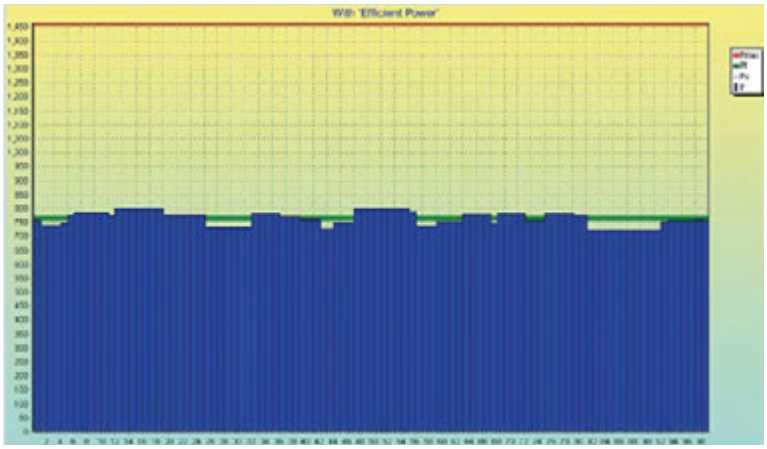
René Meuleman is Business Leader for Global Glass at Eurotherm.

A key feature of the EPower controller's popularity is Predictive Load Management, which uses proprietary control strategies in combination with full cycle firing mode to minimise energy usage and reduce associated costs. It particularly benefits multi-zone applications such as float glass roof and lehr heating power supply and glass melting furnace electrical heating systems.

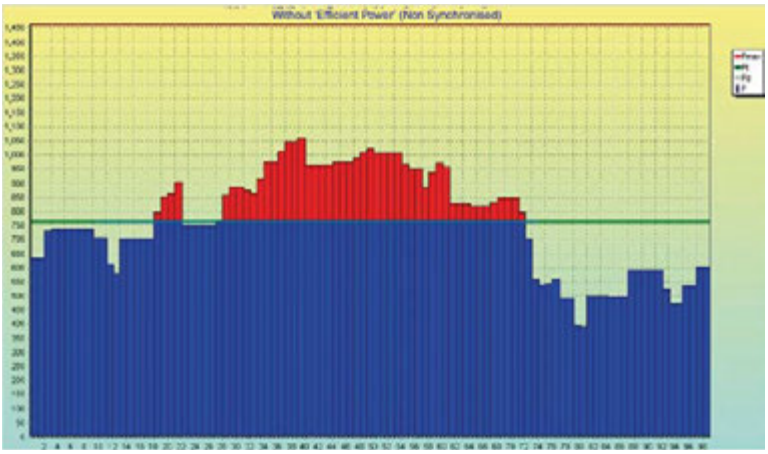
Problems with phase angle firing

Electrical heating systems such as glass furnace boosting, glassfibre insulation and reinforcement bushings, tin baths and annealing lehrs normally use SCR (silicon controlled rectifier) or thyristor controllers, firing in standard phase angle mode. Even though this method offers smooth power control, it has two major disadvantages; unwanted harmonic distortion and poor power factor (cos ϕ).

Utility companies apply a surcharge or calculate an additional cost into their kWh tariff when the power factor goes below around 0.9 (or if any agreed maximum power demands are exceeded). Over the course of a year, this can translate into thousands, or even tens of thousands of dollars, depending on the size of the installation. Problems caused by phase angle firing, such as harmonics, RFI (radio frequency interference), line losses, wasted energy (kVAr) and transformer overheating also result in the need for increased equipment capacity to compensate for these disturbances. For example, expensive active or passive filter systems may need to be installed.



Power demand is balanced with Eurotherm Predictive Load Management.



Costly power peaks can occur without load management.

Benefits of full cycle firing

If the application allows for it, the easiest way to increase the power factor is to step away from phase angle firing and start using full cycle firing, also known as zero cross or burst firing. In this firing mode, a modulation period is defined, within which the SCR is modulated with single or multiple full cycles according to the power demand.

Theoretically, full cycle firing will result in a power factor of 1 but due to unavoidable inductive loads from transformers and wiring, in a typical glass melting power supply system the overall power factor will typically be >0.9. By avoiding the phase angle influences, this type of system will run at the highest achievable power factor.

However, a downside to full cycle firing is that it can introduce a flicker effect (main voltage variation), which can in turn affect motors and create a visual disturbance (light flicker, similar to fluorescent lighting). This effect can become more severe in high power, multiple SCR controlled applications such as tin bath and annealing lehr heating, when running large numbers of zones. As these systems can easily contain more than 40 zones running at different power levels and variable setpoints, if not properly controlled, this may lead to large uncontrolled peaks of power. Thus, many zones randomly fired in time will potentially increase the risk of random huge peak power consumption.

In many countries, monthly peak power demand is a typical extra cost factor that end users must pay for electrical energy. Uncontrolled peak power demand is also likely to affect emergency power generation like diesel generators, which are likely to trip if power demand is unstable.

If the overall power demand of a multi-zone system is not controlled, it also becomes necessary to design in a specific amount of power overhead, based on the maximum possible peak values and accepting the consequential ▸

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additional cost. However, on existing installations where process improvements are being made, products are being upgraded or production capacity is being increased, the additional load may exceed the designed total power capacity of the installation. This can result in possible power overloads or black-outs.

Power management solution

Both high peak power demand and a poor power factor lead to higher energy costs and increased CO_2 emissions. As a solution, the Predictive Load Management feature in Eurotherm EPower Controllers will substantially reduce full cycle firing drawbacks.

The EPower power management system is based on a control module that can control up to four thyristor power stacks in a 'PLC-like' design layout. Up to 63 of these control modules can be integrated together via a fast network to become an intelligent power control system with the flexibility to effectively manage the requirements of both small and large-scale heating installations. These can range from glass bending lines, tempering furnaces and autoclaves, up to complete float glass baths, annealing lehrs and complex multiple zone furnace boosting installations.

The EPower Predictive Load Management manages the power demands to maintain an almost constant balanced power level, preventing load peaks and spikes.

How predictive strategies can help

In multi-zone systems using full cycle firing, the sophisticated Predictive Load Management can reduce peaks in power by balancing or sharing the demand across many loads automatically. It effectively 'smooths' the average power demand on the distribution, while still maintaining the desired power to each of these zones. It also optimises and limits the maximum allowable peak power demand of the system.

Managing electrical power in this way substantially reduces energy consumption and associated utility and equipment costs. Implementing a best practice of efficient energy consumption also results in considerably less CO_2 emissions released to the atmosphere.

Conclusion

Improving the power factor to reduce energy waste, controlling the demand and reducing peak consumption during 'on' peak times can result in substantial savings. In addition, the predictive load management function helps to improve the quality of the main power supply, ultimately reducing CO_2 emissions. The risk of power outages is reduced and extra remedial equipment is no longer necessary.

The Eurotherm by Schneider-Electric global glass team can work with customers at the early design stages to help them realise the full benefits, prior to installing a new infrastructure and negotiating energy contracts. As sophisticated SCR power control strategies can be complicated to understand, Eurotherm has provided a white paper containing more explanation on Predictive Load Management, available via the Eurotherm website glass solutions page.

Acknowledgements

The authors would especially like to acknowledge the contribution of Yves Level and Mikael Le Guern to the patented 'Predictive Load Management' strategy. ●

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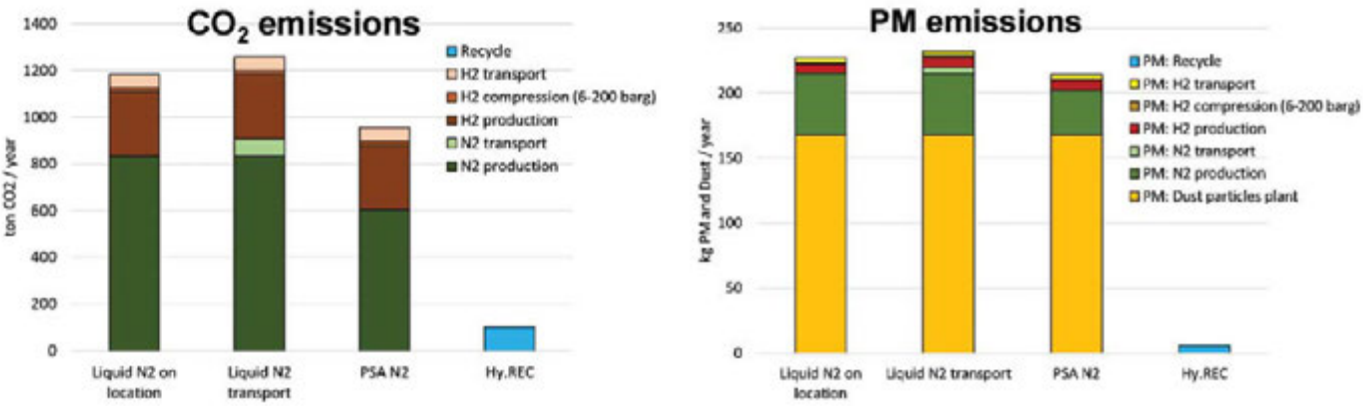

Figure 1: Example of pollutants reduction due to decreased production and/or transport movements when using the Hy.RECmix (Source: Modeling and test data, HyGear).

Gas recycling and its advantages

Dr Marco Rep discusses the application of gas recycling systems within float glass production operations.

As the focus is shifting towards the reduction of harmful emissions, industries are constantly searching for alternative ways to reduce the environmental impact of their processes. At the same time, companies in the glass industry are continuously seeking ways to optimise the glass production process, improving glass quality and reducing costs.

As a gas supplier, HyGear made its entry to the flat glass industry with its small-scale on-site hydrogen generation systems that fit the requirements in terms of gas purity, reliability in gas flow and significant cost reduction. The company has also identified the need of glass companies to use more protective gases in order to improve the quality of their end product. Currently, all these gases are vented to the environment and largely, within the facility of the glass plant.

The increasing desire to reduce environmental impact therefore conflicts with the objective to reduce costs and improve product quality. This was the starting point for the development of the Hy.RECmix. This technology has the ability to recover, clean and recycle the vented gases from the tin bath and feed them back into the process. By using this method, the amount of fresh gas that is required for the process reduces, thus leading to lower expenses and less venting. This results in a reduction of harmful emissions, without jeopardising product quality.

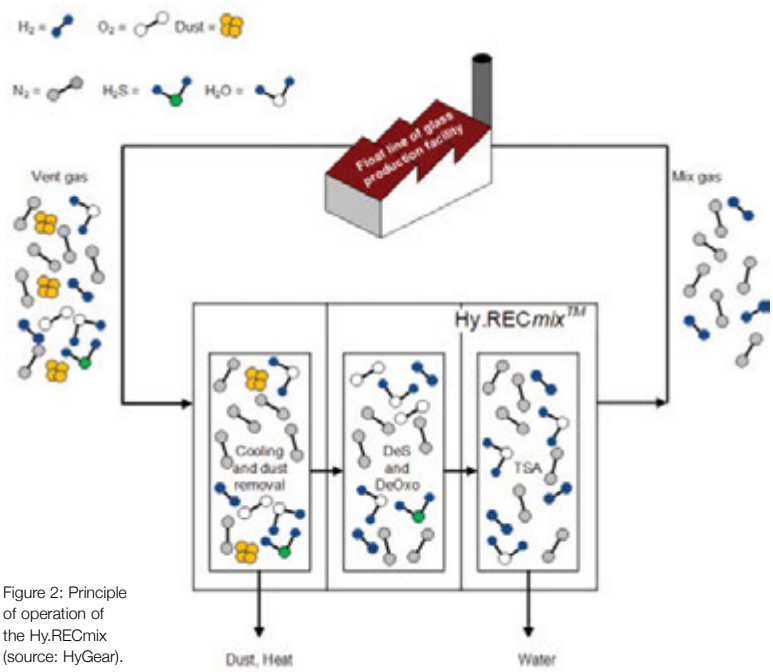

Figure 2: Principle of operation of the Hy.RECmix (source: HyGear).

Advantages

HyGear is not the first company to design gas recycling systems. The reason for the limited market penetration of previously launched systems is the low internal rate of return, caused by high capital investment and high energy consumption. Both aspects are due to the fact that the spent gases are only available at low pressure and most of the common upgrading methods require large pressure differentials. The Hy.RECmix is designed on innovative low pressure upgrading technologies and therefore, consumes the lowest possible electricity and lowest possible maintenance expenses.

Most importantly, the Hy.RECmix does not interfere with the glass production process. Connecting the system to the float line is not limited to the period when a cold or hot repair has to be carried out; it can be performed while the float line is operating under normal conditions.

Reduced environmental impact

The development of the Hy.RECmix is to recover the gas mixtures from the tin bath in float glass production and to reuse the gas within the process. In the current production process, significant amounts of hydrogen and nitrogen gas mixture, including pollutants, are vented and left unutilised.

This technology has proved to be an effective method for cost reduction as the amount of fresh gas feed will decrease and the carbon foot print of the whole process will decrease as well. Figure 1 shows the reduction of CO_2 and dust emissions associated to the supply chain of nitrogen and hydrogen.

Working principle

Extraction of the entire mixture of hydrogen and nitrogen can be performed from the hot end of the tin bath. Depending on the desired venting rate, this could go up to 700 Nm^3 per hour on a single Hy.RECmix system.

There are three stages in the process of gas recovery by the system (figure 2):

- Firstly, the dust removal stage uses cooling and mechanical separation techniques to remove tin-oxide from the recycle gas flow. Tin can be recovered from the captured dust and used again in the float line.
- Next, the sulphide and oxygen removal stage uses ▸

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Putting digitalization into practice

Reaching the first milestones

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physical and chemical low pressure separation techniques for desulphurisation and deoxidation.

- And finally, the post treatment stage concerns drying of the gas mixture and further purification up to the purity and dew point required to be fed back into the process.

The advanced gas cleaning system, Hy.REC will feed the recovered gas through HyGear's low pressure supply system to each of the float line bays separately, ensuring low pressure drop and continuous gas supply. Through the company's highly reliable feeding system, the float glass plant operator has the ability to configure the gas composition separately in each bay of the float line, allowing the controller to reduce the hydrogen required in different parts of the tin bath.

Technology status

The Hy.RECmix technology was developed in close co-operation with Saint-Gobain. In recent years, modules for cleaning different components have been tested at HyGear as well as Saint-Gobain's float line in Herzhogenrath, Germany. These tests have led to an integrated system that is currently installed at Saint-Gobain's float line in Porz, Germany (figure 3), where it is deployed to recover a maximum of 700 Nm^3 per hour of mixed gas from the tin bath, clean it and feed it back into the process.

More information

The HyRECmix offers a series of technologies that are combined in an innovative way to lower capital and operational expenses. Operation of the system is fully automated and the quality of gas produced is continuously monitored by the system's programmable logic controller.

The standardised system fits every float line but can be tailored to the specific requirements of different lines related to number and location of injection points and variations in gas compositions over the tin bath. Systems are housed within a 40ft container or can be skid-mounted to match space restrictions in specific situations. Installation, integration and commissioning at the site can be accomplished in four weeks. ●

Figure 3: Hy.RECmix for Saint-Gobain's float glass plant in Porz, Germany (source: HyGear).

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Screen printing equipment innovations review

Paulo Bardotti discusses Cugher's latest flat glass screen printing innovations, including an integrated system for coated glasses, a printing system for paired glasses and printed systems for laminated vehicle sidelites.

For over 50 years, Cugher has been designing and manufacturing machines and systems for silk screen printing on flat glass, integrating its technology with solutions dedicated to drying, automation, process control, handling, storage and quality control. The company is recognised as an innovative and technologically advanced manufacturer, especially in the automotive market, where it represents the ideal partner offering solutions for all types of glass.

Via thorough knowledge of the production processes in which its technologies are integrated, Cugher responds quickly and effectively to the needs that emerge from customers, often anticipating them.

Integrated system for coated glass

Recent trends in the automotive and architectural glass sectors are oriented massively towards the use of low-E glass coating systems, so that they can significantly reduce the power of air conditioning equipment. Basically, the mechanism to be put in place is to take out IR and UV energy from sunlight, to reduce the demand for air conditioning during the summer.

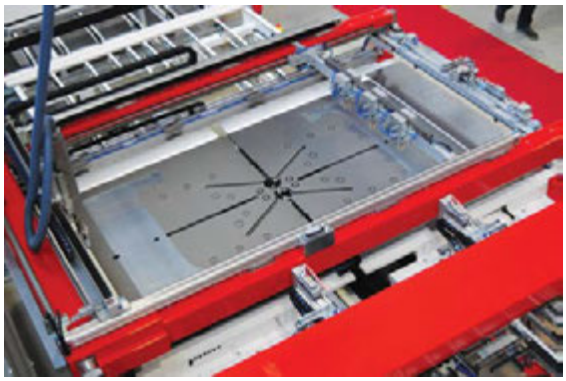
Cugher Glass, which has always elected the automotive and architectural sectors as drivers of its production, is constantly in touch with the main players within the sector and focuses its research and development activities on their needs, sometimes to anticipating them.

When the coating technique began to enter massively into automotive and architectural glass production processes, given the incompatibility of these materials with the screen printing technique, Cugher had to choose between two possible alternatives: To design its lines for the screen printing on the opposite side to the coating or to make sure that the glass arrives on the printing table with the trimmed coating.

In this second case, the printing process takes place as usual. Therefore, nothing changes for the operator except for the fact that greater attention needs to be paid to the handling of glasses.

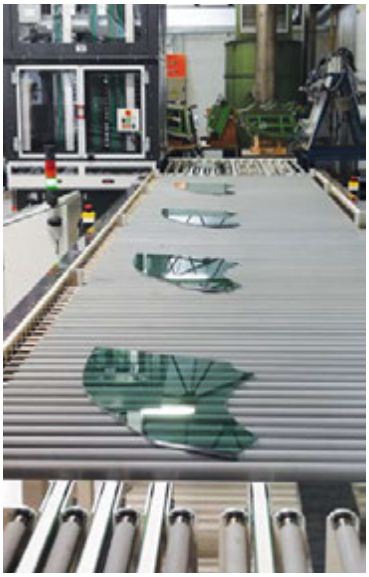
Conversely, if the customer decides to keep the coating on the opposite side of the screen printing, the process becomes more complicated. Coated glasses do not withstand the typical mechanical actions of centering, so it is necessary to move the glass with the coating facing upwards until the printing time. The glass is centered upside down and is then turned over on the shuttle that takes it to the machine.

After printing, everything proceeds as usual, apart from the adoption of full rollers to reduce the surface load on the coating. ▸



G series printing table.

Cugher screen printing line.



Roller conveyor with sidelite glasses.

Booking conveyor.

Printing J series, in line with IR dryer.

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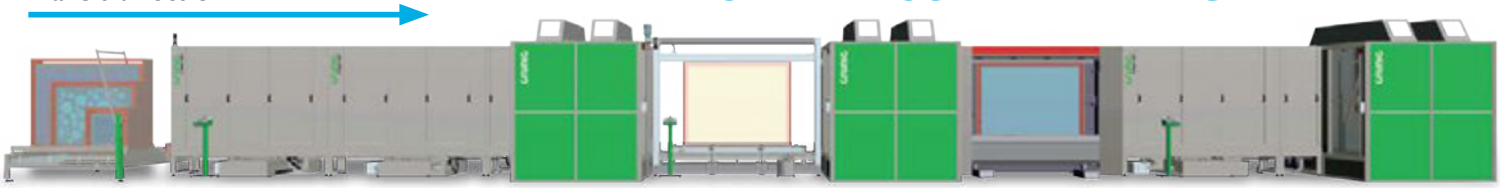

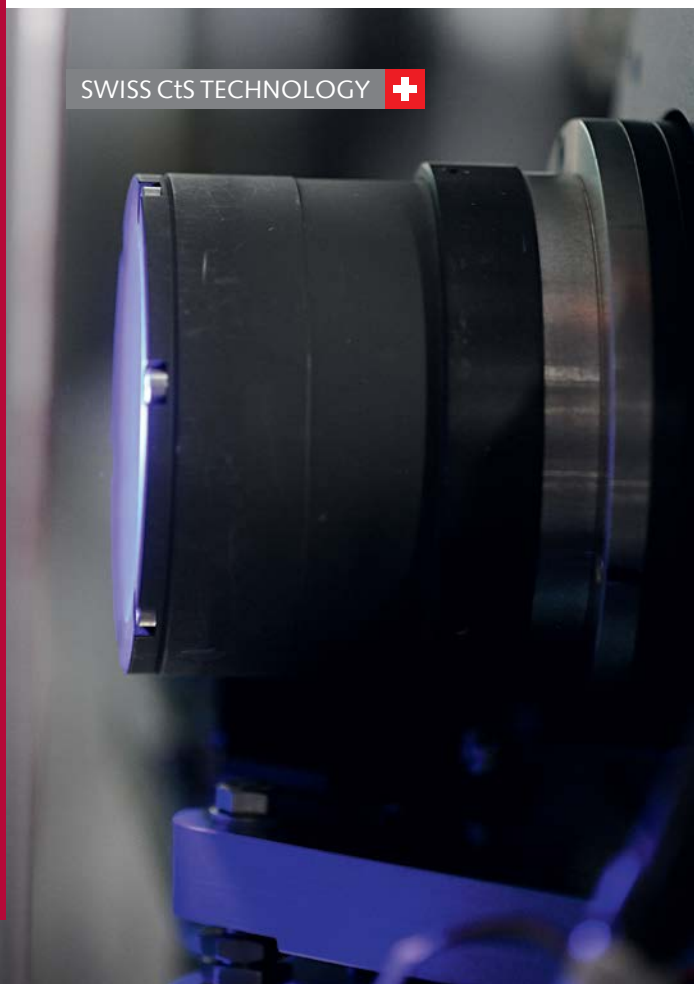

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Printing systems for paired glasses

Another issue in the automotive sector is the management of paired inner/outer glasses. This type of glass, whether windscreens, side or rear windows, are bent separately via the latest 'press-bending' technology and only subsequently are they paired. Otherwise, they are bent already paired with the more traditional 'gravity' technology.

In the case of gravity bending processes, the coupling can take place just before the bending furnace - the most widespread solution - or at an earlier stage, immediately after washing the glass arriving from the cutting line. This second solution is adopted to substantially reduce the phenomenon of contamination between the different layers. From the screen printing and handling point of view, this solution requires the creation of a more complex line.

Since paired glasses must be handled with a layer of powder in between them, which makes the two glasses free to slide, the handling and centering systems must be rethought for this particular specification.

The whole part of the line dedicated to handling must be designed, therefore, with particularly soft accelerations and braking to avoid decoupling the glasses. In particular, the screen printing machine must be designed to be able to centre the pair of glasses on the printing surface that otherwise would not maintain the register.

The machines suitable for this type of process both belong to the J series with belt conveyors and the GB series, with shuttle transport. In the case of the J series, the pair of glasses is handled on a belt conveyor, so it is important to pay attention to accelerations. In the case of the GB series, the pair of glasses is pre-aligned and then transferred to the printing table, with a shuttle that blocks the two glasses, preventing mutual slippage.

In terms of quality, the two machines offer exactly the same performance. However, with the GB series machines, it is possible to save time in handling glasses, optimising the overall cycle time (180 pieces/h).

Printing laminated sidelites

Sidelite lines require rather high cycle times and require machines capable of handling particularly complex and highly asymmetrical glasses. Cugher has always produced screen printing machines capable of handling complex shapes. In the case of automotive side glasses, the difficulty of the asymmetrical shape is added to the complication of the very low thickness of the glasses to be printed.

To meet demand for high standards of acoustic comfort – increasingly frequent in the world of luxury cars - Cugher has developed a specific series of roller conveyors that complete the offer of lines dedicated to side windows. The choice of roller conveyors comes from the desire to adopt barrier photocells that improve and simplify stops and centering of thin glasses. Doing this, Cugher is able to detect and manage very thin glasses with complex shapes, without putting them at risk of impact in critical points such as corner tables, stackers and centering stations. ●

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Mould design to match every filler's requirements

Apart from access to the necessary knowhow, glass container quality is only as good as the quality of equipment and materials employed. Optimal production conditions need detailed attention to mould equipment design and materials. The following contribution evaluates what lies behind sophisticated mould design co-operation and the benefits afforded to container manufacturers.

When the production of a new bottle or jar is planned, besides the mould design itself, attention should be focused on the container design. It depends on the type of container and whether empirical data (weight analysis, deformation studies etc) are already available or comparable.

Heye International specialises in the knowhow necessary to handle new designs. In the case of traditional and lightweight container designs alike, the company uses the Finite Element Method (FEM), deriving values relating to the internal pressure situation, head load and impact stress test. This FEM is a simulation software that ultimately reveals if the container with the stipulated weight and wall thickness data meets the filler's requirements.

Several years ago, UniMould developed a special and well-proven plunger coating.

Damage to the container's internal surface is avoided by a special plunger material and coating combination.

As an alternative, for ultra-lightweight containers, Heye offers customers the support of a pre-test under real production conditions, either at the customer's production site or at a glass plant within the Ardagh Group.

UniMould has considerable long-term experience in the manufacture of NNPB/PB plungers, plugs and cooling tubes.

Co-operation benefits

When it comes to the design of moulds and plungers for new containers, Heye works together closely with its sister company UniMould, which has considerable experience in the manufacture of NNPB/PB plungers, plugs and cooling tubes.

Based in Obernkirchen, Germany, UniMould GmbH has over 60 years' experience in the production of accessories for the glass packaging industry. The company delivers quality and service that exceed customer expectations, in a market where quality standards are constantly raised and surpassed. UniMould continually invests in the latest machine tool technology to deliver the highest quality components possible, on time and at a competitive price.

Several years ago, UniMould developed a special and well-proven plunger coating. Together with the high quality mould and plunger material, this coating optimises the impact and internal pressure condition of the container. Damage to the container's internal surface is avoided by this special plunger material and coating combination.

"This co-operation has resulted in a market leadership position with regard to the performance and stability of glass containers" says Knut Prasuhn, Head of the Service Department at Heye International. "Our customers benefit from this 'one-stop' service and co-operation, generating a wide diversity of valuable experience." ●

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Pick and place take out innovation

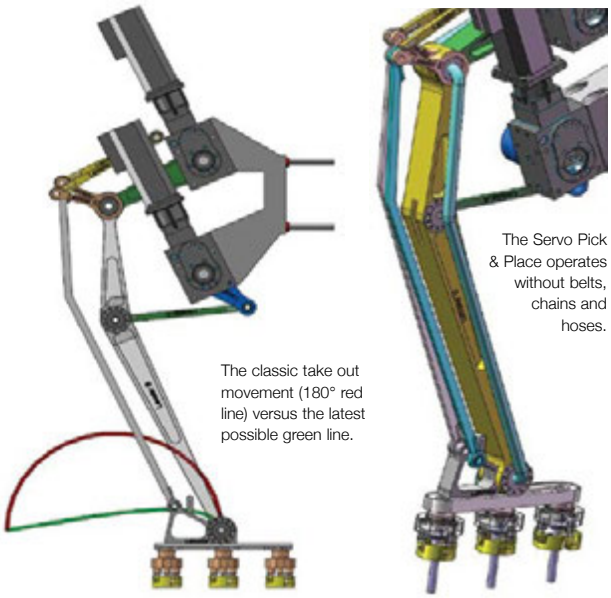
Since launching ISX forming technology at glasstec 2018, T&T Turnov has made exciting progress in such areas as servo pushers, introducing an innovative 'pick and place' device to replace conventional servo and pneumatic take out mechanisms. Redesigned take out tongs have also been developed to replace traditional angular operating technology. Both systems are available in standalone versions and also as fully integrated technology in the T&T ISX machine, as Rolf Themann explains.

ISX Servo Pick & Place equipment consists of two servo motors, allowing any movement required to be performed in X and Z axes. The X axis is where the finished bottles from the blow moulds are picked up and taken to the dead plate, while the Z axis is the fully adjustable stroke, lifting the bottles gently upwards from the blow moulds and transferring them to the dead plate, where they are released by a specially developed three jaw chuck opening tong head. This tong head does not open in an angular or parallel way but like a spiral instead, gripping the articles more smoothly and without requiring much space to perform this action.

Any Z and X stroke combination is possible with the Servo Pick & Place. It is much faster than classic and servo take outs. Classic take outs always perform a 180º rotational movement regardless of the article produced on an IS machine but for many jobs, this movement could be much shorter. However, existing pneumatic and servo take out mechanisms are unable to accommodate this requirement.

This is no longer an issue with the Servo Pick & Place device. Thanks to a freely programmable cam for each article, which can be stored in the set up system of every IS machine controller, it is now possible to shorten the distance from pickup point A to release point B by 33% per movement. Even for still and sparking wine bottles that feature a base with a push-up or to overcome a heat shield between the blow mould and dead plate, this cam is still much faster as it needs to lift the article only slightly higher than the bottom mould or over the heat shield. This distance is still much less than regular take outs with 180º movements.

The reduced distance from pickup point A to release point B and back for the next bottle allows up to 33% savings during each movement. In turn, this helps to shorten times and can increase overall machine speeds or deliver longer dead plate cooling times. Initial performance calculations show that a return on investment can be achieved in less than seven months.



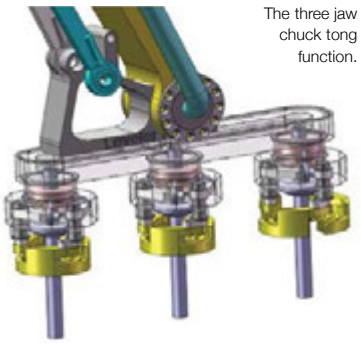
The classic take out movement (180° red line) versus the latest possible green line.

The Servo Pick & Place operates without belts, chains and hoses.

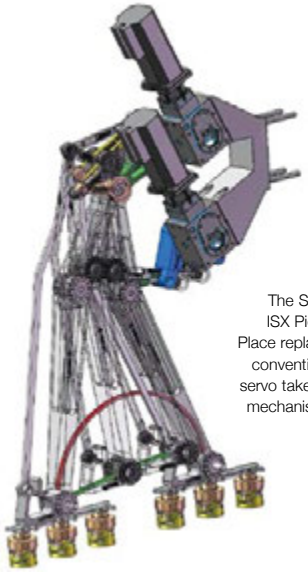
Equipment advantages

The patent-pending Servo ISX Pick & Place development delivers the following user benefits:

- Programmable cam per article or group of articles, storable in the set up system of the IS machine.
- Exchange of tongs in a service position closer to the operator, which benefits tong exchanges and job changes.
- No more manual adjustments of the height necessary.
- No belts or chains in the take out arm, so no backlash or exchange of belts necessary.
- Three jaw chuck tong function, providing less defects on the neck and softer gripping.
- Optimised and shorter cams results in shorter pickup times and faster kick back to the blow moulds, with a 33% time reduction per movement.
- Moving very small masses and therefore very dynamic and fast. Smoother movements with less vibration.
- Fast cycle times, measured at 25 and above per minute.
- The unit's slim design results in more space between the blow head and the Servo Pick & Place.
- Connected to a cross beam or overhead manifold structure, providing more space on the dead plate and a better view for the operator.
- Low maintenance costs, with no belts, chains or free moving cooling hoses in the take out arm and no more gears and screw spindles under the conveyor to adjust take out height compared to conveyor belts.
- No moveable hoses or pipes to supply air into take out tongs and/or additional air to cooling hoses.
- Less than seven months ROI, if calculated on the basis of a 10-section double gob IS machine. ●



The three jaw chuck tong function.



The Servo ISX Pick & Place replaces conventional servo take out mechanisms.

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A deeper dive on direct-to-object cylindrical printing

Direct-to-object printing on cylindrical items is a comparatively recent application that is opening up a range of creative possibilities. Digital printing techniques (enhanced by specialty inks and advanced print heads) have been integrated with automated workflows to deliver impressive, repeatable quality at more cost-effective price points. The result is expanding business opportunities for printers and enhanced branding and promotional uses for customers. Benjamin Adner reports.

First, a definition: Direct-to-object (DTO) cylindrical printing is when a machine directly lays ink onto a curved surface that usually is the wall of an object that has a circular cross-section and a constant, tapered or variable diameter. Printing on cylindrical objects can be achieved using pad, screen or digital techniques.

Pad printing is suitable when the job calls for one or two colours over a limited (non-wraparound) area, typically less than 25% of the surface. Screen printing can reproduce multi-colour graphics spanning 360 degrees of surface area. Screen printing has the advantage of widely installed equipment and a well-practiced technique but is disadvantaged in labour time, material costs and additional production steps. As today's cylindrical jobs call for added colours and creative imaging options, screen printing is being supplanted by more efficient and capable digital systems.

DTO digital offers three main advantages over screen printing: Producing multiple colours and/or full-wrap design effects in one pass; the ability to do short runs with customisation; and significant time and cost savings. Taken together, these strengths make for a compelling case.

This article focuses on the latest digital method.

Abundance of applications

While digital printing on flat objects has been a standard industry practice for years, users can now digitally print on an expansive range of cylindrical items. It is important to note, however, that many machines on the market restrict what type of cylinder the printer can handle.

Some key considerations are printable diameter, length of the object, angle of a taper and depth of the largest contour. In addition to machine limitations, users should also take into account the composition of the item, as certain inks can properly adhere only to specific substrates.

Among the many cylindrical items that can now be digitally printed, glass objects are becoming increasingly popular. To ensure a successful result, items must first be flame-treated to remove impurities and any coatings and debris from the surface, then treated with primer to allow the ink to adhere properly. Inkcups' proprietary Magicoat is the top glass pretreatment solution on the market for this purpose. Inkcups digital inks are highly durable and abrasion-resistant (eg up to 500 washes for glassware) and meet ASTM standards for adhesion. ▸

The MagiCoat pretreatment system from Inkcups.

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Glassman Events are pleased to announce the return to Asia with the launch of a new show in Seoul, South Korea.

It is the first time the combined exhibition and conference has been held in this fascinating country. It follows the success of two previous Glassman events in Bangkok and Jakarta in 2018 and 2019.

South Korea offers ample opportunities for professionals and has an established glass industry. The country is a hotbed of innovation and is home to some of the world's most recognised brands such as Samsung, Hyundai and LG Electronics – all of which use glass in their products.

Domestic glassmakers include Samkwang Glass, Kumbi Corporation, Techpack Solutions and KC Glass and Material.

The Glassman event brings together glassmakers with leading technology suppliers.

The two-day show will include a conference that will focus on the latest trends, issues and opportunities in the glassmaking industry.

Recent attendees at Glassman shows have included glassmakers such as O-I, Ardagh, Verallia as well as their customers such as Heineken, Coca- Cola and Bacardi.

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Inkcups printers deliver photo-realistic images for personalisation on several applications.

Colour and design variety

The ability of DTO digital machines to print full colour including varnishes and specialty inks, enables a wide variety of design techniques. These include:

- Mirror prints – colour images, viewable on the inside and outside of glass.
- Tone on tone – solid matte-finished substrate, enhanced with one ink or clear coat.
- Stained glass – colour translucent enough to see through.
- Relief effects, where all or parts of the image are layered to be felt by the user.
- Simulated frost/etching imagery.

Full-wrap cylindrical printing also demands seamless borders with no visual 'lap mark'. For added flexibility and ease of file preparation, original graphic artwork should be able to be imaged on cylinders and tapers, without the need for manipulation or distortion. For example, flat images will print to scale on a curved surface, with software automatically making the adjustment. The best machines on the market will easily handle these requirements.

Full colour DTO digital is by definition a faster process than screen printing, thanks to fewer production steps. There is less setup time for multiple colours and more complex jobs, which enables reduced run lengths. This means that users can better manage inventory by producing smaller, on-demand runs, as well as respond to time-sensitive demands, such as quick-turnaround jobs tied to sports competitions, events or celebrations. This not only reduces product lead times but reduces the decorator's inventory carrying costs and scrap rates significantly.

What to look for

When shopping for a DTO digital printing solution for cylindrical applications, consider the types of objects and materials to be printed on, as well as the range of colours and design techniques encountered. Not all pretreatment methods and inks are created equal, so be sure to evaluate quality and durability on different items (asking for test samples is always a good idea!). Make sure the equipment supplier understands the individual needs of the market and can provide testing, application guidance, direct sales support and expert technical support.

With these considerations in mind – and the right partner for hardware, consumables and service – get ready to dive into additional market opportunities. ●

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Vial production line developments

Alessandro Crescentini presents the latest vial processing machinery innovations from OCMI-OTG.

OCMI's 20 station, rotating vial forming machines are capable of a maximum output of 3000 pieces/h for 2R vials. The latest version is equipped with specially developed pre-forming and main forming stations, where plunger and roller movements are driven by servo motors. The main purpose of this development is to assure the best precision and quality of the mouth forming process and simplify the operator's job, with the possibility of setting the main parameters for tool motions via a touch screen, integrated in the machine cabinet.

Effectively, the key parameters to be set from the machine cabinet are the initial and final positions of rollers and plungers, the entry/exit acceleration of the rollers and plungers and the plunger entry speed.

The vial forming section of the FLA20/S machine includes two independent stations, equipped with one roughing roller each for the initial preparation of vial shoulders. The main forming operation is then performed by the two servo-controlled stations, equipped with two rollers and one plunger.

Plungers are internally lubricated in order to keep the best cleaning conditions of the machine during operation.

The same development with servo control of tooling stations can be applied to OCMI dropper and dental cartridge forming machines.

Open house success

The latest generation OCMI vial forming machine type FLA20/S was introduced during the company's 'open house' event in Milan, staged in April 2019. At that time, the machine was equipped with an Optivial camera inspection system for dimensional control. Accuracy of inspection by Optivial has been developed by increasing the number of vial pictures to be taken in order to improve the precision of average dimensional values.

The Optivial back-light box has been renovated with a covering device, equipped with two small cooling fans in order to minimise the risk of overheating the lighting device.

The FLA20/S machine can be connected with the LF520 post-forming line, traditionally manufactured at the French factory of OCMI subsidiary Moderne Mecanique. This line is usually equipped with cooling fans, a calibration section including control of the total length and internal mouth diameter and printing station. The calibration station is equipped with latest generation electronic gauges, managed by dedicated panel.

Stress relief

The line presented to customers in April was equipped with a standard electrical annealing lehr, with vials conveyed through racks following the same concept of OCMI ampoule ovens. This lehr can process vials with a minimum total length of 35mm and assures the complete removal of glass surface stress thanks to the optimal distribution of heating elements along the three oven sections.

An alternative version of vial annealing lehr developed in OCMI's Italian headquarters is served by a feeding manipulator, with six mechanial grippers picking the vials from a cooling conveyor and placing them in a horizontal position on drilled metal trays. The pick-and-place manipulator allows users to reduce the total length of vials to be processed, since the grippers are adjustable according to vial height.

In its standard configuration, the LF520 line works in association with a traditional packing section, including a mechanical vial pushing device inside the box.

Automatic options for tube loading and final packing

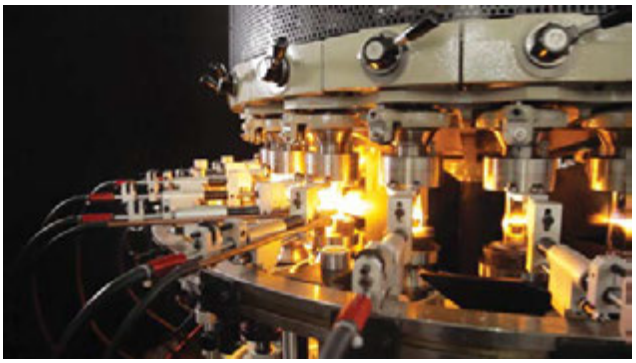
Optional equipment includes Roboglass (automatic tube loader) and PM-V (automatic packing machine), both of which are available to complete the line and minimise manual handling processes. The recently developed Roboglass automatic tube loader replaces the original pneumatic control of tube handling with a more advanced system consisting of solenoid valves, while the OCMI automatic loader completely replaces the semi-automatic rotary turret loaders installed on standard forming machines.

The only manual operation required by the operator is the loading of glass tube bundles (four or five bundles is the recommended quantity) into the storage area from a safe working position. This quantity of

The Optivial camera control system.

Example of a complete OCMI vial line.

OCMI's FLA20 vial machine.



The FLA20-S vial forming machine from OCMI.

loaded tubes gives to the operator much more time before loading the next bundles.

Job changes are very quick and involve only the replacement of tube adaptors of loading stations and changes to different tube diameters via the manipulator switch; diameters to be processed are from 8mm up to 30mm.

The process involves picking a single tube from the bundle and lifting it up to the loading area at the top of the equipment. Here, the first cylinder rotates the tube 90° up to a vertical position and another cylinder delivers the tube to the pre-loading area (if the station has one tube under processing) or to the loading area (if the station is completely empty).

Each unit has been developed with independent function controls from the Roboglass touch screen panel. For example, the operator can choose the stations to be loaded during the setting of the equipment or can exclude some stations from loading if technical problems are encountered.

The tube lifting system, equipped with specially designed tube support parts, reduces the risk of scratching the tubes in the storage area. At the same time, Roboglass retains the same dimensions and compact structure of previous versions, permitting installation in even the narrowest production areas. The structure also allows users to select the best position for the automatic loader, according to the space available between vial lines.

The floor space occupied by Roboglass is no more than 2.5m^2 and the equipment can be oriented according to the layout of production lines.

The PM-V automatic packing machine is available with four or five box filling stations, placed on a rotating table. It replaces traditional manual packing operations and solves the problem of friction and scratches. With this option, there is no contact between vials thanks to the use of vacuum cups when picking from the line, while the risk of scratches or breakages occurring during packing is minimised.

A presence sensor installed before the loading point of the packing machine detects missing vials and assures complete vial rows are packed in the box, without any empty space. The number of vials per row and the number of rows can be set from the control panel, according to the dimensions of the box.

Thanks to the options described here, OCMI is able to offer complete automatic lines from tube loading to vials packing, where the functions of the operators are almost completely limited to production supervision. ●

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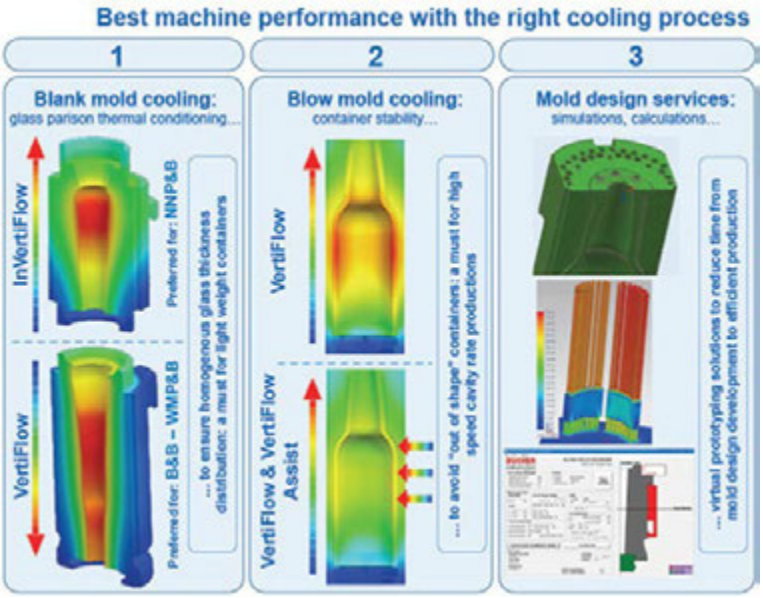
Mould design: Blank mould cooling options

In the second of a series of four articles, Dominique Vassaux considers the importance of mould cooling, its influence on the performance of the IS process and on container quality. He explains the different cooling needs depending on the type of production process.

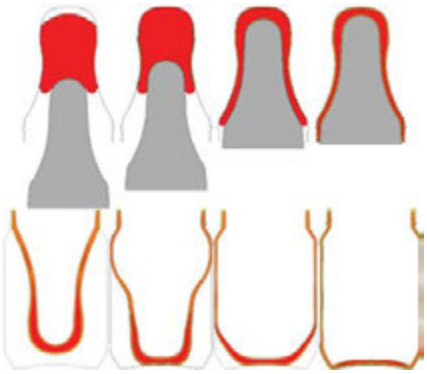
The blank side VertiFlow system directs cooling air from top to bottom of the blank mould, whereas the blank side InVertiFlow system directs cooling air in the opposite direction. As a result, the temperatures are much colder at the top of the blank mould when using blank side VertiFlow, whereas it is colder at the bottom when using InVertiFlow. Both systems are very flexible as the cooling air entry and exit positions can be defined without much constraint, giving the mould designer a direct influence on the vertical temperature distribution of the blank mould.

Cooling the blank mould by means of vertical holes provides increased cooling efficiency (compared to traditional radial stack cooling), as more heat can be extracted from the mould but also improved container glass thickness distribution since the cooling holes ensure an even horizontal temperature distribution and the correct vertical temperature gradient on the blank mould cavity. This second benefit is key when producing very lightweight containers.

Obviously, the vertical blank mould temperature distribution must be tailored to suit the parison thermal conditioning requirements, which is mainly a function of the production process: ▸



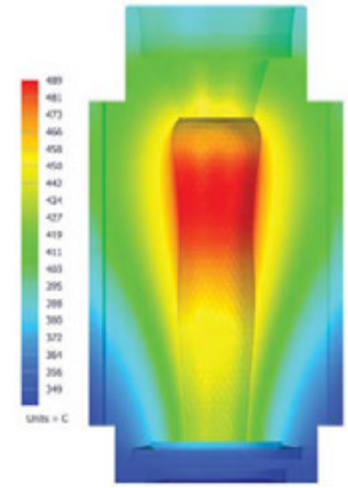
Cooling overview.



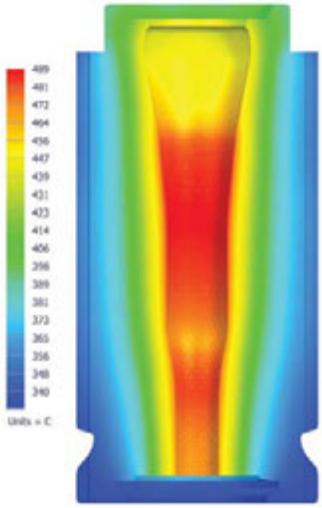
Widemouh press-blow process.

Blow-blow process.

Narrow neck press-blow process.



Blank side InVertiFlow ToC profile.



Blank side VertiFlow ToC profile.

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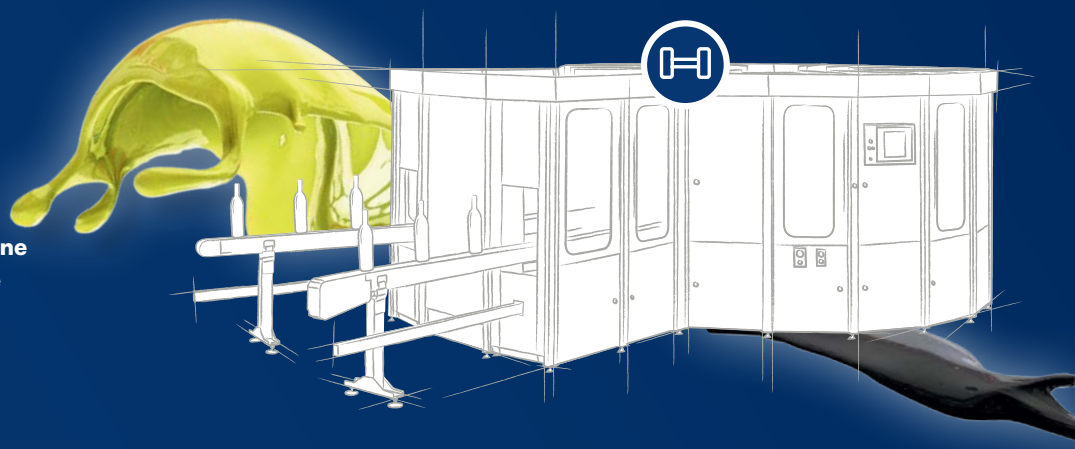

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- **Blow-blow (BB):** In order to counterbalance the mould/glass contact time difference 'below and above' the glass filling line and consequently, improve the settle wave mark on the final container, cooling must be focused at the top of the blank mould, in particular on the filling line region (where the glass stops inside the blank cavity). At the same time, less cooling is given on the neck and shoulder areas of the blank cavity, to ensure smooth forming behaviour of the shoulder at the blow side.
  Bucher Emhart Glass (BEG) recommends blank side VertiFlow for the BB process, as it makes the top of the blank mould much colder than the bottom.
- **Narrow neck press-blow (NNPB) process:** Most of the cooling air needs to be focused at the lower part of the blank mould cavity, in order to guarantee enough glass thickness in the neck and shoulder of the formed container, avoiding hollow necks and thin shoulders.
  BEG recommends blank side InVertiFlow for the NNPB process, as it maximises cooling at the bottom of the blank mould to maintain cold glass in the neck and shoulder of the parison.
- **Widemouth press-blow (WMPB):** Cooling air must be focused on the neck ring for jar productions to guarantee finish stability, avoiding dimensional defects on the finish.

BEG recommends blank side VertiFlow for WMPB jar production, as some VertiFlow cooling holes can be used to cool down the neckring in the blank mould closed position, allowing increased cooling capacity and temperature homogeneity at the neckring cavity.

In general, in case a glass plant produces a mix of containers with all production processes, BEG recommends blank side VertiFlow cooling, as it provides total flexibility from a clamping and cooling perspective. However, the mould designer must understand the importance of configured cooling holes design, in order to balance correctly the vertical temperature distribution to suit the need of the parison thermal conditioning for each production process. Therefore, training at BEG is key in order to achieve best cooling performance. ●

The third in this series of articles will be published in the November/December 2019 issue of Glass Worldwide.

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Amazing discoveries part 22… Swabbing in blow-blow production (2)

Following his exploration of different steps to be taken towards optimising forming process stability and reducing the weight of glass containers, in the coming issues Paul Schreuders addresses amazing discoveries related to XPAR Vision's BlankRobot development. Introduced at last year's glasstec exhibition, BlankRobot is a true revolution in glass forming, whereby the amount of disturbances to the forming process is reduced drastically, hence paving the way for effective forming process automation. Here, the focus is on swabbing and the BlankRobot itself.

As explained in issue 74 and subsequently, following the Paris Climate Change Conference (COP21) and taking their social responsibility seriously, many if not all food and beverage packing companies are actively working to reduce their carbon footprint. Since packaging is a substantial part of this carbon footprint, supply chain collaboration is a key for success. Knowing the competitive field of metal, plastics and bio-based packaging, for glass the keys to survival are to recycle and reduce weight (improving the content-to-glass ratio). Reducing weight requires further optimisation of forming process stability.

For 20 years, XPAR Vision from the Netherlands has been leading the development of hot end sensors for improved glass container forming. At last year's glasstec event in Dusseldorf, the company launched its own Blank Robot device.

As the name suggests, the BlankRobot is designed not only for swabbing but for other applications as well. For swabbing, by applying a special lubricant together with a highly precise application, swabbing frequency is reduced to once every three hours only, leaving enough time for the robot to execute other functions.

Figure 1: BlankRobot system installation.

This article explains the necessity for knowledge about all aspects of swabbing in order to support users in the effective application of swabbing robots.

Daily operation considerations

In the last XPAR Vision 'Amazing discoveries…' article (parts 21), the operating principles for swabbing blow-blow products was described, from references where the BlankRobot has been operated in green and flint glass production (figure 1).

XPAR Vision maintains several BlankRobot systems in daily operation at various customers. Here, the benefits in terms of process improvements and effect to bottle quality are explained further.

As explained in the part 21 summary, the experiences of customers using BlankRobot in daily operation confirm the XPAR Vision BlankRobot concept. Using special LubriGlass lubricant in a dedicated manner and special application technology, expectations are met and even exceeded when considering the positive additional effects. Swabbing intervals are increased to 120 minutes in blow-blow compared to a maximum of 30 minutes by manual swabbing or competitive robot swabbing.

Results

In the end, numbers are leading to determine the performance of automatic swabbing. With reference to the BlankRobots in daily operation at different customers in blow-blow production, XPAR Vision is delivering to the expectations set during the equipment's introduction in 2018. Expectations set at that time deliver effective automatic swabbing, resulting in extended swab intervals. With fewer swab cycles, disturbances to the forming process due to swabbing the stability of the forming process increase, with better efficiency and improved bottle quality as a result.

Forming process stability

With the above-mentioned swab interval in blow-blow production, which is expected to extend to 180 minutes intervals on NNPB lightweight production, the disturbance of swabbing to the forming process is minimised to almost zero. The BlankRobot achieves this by the concept of precisely applying a special and patented lubricant (from LubriGlass) in extremely small amounts to the blanks and neck rings.

Looking at the process performance in terms of the level of process variation, ideally measurable by the XPAR

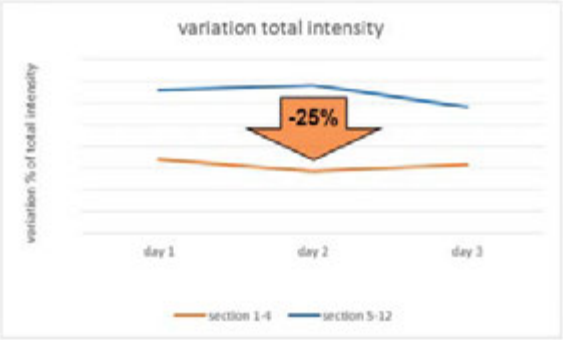

Figure 2: Variation of total intensity. NB sections one-four are swabbed by BlankRobot, whereas sections five-twelve employ manual swabbing.

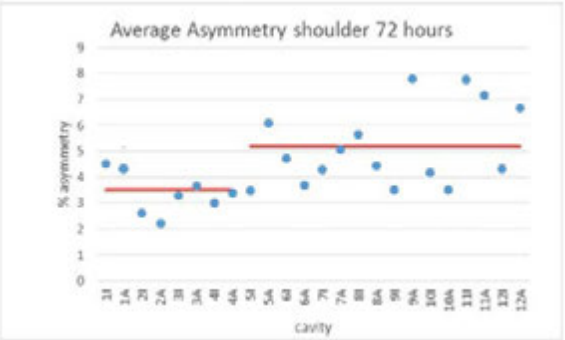

Figure 3: Average asymmetry. NB sections one-four are swabbed by BlankRobot and sections five-twelve by manual swabbing.

Vision IR-D system, the high level of repetitiveness and reproducibility when applying automatic swabbing results in up to 25% reduction in overall forming process variation (figure 2).

This results not only from replacing manual swabbing by robotised swabbing (approximately 10% improvement) but an extra gain of approximately 15% also comes from the increased swab interval by the BlankRobot.

The increased forming process stability directly reflects in better and consistent quality of the bottles produced. The best indicator to observe involves wall thickness problems, which are an immediate effect of poor swabbing performance or in other words, high swabbing disturbance. Wall thickness variation shows itself in uneven glass distribution in the bottle. The circumferential or horizontal glass distribution is the perfect indicator to be observed. In the IR-D, this indicator is referred to as 'asymmetry'.

When reviewing the performance of asymmetry in the bottles from sections swabbed with BlankRobot (one-four) and the other sections by manual swabbing (five-twelve), an impressive improvement of 30% is shown (figure 3). A lower level of asymmetry indicates a more even horizontal glass distribution.

The BlankRobot automatic swabbing operation shows direct improvement in process performance and bottle quality. Gains are found in process stability, with direct opportunities for bottle weight reduction and production speed increases and direct financial gains in terms of fewer quality losses due to swabbing.

Blank coating – yes or no?

Besides the positive effects to the bottle and the forming process, it is important to evaluate the effect on production means as well. One important factor here is the time (blank) mould sets can be used effectively. Experience shows at least an equal stand time of the blanks, which means no negative effect on the lifetime of blanks.

Additionally, a factor not originally considered but one that has a positive spin-off effect is the fact that automatic swabbing with BlankRobot is a pre-condition to refrain from using a coating on blanks.

In figure 4a (glass distribution in time (10 minute intervals) on one cavity), the impact on glass distribution is evident when exchanging a coated blank with a new coated blank. This effect is not noticeable when uncoated blanks are put in when replacing blanks.

In figure 4b (glass distribution in time (10 minute intervals) on one cavity), the impact on glass distribution is insignificant. These results are observed during the same production run with coated blanks swabbed manually and uncoated blanks swabbed with the BlankRobot. The fundamental effect of lower glass distribution ratio (1.8 verus 1.5) comes from the improved process variation by automatic BlankRobot swabbing, as outlined earlier.

As a pre-condition to work with uncoated blanks, automated swabbing with BlankRobot is a necessity. Precise swabbing is needed after blank exchange at individual cavities to guarantee process stability in terms of stable glass distribution.

Additionally, the effect seen before in the horizontal glass distribution is clearly visible. In figure 3c, the asymmetry level in the shoulder is observed for coated blanks versus uncoated blanks. Here, a 20% improvement, additional to the 30% seen in figure 2 is achieved. The combination of using uncoated blanks in combination with BlankRobot swabbing brings enormous potential for process improvements. The total of 50% less variation in horizontal glass distribution while maintaining stable glass distribution in time is achievable with the implementation of the BlankRobot for automatic blank swabbing.

In addition, avoiding the cost of coating is financially interesting. Even more importantly, the health and safety of mould shop workers is no longer compromised, as well as the environmental impact by not having to apply hazardous coating substances.

Summary

The experience of customers using the equipment in daily operation confirms the XPAR Vision BlankRobot concept. Using a special lubricant from LubriGlass in a dedicated manner by innovative application technology, expectations are met and even exceeded when considering positive side-effects. Swabbing intervals are increased to 120 minutes compared to a maximum of 30 minutes by manual swabbing or competitive robot swabbing.

The positive effects are supported by the numbers shared in this article. Gains are found in process stability, improved glass distribution and reduced swabbing-related defects, bringing direct opportunities for bottle weight reduction and production speed increases.

Next steps

With blow-blow bottle production and neck rings, the dynamics are different again. In future articles, the author returns to the effects of using a BlankRobot with this equipment. ●

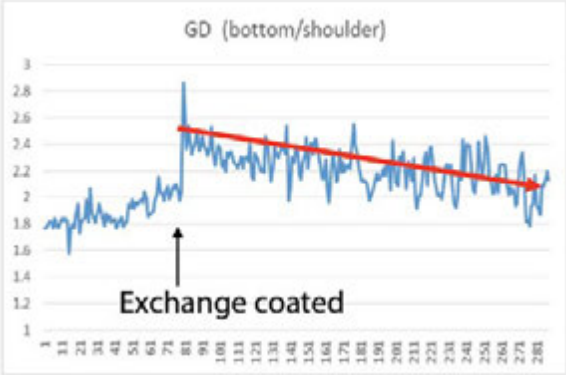

Figure 4a: The new coating blocks heat transfer, resulting in changed glass distribution (more glass in the bottom, less in the shoulder). In time, this effect changes due to deterioration of the coating.

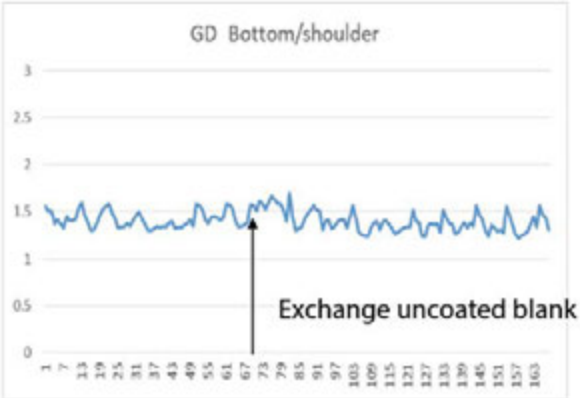

Figure 4b: No significant change in glass distribution is evident when changing to an uncoated blank.

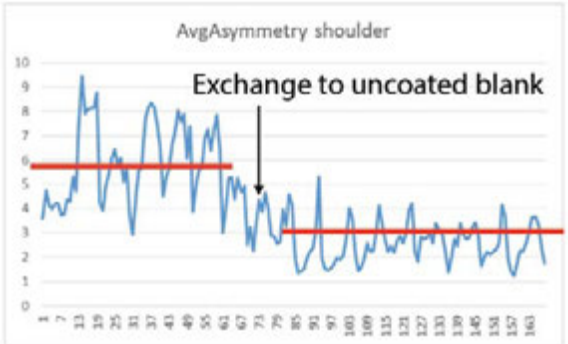

Figure 4c: Asymmetry variation in time (10 minute intervals) on one cavity.

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EU glass industry performance in 2018-2019

Glass Alliance Europe

Data released by Glass Alliance Europe confirm that glass is a sustainable and resource-efficient material. It enables a wide variety of glass products, including high-tech applications (in flat glass, container glass, special glass and fibre glass sectors) for a low-carbon economy.

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The state of the European glass industry is still satisfactory today. Figures for 2018 confirm the industry's global stability, with a production of nearly 36.6 million tonnes, representing a slight increase compared with 2017 of 0.16%.

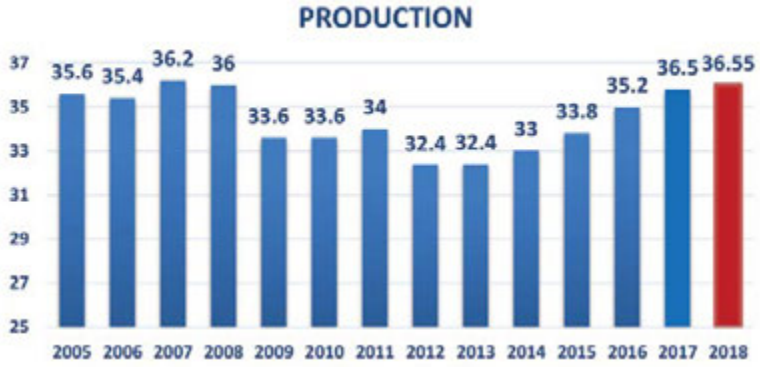
The glass industry can be proud of its achievements. It remains an important player in the European sustainable economy. There is no doubt that to maintain glass production in Europe, co-operation with the authorities and high commitment within the industry are key factors for success in the future.

In 2018, EU-28 glass production reached a volume of 36.55 million tonnes, a slight increase of 0.2% compared with 2017, which could indicate that the market is stabilising. It is important to point out, however, that production levels can be deeply impacted by third country imports into the EU and mostly, those covered by illegal dumping and state aid subsidies.

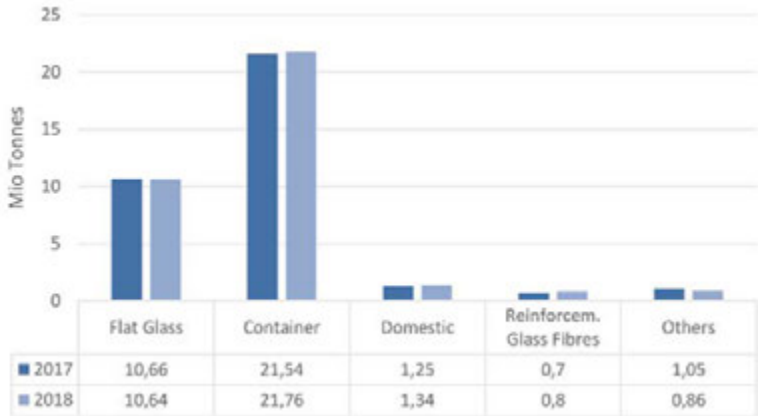
The European production level still maintains the EU as one of the largest glass producers in the world, together with China and North America. Germany remains the EU's biggest producer, with about one fifth of the volume, closely followed by Italy, France, Spain and the UK.

Production evolution within glass sectors

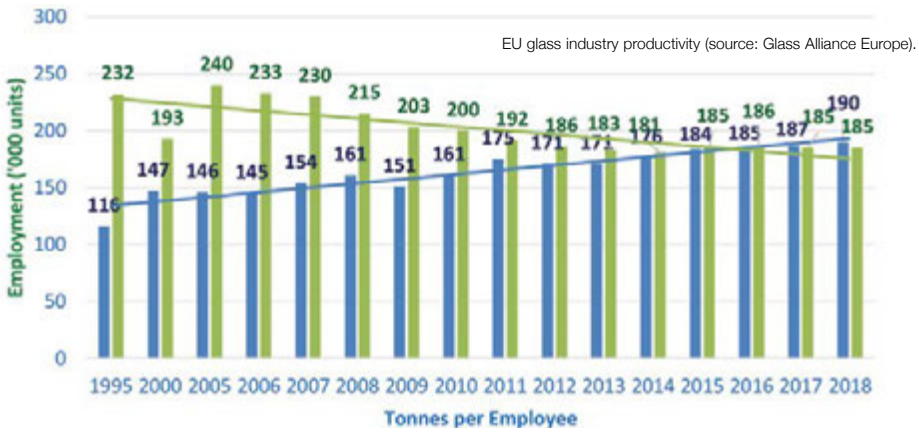
Since 2016, all glass sectors have successfully increased their production, thanks to a revived economy mainly in the construction sector, car industry, energy, engineering and food and beverage sectors.



EU glass production, in million tonnes (source: Glass Alliance Europe).



Glass production breakdown (source: Glass Alliance Europe).



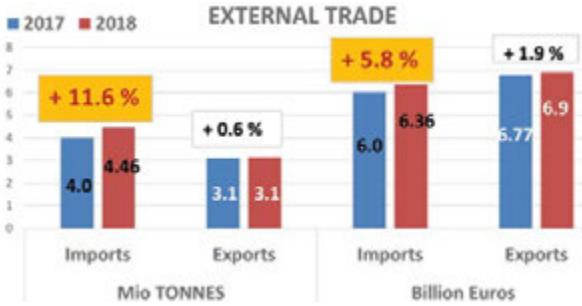
EU glass industry productivity (source: Glass Alliance Europe).

External trade

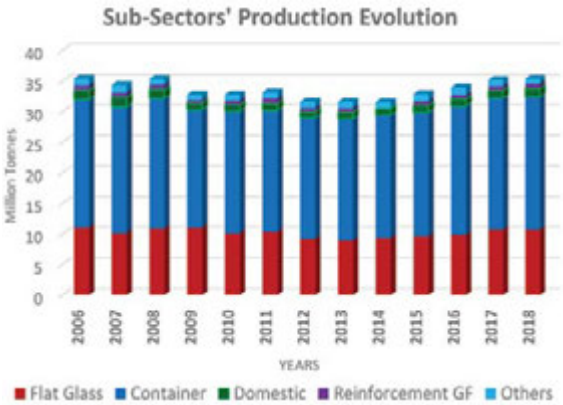
Regarding foreign trade from third countries, imports from Asian countries and in particular China, remain major competitors.

Compared with 2017, 2018 extra EU-28 exports remained stable (+0.6%) in volume at 3.14 million tonnes and increased by 1.9% in value. with €6.91 billion. The EU-28's four major clients in volume terms are the rest of Europe (44.8%), including Switzerland (15.5%), Turkey (7.3%) and Russia (4.4%), followed by the USA (11.9%), North Africa (6.4%) and Far East Asia (8.4%) including China (3.4%).

As for extra-EU imports in EU-28, in 2018 they increased in volume terms by 11.6% (nearly 4.5 million tonnes) and in value terms by 6.6% (€6.36 billion) compared with 2017. Far East Asia accounted for 39% (including 31% from China alone), the rest of Europe for 41.7% (including Turkey (9.4%), Russia (9.6%), Switzerland (8.1%) and Ukraine (5.5%), North Africa for 7% and the USA for 3.1%.



Export/import performance 2017-2018 (source: Eurostat).



Production evolution within sectors in million tonnes (source: Glass Alliance Europe).

Employment 2018

The industry's number of employees has stabilised since 2013. Currently, the EU-28 glass industry employs about 186,000 people (including processors), showing a stable socio-economic situation.

Productivity figures have remained stable since 2015 (190 tonnes per employee in 2018), proving the efficiency of skilled employed people (185,000 units).

Outlook

Behind these 2018 figures, which have been aggregated at the level of the whole glass industry, it is important to realise that the situations are contrasted in the different sectors. Evolutions in production and employment, as well as in the origin of imports to the EU, are very different between glass sectors.

The global trend indicates steadily increasing imports in all glass sectors, however, with limited exports.

Although market conditions and consumer confidence have been restored since 2015, competition remains intense with non-European glass manufacturers. Investment outside the European borders has materialised and imports are gradually and insidiously increasing, taking bigger EU market shares in nearly all glass sectors.

For 2019, one can pre-empt an ever-challenging manufacturing climate with the pending structural change due to the revised ETS legislation (ETS sector -43% by 2030) and the future EU decarbonisation policy of energy-intensive industries.

Moreover, the political worldwide context is also evolving and can impact the EU's global economy (Brexit, US policies, China etc). ●

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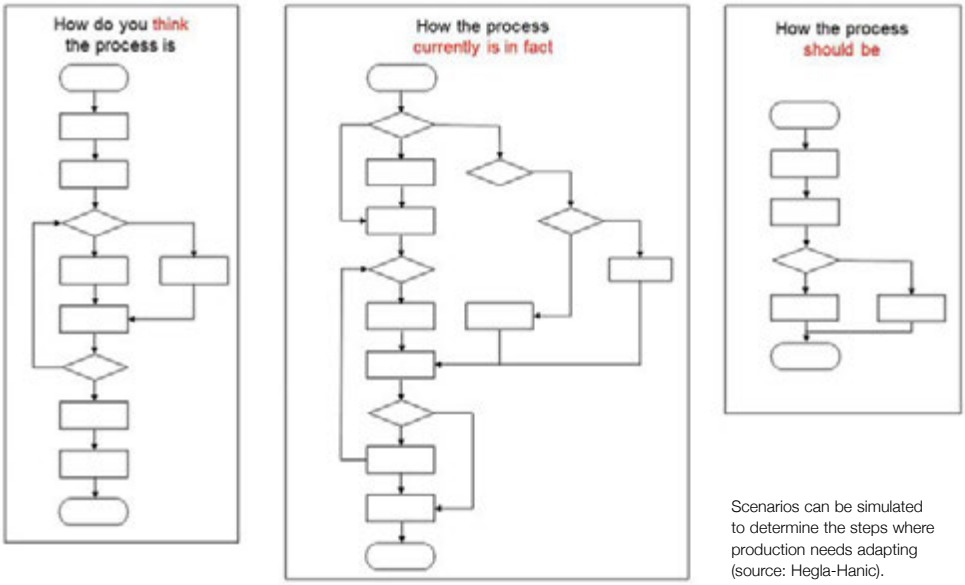
Shop floor logistics: Running almost automatically

With production processes constantly being optimised, both time and cost pressures require the constant revision and reorganisation of organisational structures in internal logistics. This is no different in the glass industry, says the VDMA Forum Glass Technology. With companies increasing their digital networks, the use of automated guided vehicles will also make it easier to implement these processes.

The magic words are shop floor logistics. People are - and will always be - part of the logistics chain. With the help of automated work steps, employees are able to focus on their tasks more closely and therefore, work in a more targeted manner. Mobile and driverless machines are deployed to complete distracting ancillary activities or transport routes and not just at the cold end of glass production.

The first step is an analysis, a data-based process that requires as much data to be collected as possible. Hegla-Hanic GmbH & Co KG has defined the necessary steps for its production solutions. The challenge in production is co-ordinating the machining and cycle times of the equipment. What happens at individual steps, how good are the interfaces and how smooth are the transitions? How well is the supply of work materials co-ordinated?

Machine parks are generally designed to be very heterogeneous, certain processes have 'grown', habits have crept in, information is scattered and of course, there are always unplanned downtimes.



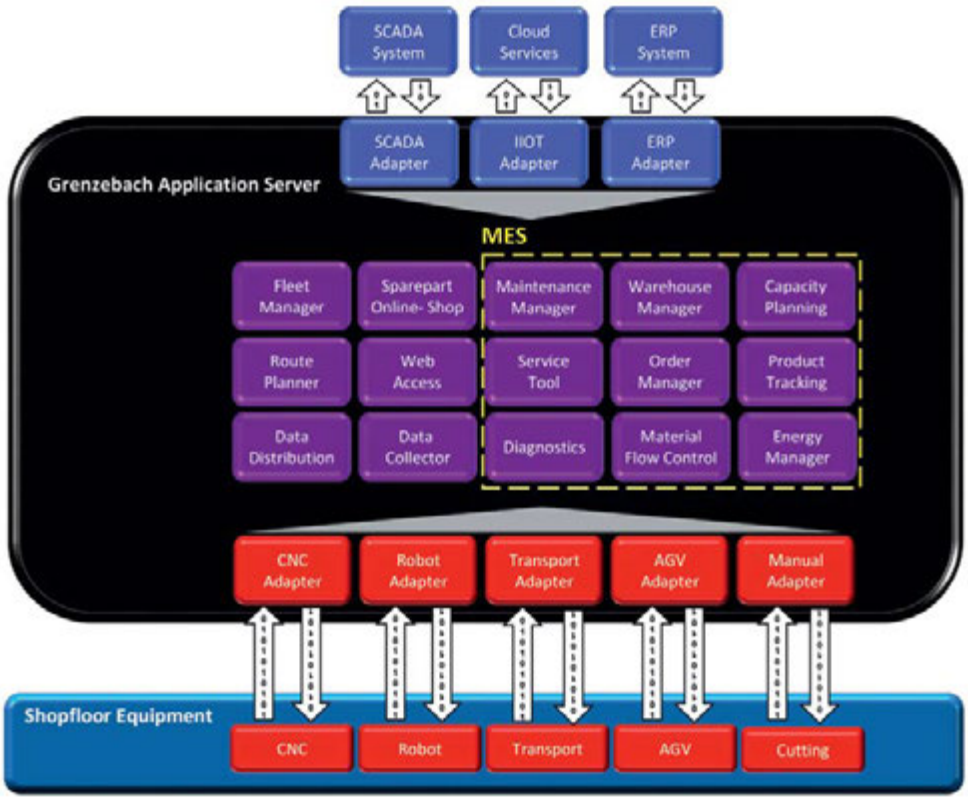
Scenarios can be simulated to determine the steps where production needs adapting (source: Hegla-Hanic).

Contrary to expectations

Taking a closer look at processes often shows that they are far more complex than initially thought, despite the fact that they should be simple and efficient. The goal is to determine the ideal state, an analysis process that is more successful the more data the company has collected.

Scenarios can be simulated to determine the steps where production needs adapting. To do so, affected teams must describe the requirements and the ideal process and then compare both with the actual state. Simulating scenarios with the respective production software enables different solutions to be tested, which in turn allows the optimal process to be honed in on.

Driverless transport systems are flexible in this context, particularly



Grenzebach has devised solutions for transporting glass racks and L-frames (source: Grenzebach).

when it comes adapting to future requirements, meaning production lines will no longer require redesigning.

Geopositioning in production facilities

The use of automated guided vehicles is conceivable in any industry sector, regardless of the product. Transporting glass is a particular challenge.

Grenzebach GmbH & Co KG has devised solutions for these specific applications, in particular for transporting glass racks and L-frames. However, this is just a single part of the digital system. The company has developed its own application server as a modular platform on which all digital production processes can be mapped. All devices and machines on the shop floor are connected to the server via adapters, allowing adjustments to be integrated quickly and the results to be analysed.

The quantity and speed of production require the material flow to be reliable, a step during which automated guided vehicles are often deployed to cover a wide range of tasks. Grenzebach has installed a laser system in the entire driving area, which is used to navigate the machines. The environment is mapped using a navigation scanner that detects how light reflects off reflectors installed on the walls at certain distances. As soon as two or more reflectors are detected, the vehicle is able to accurately determine its current position. Using a triangulation algorithm in the control software, the necessary steering commands are sent to the vehicle.

The company also uses a second navigation system, known as a dead reckoning navigation system. This system is equipped with an odometer and an angle encoder and is installed on the vehicle's drive wheels, resulting in even more accurate navigation, while a map of the environment is marked with the precise positions of the wall reflectors. An alternative method is to use contour navigation, which does not require an unrestricted view of reflectors but is performed by the transport system itself using safety scanners.

Still room for improvement

According to Dipl-Ing Thomas Albrecht, an expert on automated guided vehicles at the Fraunhofer Institute for Material Flow and Logistics (IML), the topic has been trending across industries for three to four years. In comparison with other automation solutions, these systems are the most flexible when it comes to linking production processes. Compared to manually operated forklifts, AGVs are more gentle on the transported product and also do not cause accidents. However, as long as people remain in the driving area, the vehicles must be able to perform emergency stops, a process generally associated with abrupt braking.

The share of automated guided vehicles in the floor conveyors product group is currently still in the low single-digit percentage range, with exact figures not (yet) available. ●

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Usable Glass Strength Coalition review

Alastair Cormack and Robert Weisenburger Lipetz discuss the benefits of industry coalition funding of fundamental research in usable glass strength.

glass WORLDWIDE Official journal of UGSC

The Usable Glass Strength Coalition (UGSC) was an industry-led consortium, providing an opportunity for companies that participate in the glass industry to share the costs and potential benefits of fundamental research into usable glass strength. The shared vision was that most glass companies cannot independently support a fundamental research agenda to understand and significantly improve the usable strength of glass. However, by working together with pooled funding and shared risk, the opportunity to significantly improve the usable strength of glass would be achievable.

Over its seven year history, the coalition was able to support two university-based research projects that, in turn, generated five research publications and helped prepare four students for careers in the glass industry. This article describes the rationale and history behind the coalition's formation, as well as the products of the enterprise.

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Robert Weisenburger Lipetz MBA, Executive Director, Glass Manufacturing Industry Council.

Why fundamental research in glass strength?

Although a ubiquitous and extremely versatile material, it is well known that glass is subject to a fundamental flaw: It fractures. This is because it is brittle and once cracks begin to propagate, they cannot be stopped, unlike metals, in which dislocations limit crack propagation. To make glass strong enough to use, extra weight is added. If it was possible to understand the fundamental science behind why glass factures and hence prevent it, glasses could be created that are tens or hundreds of times stronger in use. As a result, innovative manufacturing processes could be designed that would make current glass products much lighter. In addition, new products could be developed for applications that previously required metallic materials such as steel. The use of glass as a material would be revolutionised and there would be a huge impact on sustainability objectives.

Table 1 compares the theoretical, intrinsic strength of glass (actually, silica) and the usable strength for some common products. As is well known, glass is highly susceptible to the generation of surface flaws during manufacturing and handling. The flaws are sources of the cracks which lead to fracture. As a result, the usable strength of glass is only a fraction of its potential. Note that silica fibres, prepared and measured under carefully controlled, environmentally-free conditions have been found to have intrinsic strengths as high as 11-13 GPA, rising to 14 GPa at liquid helium temperatures. However, typical glass applications realise only 0.5% of the intrinsic strength. So far, engineering solutions, such as improved processing techniques (ie more automation, less handling by humans) and secondary treatments like thermal and chemical tempering, have only pushed the strength envelope to under 10% of intrinsic strength.

Condition of glass	Strength (lb/in²)	Strength (MPa)
Theoretical	2,000,000	17,000-18,000
Pressed articles	3000-8000	21-56
Blown ware	4000-9000	30-63
• Inner surface	15,000-40,000	105-280
Drawn tubing or rod	6000-15,000	42-105
Glass fibres		
• Freshly drawn	30,000-400,000	207-2758
• Annealed	10,000-40,000	69-280
Window glass	8000-20,000	56-138

Table 1: Theoretical versus usable strength of glass.

Even modest gains in glass strength translate to significant efficiencies. Less raw material is needed to make the same products. Less energy is required, creating cost savings and reducing emissions. Stronger glass means lighter products and more applications. Transportation costs are reduced. Storage is more efficient. Products can be packaged, transported and used with greater safety. Stronger, lighter glass vastly multiplies its possible applications for products and makes them more efficient. A breakthrough in fundamental understanding, leading to the production of stronger glass, would be a game changer.

With recent developments in experimental and theoretical techniques in mind, a group came together to try and address the problem. The origins of the present initiative go back almost 20 years.

History and organisation

In 2007, The Glass Manufacturing Industry Council (GMIC), American Ceramic Society's Glass and Optical Materials Division (GOMD), Center for Glass Research (CGR) and National Science Foundation (NSF) issued the following contest challenge to the brightest international university students: "If glass of any type were available at 50 times its current strength, what new products, engineering opportunities or cost savings could emerge into the marketplace?"

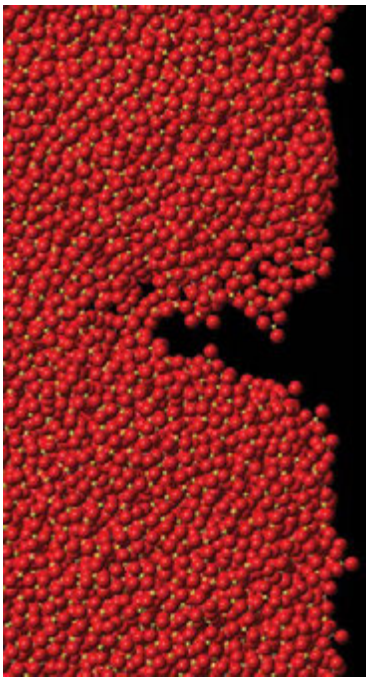
The contest received 47 papers from 28 universities in five countries. First Prize went to Armin Dillert of Friedrich Alexander University in Erlangen. His concept for 'Flexible Thin Solar Panels' demonstrated the potential of combining the fundamental benefits of glass with super-thin, super-strong glass. Second prize winner, Julieann Heffernan of the New Mexico Institute of Technology provided a convincing argument for the conversion

of rooftops from traditional asphalt shingle to glass. But as her analysis showed, this would not be cost-effective without significant increases in the usable strength of glass.

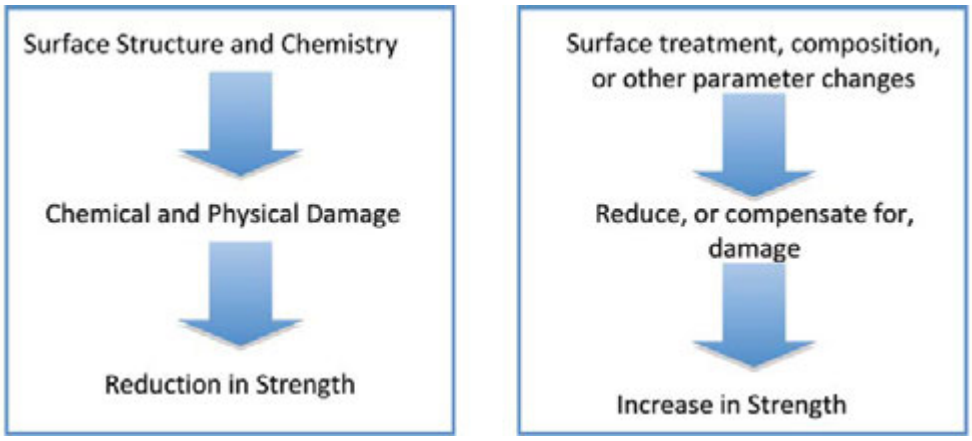
Around that time, the development of several cutting edge research tools has advanced to where they can be exploited for glass strength research. Unfortunately, government funding to rigorously put these techniques and capabilities to use in understanding glass strength was not readily available and research was sporadic. Although university researchers had good ideas for advancing glass strength research, they found few avenues for funding, particularly in the USA; most of the progress was being made in Europe and Japan. Discussions with the usual sources of funding, like the US DoE, DoD and NSF, revealed little enthusiasm for funding research in glass, which was generally seen as a mature field.

A loose group of university, industry and agency members, including Dr Chuck Kurkjian, formerly of Bell Labs and Michael Greenman, then Executive Director of the GMIC, had been meeting at various conferences to discuss how to move forward. At that time, it became clear that without strong support from the glass manufacturing industry, little was going to happen.

The PacRim 2009 meeting in Vancouver, BC became the tipping point. After a full day symposium on glass strength, wheels were put in motion to establish a consortium of glass companies, later to become



A crack propagates into the glass from a surface flaw.



Research Roadmap. The left graphic summarises the two phases of research, providing a route to understanding what causes the reduced usable strength of glass. The first focusses on glass surface structure and chemistry, while the second addresses mechanisms of chemical and physical damage as they relate to usable strength reduction. The right graphic is acorollary, emphasising a way to increase the usable strength by taking advantage of the research outcomes funded by the coalition.

the UGSC. This led to follow-up meetings at Alfred University and Penn State, resulting in the coalition vision statement: 'Glass companies cannot independently support a fundamental research agenda to understand and significantly improve the usable strength of glass. However, by working together with pooled funding and shared risk, the opportunity to significantly improve the usable strength of glass is achievable.'

Initial seed funding from Corning, Johns Manville, Owens-Illinois, Owens-Corning, Saint-Gobain Containers, Annheuser-Busch/InBev, International Partners in Glass Research, Coca-Cola, Diageo, Emhart and Rio Tinto Minerals was used to support the development of formal operation and participation agreements and a research roadmap.

At a meeting in Savannah, Ga in 2011, led by Alastair Cormack (Alfred University), the Coalition Research Team affirmed the need for a programme of basic research, focusing on the question of how and where flaws nucleate in glass. The objective was to gain a deeper, fundamental understanding of the relationship between surface structure, surface chemistry and the strength of glass, illustrated in a two-step graphic. The first step starts with understanding surface atomic structure, since that is where the flaws of interest start. A critical component of this is understanding the effect of chemistry on surface structure and subsequently, how surface structure is impacted by chemical and physical damage. And that, of course, leads to reduction in strength. Therefore, the first goal of the research roadmap was to have the researchers explain why glass shows a reduction in strength, ie the role that surface structure and chemistry plays in reducing the strength of glass. This is the thrust of the RFP issued in March 2013.

To operate effectively, administration, management and IP oversight mechanisms were needed.

A home for the coalition was needed and the most logical choice was the Glass Manufacturing Industry Council. GMIC was already a recognised glass industry representative, co-ordinating a number of technical projects and many of the companies participating in the UGSC discussions were its members. The UGSC was incorporated as a wholly-owned for profit subsidiary of GMIC in 2011. Under this arrangement, UGSC participation was separate from GMIC membership. Research findings were shared only among UGSC participants and not with GMIC members until the findings were made public. The nature of the UGSC activities were spelt out in an operating agreement and the rights and responsibilities of participants in a participation agreement. The UGSC had its own independent board of directors that oversaw research focus and management.

Traditionally, when research is funded through universities, the university is assigned the intellectual property (IP) and a royalty free license is granted to the sponsor. Although initial thoughts centered on the idea that generated knowledge would be owned by the participants, after many iterations of drafts of the operation agreement having been reviewed by various legal and IP experts, representatives of coalition companies' management and legal departments, UGSC leaders concluded that it would be too difficult to gain consensus on the ownership of IP by the participants. An operating agreement was produced, in which IP generated directly by UGSC-funded research would become public domain, consistent with the view that the supported research was to be pre-competitive in nature.

UGSC participants received the following benefits: Coalition participants enjoyed no less than one year exclusive early access to the research body of work. Participants exclusively set the coalition research agenda and selected research projects for funding. Participation dues and corresponding voting power were determined by annual glass sales. A company with more than a billion dollars in annual glass sales had dues of $40,000. However, that also gave four votes on the board of directors. Companies providing less support had fewer votes on the board. One hundred percent of UGSC revenue came from participants' dues. These funds paid for the university research contracts, as well as administrative expenses. Various companies participated in ▸

the coalition over its seven year history, including 3B, Coca-Cola, Diageo, Johns Manville, Owens Corning, PepsiCo, Sun Chemical, Rio Tinto Minerals, Owens-Illinois and Annheuser-Busch InBev.

Products

Scientific research produces outcomes that can be either tangible or intangible. In the case of the research sponsored by the UGSC, tangible outcomes include students (undergraduate, graduate and post-doctoral) educated in glass science who subsequently become employed within the glass industry, publications in the archival literature describing the work done for the benefit of future generations of glass scientists, as well as technical presentations at national and international scientific conferences.

Two projects were supported by the coalition during its lifetime. The first, at The Pennsylvania State University, was entitled 'Controlling and understanding reactive surface sites on multi-component glasses', with PIs Carlo G Pantano and Seong H Kim. The second was at the Colorado School of Mines, entitled 'Fundamental Understanding of Strength Limiting Flaws in Multi-Component Glass', with PI Ivar Reimanis. Both RFPs attracted more than a dozen high quality proposals, each making the final choice quite difficult.

The UGSC funding led directly to five publications:

- Probing Hydrogen-Bonding Interactions of Water Molecules Adsorbed on Silica, Sodium Calcium Silicate and Calcium Aluminosilicate Glasses, J Phys Chem C (2018), 122, 17792–17801, Sheth et al.
- Characterisation of surface structures of dealkalised soda lime silicate glass using x-ray photoelectron spectroscopy, specular reflection, attenuated total reflection infrared and sum frequency generation spectroscopies, J Non-Crystalline Solds, 474 (2017) 24-31, Sheth et al.
- Effect of heat treatment on the surface chemical structure of glass: Oxygen speciation from in situ XPS analysis, J Amer Ceram Soc (2017), 1-13, Bannerjee et al.
- Elemental areal density calculation and oxygen speciation for flat glass surfaces using x-ray photoelectron spectroscopy, J Non-Crystalline Solids, 450, (2016) 185-193, Bannerjee et al.
- Zero Stress Ageing in Notched Multi-Component Glass Fibers, Journal of the American Ceramic Society (2018), Van Sant et al.

Two more are in preparation.

More than a dozen talks, including invited presentations at national and international meetings, such as the International Congress on Glass, The American Ceramic Society's Glass and Optical Division Conferences and the Conferences on Glass Problems, held every year, were based on work supported by the coalition. Both the graduate student and post-doc who worked on the Penn State project are now employed by major glass companies in the USA. The CSM project supported an undergraduate student and a research assistant professor.

UGSC support also enabled the university groups to acquire additional pieces of equipment to enhance their research capabilities.

Less quantifiable outcomes include closer relationships between university researchers and industry practitioners and informal networking.

One thing that became clear is the merit of using a combination of experimental techniques to characterise glass surfaces and the difficulty of probing just the top few Ångstroms to identify clearly the active sites. There is a lot more work to be done if the atomic structures associated with flaw creation are to be properly understood.

Summary

The UGSC can be seen as a contemporary model for industrially-funded precompetitive research. It brought together a group of companies, ranging from large manufacturers to users and suppliers, with the specific purpose of focusing on a single – but critically important – property of glass, namely its (mechanical) strength, with the goal of understanding its fundamental scientific orgins and thus how to improve it.

A key point is that such coalitions spread the cost. They enable companies to be involved in long-term research, when they have no relevant in-house capability or cannot devote adequate resources to run their own research projects. As noted above, it produced a number of positive outcomes, in the form of people educated to work in the glass industry and several contributions to the scientific literature, whose merits are being recognised by being cited in the work of others. Furthermore, it enabled the application of novel techniques such as vibrational sum frequency generation spectroscopy and atomic probe tomography to glass surfaces, experiments which would probably not have been performed without the input from the coalition.

To be successful, the coalition required the active participation of individuals within the various companies, who could champion the notion of precompetitive, long-term research to their senior management. It is believed that the coalition's approach to IP should serve as a model for future industry-based funding efforts. The idea is that, because its nature was defined to be precompetitive, the results and data generated by the UGSC-sponsored research would enter the public domain after a period of time, during which company participants would be able to determine whether IP could be created by further research, which built on the output of the UGSC-sponsored research. Such further research would be conducted by the company in its own facilities.

A weakness of this approach is that the longevity and critical size of the coalition is dependent on continuing support from corporate participants. Ongoing budget commitments from participants of more than a year at a time can be hard to sustain. This is not, perhaps, entirely surprising in an industry that is often thought to be a mature commodity market, particularly in the flat glass and container segments. As personnel changes within companies occured, continuing support for the coalition sometimes experienced a change in priority. Matching university-based research time spans against the shorter ROI horizon of commercial enterprises proved to be a limiting factor.

In retrospect, this initiative proved that the industry can collaborate on longer-term research missions of mutual benefit. It developed a successful model of organisation that could easily be applied to future coalitions. Organising around an industry trade association proved to be a practical structure and streamlined administration. It also showed that sharing the early research results but eventually relinquishing the IP to the public, relieved the coalition of the burdens that would come with attempting to form an IP sharing partnership.

It is to the industry's benefit that new research techniques were applied to research as a result of the coaltion's interests. Ultimately, the coalition demonstrated that the technical and intellectual capacities of universities can be initiated more rapidly and with better focus on industry's interests, when the industry comes together to fund precompetitive fundamental research. ●

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Furnace design – Operation and process simulation seminar

In May 2019, Glass Service organised the 15th International Seminar on Furnace Design – Operation and Process Simulation in the mountain resort of Velke Karlovice, Czech Republic. The event attracted approximately 150 glass experts from 25 countries, including the USA, Mexico, Japan, India, Saudi Arabia, Russia, New Zealand and several European nations. Feedback from participants was very positive.

Staged in conjunction with the seminar were the ICG Technical Committee 15 and 21 and the GS Glass Furnace Model (GFM) user meetings, attended by 40 glass specialists.

The seminar highlighted the latest developments in furnace optimisation and CO_2 reduction, with support from simulations and advanced control. There were contributions from such companies as Johns Manville, Owens Corning, AGC, SEFPRO and FIC UK. Also discussed were the latest developments surrounding Industry 4.0, notably what it will bring to further automate and optimise the glass melting process, including automatic batch monitoring integration.

The 7th GS Modeling Award was presented to Bruno Purnode from Owens Corning, for making a significant contribution to the use of simulation tools within his company and at conferences throughout the world.

Approximately 150 delegates attended the 15th International Seminar on Furnace Design – Operation and Process Simulation in Velke Karlovice, Czech Republic.

This meeting takes place every two years and brings together 150 or more glass experts to discuss the use of simulation and control tools, with the goal of optimising glass melting and forming processes. The next event will be held on 16-17 June 2021. ●

Further information:
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web: www.gsl.cz

Forthcoming events

SEPTEMBER 2019

9 September: Introduction to glass packaging / GTS training programme (Sheffield, UK)

10 September: Glass appreciation – an introduction to glass / GTS training programme (Sheffield, UK)

17-18 September: Glassman Europe (Lyon, France)

17-19 September: GlassTrend Seminar on Process Automation and Big Data (Munich, Germany)

17-19 September: GlassBuild America 2019 (Atlanta, USA)

24-26 September: Gulf Glass 2019 (Dubai, UAE)

30 September – 4 October: CelSian – NCNG International Glass Technology Course (Eindhoven, the Netherlands)

OCTOBER 2019

1-4 October: Vitrum (Milan, Italy)

9 October: PharmaGlass Workshop / GTS training programme (Sheffield, UK)

9-10 October: Refractories for the glass industry - Lucideon training course (Stoke-on-Trent, UK)

10-11 October: 13th International Conference of the AIGMF (Mumbai, India)

10-12 October: glasspex India 2019 (Mumbai, India)

10-12 October: glasspro India 2019 (Mumbai, India)

14-17 October: 43rd ASEAN Glass Conference (Mactan, Cebu, Philippines)

15-18 October: Glass failure analysis / GTS training programme (Sheffield, UK)

20-25 October 2019: 5th ICG Winter School (Wuhan, China)

23-24 October: South Africa Glass (Johannesburg, South Africa)

23-25 October: PRINTING United 2019 (Dallas, USA)

28-31 October: 80th Conference on Glass Problems (Columbus, Ohio, USA)

NOVEMBER 2019

8 November: ATIV Training Course on Industrial Emission Directive (Parma, Italy)

12-14 November: Glasstech Asia 2019 (Jakarta, Indonesia)

13 November: 'Fundamentals of Glass' / GTS training programme (Sheffield, UK)

20-21 November: Colombia Glass (Bogota, Colombia)

21 November: Glass Focus 2019 (Sheffield, UK)

21-22 November: Sisecam International Glass Conference/34th Sisecam Glass Symposium (Istanbul, Turkey)

27-28 November: GlassPrint 2019 (Düsseldorf, Germany)

GLASSPrint2019 CONFERENCE

28 November: British Glass health and safety leadership seminar (Derby, UK)

FEBRUARY 2020

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

APRIL 2020

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

MAY 2020

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

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

JUNE 2020

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

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

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

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

SEPTEMBER 2020

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

OCTOBER 2020

20-23 October: glasstec 2020 (Düsseldorf, Germany)

26-29 October: 81st Conference on Glass Problems (Columbus, USA)

Furnace Solutions 2019

This years' Furnace Solutions and training day were again a great success for delegates, speakers, sponsors and the organisers, the Melting Technical Committee MTC, of the Society of Glass Technology. Delegates came from far and wide, including the USA, Israel, Turkey and Western Europe. More than a third of delegates represented 15 glass producers.

Themed 'Guilty as Charged', this year's training day focused on the importance of the batch house to produce consistent glass quality. The day started with lively presentations from Dr Richard White (Lucideon), Martin Marshall (GTS) and Dr Richard Hulme (Guardian Glass).

Richard White and Martyn Marshall's presentations focused on how to test raw materials and how different raw materials create glass formulations. Then Richard Hulme brought together elements of the inherent difficulties in analysis and measurement, as well as the need to understand the physical and chemical properties of glass and how these may be affected – for good or ill – by making batch changes.

Peter West (Ardagh) focused on the mechanics of batch house operations, while a SORG representative presented the company's thoughts on the basics of glass melting and colour forehearth conditioning.

Of great value to those attending the training day were the panel sessions, where conference speakers and trainers debated lively and topical questions of the day.

Continuing the theme of the training day, Trevor Wilson (DSF Refractories) concluded proceedings, delivering the Mellor Memorial Lecture for the IOM3. The theme of his lecture was the effects of carry over on regenerator refractories. The Mellor Memorial Lecture honours 150 years since the birth of renowned ceramicist Joseph Mellor, who was instrumental in developing refractory and ceramic understanding into a science and the beginning of the Iron and Steel Institute, which evolved and merged with other institutes to become what is now known as IOM3.

Delegates came from far and wide, with over a third representing 15 glass producers (image courtesy of SGT, Christine Brown).

Furnace Solutions highlights

At the start of the Furnace Solution conference, first time speaker Sebastian Woltz (EME) presented his thoughts on the challenges of upgrading the batch plant. And continuing the SGT's commitment to keep the conference relevant and interesting for glassmakers, Tony Pawinski (VRTM) demonstrated his virtual reality training package for IS operators. During a breakout period, delegates enjoyed experiencing first hand, living in a virtual IS World.

A topic of importance to everyone in the industry is health and safety. As a departure to traditional presentations, Andrew Bowker from the Health and Safety Executive was invited to brief the conference on the H&SE's strategy and manufacturing priorities, 'Welding Fumes' and how the organisation works with stakeholders through its 'CHARGE' initiative; 'CHARGE' stakeholders are the H&SE, glass, mineral, ceramic, stone and concrete industries and trade unions. The UK has a very good health and safety record and Andrew Bowker outlined how this impressive record will be improved in the future.

Refractories are always an important topic at Furnace

The conference was again deemed a great success by delegates.

The training day focused on the importance the batch house to produce consistent glass quality (image courtesy of SGT, Christine Brown).

Solutions. Michel Gaubil (SEFPRO) discussed the thermo-mechanical stresses induced by the glass corrosion process of fusion cast AZS soldier blocks. And Benjamin Köster (Hotwork) continued the refractory theme, demonstrating how regenerators can be repaired using oxygen to hot hold the furnace.

The environment is never far from the industry's minds. Andy Reynolds and Fives Stein are working hard to develop all-electric furnaces to meet future zero CO_2 emission targets. Andy Reynolds' paper looked at their work understanding refractory corrosion in an all-electric furnace.

The SGT always encourages glass producers to pass on experiences to their peers and the 2019 Furnace Solutions event was no exception. In 2017, Libbey installed Optimelt technology at its Leerdam site in the Netherlands. Frank Schuurmans, Leerdam's Project Manager reported how Optimelt heat recovery technology was installed and how well the technology is working. He reported Optimelt is now operating at 99% of the time.

Award winning presentation

The winner of this year's coveted Michael Garvey Award for the best paper of the day was Burcin Gul of Sisecam. On winning the award, Ms Gul commented: "I truly appreciate SGT an MTC providing such a great platform and recognising my efforts."

Burcin Gul is a young research engineer, who gave her first conference paper in English. Her paper clearly demonstrated her knowledge and understanding of computer modelling and glassmaking to model the effects of the combustion space in an end-fired furnace, improving energy and cullet consumption.

The conference concluded with Andy Reynolds and Nigel Longshaw signing the Fellows book to formally become Fellows of the SGT and Neil Simpson was presented with a special award for his outstanding commitment to further the SGT's goals.

The SGT has always aimed and prided itself on making its conferences social events. This year, more than 40 delegates enjoyed dinner together on the eve of the Furnace Solutions conference and following an inspiring training day, where old and new friends came together for an evening of laughter.

After the training day, Lucideon's Richard White commented: "It was a pleasure to be able to partake in the meeting" and first time attendee Sam Leaper from sponsor Henry F Teichmann said: "Thanks to everyone connected with the event for setting it up and taking care of everything. I enjoyed the conference very much and will look forward to next years' event."

The theme for next year's training day and conference is 'Know your furnace'. The training day will concentrate on how and why it is important to monitor the furnace and its operation. The conference will take that theme further, with papers from experts who audit and monitor furnaces. The SGT is looking for contributions from experts who can pass on their experience and demonstrate the latest technologies. Potential contributors are invited to send a title and short abstract of their papers to Christine Brown at christine@sgt.org by the end of 2019. Next year's conference will again be held at Lucideon, Stoke-on-Trent on 3 and 4 June. ●

Stuart Hakes, SGT President, presents the Michael Garvey Award for the best paper of the day to Burcin Gul of Sisecam (Image courtesy of SGT, Christine Brown).

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13th AIGMF International Conference

Parallel to glasspex and glasspro India shows, The All India Glass Manufacturers' Federation (AIGMF) will be organising its 13th bi-annual international conference in Mumbai on 10-11 October 2019. Powered by *Glass Worldwide,* glasstec and VDMA, the conference will focus on Glass Industry 4.0 and will cover important topics from all segments of glass involving Indian and international speakers.

The high profile content-driven conference will highlight the key issues and developments by industry experts and will witness speakers and delegates from both national and international companies. Welcome speeches will be delivered by Raj Kumar Mittal, President, AIGMF and UP Glass Manufacturers' Syndicate (UPGMS) and Managing Director–Mittal Group of Glass Industries of Firozabad, Birgit Horn, Director of glasstec, Messe Dusseldorf Germany and Dr K Muraleedharan, Director, Central Glass and Ceramic Research Institute (CGCRI).

Provisionally, the two day technical sessions will include the following presentations:

- Modern automation systems in batch plants and cullet recycling plants (ZIPPE).
- Glass marking - When traceability becomes an obligation (HEGLA).
- SORG forehearth systems: The SORG 340S+ forehearth and the SORG colouring forehearth system (SORG).

The conference attracts presenters from leading international suppliers, including Simon Parkinson from PSR in 2017.

Former AIGMF President, Sanjay Somany will feature prominently during proceedings.

With Indian and international speakers, the conference will attract representatives from the various glass sectors.

René Meuleman and Seetharaman Jayaraman of Eurotherm by Schneider Electric were speakers at the AIGMF conference in 2017.

The conference will include panel discussions featuring figureheads from the Indian glass industry.

XPAR Vision at the 12th AIGMF International Conference.

- 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 (BIS)).
- Refractory materials challenges in soda lime glass feeders (Saint-Gobain SEFPRO).
- Energy savings in glassmaking: Importance of correct vacuum setting (Pneumofore).
- Aesthetics and functionality through glass (Central Public Works Department (CPWD), Ministry of Housing and Urban Affairs, Govt of India).
- Maintenance 4.0 for cold end lines (EMS (Emmeti)).
- Furnace optimisation and NO_x reduction (AMETEK Land) – to be confirmed.

Dave Fordham, Publisher, *Glass Worldwide,* will be moderator for international speakers and Professor (Dr) A K Bandyopadhyay, a specialist in glass technology and also a member of the editorial board of *Kanch*) will be moderator for Indian speakers.

The event will also feature networking lunch opportunities and several special events including:

- Glass - a vital building material for Smart Cities / Glass aiding Swachh Bharat Abhiyaan (clean India campaign): Dr K Annapurna (Central Glass and Ceramic Research Institute), Ar Deepak Gahlowt (Confederation of Construction Products and Services), Sanjay Somany (AIGMF and HNGIL), Dr Devendra Kumar (Dept of Ceramic Engineering, IIT, BHU), Thomas Schlitt (Messe Düsseldorf (I) Pvt Ltd) and Dave Fordham *(Glass Worldwide).*
- Unveiling Exhibition- 'Adopt a Glass Bottle for Healthy Environment': Sanjay Somany and Vinay Saran (AIGMF).
- Release of *Kanch* and *Glass News* special issues.
- Panel discussion: Bharat Somany (AIGMF and HNGIL), Mr K C Jain (AIGMF and Sisecam Flat Glass India Ltd), Ar Deepak Gahlowt (Confederation of Construction Products and Services), Gesine Bergmann (VDMA - Forum Glass Technology), Dr K M Soni and Usha Batra (Central Public Works Department / Ministry of Housing and Urban Affairs, Govt of India), Dr Devendra Kumar (Dept of Ceramic Engineering, IIT, BHU) and Dave Fordham *(Glass Worldwide).*

With discounts available before 25 September, information about registration and the final conference programme is available from the website. ●

Further information:
The All India Glass Manufacturers' Federation (AIGMF), New Delhi, India
tel: +91 11 23316507
email: info@aigmf.com
web: www.aigmf.com

Boston becomes 'glass city' for ICG congress

With *Glass Worldwide* as official glass industry magazine, more than 900 people from 45 countries attended the International Congress on Glass and Annual Meeting of The American Ceramic Society Glass and Optical Materials Division in Boston, Massachusetts this June.

With apologies to Toledo, Ohio, Boston became the 'glass city' for a week when it hosted the International Congress on Glass (ICG) and the Annual Meeting of The American Ceramic Society Glass and Optical Materials Division (GOMD).

Richard Brow, Congress President, commented in his opening remarks: "Boston is known as a centre of innovation. This week, we get to be immersed in our own innovation."

More than 900 people from 45 countries attended the congress, organised by the ICG and GOMD. Students accounted for 200 of attendees.

The event marked several auspicious milestones, including the 25th edition of the congress, the 100th anniversary of the ACerS Glass and Optical Materials Division and the Society of Glass Technology's first awarding of its Michael Cable Award and lecture.

Programme Chair John Mauro and his committee worked with the ICG's Technical Committees to present a smorgasbord of 43 technical sessions, two poster sessions, a Festschrift, eight award lectures, networking receptions and working committee meetings.

"This was such a wonderful opportunity to bring together the global glass community to exchange technical ideas and deepen our sense of camaraderie in the world of glass" Mr Mauro explained. ICG President Alicia Durán echoed this sentiment, commenting: "This congress is part of our scientific work and like science, is a collective effort."

GOMD Chair Liping Huang presided over the 100th anniversary segment of the opening ceremony, receiving congratulations and recognition from ICG, SGT and the Deutsche Glastechnische Gesellschaft (German Glass Society),

Stuart Hakes, SGT President, addresses delegates in Boston (credit: ACerS).

Dr Arun K Varshneya with Mark Mecklenborg, Executive Director of ACerS (credit: ACerS).

Marcus Fish, Development Director at Ceramic and Glass Industry Foundation, was among this year's speakers (credit: ACerS).

Professor Ahmet Kirman, Sisecam Group Vice President and CEO, with ICG President Alicia Durán (credit: ACerS).

Stuart Hakes (SGT President) and John C Mauro (ICG 2019 programme Chair) with Dr Arun K Varshneya (credit: ACerS).

which will celebrate its centenary at the 2022 ICG in Berlin. The celebration included the Morey and Stookey lectures, as well as the first awarding of the L David Pye Lifetime Achievement Award to Charles Kurkjian and John Douglas Mackenzie.

Liping Huang had a surprise and a 'big reveal' for the audience as the morning came to a close, a replacement ceremonial glass gavel for the GOMD to replace the delicate, hollow glass gavel. The new gavel is ion-exchange strengthened glass, with a black ribbon of glass-ceramic spiraling throughout. Like the original, it was made by an artisan-scientist at Corning.

The organisers also worked to achieve gender parity on the programme committee. Alicia Durán encouraged the community to continue to bring women into all segments of the industry: "Having women working with you improves efficiency" she says. "We must continue with this. It is very important."

The conference was characterised as energetic, with well-attended sessions and networking events, lively conversations in sessions and during coffee breaks and excellent award lectures. It was exciting to hear so many languages spoken in the hallways and to know the topic was glass!

The GOMD George W Morey Award winner, Himanshu Jain, set the tone of the conference during his lecture, saying: "A researcher's crucial question is 'so what?' That's a very dangerous question, because if you keep asking it, it can get pretty depressing pretty soon."

But he also showed how that question leads to unexpected discoveries. He showed an example from his work of learning how to grow single crystals via a solid–solid transformation in chalcogenide glass that cannot be grown from melt processes. ▸

More than 900 people from 45 countries attended this June's meeting in Boston (credit: ACerS).

A complementary technology fair provided an opportunity for suppliers to interact with attendees (credit: ACerS).

Towards carbon-free glass production and sustainability goals

In a specially organised GlassTrend session during ICG 2019, the technological challenges for the glass industry to face the Paris climate agreement was the leading topic. Invited speakers presented their views on these challenges and on innovative melting technologies enabling CO_2 neutral glass production, including low carbon combustion processes, the latest developments in full electric melters and the use of alternative and low-carbon raw materials. For example, several presentations by furnace engineering companies focused on new developments and the perspectives of large (> 200 tonnes/day) electric melting furnaces. CFD modelling is considered to be an essential tool in the design of these large electric melters.

Sustainability debate

Separately, GlassTrend organised a 'sustainability debate' for the first time. More than 40 people from the international glass industry took part in a lively debate about a series of three, slightly provocative statements related to:

- The supposed inevitability of implementation of global CO_2 taxes in order to stimulate investments in 'green' measures by the industry.
- The expected future use of hydrogen as a green sustainable fuel for glass furnaces 20 years from now.
- The expected recycling ratios in all glass sectors (including float, fibre, container, domestic and special glass) 20 years from now.

The main goal of this debate was to collect valid arguments for and against these three statements, with an open mind, rather than pushing personal opinions upon other participants. All sensible arguments, for and against, were written down on a flip chart and only at the very end, after considering all pro and con arguments, could participants give their final personal opinion by voting with a green (pro) or red (con) card.

The statements, arguments and final voting results are summarised in the accompanying table.

As organiser of the first debate of this kind, GlassTrend received many positive reactions on the format adopted and is expected to repeat this interactive session at future GlassTrend events.

More than 40 people attended the first GlassTrend 'sustainability debate'.

Debating and voting (statement three) during the first GlassTrend sustainability debate in Boston.

Further information:
web: www.glasstrend.nl

	Arguments		
Statement	**Pro**	**Con**	**Score pro-con**
A global CO_2 tax of minimum $50/ton is required to stimulate the glass industry to invest in measures for CO_2 reduction.	• Supports return on investment. • ROI is there at $50/ton. • Re-invest this money in CO_2 measures. • Will stimulate investments in renewable energy. • Will stimulate local production and saves transport costs.	• Glass industry is suffering economically. • Worldwide enforcement difficult, will result in uneven playfield. • $50/ton does not support ROI. • Will generate a lot of administration. • Better start on voluntarily basis.	23 -15
In 20 years from now, hydrogen combustion will provide 80% of the energy input in glass tanks.	• Hydrogen storage is effective. • Natural gas infrastructure can be used. • Electric grid unavailable. • Flue gas volume similar for same caloric value in case of H2 versus NG combustion. • Greenfield factory near H_2 pipeline. • Improved glass quality in hybrid tank.	• 80% too high, 30% more realistic. • Direct use of electricity preferable. • Safety issues. • Price and availability. • Absence of economic drivers. • Consequences for melting process?	11 - 27
In 20 years from now, recycled cullet % will be >80% in all glass sectors, including flint container, float, fibre and tableware, similarly to coloured container glass.	• Cost-wise OK. • Long-term compliance with regulations. • Supports long furnace lifetime. • Will increase production efficiency. • Ambition OK. • Less use of natural resources/less mining/less transport.	• High quality cullet not available, too costly. • Inadequate co-ordination between industry and authorities. • Alternative raw materials will also reduce CO_2. • How realistic? • Problems for full electric melters. • CO_2 from transport.	5 - 33

Summary of statements, arguments and final scores from the GlassTrend sustainability debate in Boston.

Answering the question "So what?", the programme covered all aspects of glass research, development, production and applications. "John (Mackenzie) and his committee put together a marvelous program that ranged from basic physics on the quantum scale to challenges with manufacturing thousands of tons of glass per day" Richard Brow noted.

A Festschrift, organised in honour of Alfred University professor emeritus Arun Varshneya threaded through the programme. Former students, current and former colleagues and family spoke at the four day Festschrift. Affectionately known as the 'Glass Guru', the broad impact of Dr Varshneya's work as a teacher, mentor and entrepreneur revealed itself as his protégés presented their work and talked about the influence of his work on their careers in academia, industry, government and management.

The next ICG meetings will take place in 2022 in Berlin, Germany and in Calcutta, India in 2025. ●

Further information:
web: www.ceramics.org/event/icg2019

Sisecam International Glass Conference

This November's Sisecam International Glass Conference is expected to attract leading personalities from the global glass industry to Istanbul.

Sisecam Group, the only global player active in all core areas of the glass industry, will organise the first 'Sisecam International Glass Conference' in Istanbul, Turkey on 21-22 November, 2019. Combined with the 34th Sisecam Glass Symposium, the conference will have the main theme of 'Glass in the sustainable future: Achieving what is possible'. The international organisation will also feature select sub-sessions and expert training offered by leading technology companies in the glass industry such as CelSian, Glass Service, Eurotherm, AMETEK Land, RHI-Magnesita and SEFPRO.

The future of the glass industry and the latest technologies will be discussed, attracting researchers and industry professionals from all around the world and raising the perception on the central role of glass on a sustainable future.

Leading glass science platform

As the premier glass science and technology platform in Turkey, Sisecam Glass Symposiums have been growing steadily and strongly for the last 33 years and have hosted joint meetings with the International Commission on Glass (ICG) in the past. ICG comprises 33 national organisations in glass science and technology and has worked with Sisecam on three times in the past.

Sisecam Group organised its first symposium in 1985 alongside the annual meeting of ICG in order to announce the group's 50th anniversary to the world, based on the principle that information grows when shared. Following the 1985 and 1996 ICG Annual Meetings, the 2017 ICG Annual Meeting held in conjunction with the 32nd Sisecam Glass Symposium attracted 417 participants, with five parallel sessions for three days and 171 presentations in three panels.

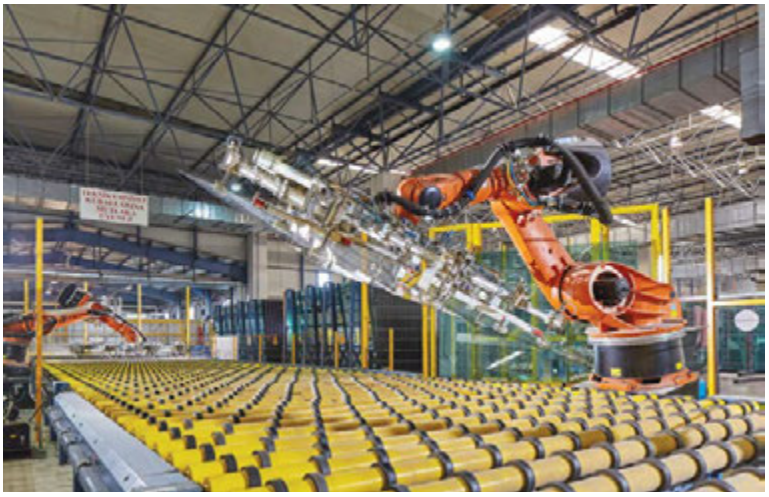
Joint meetings with ICG have empowered Sisecam Glass Symposiums to promote interaction, exchange and co-operation between members of the international glass community and members of national academia, helping to push forward the development of international glass science and technology. With the upcoming international glass conference, Sisecam now aims at transforming its glass symposium into a comprehensive international congress. This ambitious goal is a result of Sisecam Group's sense of responsibility for being the only global player active in all core areas of the glass industry.

Today Sisecam Group is a global player in flat glass, glassware, glass packaging and glass fibre, as well as soda and chrome compounds. The group carries out its production activities in 13 countries, with a workforce of 22,000 people and sells its products to more than 150 countries. Sisecam has manufacturing activities in Turkey, Germany, Italy, Bulgaria, Romania, Slovakia, Hungary, Bosnia-Herzegovina, the Russian Federation, Georgia, Ukraine, Egypt and India. The group operates 43 production facilities.

The group is among the world's top five glass packaging manufacturers.

In terms of production capacity, Sisecam Group ranks among the top three in glassware, top five in flat glass and glass packaging, top 10 in soda production and the leader in chromium chemicals worldwide. The group is also among the world's most distinguished glass manufacturers, due to its degree of specialisation and the considerable competitive advantage of its operations.

Sisecam aims to become one of the top three global manufacturers in its core business fields. Combining its extensive experience with an ambitious vision, the group is growing as a people-oriented, environment-friendly global company that shares, creates wealth and shapes the future with products and services that add value to its stakeholders in line with its sustainable growth strategies.●



Sisecam Group ranks among the world's top five in flat glass production.

Sisecam is one of the world's top three glassware manufacturers.

Further information:
web: www.glassconference-sisecam.com

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80th Conference on Glass Problems

Robert Weisenburger Lipetz previews this year's Conference on Glass Problems for *Glass Worldwide,* exclusive official journal. The event will combine an extensive technical programme with short courses, a symposium and an exhibition.

The 80th Conference on Glass Problems (GPC) takes place on 28-31 October in Columbus, Ohio, USA. For more than eighty years, the Conference on Glass Problems has been the leading forum for the exchange of ideas to address shared challenges for glass manufacturing professionals. It is at the GPC that the world's leading technical experts address current problems in manufacturing, with solutions citing real world examples. It also provides an exhibiting platform for solutions providers to share their innovations that delivers high participation by manufacturers.

Bruno A Purnode, Global Leader Melting Controls and Modeling Technology, Sr Research Associate at Owens Corning provides this assessment: "I find the Glass Problems Conference to be the best conference for the glass industry in North America. I learn from high quality lectures from leading industry scientists and technologists. Workshops result in beneficial discussions among industry representatives. At the same time, the conference allows me to meet with my suppliers and their latest innovations. This conference has it all in one place. This is perfect for the limited time I have as a technical manager."

The Conference on Glass Problems is organised by the Glass Manufacturing Industry Council (GMIC), the trade association bridging all segments of glass manufacture and Alfred University, the USA's leading glass research institution. The American Ceramic Society endorses it, with *Glass Worldwide* as the official journal.

The GPC programme content is directed by an industry advisory board and is composed of invited papers and submitted abstracts, with the proceedings distributed to attendees and also published by John Wiley & Sons. Speakers providing practical, take-home information are given preference. In addition to the extensive two day technical programme, the conference provides hard to obtain technical education.

Two excellent technical short courses are offered, one on 'Fundamentals of batch and furnace operations' taught by C Philip Ross and the other 'Refractories' taught by Michel Gaubil, Director of Refractory Solutions Engineering, SEFPRO. Of particular note is the full day symposium entitled 'Sustainability in glass manufacturing'.

Conference on Glass Problems is the leading forum for the exchange of ideas to address shared challenges for glass manufacturing professionals.

This abundance of value for time invested in a few days is what sets the Conference on Glass Problems apart from other trade shows and conferences.

To be presented at the Greater Columbus Convention Center and the Hilton Columbus Downtown in Columbus, Ohio, the conference programme at the time of going to press includes:

Fundamentals of batch and furnace operations

In one of two short courses, C Philip Ross, President, Glass Industry Consulting International (GICI) provides an introduction to the principles of commercial glass production employed in batch and furnace operations by USA glass producers. Raw materials, glass technology and properties, melting furnaces and environmental issues will all be touched upon. Suggested attendees could be suppliers or newer individuals to glass manufacturing, seeking an introduction to the issues faced in glass production.

Refractories

The second training session, delivered by Michel Gaubil, Director of Refractory Solutions Engineering, SEFPRO, will focus on process and product (both fused cast and sintered) for soda lime glass furnaces (containers ▸

STOP PRESS

81st Conference on Glass Problems will take place on 26-29 October 2020 at the Greater Columbus Convention Center and the Hilton Columbus Downtown in Columbus, Ohio, USA.

HFT is a longstanding supporter of GPC.

Hospitality will be provided by various supplier organisations at the conclusion of the conference sessions.

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The SmartMelter solution for furnace life optimisation will be among the innovations on show.

and flat glass). After presenting the main process characteristics, he will describe product family, properties and their application inside the glass furnace, before discussing the challenges for regenerators refractory material in term of thermal performances and corrosion.

The training session will be divided in three parts: Fused cast process and product for soda lime application; sintered process and product for soda lime application; and refractory solution for glass furnace regenerators.

GPC sessions

Held on 29 and 30 October, the main GPC programme begins with the following series of five plenary sessions:

- Jane Cook, Director, Earth and Mineral Sciences Museum & Art Gallery, Penn State University – *From STEMware to STEAMware: Examples of manufactured glass bridging the art/science divide.*
- Ludovic Valette, Vice President, Global R&D, Owens-Illinois – *The importance of R&D for the glass industry.*
- Hisashi Kobayashi, Corporate Fellow R&D Industrial Applications, Praxair Inc – *Future of oxy-fuel glass melting: Oxygen production, energy efficiency, emissions and CO_2 neutral glass supply.*
- Ashtosh Ganjoo, Research Associate, Vitro Architectural Glass – *Glass and coated glass for solar energy.*
- Nisha Sheth, Research Engineer, Vitro Architectural Glass – *The peculiar wear behaviour of glass surfaces.*

Melting and combustion

- Jim Uhlik, Director of Technical Services, Toledo Engineering Co Inc – *A glass problem solved.*
- Mehdi Zmirli, Research & Development, Bernard Bonnefond – *Latest development in Varivolt technology for faster regulation of power supply to glass melters.*
- Michael Gallagher, Principal Research Engineer, Air Products & Chemicals – *Synchronised oxy-fuel boost burners for zero-port performance optimisation in float glass melting furnaces.*
- Andrew Reynolds, Business Development Director, Fives Stein Ltd by Fives in Glass – *Electric boosting in hybrid furnaces (practical application and limitations of higher levels of electric heat input).*
- Erik Muijsenberg, Vice President, Glass Service Inc – *Carbon reduction with super boosting and advanced energy management.*

Batch, environmental and modeling

- Roger Barnum, Director, Jenike & Johanson Inc – *Designing furnace feed systems that work.*
- Jonathan Blevins, CFD Engineer, TECO – *Furnace optimisation through utilisation of EBM and GTM-X.*
- Ruediger Margraf, Managing Director, LUEHR Filter GmbH – *Fabric filter and catalyst (SCR) - Does this fit together?*

Refractories

- Pierrick Vespa, R&D Project Engineer SEFPRO, Saint-Gobain SEFPRO – *Innovative tuckstone solution for long life glass furnace superstructure.*
- Rolf Weigand, Executive Director, Ancorro GmbH – *Optimisations and energy savings, especially in container glass production by using a refractory coating.*

HWI will be offering refractory solutions to visitors in the hospitality suites.

CelSian will be present in the exhibition area, as well as presenting a paper on the application of advanced sensors in the glass industry.

Sensors and control

- Lieke de Cock, Team Lead Furnace Support, CelSian Glass & Solar BV – *Application of advanced sensors in the glass industry.*
- Paul Schreuders, Chief Executive Officer, XPAR Vision BV – *A New World of glass making!*
- Ritesh Rawal, Technical Manager – Precious Metals, Johnson Matthey – *Application and stability assessment of HTX: A new high strength, high temperature thermocouple.*
- Mark Bennett, Glass Sector Lead, AMETEK Land – *Not just a pretty picture – In-furnace thermal imaging.*

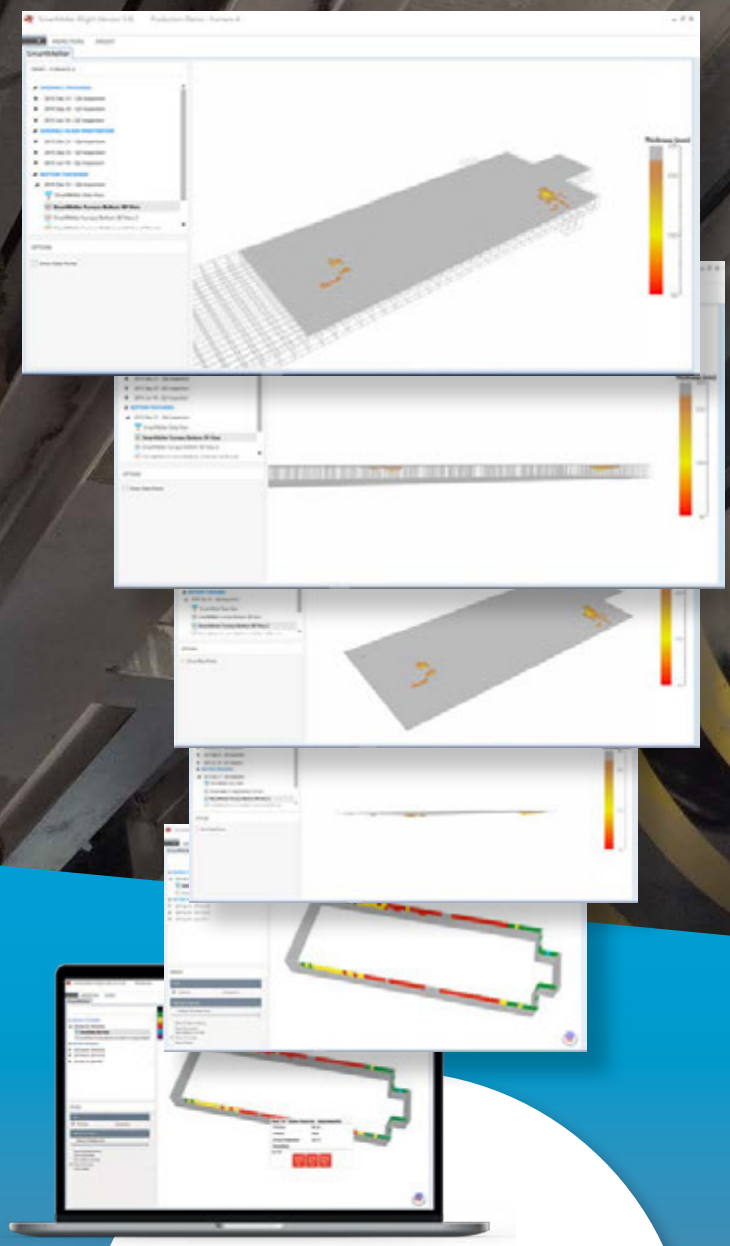
GMIC symposium

'Sustainability in glass manufacturing' is the title of a symposium organised by the Glass Manufacturing Industry Council on 31 October. Sustainability has many definitions, typically with at least three main aspects, namely environmental, economic and social/cultural.

This symposium will concentrate on sustainable glass manufacturing, defining 'sustainable' as: Available batch ▸

In addition to its hospitality suite, Air Products will present a paper on Synchronised oxy-fuel boost burners for zero-port performance optimisation in float glass melting furnaces.

CLEAR INSIGHT INTO FURNACE HEALTH



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GPC booth exhibitors/hospitality suites

Regular intervals to the Conference on Glass Problems will allow delegates to visit a sold-out exhibition of leading suppliers of glassmaking plant, equipment and services. In addition, hospitality will be provided by various supplier organisations at the conclusion of the conference sessions. At the time of going to press, exhibitors and hospitality suite hosts include:

Advanced Control Solutions Inc
Integrator of advanced control system solutions.
www.acsitoledo.com

Air Pro Fan & Blower Co
Manufacturing centrifugal fans for process air requirements.
www.airprofan.com

Air Products
Improve with O_2 enrichment and oxy-fuel technologies.
www.airproducts.com/glass

Allstates Refractory Contractors LLC
A full service industrial process general contractor.
www.allstatesrefractory.com

American Ceramic Society, The
Professional society for ceramic/glass scientists, engineers, manufacturers, 10,000+ members worldwide.
www.ceramics.org

American Glass Research
Independent testing, training and analytical services that solve glass problems.
www.americanglassresearch.com

AMETEK Land
Infrared non-contact temperature measurement.
www.ametek-land.com

Antonini srl
Designer, manufacturer, supplier and installer of annealing and decorating lehrs.
www.antoninisrl.com

BASF Corp
A leading provider of temperature sensing products to the glass industry.
www.catalysts.basf.com/tempsensing

Batch House LLC
Batch plant and cullet handling design/build supply.
www.batchhouse.com

Borton-Lawson
Provides design and construction support services in the glass industry.
www.borton-lawson.com

Bucher Emhart Glass
Supplier of advanced technologies for manufacturing and inspecting glass containers.
www.bucheremhartglass.com

CANTY
High temperature cameras for glass applications.
www.jmcanty.com

CB Mechanical LLC and Part for Lehrs LLC
Companies dedicated to installing, starting up and servicing lehrs.
www.partforlehrs.com

CelSian Glass & Solar BV
Glass technology and knowledge provider.
www.celsian.nl

Chiz Bros: Refractory and insulation specialist
Refractory and high temperature insulation supplier.
www.chizbros.com

Clarage/Twin City Fan
Design and build industrial fans.
www.clarage.com

Cosa Xentaur
30 years of measurement experience.
www.cosaxentaur.com

DSF Refractories
UK's largest shaped refractory manufacturer and specialist in glass industry applications.
www.dsf.co.uk

Dura Temp Corp
Hot ware handling and SEFPRO expendables distributor.
www.duratemp.com

Dürr Systems Inc
Global provider of air pollution control systems.
www.durr.com/en/industries/materials/glass-industry

Dynics Inc
IPC MFG ICS security and plant floor visualisation.
www.dynics.com

Edward Orton Jr Ceramic Foundation (The)
Validating thermal processing for over 100 years.
www.ortonceramic.com

Eurotherm by Schneider Electric
Worldwide supplier of advanced control and systems.
www.eurotherm.com/glassproblems

FIC (UK) Ltd
A world leader in innovative electrical heating technologies for melting/conditioning of all glass types.
www.fic-uk.com

Fives in Glass
Leading supplier in high quality glass melting and conditioning.
https://glass.fivesgroup.com

FlammaTec
Supplier of advanced burner technology for glass furnaces.
www.flammatec.com

Fosbel Inc
Wide range of repair and inspection services.
www.fosbel.com

Frazier-Simplex Inc
Engineering design and construction project management consulting.
www.frazier-simplex.com

Fuse Tech/Hot Tech Group
Glass furnace refractory maintenance, repairs and rebuilds.
www.fusetech.com

GEA Group
Offers filtration techniques for particulate removal and dust transport.
www.gea.com

Glass Manufacturing Industry Council (GMIC)
Glass industry trade association representing all four glass sectors.
www.gmic.org

Glass Service
Consultant for glass melting/conditioning, furnace control, operation and furnace modeling.
www.gsl.cz

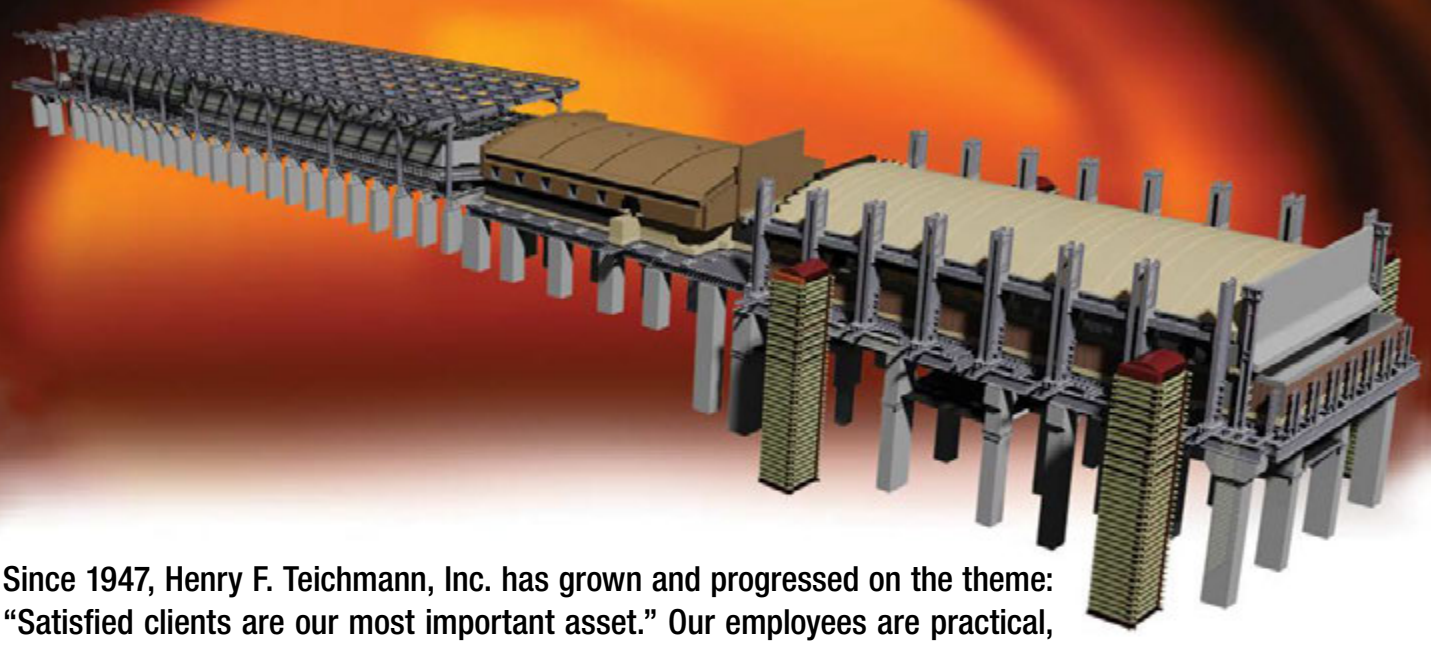
Glassworks Hounsell
Worldwide supplier of all types of batch charging equipment and electrodes for electric melting.
www.glassworkshounsell.co.uk

HarbisonWalker International
Engineers, manufactures and supplies quality refractories for glassmaking.
www.thinkHWI.com

Henry F Teichmann Inc
Engineering, construction services and lehrs.
www.hft.com

Heraeus
Precious metals - fabricated products and services for glass manufacturing.
www.heraeus.com

Holland Manufacturing Corp
High quality refractory shapes for glass applications.
www.hollandmanufacturing.com



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www.honeywellprocess.com/hts

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www.hornglass.com/en

Hotwork-USA
The only continuous operating Hotwork heatup company since 1965.
www.hotwork.com

JADCO Manufacturing Inc
A leading provider and manufacturer of wear products.
www.jadcomfg.com

Jenike & Johanson
Solids handling expert.
www.jenike.com

Johnson Matthey
Precious metal solutions and technical expertise.
www.noble.matthey.com/markets/glass

Lahti Glass Technology Oy
Batch plants and cullet return systems for the glass industry.
www.lahti-glass.fi

LDX Solutions fna Dustex
Global supplier of clean air technologies.
www.ldxsolutions.com

LGP International LLC
Specialising in precise measurements of glass and melt properties for more than 50 years.
www.glass-properties-lab.com

Lilja Corp
A leader in industrial and glass furnace construction.
www.liljacorp.com

Luoyang Dayang High-Performance Material Co Ltd
Leading Chinese fused cast AZS, alumina, high zirconia manufacturer.
www.refractory-dy.com

Magneco/Metrel Inc
Colloidal silica bonded monolithic refractory.
www.magneco-metrel.com

McGill AirClean LLC
Providing air pollution control systems worldwide for over 50 years.
www.mcgillairclean.com

Mixer Systems Inc
USA manufacturer of four types of mechanical glass batch mixers.
www.mixersystems.com

Monofrax LLC
Fused cast refractory innovation, quality and service.
www.monofrax.com

Motim Fused Cast Refractories Ltd
A world leader producing fused cast AZS and alumina refractories.
www.motim.hu

Nalco Water, an Ecolab company
Leader in water treatment and batch optimisation.
www.ecolab.com/nalco-water

Optris Infrared Sensing LLC
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materials, energy, affordable business economics, compatible with process and safe for the environment, for manufacturing and for the use of the products.

The Sustainability in glass manufacturing symposium will have four sessions: Environment, Energy, Technology and Process. The audience will be glass manufacturers, refractory and equipment suppliers, raw material and energy suppliers, design engineers, process engineers, academics and glass researchers, technology, process design, analysis and improvement.

Participants should come away from the symposium with knowledge of the current state of glass manufacturing technology and both the ongoing and anticipated developmental efforts to improve the sustainability of glass manufacturing.

The Symposium Director is Bob Lipetz, Executive Director, Glass Manufacturing Industry Council and the Programme Chair is Brian Naveken, Furnace Design Engineer - Technical Group – Toledo Engineering Co. The Programme Committee includes: Sutapa Bhaduri, Technology Strategist and Sustainability Global Leader, O-I; Scott Cooper, Glass and Materials Science Group Leader – R&D, O-I; Rod Gravely, Technology Director, CCS Systems – Tri-Mer; Aaron Huber, Senior Manager, Furnace Research Group, Process Technology – Johns Manville; Patrick Jackson, Director, Global Energy Management – Corning; Mikael Le Guern, Business Development Manager, Schneider-Electric; Erik Muijsenberg, Vice President – Glass Service; Glenn Neff, Vice President – Glass Service; Nassreen Olang, R&D Leader, Corporate Product Stewardship Leader – Owens Corning; C Philip Ross, President - Glass Industry Consulting International; Adam Tomaino, Senior Engineer/Refractory Materials and Float Glass Production – Vitro Architectural Glass; Steve Weiser, former Total Systems Cost Community Leader – O-I; and Jeff Yigdall, Chief Technology Officer – Green City Glass.

The following programme of papers has been organised:

- *Emissions considerations and technologies overview* – C Phil Ross, President, Glass Industry Consulting.
- *Towards CO_2 neutral glass – production* - Andries Habraken, Project Manager, CelSian.
- *Science based targets* – Cynthia Cummis, Director of Private Sector Climate Mitigation, World Resources Institute.
- *Waste heat extraction, risks and rewards* – Kayla Olson, Tri-Mer Corp.
- *Extracted heat utilisation, rewards* - Gary Snedaker, Renewable and Conventional Power Generation Solutions, Powerthermix.
- *Energy reduction success stories from other industries* – Bruce Bremer, President, Bremer Energy Consulting Services.
- *All electric melting* – Rene Meuleman, Global Glass Industry Technical Lead, Schneider Electric.
- *Future of hybrid melting furnaces, including economics* – Edward Ferreira, Furnace Design Engineer, TECO.
- *Comparison of technologies for cullet processing – for sustainability goals* – Stefan Ebner, Sales Director, Binder+Co.
- *All electric forehearths and channels* – Brian Baker, Director Furnace Engineering, Knauf Insulation and Mark Paeplow, President/General Manager, KTG Engineering.
- *Process discipline – Aligning production and sustainability goals* – Jeff Yigdall, Chief Technology Officer, Green City Glass.
- *Four major levers for contribution of glass industry carbonisation* – Luc Jarry, Global Market Director, Air Liquide and Chris McCrea, Vice President Materials and Power Market, Airgas, an Air Liquide company.
- *Low carbon fuels* – Shrikar Chakarvarti, Associate Director, Business Development & Industrial Applications, R&D – Praxair Inc. ●

GPC provides an exhibiting platform for solutions providers to share their innovations.

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USP speaker confirmed for PharmaGlass

Glass Technology Services will host its next PharmaGlass workshop on 9 October 2019. Following the growing popularity of these events, Dr Desmond Hunt, Principal Scientific Liaison at the USP, has been confirmed as a guest speaker.

Dr Hunt will provide delegates with an update on the current status and developments of the United States Pharmacopoeia, with regard to key glass chapters (USP <660> and <1660>).

These free-to-attend, one day workshops, first launched in 2018 have been growing in popularity ever since. The programme includes topics crucial when considering the specification, verification and troubleshooting of glass primary packaging for pharmaceutical applications.

Open to delegates throughout the pharmaceutical supply chain, the workshops attract professionals across manufacturing, quality assurance, regulatory compliance, packaging specification and new product development roles.

"As a leading expert in glass fracture analysis, pharmacopoeial verification and delamination, we're honoured that Dr Desmond Hunt has recognised the PharmaGlass workshop as an opportunity to speak with representatives from across the supply chain about developments to the USP glass chapters" commented Phil Marsh, Business Development Manager at Glass Technology Services. "We've seen a surge in requirements from across the pharmaceutical supply chain for independent technical support, consultancy and product verification and launched these workshops to provide independent information, guidance and support to our growing global client base and answer many of the most frequent enquiries we receive."

The agenda provides attendees with an introduction to glass, including manufacturing and processing of both tubular and moulded packaging formats. Glass durability, mechanical performance, due diligence, common defects and types of failure are all discussed by experts in their respective fields. Key regulatory and due diligence topics include pharmacopoeial verification, performance testing, dimensional specifications and the importance of appropriate selection in terms of specifications, performance and hydrolytic resistance.

Discussions will include recent developments and emerging requirements across glass delamination, durability and elemental migration, including the ICH Q3D guideline with respect to glass packaging.

The day features a tour of the Glass Technology Services laboratory facilities, including demonstrations of key pharmaceutical services. Experts will discuss some of the cutting-edge research and developments underway for applications across life sciences applications, including 'dissolvable' glasses designed for selective release of ions, phosphate fibres for integration within the human body, 3D printing and additive manufacture and anti-bacterial glasses, all under development for use across different biomedical and life sciences applications.●

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