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GLASS INTERNATIONAL

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GREG MORRIS, EDITOR

All set for Turkey

Happy new year to you! This is our first issue back after the Christmas break and we hope you are feeling suitably refreshed after the winter holiday.

Let's also hope that the glass industry – the container sector in particular – continues its upwards trajectory with demand for glass currently thriving in the majority of the globe.

One of those places is in Turkey where the glass industry has expanded considerably in recent years. Thanks to its rich cultural heritage towards glass and its ambitious expansion policies Turkey is now the most important country in Europe for glass manufacturing.

It is home to four major players, with Sisecam the most known but with GCA, Park Cam and Basturk Cam all playing a role on the international scene. The businesses are no longer confined to the domestic market – Sisecam has expanded as far as the USA with its soda ash offering, while Park Cam's owner Ciner Group has invested in sites in northern Europe.

To reflect the increasingly important role of the Turkish glass sector, the Glassman Europe trade shown and conference will take place early next month in Istanbul. It is an opportunity for technological suppliers to showcase their latest innovations while the accompanying conference will include domestic and European speakers providing updates on the latest industry trends.

We hope to see you in Istanbul in February!

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Grenzebach breaks ground on Romanian production centre

Grenzebach broke ground on a production hall for its site in Iasi, Romania which will address growing European demand from glass, building materials and intralogistics industries.

Last month, representatives of the Grenzebach Group and the construction company, Demo Construct, officially laid the foundation for the production hall of Grenzebach Romania in Iasi.

Dr Steven Althaus, CEO of the Grenzebach Group, said: "The addition to this location makes our Grenzebach Romania an even more attractive company, with its ideal location at the E59, as a hub for the European business in the glass, construction and intralogistics industries."

Completion is scheduled for the fall of 2023.

The expansion will create around 100 new jobs for the company.

The new building in Iasi will be constructed on a 30,000m² site directly adjacent to the company's existing location.

The building will be a modern production centre, providing production areas for the glass, building materials, and intralogistics sectors and also spacious areas for future developments and service.

The existing factory building will also be modernised to conform to today's efficiency and sustainability requirements.

Schott begins hydrogen tests

Speciality glass manufacturer Schott has begun its large-scale tests on how to power its melting tanks with hydrogen.

Over a period of one month, R&D experts will gradually increase the ratio of hydrogen in the melt up to 35% at Schott's headquarters in Mainz, Germany.

Schott launched the project earlier this year in an aim to manufacture carbon neutral glass.

The project is supported by partners including the European Union, Mainzer Stadtwerke, Staatskanzlei Rheinland-Pfalz, and the Environmental Ministry of Rheinland-Pfalz.

Encirc and Diageo partner for hydrogen powered furnace

Encirc and Diageo will partner to create the world's first net zero glass bottles at scale by 2030.

Encirc, a Vidrala company, plans to build a new ultra-low carbon hybrid glass furnace at its Elton plant, Cheshire, UK to begin glass production in 2027.

The furnace will:

- Reduce carbon emissions by 90%, with an energy mix of green electricity and low carbon hydrogen. It is expected that carbon capture technology will capture the remaining carbon emissions by 2030.
- Be powered by zero carbon electricity and hydrogen, from the Vertex Hydrogen (HyNet) plant in Cheshire.
- Be fully operational by 2027.
- Produce up to 200 million Smirnoff, Captain Morgan, Gordon's and Tanqueray bottles annually by 2030.

The hydrogen used to power the new furnace will come from Vertex Hydrogen, a partner of the government-backed HyNet North West cluster – the UK's leading industrial decarbonisation project.

Adrian Curry, Managing Director of Encirc, said: "This will be a major step in our goal of producing net zero glass by 2030.

"With support from the Government and key partners, Encirc and Diageo we believe it will be possible to have this first of its kind furnace up and running at the beginning of 2027."

Sisecam invests €228 million in sustainable glass technology

Sisecam will increase the capacity of its second frosted glass furnace and energy glass processing line in Mersin, Turkey in a €228 million investment focused on solar energy.

Sisecam will increase its frosted glass furnace investment capacity in Mersin, from 180 thousand tons to 244 thousand tons per year.

The Turkish glass manufacturer will also increase its yearly capacity of energy glass processing line from 20 million m^2 to 26.6 million m^2.

Prof. Dr. Ahmet Kırman, Sisecam's Chairman and Executive Member of the Board, said: "While the cost of energy increases, the decrease in the costs of generating electricity from solar energy and the sustainability focus in the global arena offer new opportunities in the frosted glass and energy glass industries.

"With this strategic move, Sisecam's installed frosted glass production capacity will reach 324 thousand tons per year by the end of 2024."

Prof. Dr. Ahmet Kırman stated that the global solar energy sector, which was 40 GW in 2010, reached 710 GW in 2020.

He said: "With the contribution of the trends supporting the sector, the global solar energy installed power is expected to increase fourfold by 2030 and exceed 3,000 GW. The USA, which currently provides 3% of its energy needs from solar energy, aims to increase this rate to 40% by 2030 and to 45% by 2050.

"This transformation also accelerates the initiatives of industrial players to transform their energy consumption into green energy sources and to limit their carbon footprints. More and more companies are putting renewable energy investments on their agenda. We believe that this investment will support the development of the rapidly growing solar energy sector in Turkey."

NEWS IN BRIEF

BA Glass celebrates €60 million investment

BA Glass celebrated its €60 million investment in its Sofia, Bulgaria container glass production site.

The new furnace was installed to meet increased customer demand in the region, has three lines and represents a 100% capacity increase at the site.

Allied Glass changes name to Verallia

Allied Glass has changed its name to Verallia in the UK.

The name change is part of its integration into the Verallia group after a £315 million acquisition in November 2022.

The acquisition allows Verallia to benefit from Allied Glass's expertise in premium glass bottles, specifically in the Scotch Whisky and Gin sectors, and its established position on the UK market.

Borosil starts up second Jaipur furnace

Indian glassware producer Borosil has begun commercial production from its second furnace at its facility in Jaipur, Rajasthan.

The facility manufactures opal ware glass with a capacity of 42 tonnes per day.

Borosil set up the new plant as part of its ongoing Rs 625 crore expansion plan which will be implemented until 2024.

Schott appoints Board Management member

Dr Andrea Frenzel will become the newest member of the Schott Board of Management on April 01, 2023.

Dr Frenzel will succeed Hermann Ditz, who will enter his retirement.

She is currently the President of the Intermediates Operating Division at BASF in Ludwigshafen, Germany.

At Schott, she will be assuming responsibility on the Board of Management for three business units and two overarching corporate functions, for which Mr Ditz was previously responsible.

Fusion energy breakthrough enabled with Schott glass

National Ignition Facility (NIF) at Lawrence Livermore National Laboratory in California, US have achieved net energy gain in a fusion reaction for the first time.

Schott helped reach this new milestone in laser fusion research, by supplying the world's biggest laser at NIF with laser glass and other critical optical glass components for its research.

For over half a century, scientists have tried to recreate the fusion reactions that power the sun.

Their challenge has been generating more energy than a fusion reaction itself consumes.

For the first time, NIF has now reached this major milestone, known as net energy gain.

Last week, NIF's experiment delivered 2.05 megajoules (MJ) of energy to the target, resulting in 3.15 MJ of fusion energy output.

The result was ignition, as well as modest net energy gain. Scientists believe this technology could one day help generate commercial-scale power.

Bill James, Head of Research and Development for Schott North America, said: "Our optics teams are very excited about this achievement. We've been working toward this for decades, solving problems that seemed unsolvable. We're looking forward to continuing to deliver perfect optical glass solutions as part of our commitment to developing clean power solutions."

Saint-Gobain sell its UK distribution businesses

Saint-Gobain will sell its merchanting brands in the United Kingdom to the Stark group.

Following a competitive sale process, Saint-Gobain has signed a binding agreement for the sale of all its merchanting brands in the UK – including the builders and timber merchant Jewson – to the Stark group.

The divested assets are expected to generate revenues of around €2.7 billion in 2022 with an operating margin of around 2%. They comprise 600 outlets and employ 8,900 people.

The divestment is based on an enterprise value of £740 million (approximately €850 million).

This transaction is expected to be completed in the first quarter of 2023 and is not subject to any external conditions.

Saint-Gobain will then no longer have any distribution businesses in the UK.

It follows the divestment of specialist distribution brands in the UK over the last 18 months, representing around €650 million of revenues at around breakeven in terms of operating margin, based on an enterprise value of around €200 million.

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Top 10 stories in the news

Our most popular news over the past month, as determined by our website traffic. All full stories can be found on our website.

1. Phoenix Award Committee names Glass Person of the Year 2022
2. Schott begins large-scale hydrogen tests
3. Encirc and Diageo partner to create hydrogen-powered furnace
4. Vetropack invests CHF 400 million in Italian glass plant
5. Israeli manufacturer to produce carbon neutral glass
6. Turkish glass packager set to complete furnace investment
7. French glass manufacturer issues call for buyers
8. Glass Futures: sustainable fuels could reduce glassmaking emissions
9. Glass industry calls for EU energy pricing measures
10. Winners revealed at Glass Focus Awards 2022

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NEWS IN BRIEF

Bastürk Cam invests in second furnace

Bastürk Cam is set to complete the investment of its second furnace in early 2023.

With a capacity of 560t/day the new oven will triple capacity. This means the organisation will be able to create 2 billion bottles for production.

With more lines, the group can also diversify its product range and focus on specially designed products.

Hotwork International installs PV system

Hotwork International has completed its investment into a photovoltaic (PV) system at its subsidiary in the Philippines.

The PV system has an integrated battery storage and off grid availability, and can generate twice as much electricity; annually, up to 200% per year.

The electricity is consumed by offices, warehouses, and production.

Guardian Glass creates online Resource Hub

Guardian Glass has created an online Resource Hub, which offers 24/7 access to technical information, analytical tools, and training for the glass industry.

In addition, Guardian Glass for BIM (Building Information Modelling) is an Autodesk Revit plug-in that works within the Revit workflow to guide selection and specification of Guardian Glass products.

Verallia relights French furnace

Verallia France relit furnace number three at its Chalon-sur-Saône site.

After 49 days of work, furnace number three was relit at the Verallia Group's site during a traditional match ceremony.

The furnace, which has been operating continuously since 2016, will be relit for the next seven years.

Vidrio Formas completes capacity expansion at Mexican site

Mexican glass manufacturer Vidrio Formas has finalised the second stage of its expansion at the new Plant II facility in Lerma, Mexico.

The first stage was completed in July 2021 with the construction of the new facility and the installation of the batch plant and one 117m² furnace with two manufacturing lines.

The second stage includes the addition of two more manufacturing lines to complete the original design of the furnace, which has increased the capacity from 160 t/d to 320 t/d.

With this expansion Vidrio Formas' capacity has been increased by more than 65% in the last two years.

Vetropack invests CHF 400 million in glass plant for Italian market

Vetropack Group will invest over CHF 400 million in a new plant in Boffalora sopra Ticino for the Italian market.

Production is expected to start in Boffalora sopra Ticino near Milan in the second quarter of 2023.

The new, high-tech site offers more flexibility in production with higher capacities and a focus on sustainable processes.

As the previous site in Trezzano sul Naviglio would not meet Vetropack's goals in terms of quality and sustainability in the long term, the group decided to build a new production facility in Boffalora sopra Ticino, approximately 25 km away.

The production plant is being built on the site of the former Reno De Medici paper mill and covers an area of 347,000 m², of which 170,000 m² will be used for production facilities.

Like in the old plant, two furnaces will be put into operation at first. Compared to the previous site, however, the manufacturer expects an increase in production capacity of around 70%.

All 301 employees of the previous site have been offered a transfer.

At the Boffalora site, Vetropack will invest in high-performance and smart technologies which facilitate more flexible, customised, and resource-efficient operations.

A series of measures will also reduce potential environmental pollution considerably.

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NEWS IN BRIEF

Saint-Gobain signs PPA for Spainish subsidiary

Saint-Gobain has signed a Power Purchase Agreement (PPA) with Endesa, a Spanish energy supplier.

The 11-year agreement will start in 2024 and will cover around 55% of Saint-Gobain's Spanish electricity needs.

The agreement will enable a reduction in CO_2 emissions of approximately 39,000 tons per year.

Consumers trust in glass, survey reveals

Findings revealed that nearly 8 in 10 consumers view glass as a material fit for the future.

An independent research survey was carried out among more than 4,000 consumers across 13 European countries, commissioned by FEVE.

Over a third of consumers polled stated they're choosing glass specifically because inert glass packaging better preserves health and keeps products safer for longer.

Sisecam's ultra-light water bottle

The production of Sisecam's 110 grams ultra-light weight mineral water bottle features 15% less production-based CO_2 concentration compared to a 130-gram standard mineral water bottle.

Already offered for sale in Turkey, the ultra-light mineral water bottles are planned to be presented to global markets in 2023.

Encirc invests in UK bottling facility

Encirc, a Vidrala company, has entered into a deal with Accolade Wines to purchase the assets of 'The Park' bottling and warehousing facility in Bristol, UK.

The £30 million agreement will see Accolade Wines entering a 10-year contract bottling and distribution agreement with Encirc to ensure ongoing support for its flagship beverage brands.

The transaction is scheduled to close in January 2023.

Orora invests in $25 million glass beneficiation plant

Orora has invested in a $25 million glass beneficiation plant located adjacent to its glass facility in Gawler, South Australia.

The glass beneficiation plant was officially opened last month by South Australia Deputy Premier, the Hon Susan Close.

The plant will increase Orora's collection of recycled glass and reduce its greenhouse gas emissions.

Through container deposit schemes, the glass beneficiation plant processes used glass to create cullet, which is then transferred to the Orora Gawler glass plant to be put through the furnaces and created into new glass containers.

The plant allows Orora to process up to 150,000 tonnes of glass each year – which is equivalent to approximately 330 million wine bottles or 750 million beer bottles.

The plant will allow Orora to access more recycled glass from across Australia, therefore reducing the amount of glass that ends up in landfills as well as lowering its greenhouse gas emissions.

Additionally, Orora intends to implement Oxy-Fuel furnace technology with its next furnace rebuild in 2024, which will move the furnace into the top 10% of energy efficient glass furnaces worldwide.

Absolut Vodka and Ardagh Group co-invest in hydrogen furnace

Absolut Vodka has signed an agreement with Ardagh Glass Packaging in Limmared, Sweden, to use a partly hydrogen-fired furnace commencing in the second half of 2023.

Absolut has been a partner with Ardagh's Limmared glassworks for 40 years, which currently uses a combination of natural gas and electricity to power its furnaces.

From the second half of 2023, Ardagh will launch a pilot in its Limmared plant replacing 20% of its natural gas with green hydrogen to manufacture all of Absolut's bottles across its portfolio.

The hydrogen will be produced onsite by using renewably sourced electricity.

The use of hydrogen would reduce Absolut Vodka's carbon footprint from glass by 20%.

It follows other joint initiatives to reduce carbon emissions, such as the light-weighting of glass, increased use of electricity in the current furnace and a significant increase in recycled flint glass – today reaching 53% with the ambition to go even further.

Absolut owns one of the world's most energy-efficient distilleries. It has 98% fewer emissions than an average distillery and has built up a surplus of emission rights as a result.

Absolut will support Ardagh in this project and the parties will work together to fulfill Absolut's ambitions of a CO_2 neutral product by 2030.

AGC Glass Europe launches Low-Carbon Glass range

AGC Glass Europe has launched its Low-Carbon Glass range which has a 40% reduced carbon footprint compared to its standard glass.

To achieve this drastic CO_2 reduction, every link in the value chain was examined.

This included limiting direct carbon emissions from the glass production processes as well as lowering all CO_2 emissions from electricity production, the supply chain upstream of AGC's processes, and other indirect emissions.

As a result of this in-depth process, AGC is now producing Low-Carbon Planibel Clearlite, a low-carbon float glass whose carbon footprint has been slashed by 40% to just 7kg of CO_2 per m² (4mm thick).

The first Low-Carbon Planibel Clearlite was successfully produced at the AGC plant in Moustier, Belgium and is available and in stock now.

In 2023, the AGC plant in Seingbouse, France will also start producing Low-Carbon Glass.

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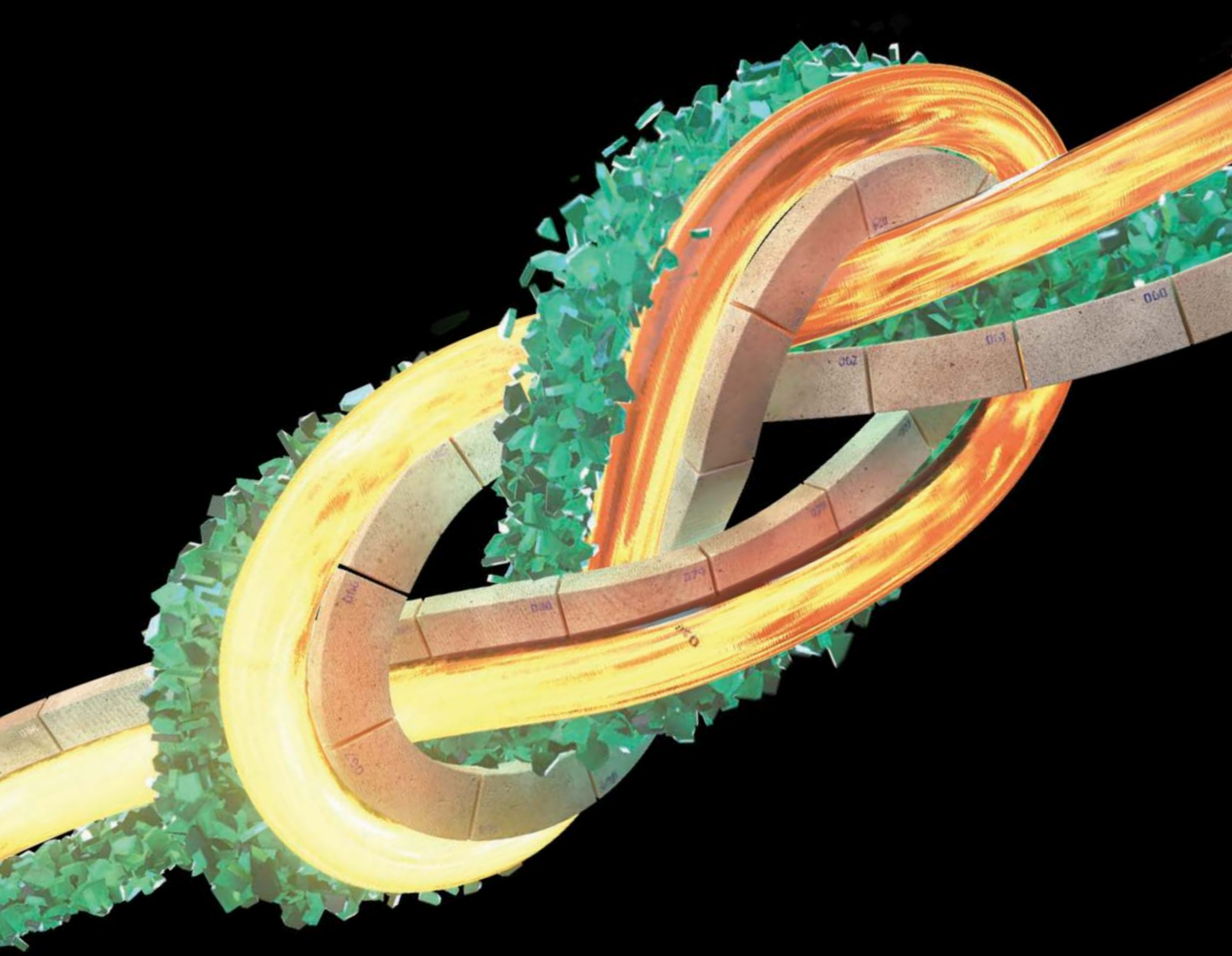

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Basturk Cam triples capacity with second furnace

Turkish manufacturer Basturk Cam is about to complete an investment in its second glass packaging furnace. With a capacity of 560t/day, the new oven will triple capacity and enable the group to diversify its product range.

▲ Top image: Basturk Cam will triple its capacity once the new second furnace completes its heat up.

▶ Mehmet Akif Bastürk, Chairman of Basturk Cam.

First of all please tell us a little more about Basturk Cam?

We established Bastürk Cam in 2017 as a part of Bastürkler group, which has 45 years of industrial experience. We have planned the first two production facilities as glass packaging production in Malatya, Turkey. Accordingly, we commissioned the first furnace in March 2018. We have been producing flint glass for about 4.5 years with this furnace, which has a daily production of 300 tons. We have been supplying our products to both the domestic and foreign markets since the first year. We have exported to more than 30 countries so far. European countries including the UK constitute the majority of our sales to the foreign market. Our sales to America, Africa and the Middle East regions also continue. We achieved this by establishing a long-term partnership relationship with the companies we work with, we are still working with our first day customers.

At the moment, we are establishing our second furnace with a daily capacity of 560 tons in order to meet the needs of our business partners and new markets, while increasing diversity at the same time. We triple our capacity. Our giant investment, which will also be in the field of glass packaging; continues rapidly despite the effects of the pandemic and the global energy crisis.

Can you describe your current investment?

Our new oven will be one of the largest in the industry with the end- firing feature of glass packaging. The capacity of the furnace will be 560 tons per day and our total capacity will reach 860 tons. Assuming that we produce all of the bottles, this means approximately 2 billion bottles of production. Our facility has modern equipment with high energy efficiency. As in the first furnace, all of the machines are of European origin. In blending systems; EME, in furnace systems; Horn, in production machines; Heye, in fault separation devices; Iris and in cold end systems; we worked with All Glass and Thimon.

Continued>>

The company's first furnace produces flint glass.

What is the schedule of this investment?

We plan to ignite the furnace at the end of February. After 20 days of heat up, we will start product shipments in March. Although there were disruptions according to our plans at first, we managed this process well. In this process, we faced many obstacles due to the crises in the world. Some of these; global travelling problem, lack of electronic parts, the general lack of raw materials and the unavailability of containers. We have overcome all this and will be engaged very soon.

The expansion will enable it to diversify its product range and meet increased demand.

How will your customers benefit from this investment?

Our biggest benefit will be to prevent them from having trouble finding glass products. We foresee that it will be difficult to find glass packaging in the current crisis environment and we feel its effects already. In response to the increasing demand, there are also decreases in supply due to the risk of investment. We aim to fix these for our partners.

Apart from that, we will develop and expand the product portfolio. For example; in our new furnace, we will be able to produce smaller products that were outside the limits of our previous production.

Of course, at the same time, we will increase our sales flexibility by offering more diverse products in the same period with more lines, and we will be able to focus more on specially designed products.

Why did you decide to make this investment?

We attach importance to being the preferred and long-term business partner in the relevant sector while entering into the investments we will make. This can be possible by correctly analysing the needs of the sector and responding to its demands in a timely manner, and by maintaining the environment of trust in the long term. In this context, we decided to triple our capacity by analysing the gap created by the increasing demand for glass packaging.

Is this investment likely to create new jobs?

The investment will provide many direct and indirect employment opportunities. For this project, we will employ a total of 200 new personnel, together with the friends we have already included in our team. At the same time, we will contribute to the growth of the glass industry regionally. As an example, our sub-suppliers have also started to employ new staffs. This means that the amount of employment will be much higher.

Many companies in central Europe have been hit by the energy crisis. Is this the same situation in Turkey?

The investment included modern technology from established European suppliers.

The effect of the energy crisis was the change in our costs. We experienced unprecedented energy hikes, though not as much as Central Europe. Uncertainty in the rate of increase was perhaps the biggest problem for us and for the world. Of course, we have a hard time explaining these to customers. Our advantage as Turkey has been that the state suspends the increase from time to time and the increase is relatively less compared to European countries.

What technology suppliers were used for this investment?

The furnace has been carefully planned and designed to minimize energy consumption. In addition, there will be a decrease in energy consumption per unit depending on its size and other technical features. Advanced patented materials used in the entire production facility will also be environmentally friendly. Emission and NOX values will be at the lowest level.

How is Basturk Cam investing in its workforce to maintain existing levels of quality?

We provide it with the combination of experienced people who are experts in their fields and people who have the ability to develop themselves and have a high interest in the field. In this cooperation, we provide in-service and out-of-service training opportunities. Our personnel can receive training directly from machine manufacturers as well as from technical personnel. At the same time, we enable them to participate in international fairs and company visits so that they can follow the latest trends, and we provide the opportunity to follow the innovations and apply them in our company.

Was decarbonisation/sustainability a factor in this investment?

Glass production is an energy-intensive industry. Intensive use of energy also requires great sensitivity in terms of both the environment and costs. For this reason, these criteria have been taken into account in the furnace design and in the selection of special burners for furnace combustion burners in order to keep the fuel consumption at the lowest values.

By optimizing the supply of some of the materials used as glass raw materials from local sources in our region, an additional positivity in terms of logistics costs and the environment has been achieved.

What are your ambitions for Basturk Cam over the next few years?

Our goal, in the first place, is to increase our market share in existing countries and to reach new geographies where we have not been yet. ■

Basturk Cam, Malatya, Turkey https://www.basturkcam.com.tr/en/

Shortly after being named British Glass Rising Star of 2021, Saint-Gobain engineer Will Ruane* sustained a complete spinal cord injury while on holiday. The accident fractured his spine, leading Will to become paralysed from the waist down and a full-time wheelchair user. He discusses how his return to work and passion for the glass industry helped him on his rehabilitation journey.

In 2021, I was selected to be part of a global technical team as a Reporter for Saint-Gobain's furnace repair at its Eggborough facility in North Yorkshire, UK (***Pic 1***).

The £30 million project was the largest industrial investment in the UK by Saint-Gobain since the Eggborough plant was built in 2000.

My contribution to the project, as well as my overall performance at Saint-Gobain, gained me British Glass's Rising Star Award in November 2021, which was a really proud moment.

Once the ramp up of the manufacturing line was complete and production was stable, I took a holiday to Turkey in November, where I unfortunately sustained a complete spinal cord injury.

▲ Will on site at Saint-Gobain's Eggborough plant in the UK.

For me, a key part of rehabilitation was getting back to normality, which work was a massive part of. I find my job and what we do very rewarding.

My role has had to evolve slightly, but thanks to the support of Saint-Gobain, I have been able to return to work full-time.

Will overcomes adversity on his path as a rising star

▲ Pic 1 – Saint-Gobain's glass manufacturing factory in Eggborough, North Yorkshire, UK.

Getting into glass

To be brutally honest, before I worked for Saint-Gobain, I had not heard of the company. So, I applied for the role of Finance Intern in 2015. But once I got there, I fell in love with glass manufacturing and realised that finance was not for me.

Once I graduated from my Accounting and Economics degree, I re-joined Saint-Gobain with the position of Management Trainee.

I then worked on the laminating line at Saint-Gobain's Eggborough facility as a Production Assistant for nearly two years, before moving to the float line in 2019.

The thing that I still love to this day is the scale of the operation. The amount and the size of glass that we make. It really strikes me how challenging it is to make good glass.

We have a good understanding of the furnace, but due to the nature of it, it's not something you can easily open up and see into. Glass is heavy industry, as I like to think of it. What particularly attracted me to it is the final product.

At the Eggborough plant, we make glazing products for the residential and commercial sector. We take raw materials and melt them in the furnace before the glass pours onto a bed of molten tin in the float bath, known as one continuous ribbon of glass.

We also have off line transformation capabilities at Eggborough, so the glass can be either sent to our customers as float glass or it can be coated or laminated depending on our customers' needs.

The fact that glass is infinitely recyclable is just like no other material. We talk about single use plastic and what an issue that is. But with glass, you can pass it through the furnace as many times as you want, and still get a beautiful product at the end of it.

It brings benefits to everybody's life. I try and imagine a world without glass, and the what the buildings would look like. On a personal perspective, what my recovery in hospital would look like if there were no windows. I know it would be a much slower recovery and a lot less enjoyable not having natural light.

I think glass is a wonderful material that doesn't get the credit it deserves because it's seen as a household object. It is so much more than that. It would be a very boring life without glass.

Eggborough furnace repair

2021 was an exceptional year for the Eggborough plant with the cold repair.

Contractors from all over the world were brought in to help deliver the project on time, in budget, all during the global pandemic.

The furnace was stopped for the first time since the line started in 2000, at which point it was knocked down and rebuilt completely using 7,000 tonnes of new refractory materials before heating-up and restarting production just 115 days later.

However, we were still able to supply our customers during that time, due to the stock built up leading up to the repair and the network within Saint-Gobain. (***Pic 2***)

As the Reporter for the heat up, I took measurements and ensured that the expansion was controlled while working with the teams that came from all over the world.

Once we restarted production, each day we would have multiple reviews of production and different parameters. I would also be involved in collating all the data to present our progress.

In the process of rebuilding the furnace, you're heavily involved in parts of the line you'd never normally see. It was certainly a once in a lifetime experience. You're standing inside a furnace, and that's it for 20 years until it's knocked down again. I was really pleased because I was the last person to leave the new furnace the night before we started the heat up.

We are at a higher tonnage capacity now than we have ever been. This is produced at a lower energy consumption, at a 20% energy reduction,

Continued>>

▲ Pic 2 – Interior of the Eggborough site.

due to the new design of furnace.

Saint-Gobain also continues to use a high percentage of cullet. We are at a minimum level of 40% cullet and aim to grow that further given the direct and positive impact on the environment, and the reduction of energy required in the process.

The fact that Saint-Gobain put me forward for the Rising Star award, and then British Glass recognised that it was an exceptional year and the role that I played in it, was a really proud moment (***Pic 3***). It was a nice recognition of what was a very challenging year.

I'd like to think that I'll see another furnace repair at Eggborough in another 20 years. That's my goal.

Accident

After the incredible experience of the cold repair and subsequent heat-up and restart of the line, I thought I needed a well-earned holiday.

So, I went away with my friends in early November, and that's unfortunately where I had my accident in Turkey.

I fell down some stairs, which fractured a vertebrae in the low thoracic section of my spine at T11 level (just above my waist).

After 5 hours in surgery, I woke up with titanium rods and screws fixating five vertebrae in my spine from T9 to L1. However, unfortunately the fracture led to damage of my spinal cord at T11 level.

The spinal cord is effectively the motorway that the signals from your brain travel down. From that point forward, everything below the injury doesn't work; fully paralysed, no feeling or movement. So, I'm a full-time wheelchair user now.

Bowel and bladder functions have been impacted because, again, that's below the injury. As well as temperature regulation, blood pressure regulation - all these sorts of weird and wonderful things that happen with a spinal cord injury.

I spent two weeks in a hospital in Turkey recovering before I flew back to the UK. Long story short, I went to a number of different hospitals but eventually ended up in Sheffield at the Spinal Rehab Centre, and stayed there until the end of February 2022.

So, I left hospital after nearly four months. Then I returned to work in April, a couple of months after coming out of hospital.

Return to work

Saint-Gobain has been unbelievably supportive. They allowed me to come back on a phased return.

When I first came out of hospital, I was very physically tired. There was no way could I come back on five days a week.

Everything takes longer and is harder. This is not moaning, it's just fact. It might have taken me 20 minutes to get ready before my injury, now it might take me 45 minutes on a morning. Even putting a pair of socks on now still is difficult, you have to wrestle with your foot to get it to your face.

So I went from a day a week, then two days a week, and so on. I've built up back to full time now.

My role evolved from Production Assistant, because that's quite hands on, particularly in the hot end around the furnace. It would involve going out, taking pyrometer readings at the furnace, doing work in the batch plant, doing measures, at times working with the masonry team, and working with the hot and cold end operators.

Clearly, there are many parts of the glass factory which are not accessible in a wheelchair and unfortunately, probably never will be by nature of the industry. So, my role had to evolve. But it's not drastically different, just a slight tweak.

My work as a Research and Development Engineer is data-driven. It's aimed at improving quality, improving yield, reducing energy consumption, and working with plants all across the global Saint-Gobain network. For example, I work closely with our technical department in Paris.

In September 2022, I spent a week in Paris working with them. I thought after my accident that part of my career had ended. I didn't think I'd be able to do international travel. But I've been very surprised about what I've been able to do thanks to Saint-Gobain's support.

Even in my wheelchair, I can still get around the line; I can get around the burner corridors, as we call them, next to the furnace.

Saint-Gobain also bought me a wheelchair that stands up. So, I just push it up and it will literally stand me up and support my legs.[1] This meant that for the first time in 12 and a half months, I got to look into our furnace with my own eyes. So that was just incredible.

A few people have said to me after a life changing injury like this to 'take a year or two off to come to terms with it' and have time for your rehabilitation.

Continued>>

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But, for me, getting back to work was a key part of my rehabilitation because I wanted to gain my independence back.

I describe it to people that, when you have an accident, you almost become a baby in an adult's body. You can't do anything for yourself for a period of time. So, it's about getting small wins, getting the independence back.

For me, a key part of rehabilitation was getting back to normality. Me coming out of hospital and then not working, that's not normal.

I work for Saint-Gobain and for the glass industry because I want to get reward in return. I find my job and what we do very rewarding. The people that I work with at the Eggborough site are fantastic as well as in the wider glass community, within Saint-Gobain and externally.

I don't know if you ever complete rehab. It's only been 10 months since I left hospital, but it's not a recovery as such because you're never going to get better – it's a lifelong condition now.

So, I don't think you can ever say you finish your rehabilitation journey or are recovered, but it's that continual improvement. It's never been satisfied with what you've got, always wanting to get better. Work is a massive part of that for me.

The future

I'm a big believer, and am really keen to show people, that working in the glass manufacturing industry with a disability is not only fantastic, but possible.

I'm still working towards becoming a Float Line Senior Manager. I would say that when I was lying in hospital, I had doubts that it would be possible.

But the more you think about it, what actually is the role of the manager? To lead a department and navigate across challenges. So, why not? Just because I'm in a wheelchair, doesn't mean that I don't have the technical knowledge. Everything that I did before, I'm just doing sat down now.

I think the way that technology is moving has opened a lot of doors. For example, technology allows me to see into the furnace. I can look into the float bath, I can be close to the line, and I can take quality samples and look at them.

Managing a float line is clearly more than just managing a process. A big element of it is managing people. I've not changed after my accident, so there's no reason think I can't continue on the path of float line management.

I also think increasing diversity in the workplace is extremely important. It only brings benefits. If the right people are in the right position because of the talents and merits they bring, not because they tick a box by any means, then increasing diversity and inclusivity in the workplace is fantastic.

People from different backgrounds, with disabilities or not, will bring different ways of thinking, different approaches. And life would be pretty boring if we were all the same, I think it's fair to say. ■

▲ Pic 3 – Will at the 2022 British Glass Awards in Liverpool, UK.

***Research and Development Engineer, Saint-Gobain, Eggborough, UK | https://www.saint-gobain.com/en**

Will has also been documenting his rehabilitation journey on Instagram, which includes training for a half marathon next year to raise money for The Matt Hampson Foundation where he receives his physiotherapy. See Link 2 to follow his journey.

Links:
1. https://www.instagram.com/reel/ClR8hXGIh2l/?igshid=YmMyMTA2M2Y=
2. https://www.instagram.com/willruane/?hl=en

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A career devoted to glass melting

Dutch melting specialist Mr Anne Jans Faber is back serving the industry after a recent health scare. He tells Greg Morris how he can help glass producers with their decarbonisation efforts.

Mr Anne Jans Faber should be considered a glass industry titan.

He has worked in the sector for more than 35 years providing advice and assistance about furnace efficiency to glass manufacturers all around the world.

In that time not only has he received five patents related to the glass industry, he has also published an extensive number of articles in journals, as well as spoken numerous times at glass conferences around the globe.

His dedication to the glass industry has been recognised with three awards during his career.

Most notably, he was awarded the Otto Schott Otto Schott Research Award 1997 on applied and fundamental research in the area of glass technology and glassy materials.

He has also received the Descartes-Huygens Prize 2005 from the French Government/French Academy of Sciences for scientific cooperation between France and The Netherlands, in the domain of innovation. In 2012 he was honoured by the German Glass Society with the German Industry Prize (Adolf Dietzel Industriepreis).

His efforts and research have certainly helped move the glass industry forward and helped industry achieve manufacturing efficiency. Now he has formed his own consultancy to help industry tackle the decarbonisation challenge.

He has been a member of the glass sector since 1986 and said he enjoys the contact with industry members which, while international in nature, is like a small community.

He particularly liked the international contacts with students from industry during the numerous training courses he presented on glass technology and estimates he has trained more than 2000 students from glass companies globally.

There is also always more to learn about glass and the melting process, he says.

"Glass, is a fascinating material but there are still a lot of challenges and things that remain unclear in the melting process, and it is that which interests me.

"From a scientific point of view glass is incredibly interesting. I've worked in the industry for nearly 37 years now and there is always something new to learn about it.

"Glass is amazing. From a batch of raw materials you can make a glass which is transparent, which I still find amazing. Glass has these transparent properties, although the starting materials are not transparent at all.

"On top of that, you could also say I like to play with fire!"

Mr Faber semi-retired from the industry when he left Dutch-based furnace organisation CelSian in January 2021.

Continued>>

The plan was to form his own company and work in his own time, but shortly afterwards he received unfortunate news about his health.

A series of small lumps around his collarbone had gradually grown in size over the past few months. Although they were not painful or causing discomfort, the lumps continued to grow.

"I wasn't in any pain or feel sick, but the lumps continued to grow. To be honest I thought it was an infection because the lumps were so small."

However during an ultra sound, doctors warned the lumps could be something more serious and that he should immediately visit a hospital for further tests. That same afternoon a biopsy was taken with medical specialists warning the lumps could be cancerous.

It was a nerve wracking five days before the hospital delivered the results: the lumps were Hodgkin Lymphoma, an uncommon cancer that develops in the lymphatic system, which is a network of vessels and glands spread throughout your body.

The most common symptom of Hodgkin lymphoma is a painless swelling in a lymph node, usually in the neck, armpit or groin.

Specialists told Mr Faber that, despite the devastating news, the type of cancer was curable with 90% of people completely recovering.

"It could have been a lot worse. The non-Hodgkin form of lymphoma is more aggressive and more difficult to treat."

What followed was five months of chemotherapy and radiation treatment. Happily after just two chemotherapy treatments doctors could see the cancer had disappeared.

Each chemotherapy treatment left Mr Faber exhausted so he was grateful that after the second treatment, each session got lighter and lighter with fewer side effects.

Eventually the treatments were stopped but he still has to visit the hospital every four months to measure blood levels, which will continue for the next few years but at an ever increase length of time between each appointment.

Now he is back working in the glass industry but said the experience had left a considerable impression on him.

"My message to anyone is it is so important to check with a doctor if you have anything like I had.

"It was about one and a half months before I went to the doctor and thankfully this Hodgkin is now curable, but 30-35 years ago it was not curable. The sooner you see a doctor, the quicker they can react and treat you."

When he returned to the industry and announced his experiences of the previous few months he was overwhelmed by messages of support.

He is now back to focusing on the industry and in particular, radiative heat transfer in glass melting.

A SMALL SELECTION OF MR FABER'S ACHIEVEMENTS:

AWARDS

Otto Schott Research Award 1997 for applied and fundamental research in the area of glass technology and glassy materials.

Descartes-Huygens Prize 2005 from the French Government/French Academy of Sciences for scientific cooperation between France and The Netherlands, especially in the domain of innovation.

German Industry Prize (Adolf Dietzel Industriepreis) from the German Glass Society (Deutsche Glastechnische Gesellschaft) in June 2012.

PATENTS

Erbium-doped planar waveguide, EP 0867985 (1998), US 5982973

European patent application No. 06077025.2,

Remote ultrasonic transducer system, November 15, 2006

WO2008018997 A2, METHOD AND APPARATUS FOR CHARACTERIZING A GLASS MELT BY ULTRASONIC ILLUMINATION

WO/2011/018463, CERAMIC OR GLASS-CERAMIC ARTICLE AND METHODS FOR PRODUCING SUCH ARTICLE

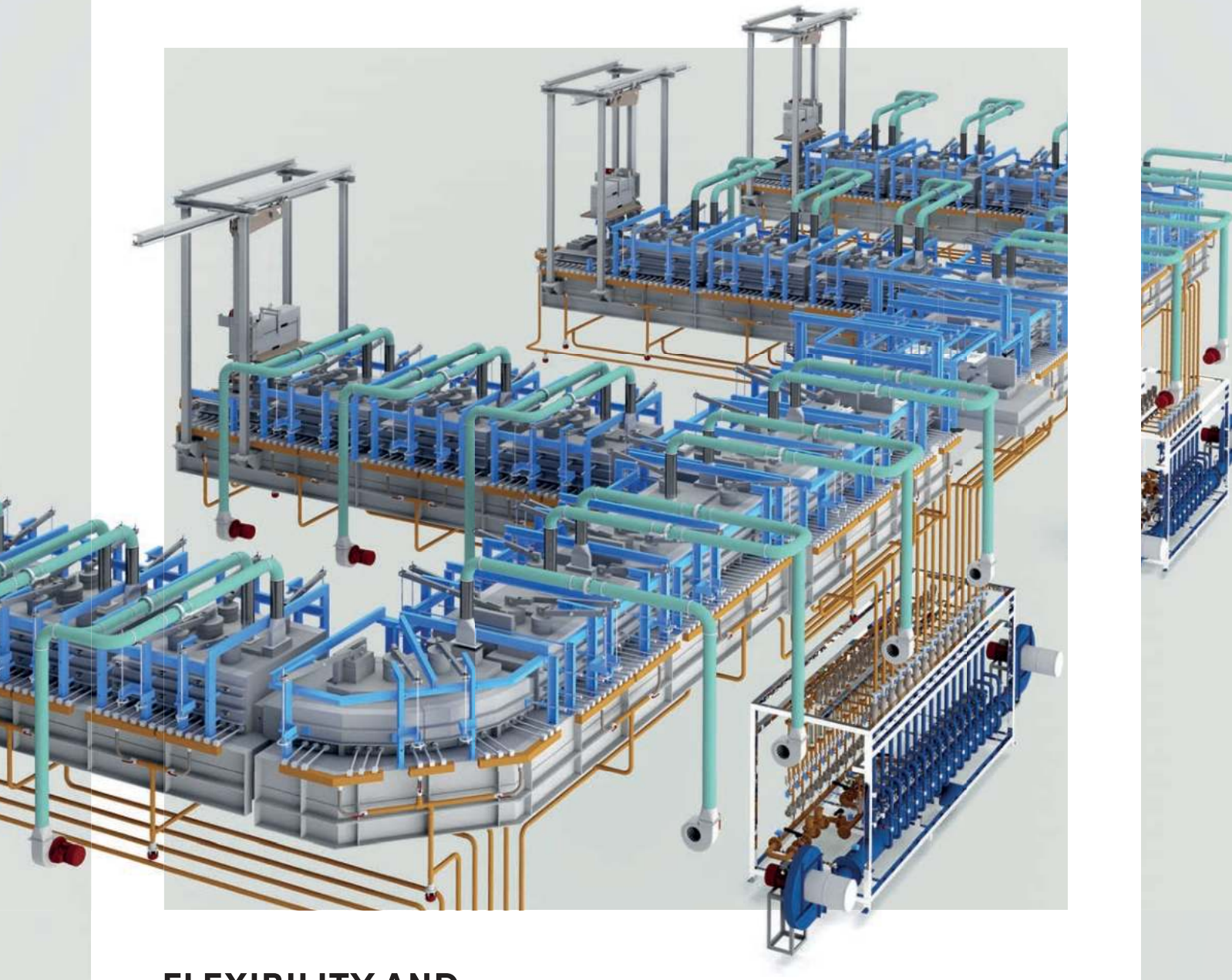
USP 8,546,282 B2, H. Kinoshita, A.J. Faber, M. Rongen, A. Goto, M. Tanabe, Y. Katahira, Glass For Light Guide Fiber, October 1, 2013

"There are three things important in glass melting: heat transfer, heat transfer and heat transfer, as well as a little bit of chemistry. In the melt it is mainly radiative heat transfer so it is an important topic.

"I consider myself as a scientific consultant and there are still a lot of things unclear in glass melting and a lot of science is needed for that.

"We still need good science and good models to predict radiative heat transfer, this data is essential in order to do CFD modelling of the melting furnace and of glass forming processes (radiative cooling).

Continued>>



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"That is a major area for me in glass, I have contacts with a few companies where we will use the data to do CFD modelling to really see what is the improvement in modelling they can achieve with this.

"It is my intention to donate my complete database and models on high temperature radiative properties to the ICG (TC 18) in future (about five years from now). In that way this information will be preserved for posterity."

Another area of focus is the measurement of refractory wall thickness of furnaces. He is working with Canadian industrial company Hatch, which has developed a technique in the steel industry to acoustically measure the wall thickness of a furnace. It has been tested in a glass furnace and is now ready for use in the industry.

The acoustic technique can increase the time of operation of a furnace, which can save a lot of money as well as identify weak points of a refractory wall.

Mr Faber is keen to point out that the acoustic technique is complimentary to the radar technique used by Paneratech in the glass industry. Some industry furnaces use chromium oxide bricks that are electrically conducting and therefore cannot use radar technique because of too much attenuation of the signal.

After the majority of his career spent in the glass industry, his passion for the sector remains undimmed even now. He feels too young to retire completely and still retains his interest in glass science.

After studying physics at Utrecht State University in the Netherlands his first role after graduation was with Dutch research organisation TNO in Delft in 1986.

During the 1990s he was leader of the Glass Melting Technology group at TNO Science and Industry.

Then from January 2012 he worked as senior scientist at CelSian Glass & Solar (former TNO Glass Group).

He was instrumental with the international GlassTrend consortium from its start in 2001. As well as a member of the Board, he was chairman of GlassTrend from 2014 to 2021.

As well as being a glass consultant he also plans to organise one or two-day training courses on glass melting and heat transfer in melting furnaces. These are aimed at those employees with experience in the industry rather than just beginners. These courses can be held face to face or online.

His consultancy, Physica Fit Faber, is also focused on the scientific support of companies in their conversion to low carbon glass production, in particular radiative heat transfer issues.

He believes the biggest challenge facing the industry, is that of decarbonisation and the sector's efforts to be carbon neutral by 2050 at the latest.

While the use of hydrogen to fuel a furnace is an option, as proven by glass companies such as Pilkington with its recent successful trials in St Helens, UK, he feels this is a solution that will not be implemented on an industrial scale for the next 10 to 15 years.

"I think in the short-term hydrogen must be studied and all the consequences, such as the impact of hydrogen on refractories. It was proven by Pilkington that you can change a gas burner with a hydrogen burner but today so called green hydrogen is not available on a mass industrial scale and is still too costly.

"On top of that in future years will glass be in the front row ahead of other industries such as cement and steel for the use of hydrogen?

"Over the next 10 to 15 years I believe we have to really focus on electricity and hybrid furnaces, such as a combination of electricity and gas.

"Even with electricity there are still problems such as is there enough infrastructure to support a fully electric fired furnace, can the electricity network support it for example?" ■

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Lahti Glass Technology modernises Corning batch house

Jarmo Nappi* describes how a solution was found in skillful engineering and extensive experience, mixed up with Nordic know-how, to renew and modernise the batch plant control system and electronic components with minimal interruption to the production lines at a Corning glass plant.

Mrs Gloria Masini, Chemical lab and batch house chief and Mr Stefano Caponi, engineering director of Corning Pharmaceutical Glass, Italy.

Corning Incorporated is an American multinational technology company that specialises in speciality glass, ceramics, and related materials and technologies including advanced optics, primarily for industrial and scientific applications.

The company originates from 1885 and have since became a global business of almost 62000 employees and the revenue of $14.08 billion in 2021.

Corning Pharmaceutical Glass is a subsidiary of Corning incorporated. It creates and supplies pharmaceutical glass tubing and vials to meet the needs of the pharmaceutical packaging industry.

Corning Pharmaceutical Glass plant in Europe is located in Pisa, Italy. The plant itself has decades of history in producing glass for pharmaceutical industry's needs and it has been owned by Corning since 2015. The plant consists of three furnaces.

One of the furnaces is for production of amber glass and two are for clear glass.

Continued>>

Contacting Lahti was an easy decision

The electronic systems of the old plant were in the need of revamping or replacing because their ageing was causing outages of the production and the growing unreliability of the plant was increasing the business risks.

When upgrading the plants control system, it is not always easy to come out with modernised solution.

Companies very often find safety in old systems, therefore the new system will be very similar to the old one.

It brings reliability but won't develop the plant operations any further.

Plant Engineering Manager Stefano Caponi has worked for Corning since 2017 and has the experience from glass industry for over 40 years.

He stood by the solutions Lahti Glass Technology were offering, even though it wasn't identical with the previous system. He knew experts of Lahti from his previous works, so he found the needed reliability in their experience, and trusted that they would work sincerely to find the best solutions for the plant.

"I've known the people from Lahti Glass Technology for a very long time, and I also know that they are good, very professional, and serious partner company. I thought their competence and experience would be a perfect match to see the complete project with all possibilities and possible issues and to bring our batch plant to a new era," Caponi says.

Caponi have had many opportunities to work in the same projects with Lahti Glass Technology during his career, so he knew about their dedication and how they approach the projects.

So eventually it was an easy decision to contact Lahti for this project, and finally, to choose them as a partner.

Three phases

Because the furnaces of the plant were continuously operating, the solution was to split the control system in two PLC's.

One PLC for the amber glass furnace and one PLC for the two clear glass furnaces. The whole renewing project was divided into three main steps.

So once the control system and the electronic parts of one furnace were replaced, the others were in operation, and the renewing project could go through with minimum harm caused to the production. Dividing also helped the client to operate within the budget.

"The project went very smoothly because it was well prepared and engineered. There was a strong co-operation and understanding between our engineers and Lahti Glass Technology's engineers, and Lahti really put themselves into our service.

"We established engineering review meeting every week, to keep up the to do -list and timing of the project.

"It was perfect way to lead the project into the right direction and it helped to grow our understanding of each other," Caponi states.

Considering the complexity of the project and the tight schedule for each of the three phases, it was a great success that there were basically no delays or other issues during the project.

This is the added value that Value Engineering of Lahti Glass Technology's Solution Clinic brings to the client companies: carefree full-service implementation.

"When we shut down the furnace, everything was ready to be replaced. Lahti Glass Technology's great ability of planning and engineering the project won us time and reduced the complexity of the project," Caponi adds.

From a project towards partnership

Gloria Masini works for Corning Pharmaceutical Glass as Batch House Supervisor.

One of her most important roles in the renewing project was to keep up the understanding between their own engineers and Lahti Glass Technology engineers.

She collected the needs from the field and reported them to Lahti Glass Technology, and vice versa.

Masini thinks the project was a great success for both parties.

"Now our control system is reliable, up to date, with all the best components and spare parts available when needed and the project really went on without any issues, so I'm happy.

"It was really challenging at times. Especially in the last part of the project Lahti Glass Technology needed to think project strictly on daily basis, moving from system to another with ongoing production," says Masini.

In a batch plant system renewing project, there are extensive number of possible issues and consequences, that must be taken into consideration in the engineering phase before they become problems.

According to Masini, Lahti Glass Technology's high level of competency and experience were in place to make the project such a success.

Lahti also offered know-how that isn't found in most supplier's repertory. For example, the plants electrical drawings and documents were basically nonexistent, so Lahti's electrical engineering and field device research played crucial part in the project.

"They listen very intensively and are very flexible in identifying the solutions that can really meet the batch plants business. For example, when identifying what parts of the plant should be replaced and what should be revamped Lahti Glass Technology really put themselves into the place of the client.

"That's not very common to this extent, even though it should be the basics for every business," Masini says.

The project was Masini's first project with Lahti Glass Technology, and she has only good experiences of their co-operation during the project.

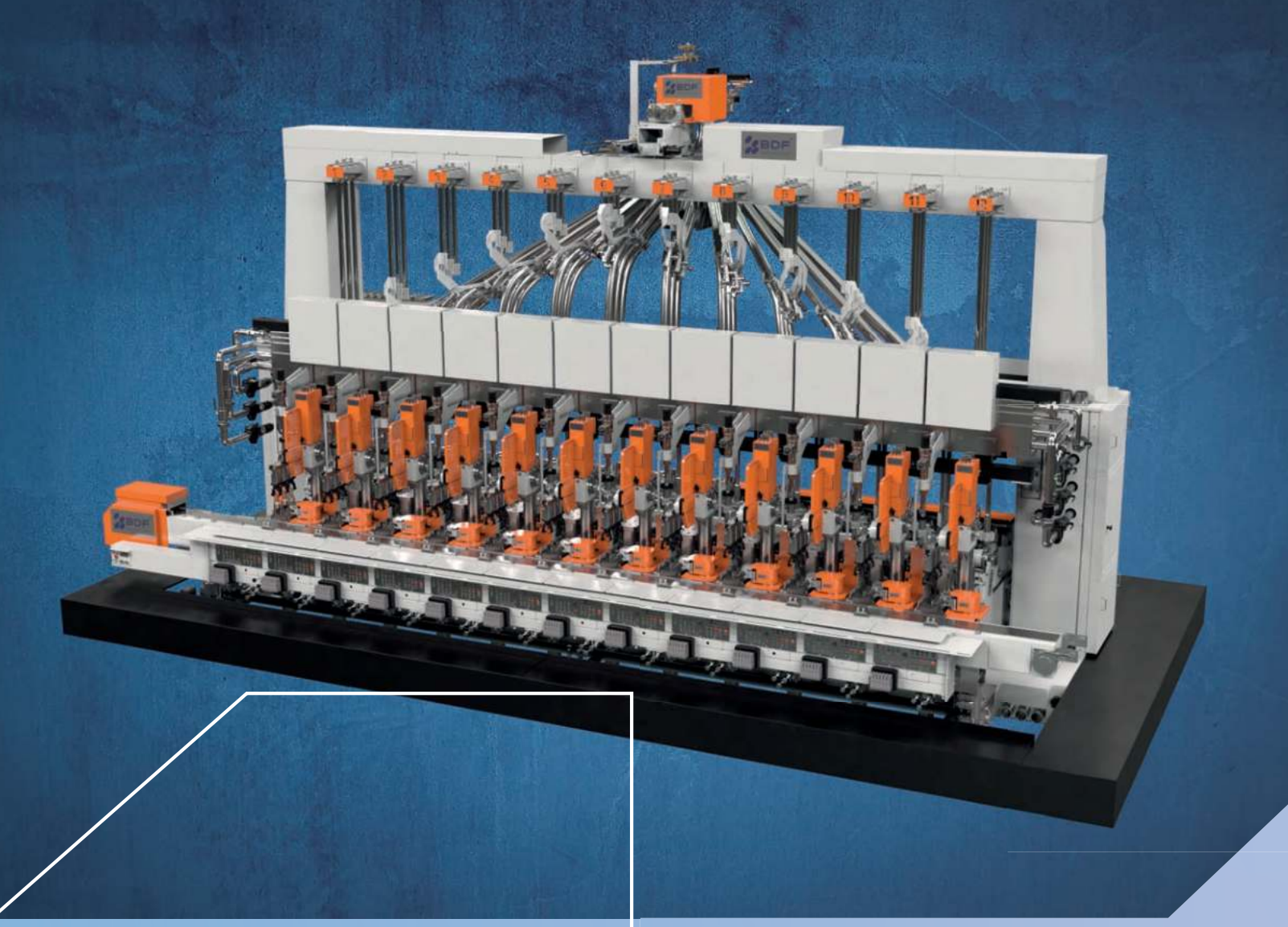
Masini is content that the partnership of the two companies is continuing with assistance for the new system and the next part of the Pisa batch house renewing project.

"Now that the control system is replaced with new and the electronic part of the plant is renewed, we have been working with Lahti Glass Technology to find a best solution to replace, revamp and to improve the mechanical parts of the batch house.

"We are now growing our understanding together of what would be the best solution using as much as possible what we already have and replace just a minimum, to keep on with the budget. As it was done with the previous project," Masini concludes. ■

***Managing Director,**
Lahti Glass Technology, Lahti, Finland
https://www.lahti-glass.fi/

Corning Pharmaceutical Glass
https://www.corning.com/emea/en/products/pharmaceutical-technologies.html



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Mr Li Sheng Hua is Phoenix Glass Person of the Year 2022

The Phoenix Award Committee named Mr Li Sheng Hua as the 50th recipient of the coveted Phoenix Award and Glass Person of the Year 2022. He discusses his career spent founding and developing China's Huaxing Glass.

How proud were you when you were told you had been nominated for the award?

It is a great honour for me to be awarded the 50th Phoenix Award. I would like to thank Mr Kevin Lievre, the Chairman, and all members of the Phoenix Award Committee for giving me the opportunity to win the award! At the same time, thanks to the industry chains and supply chains of various countries for their care and support for Huaxing Glass.

I always think that this honour is a kind of encouragement and recognition to Huaxing Glass and even myself, and it should also belong to all supporters and contributors.

What are your proudest achievements of your career so far?

My career is relatively simple. Huaxing Glass is the summary of my career and the value of life. Therefore, I am what Huaxing Glass is. In my mind, I haven't made any achievements in my life that I can be proud of. As far as Huaxing Glass is concerned at present, it cannot be said to be a success and achievement, because it is still on the long voyage to its goal, and it is still far away from the other side of the goal. Therefore, the cause is far from successful, and we still need to make unremitting efforts!

In my opinion, I should not be proud of winning this award. It is just through its own development process that Huaxing Glass has generated some value for the international industrial chain, and supply chain at the same time, and has made some contributions to the progress and development of the world glass industry.

▲ Mr Li Sheng Hua.

You have spent most of your career at Huaxing Glass and have been responsible for its growth. What has kept you motivated for so long? Has the company's success exceeded your expectations?

I think that glass brings people "environmental protection, health, crystal clear, dazzling beauty and a kind of noble life quality and other value traits", and constantly endows it with infinite vitality through technology and aesthetics of the value of the times. I believe that glass will be able to walk with people in the long river of human history and shine. In a nutshell, glass can add colour to people's beautiful life, and at the same time, it has infinite vitality. Therefore, if you can do it well, you may be able to flourish all the way and write a chapter of the value of life.

This should be the driving force behind my perseverance.

In my opinion, Huaxing Glass has developed from small to large, from weak to strong in the past 30 years. No matter whether it is small or large, it is not a success. It can only be said that it has followed the trend and is still on the way.

What do you think is the key reason for Huaxing Glass's success?

I think the key to supporting the development of Huaxing Glass to today is the company's philosophy: "committed to the success of customers and self-realisation" to guide our development direction and operating principles.

In other words, the company is market-oriented and customer-centric in all its work. But I think that the company's growth and development to today is not only the key factor of having a concept, but also a combination of factors, such as the background of the country's reform and opening up and rapid development; the second is to have good government policies and create a good business environment.

The third is there are industries and industries that give us opportunities and create an atmosphere for growth; the fourth is that all members of Huaxing Glass work together and contribute with one heart and one mind; the fifth is that there is full support from all shareholders and their families; it is the recognition and support of upstream and downstream partners from all over the world.

We have the trust of the financial community and they have given us

Continued>>

sufficient capital for development. For this reason, on behalf of the company, I sincerely thank all the above-mentioned supporters who have created conditions for our growth and development and created an environment.

At the same time, the honour I received also belongs to them.

What were the early days like when you first started the company? Was it a risk to start a company?

Huaxing Glass is taking advantage of the east wind of China's reform and opening up, relying on its own surging passion for life, a firm will, a fighting spirit and a kind of self-confidence familiar with the industry and its glass production conditions, two generations of the family have worked hard, saved and used a capital of more than 200,000 yuan accumulated to start up.

At that time, I didn't pay much attention to and evaluate the risks of starting and running a company. I just made a determined effort based on the above elements, and I was willing to gamble and admit defeat.

Was there a moment when you felt the company had 'succeeded'?

In my opinion, since the company was founded in 1987, it has grown and developed all the way to the present. It is not a success. It just conforms to a historical development trend, grasps an opportunity, chooses the right path, and does one thing right. That can be regarded as taking advantage of the trend, right on the road at the right time.

What is it about the glass industry that has kept you interested in it for so long?

I have been devoted to the glass industry all my life.

At the beginning, it should not be an interest, but a kind of understanding and familiarity with glass and a kind of persistence. The so-called familiarity is because my generation is already the third generation engaged in the glass industry (my son is also inheriting this industry now, belonging to the fourth generation), and at the same time, I happened to be born and grew up in the small place of 'Wuzhuang' (called by the locals) the hometown of glass.

Because of this, it may be naturally influenced by the family and atmosphere, forming a kind of familiarity and dedication to the glass industry or a kind of inheritance.

Therefore, after graduating from middle school, I joined a local glass company run by a hometown. Since then, my life has been bound by glass, and I have been engaged in the glass industry with different types of work, in different regions and in different forms, and my life with glass has been a story.

In addition, since the founding of Huaxing Glass, the development has been relatively smooth along the way.

It may also be tempted by this smoothness, so I deepened my understanding of the industry and became interested in it.

What are the main challenges faced by the industry today?

It is generally believed that the main so-called challenge of the industry in the future should be "realising low-carbon green production".

In my opinion, from the long history of human social and economic development, factors such as global climate change, over-exploitation and utilisation of the environment, and energy shortage have aroused the common attention of all countries in the world, and put forward higher requirements for the form of economic development.

New requirements, in this case, our industry's production factors and production forms will inevitably undergo great changes - through the use of technology of the times, to achieve the goal of green production with zero emissions. This transformation of the production form should not be understood as a challenge, but as a requirement of a high civilisation of human society, a kind of industry self-discipline and a kind of social responsibility. An inevitable logic of sustainable development!

And, what do you think the main opportunities are for the glass industry?

In my opinion, the future opportunities for the industry are certain, but not universal. The so-called opportunity must be because our glass has been walking with the development of human social civilisation and adapting to the constant changes in people's lifestyles for more than three thousand years.

Plasticity, tolerance, adaptability and a certain degree of irreplaceability required by society and people.

Therefore, the so-called opportunity lies in the infinite vitality of our 'glass' and its products. But why do we say that this kind of opportunity is not universal, because our glass and its products must adapt to the living requirements of people in various stages of social development, that is, keep pace with the times, then, from the design of production factors and forms and product effects. The sublimation of its quality, etc, have to pay a huge price, and the payment of this huge price is time-sensitive and continuous. It can be seen that to adapt to this change and meet this requirement, not all enterprises in the industry can do it. So, this opportunity is not universal.

What advice would you give to someone starting out in the industry?

In my opinion, if you want to enter this industry at present, the starting point is higher, the investment is larger, the return time is longer, and the risk is relatively high. Sufficient psychological endurance, resilience of capital and endurance of hard work are required.

Opportunities in the industry and market are relatively stable.

Do you have any investment plans for Huaxing Glass?

More than 30 years of Huaxing Glass has been developing and expanding relatively steadily, and it has never stopped, but this is the past. In the future, we will promote the comprehensive realisation of information digital intelligence, and transform the production factors and production forms, so as to create and open up new development time and space.

Is there anything that you would change about your career?

In my opinion, it is great to be able to do one thing well in one's life, not to mention that I have not yet done a good job at Huaxing Glass. Therefore, I have never thought about changing my career.

I can't change it, because apart from understanding and being familiar with the glass industry, I don't know anything else.

What are your plans for the future?

The life of Huaxing Glass is a life of struggle and a life of learning. This is the life I planned. ■

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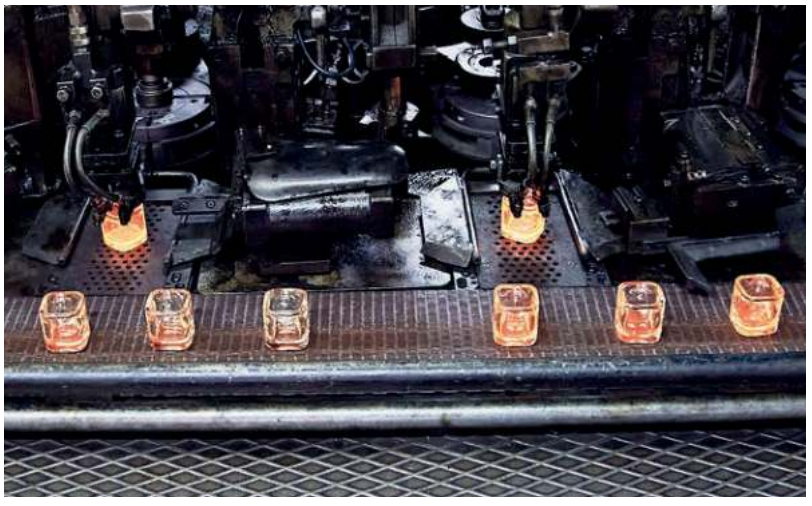
Bormioli Luigi transforms its Spanish facility

(as part of a €200 million investment)

Italian luxury glass manufacturer Bormioli Luigi is in the process of a five-year €200 million investment plan. An area of focus is its Spanish facility, which is being transformed to produce bottles for perfumery and cosmetics. Jess Mills spoke to Simone Baratta* about the investment.



Bormioli Luigi's Spanish glass facility is in the process of being transformed thanks to a €200 million investment plan by the Italian glass perfume bottle manufacturer.

Its facility in Azuqueca, located about 40km from Madrid, Spain, will be boosted by four new IS machines as well as a revamped decoration facility.

Its five-year investment plan covers the period 2019 to 2024 and will enable the company to convert the facility from a tableware glass manufacturing site to a modern hollow glass facility, capable of manufacturing items for the mid-range perfume and cosmetic glass sectors.

One IS machine was installed in 2022, and two more are planned for 2023 while the last will be placed in early 2024, to work alongside the facility's 140t/day flint glass furnace.

In 2024, decoration and finishing operations will also be integrated into the plant to build up internal production capacity, thus enabling the organisation to be more flexible and respond more quickly to customer requests.

The development of the Azuqueca site means the company can meet not only the needs of its original customers - those in the premium perfumery segment - but also can extend the perimeter of its offering to a new sector, that of the low-premium and cosmetics segment.

Despite challenges caused by Covid and the energy crisis, progress on the upgrade is going well.

It has already started to produce some items in the new style and the company is happy with the progress so far.

Simone Baratta, Bormioli Luigi's Director of the Prestige Perfumes Business Unit, said: "Obviously, there is a learning curve for the plants, so we cannot expect to move this plant at the super high-end items, but we are happy with the quality

depending on the needs of the market."

The plant was purchased in 2017 by Bormioli Luigi. After a few years of managing the site, Bormioli Luigi decided to reposition the facility from its tableware roots to the perfume and beauty segment.

To meet the requirements of this sector, the Azuqueca facility will also be equipped with automated and digital glassmaking equipment and will be the company's most up to date site with its manufacturing technology.

This will include modern technology based upon automatic control and the sorting process for bottles as well as a large data analysis system. It will enable Bormioli Luigi to increase the efficiency and capability of the glass process as well as reduce defects.

"If we are able to collect a lot of data of the status in the cold part, so from the analysis of the output bottle, we should be able to prevent a part of the defects.

"I think that is the big challenge in order to increase the capability of this process.

"We should not forget that when we talk about the beauty market, we are talking about the extreme technology of the hollow glass.

"So, when we have strange shapes and high-quality demands, some defects are somehow endemic, and we cannot avoid it because they are linked to the properties of the process.

"But there is a part of these defects that we can try to prevent in advance."

Modern technology from established equipment suppliers such as Bucher Emhart Glass, Iris Inspection machines and Antonini will be installed at the site

we are producing and so we will continue to move some items from Italy to Spain.

"And so, finally, to create some new capacity for the prestige items in Italy.

"At the end of this story, I think, in a certain time, the plant will have its own mix with its experience, and it will stabilise the good level of quality.

"That is what we aim to create in the next few years."

The original plan had been for the Spanish site to also cater for the skincare market but, post Covid, the perfume sector has bounced back.

"So, in this context, obviously we are continuing with our investments and slightly adjusting the mixture of the plant, that today is much more perfumery than what was expected at the beginning.

"But fortunately, we have the technology and the know-how. So it makes sense for us to adjust

Decoration

A key feature of the modernised site will be the new decoration facility. Set for installation in 2024, as well as containing standard technologies such as lacquering, screen printing and hot stamping it

Continued>>

will be equipped with equipment to deal with the specific decoration requirements of its customers.

Decoration requirements of the beauty industry are increasingly important as customers seek to differentiate themselves from competitors. On the one hand glass bottles are increasingly complex with ever more sophisticated shapes required by customers.

Yet on the other hand, the environmental requirements means the technologies involved in the decoration of a glass item have to be sustainable. This means the use of clean raw materials and the elimination of certain metals and VOCs for example.

Decarbonisation

Like all major glass manufacturers, decarbonisation is a key theme at Bromoil Luigi and it takes its Environmental and Social Governance (ESG) commitments seriously.

It has a 50% decarbonisation objective by the year 2030 within its manufacturing plants. The programme was only begun in 2016 but the company is already halfway to meting this objective, primarily based on its investments in electric melting.

It has identified electric melting as the major way to promote decarbonisation and has invested as such. Currently about 65% of its glasses are produce via electric melting. Despite its success with electric melting, it does not rule out investment in the use of hybrid furnaces and other alternative renewable energy means in the future.

> **"We never had a doubt about continuing with our investments because we know the potential of this market, which continues to grow."**

On top of that, it has already developed many innovations in the use of glass, such as lightweight bottles and recycled glass. Its Ecoline range includes a series of bottles, jars and caps made of ultra-light glass (58% less glass weight than a traditional container).

As well as this, it has offered its Post-Consumer Recycled (PCR) glass for several years.

Despite the pressure faced by glassmakers such as Bormioli Luigi – energy costs, soaring raw material prices and supply chain issues – the company is confident that now is the right time to make this investment. It has analysed the market for opportunities and believes the market will support its growth strategy.

"We never had a doubt about continuing with our investments because we know the potential of this market, which continues to grow.

"We are convinced that today, despite the many difficulties and many problems around, there are good conditions for this, and this is the reason for which we confirmed our investment plan.

"In fact we are already working on our next investment plan because 2024 is finally not so far," states Mr Baratta. ■

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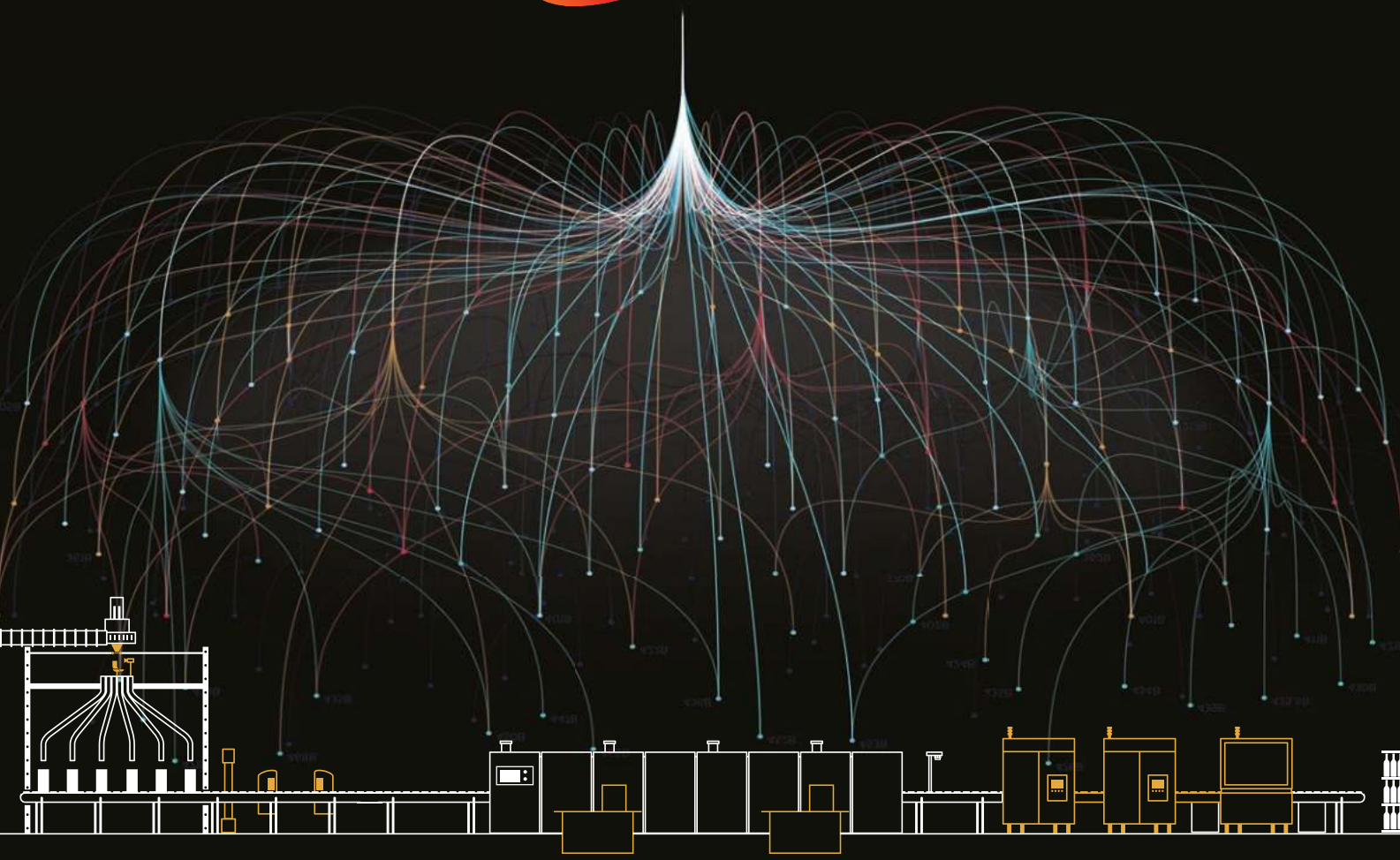

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A carbon neutral solution for the glass industry

Airovation Technologies will enable Israeli glass manufacturer Phoenicia to become carbon neutral by converting its CO_2 emissions into soda ash. As well as helping the manufacturer decarbonise, it can help prevent supply chain issues. Gil Tomer* discusses the project.

Airovation Technologies is a company based in Israel that provides solutions for air purification and carbon capture.

Phoenicia signed an agreement with the company (***Pic 1***) to install a unit that transforms CO_2 emissions from its Yeruham plant into minerals that can be used in the glass production process.

Following over a decade of research at the Hebrew University of Jerusalem, Airovation has developed a method to capture sodium carbonate (soda ash) from CO_2 at the point where the latter is emitted.

Soda ash is a key component of glassmaking. Extracting it from CO_2 is done by a patented chemical invention that uses Superoxide Radical, a powerful oxidiser.

Under the new partnership, Airovation will run a three-phase scale-up process, eventually leading to the first fully commercial unit at the Yeruham plant in 2025.

This will reduce Phoenicia's global warming carbon emissions, contribute to a circular economy, and reduce the company's dependence on soda ash imports.

▲ Pic 1. From left to right: Gil Tomer, Co-Founder & COO at Airovation Technologies; Mayor Tal Ohana; Phoenicia CEO Michel Ben Simon; and Phoenicia CFO Avi Peer. [Yoav Weiss]

How it started

Airovation Technologies originated from Hebrew University, from the team that was working in the Casali Institute of Applied Chemistry in the Hebrew University of Jerusalem. Professor Yoel Sasson led the team.

From the beginning, Professor Sasson has led the chemical research team, along with Doctor Uri Stoin, one of our inventors and the Chief Chemist. We have focused on his research on air decontamination. They are still working with us to commercialise the solution.

Our CEO, Marat Maayan, founded the company in 2013. He had this vision of saving people's lives in cases of fires in high rise buildings. That is how the company started. He was completely emergency oriented, that was part of his expertise and responsibility in the Israeli Defence Forces (IDF).

He focused on mitigating the risks that were related to bomb attacks and fires. So, he took his experience and know-how to the civil life after retiring from the army, and that's how he started Airovation.

I joined Airovation in 2017 as a Co-Founder. I started as an investor at first, but soon became close with Marat. So, I joined the company a couple of months later in early 2018.

My ambition to invest in Airovation, and later join the company, was because of the technology that I saw coming from the Hebrew University, which was nurtured by Marat's team.

We found that it could be a relevant and a breakthrough solution, disrupting even, for some industrial use cases. So we shifted the company's focus from an emergency orientation to an industrial emission orientation.

In 2018, we experimented for two weeks in Chicago at the Underwriters Laboratory (UL),[1] in the UL certification entity. The UL is an independent, non-profit organisation that tests and certifies components and products for safety; the UL Certification Marks serve as a recognised symbol of trust in customers' products. With them, we designated

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Mountains of glass from Phoenicia's plant in Yeruham, Israel. [Yoav Weiss]

an area with furniture that was burned repeatedly.

We drew the emissions, from a very dirty and uncontrolled environment, into our systems to see how our reactors and our Superoxide Radical solution - the heart of our patents – treated the different emission compositions and the different concentrations of various gases.

The results were even better than we expected. The Superoxide Radical was mineralising the CO_2 in an efficient manner inside our reactor. That was the biggest breakthrough of 2018.

In 2019, we validated another stage by taking the same equipment that went to Chicago and connected it to a plant in Northern Israel, in collaboration with the Israeli Environmental Protection Ministry.[2]

It was a pilot, but the demonstration was built on a batch process rather than the continuous process that you would want to see running in factories. But that also had extremely good results in real data and emissions coming from the field.

Emissions included a combination of NOx, SOx, all sorts of cyanides and of course a high concentration of CO_2 as well as some carbon monoxide.

That's when we understood that we needed to look at the CO_2 not as a burden, but as something to focus on.

We started focusing on clean streams of CO_2, because we found that with clean streams the minerals were becoming purer and in a grade that could immediately go back to the field for additional use in other industries. Consequently, the higher the concentration of the CO_2 the better for us.

Previously, we looked at those minerals as something that we need to dispose of, because naturally it was carrying some of these toxic substances from the emissions. But the more CO_2 meant the less presence of other toxic materials, making the minerals a high enough grade to be used for glass, as well as food, cosmetics and pharmaceuticals.

Partnership

Our partnership with Phoenicia started due to the pandemic.

We wanted to scale up our solution outside of Israel, but it was difficult to create collaborations abroad because of the travel restrictions put in place.

We couldn't send engineering teams and chemists to the other parts of the world to start testing. So, whilst working on our global collaborations, we decided to test the waters in Israel.

We reached out to the Phoenicia plant in Yeruham to ask them what their pain points were, because at this stage in Israel there are no real restrictions about CO_2 emissions.

Currently, the carbon tax is only opposed on energy producers. However, it's not regulated, and the thresholds are unclear. There are only indications that the ministry is about to pull some restrictions – they're talking about 2027 as the beginning stage.

Between the different factories that we checked in Israel, we discovered that something else took place during Covid – the disruption of the supply chain.

We learned that this was a huge pain point for Phoenicia, and many other plants around the world, as they suffered from a lack of raw materials. It almost got to a stage where Phoenicia had to close its factory because it had no raw materials.

They usually operate with a couple of months of reserves, but the reserves were about to end because the shipment was stuck in the ocean and could not be delivered.

This alerted our imagination. We understood that it's not just about decarbonising, it's about closing the entire cycle.

For Phoenicia to be able to manufacture their own soda ash, one of the key raw materials, in its backyard out of its emissions, was a strong incentive for them to say yes.

Phoenicia's end customers were also willing to pay a higher price, a surplus that would be added to the price of the product, to manufacture a blue or green glass product with this technology.

Phoenicia's CEO, Michel Ben Simon, is also very motivated. When asked why Phoenicia wanted to invest in this technology, he gave the following three reasons:

- In 2027, we will be asked by the Israeli government to eliminate CO_2 emissions by law. The best solution today is to convert the melting furnace to electrical heating (hybrid) as this innovation allows us to use all kinds of fuels without greenhouse pollution.
- The by-product is soda ash material which is one of the major materials in glass composition and the most expensive one.
- To support Israeli start-ups helping to make our plant a better place, and, in the process, support the economy and young visionaries.

In addition, Mr Simon said that Phoenicia was working on a 20,000m^2 solar panel expansion on its warehouse, which is now under construction.

The project

We have come to a stage of a continuous process in our laboratories instead of the batch that I mentioned earlier. Now we need to take this continuous process out to the field, and scale it.

Therefore, we have created a three-step scale up plan with Phoenicia.

The first stage of the plan would be to run the equipment that we'll be deploying in the first quarter of 2023. This will treat

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▲ Pic 2. Glass bottles on a production line at Phoenicia's Yeruham plant. [Yoav Weiss]

more than 1000m^3 of flue gas an hour, which is approximately between one to two tonnes of CO_2 a day.

The second stage would be between five to 10 times more. Airovation is developing a 40ft container, or modular unit, to treat the CO_2. Each unit will be able to treat between 5000 to 10,000 tonnes of CO_2 a year. This equates to approximately 5000m^3 per hour. This stage is anticipated to be completed by the end of 2023 or early 2024.

Finally, stage three will create a fully operational site by 2025. This will involve chaining eight to 10 of these modular units together to decarbonise Phoenicia's plant entirely.

Directly, we will be capturing more than 90% of the entire CO_2 emissions. However, there are several variants that need to be considered, such as cost of the raw materials and the purity our end users need; the higher the purity, the more energy is needed.

So, there is a trade-off that we have been perfecting for years. We are also developing software to help us optimise the process in all scenarios. But we've learned that the higher the conversion rate, the higher the grade of the minerals.

On average, the technology can save up to two tonnes per tonne of CO_2 captured, meaning a good life cycle analysis.

Another advantage is distributing the minerals locally. Phoenicia said that if the material was of high quality and the right granulation, then it would not need to import soda ash at all.

If the minerals do not have to be imported from overseas, then the shipping costs can be reduced. As a result, the end price can be competitive for end users of these minerals.

However, we will also try to maintain some flexibility to mitigate the risks that are connected to overwhelming a specific market.

It's important to mention that this is not the only site in the world that we're working on. This is not the only hard to abate industry we're targeting.

We have close ties with a few hydrogen manufacturers as well as the other stakeholders in the supply chain and the value chain of hydrogen.

We're strong believers that hydrogen is tomorrow's solution for the ever-increasing energy needs of humanity. With our solution, CO_2 is captured from steam methane reforming (SMR) processes to create blue hydrogen. We believe that green hydrogen will be the final play, but this will take decades. Other industries include cement, steel manufacturing, and some chemical processes as well in chemical manufacturing. All of those are significant industries with a substantial carbon footprint.

Therefore, we don't see ourselves as mineral manufacturers. Our mission is to decarbonise the hard-to-abate industries in the many different ways that we are developing.

The carbon, the minerals and the Superoxide Radical utilisation - that's just the first step.

Glass

The soda ash created with this method has no effect on the grade of the glass. That was one of the crucial points that we checked before starting.

The annual capacity of the Yeruham plant is approximately 100,000 tons of melted glass, which would remain the same once the new units were installed.

The installation of the units would also not have any impact on the production of glass bottles and jars (***Pic 2***), as the units would be directly connected to the chimney.

For decarbonisation, we're also counting on the fact that most of the factories that we are in discussions with now, both for container and flat glass, use recycled glass ***(Pic 3)***.

This will lower the amount of the CO_2 needed in the process and that are emitted from the process, which will help us decarbonise a factory entirely.

We don't want to put too much of a logistic burden on the input materials

▲ Pic 3. Glass cullet at Phoenicia's plant [Yoav Weiss].

and the output minerals. There is a range where we would prefer to work, and the recycling of the glass helps us be in the range, even within larger sites.

Therefore, we're manufacturing exactly the level of the sodium that's needed for the process. Consequently, we won't affect the colour, nor the quality of the glass whatsoever.

Decarbonisation

I really do not believe that there is just one solution to decarbonise. There is no magic wand. I think there are now 1200 glass container production sites in the world, and even more flat glass manufacturers - it's too much for one solution.

We know that there is a limit to the volume that we can capture per site. We won't be the only option for a large site, but we can be one of the few solutions in the toolbox, which is a common approach now in the decarbonising world.

But for small to medium sites, our solution can stand-alone. However, we want to decentralise our modular units to not overwhelm the mineral market in a specific region. So, we intend to deploy a lot of units in different regions of the world.

This is why we are working on building alliances and strategic partnerships. With a headcount of 35 people, there is only so much we can do at this stage. We never intended to decarbonise the industry by ourselves.

So, we will build consortiums in different regions with EPC companies that can build a plant within a plant so it can house our units properly.

We are now working in three different continents - the US, Europe, and Asia - to build alliances. This is to prepare the infrastructure that's needed to offer hard-to-abate industries a full, one-stop-shop solution, in which they don't have to worry about the logistic burden nor the maintenance.

The consortiums will be taking care of the entire chain, and will charge by the tonne of CO_2 that we are saving by capturing it. This is the first in a number of business mechanisms that we are forming.

Therefore, we will have two income sources. One being the CO_2 captured, and the other the minerals. The minerals alone justify the entire operating costs, and even part of the capital expenses. So, in portions, it will make its own return on investment (ROI).

In both ways, companies will generate some revenue from the fact that this equipment and this solution is being deployed in their backyard, so this will be a mutually beneficial partnership.

It is about global collaborations. Each and every party needs to bring its own speciality and its own capabilities to the table in order to make an impact.

That's what I found when running this journey of decarbonising and treating industrial emissions in the world, it's all about working together. ■

***COO & Co-Founder,**
Airovation Technologies, Ness Ziona, Israel
https://www.airovation-tech.com/

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References

1. https://www.ul.com/
2.https://www.gov.il/he/departments/ministry_of_environmental_protection/govil-landing-page

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Mineral solutions for greener glass production

Sibelco is exploring the use of different materials within the glass batch to help improve melting efficiency and reduce the overall carbon footprint of the glass manufacturing process. Lesley Beyers* explains.

As one of the world's largest providers of industrial minerals and other materials, Sibelco has set a target to reduce Scope 1 and 2 emissions intensity (tonnes CO_2 / revenue) by 5% per year from 2021 to 2030 – cumulatively a reduction of 37%, assuming the same scope of activities.

But it is Sibelco's Scope 3 emissions that account for by far the biggest percentage of the company's carbon footprint. That is why Sibelco is working to help its customers reduce emissions in line with best practices promoted by the Science Based Targets initiative (SBTi). And as Sibelco's second largest market, glass is a key area of research and development.

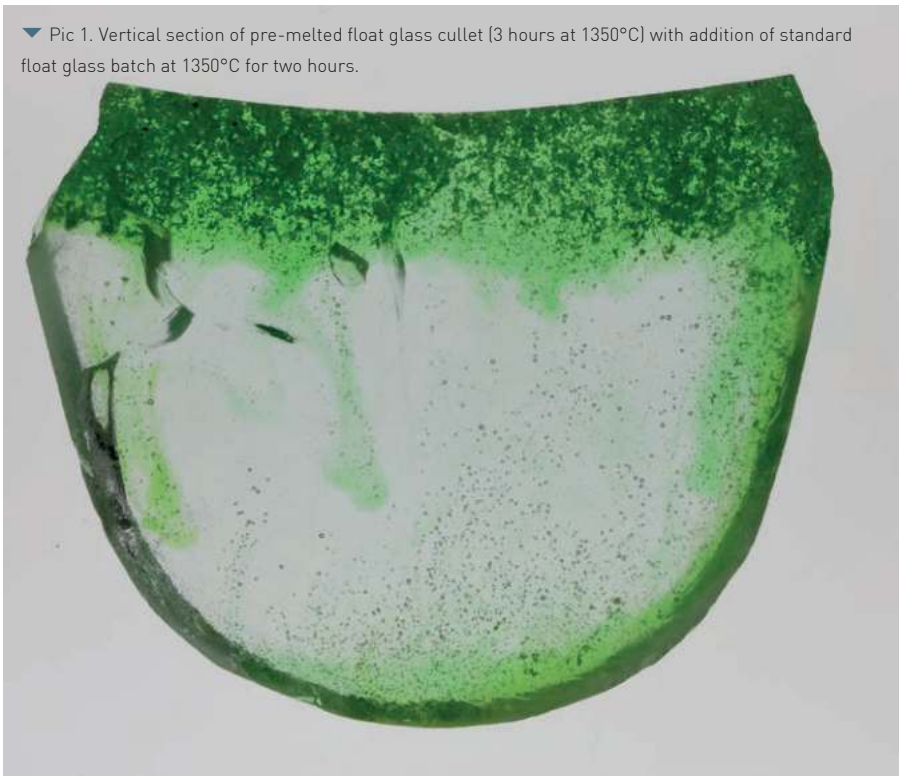
Key focus areas

Sibelco is exploring four categories of material to reduce the overall carbon footprint of the glass manufacturing process:

- materials with a lower inherent carbon footprint
- materials to reduce CO_2 emissions
- materials for low-CO_2 technologies
- materials to reduce energy demand

With regard to the first category, the use of cullet is an obvious solution – every 1,000 tonnes of cullet used during the glass manufacturing process saves approximately 314 tonnes of CO_2. Sibelco is already Europe's largest glass recycler, each year transforming over 3 million tonnes of waste glass into cullet.[1]

There are clear synergies between the remaining three categories - for energy-intensive combustion processes, materials that can even slightly reduce energy demand can have a long-term impact on CO_2 emissions.



Pic 1. Vertical section of pre-melted float glass cullet (3 hours at 1350°C) with addition of standard float glass batch at 1350°C for two hours.

Batch materials substitution

Redesigning the batch mixture by substituting one mineral for another can improve the energy efficiency of the glass-melting process. In fibreglass production for example, anorthosite can replace kaolin and some burned lime.

Due to its chemical make-up (specifically the absence of crystalline water) less energy is required to melt anorthosite. Furthermore, the partial substitution of burned lime decreases the indirect energy costs and CO_2 emissions associated with its production.

Such batch substitutions to address emissions targets reflect the philosophy of Prokhorenko: "Improvement of conventional glass melting processes without major changes in existing technology".[2]

Tailored batch materials for melt homogenisation

Lowering the energy input from the combustion space or increasing the furnace pull leads to a risk of deteriorating glass quality. Traditionally this risk has been mitigated by the introduction of electric boosting (efficient energy input) and bubblers (forced convection). A universal approach to mitigate the same risk without requiring furnace modification is the optimisation of the glass batch to improve the quality of the

Continued>>

Pic 2. Vertical section of pre-melted float glass cullet (3 hours at 1350°C) with addition of modified float glass batch at 1350°C for 2 hours

primary glass melt.[3]

A method employed at Sibelco's glass laboratory to test the melting behaviour of 500-600g glass batches reveals important aspects of primary melt quality and batch segregation. One procedure involves the melting of 300g of float glass cullet for three hours at 1350°C and the subsequent addition of 300g of float glass batch (with chromium indicator) on top of the molten glass.

A batch-free time study in this setup permits an evaluation of the impact of raw material characteristics on the batch melting behaviour.

The standard float glass batch (***Pic 1***) is seen to form a primary melt phase that is enriched in calcium and magnesium. This primary melt phase has a higher density and segregates from the rest of the melting batch materials. The remnant batch materials on top of the molten glass are rich in silica and will dissolve at a slower pace due to the decrease of fluxing compounds. In the case of the modified float batch (***Pic 2***), the segregation during melting is avoided and a more homogeneous primary melt phase is obtained.

An in-depth evaluation of glass via Scanning Electron Microscope (SEM-EDX) reveals the extent of batch segregation. A top-down composition measurement along the central axis of a glass sample (***Fig 1***) illustrates a steep concentration gradient for silica in the case of a standard float glass batch, and the absence of segregation and silica-enrichment in the case of modified batch materials.

These comparative samples were produced by melting 500g batches at 1350°C for two hours.

This focus on the primary melt phase is a more ambitious approach to lower the energy requirements of the glass-melting process.

Glass quality improvements can be achieved by modifying the physical form of the raw materials through mechanical, chemical or thermal processing.

A high initial glass quality would reduce the need for extensive mixing and homogenisation of the glass melt.

Improving conventional glass melting processes

Material solutions investigated by Sibelco offer the potential to reduce the carbon footprint of the glass-melting process, cutting energy consumption and CO_2 emissions.

The envisaged modifications and substitutions create suitable conditions within the glass furnace to increase yield (by decreasing defects), increase pull rate, and lower melting temperatures.

A further focus on primary melt quality may enable a decrease in the required residence time of the glass in the furnace; this could see further reductions in overall energy consumption and CO_2 emissions by reducing time needed to homogenise the glass. ■

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References:

1. S. Hourquebie and H. van Limpt, "Sibelco Glass Recycling," GMIC/GlassTrend Virtual Recycling Seminar, 16th June 2022.
2. O. A. Prokhorenko, "Energy-Saving Glassmelting," American Ceramic Society Bulletin, vol. 85, no. 10, pp. 29-34, 2006.
3. S. Hourquebie and H. van Limpt, "Short-Term Solutions to Keep the Melting Costs Under Control" GlassTrend Seminar on Glass Recycling & Mineral Solutions, 29th November 2022.

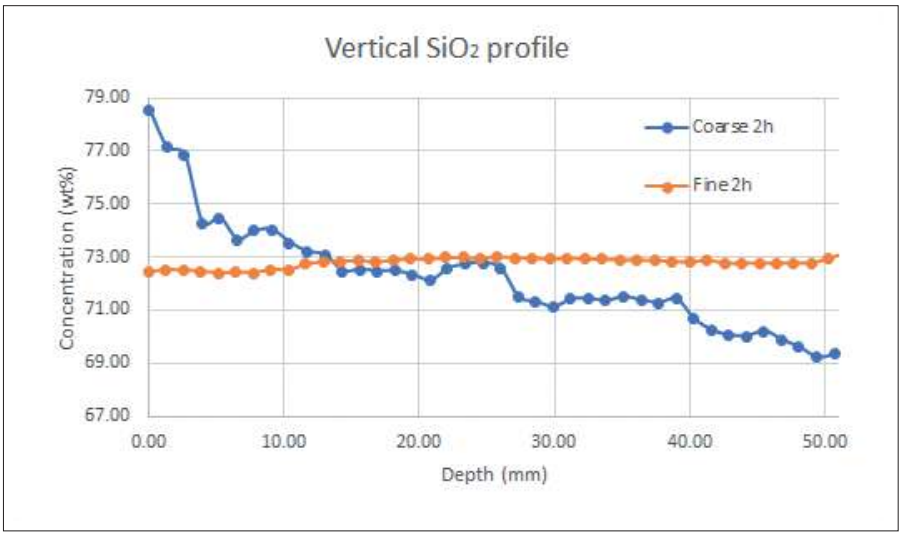

Fig 1. SiO_2 concentration in the glass measured top-down along the central axis.

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Reduction of energy consumption in working ends and forehearths

Jürgen Grössler* considers several options to reduce the energy consumption of existing or new glass conditioning systems that will also reduce CO_2 output.

▲ Fig 1. Poor air/gas mixture setting: flames burst out of the chimney.

Today, modern forehearths are no longer the 'energy destroyers' of the 1970s or 1980s. Many forehearths were widely used as K-type forehearths until the mid-1980s. Emhart introduced this so-called gas-fired forehearth in the mid-1940s and it established itself as the standard forehearth globally!

The first forehearth types that came on the market in the mid-1980s, along with high-pressure heating, improved refractory superstructure design effectively reduced energy consumption by 50% compared to their predecessors.

Such savings are no longer achievable today with gas-heated forehearths. Nevertheless, it makes sense to look for further savings potential. A simple way to save energy on existing installations is to optimise the installation settings regularly and carry out regular maintenance. Experience from audits conducted by Sorg shows that more than half of the audited forehearths or working ends were not optimally adjusted (***Fig 1***).

The air and gas ratio per heating zone is a crucial factor. Theoretical calculations show that even a deviation of 0.1% or 0.2% in the mixture can lead to an additional gas consumption of up to 10%! The proven Sorg VMC system keeps mixtures stable to +/- 0.1%.

This stability can be further stabilised and improved by installing Sorg's patented OMT trim system. The OMT system adjusts the air-gas ratio automatically or makes it stable via a permanent O_2 measurement per heating zone. This means that the air-gas balance remains stable (***Fig 2***).

Often ignored but not to be neglected is the spout heating of a forehearth, as it is an energy consumer that should not be underestimated. In the case of normal soda-lime glasses, it is not necessary to heat the spout too much.

Mixture pressures above 20 mbar and up to 40 mbar, which Sorg has seen during audits, are rarely necessary.

In principle, a mixture pressure between 10 to 15 mbar is sufficient.

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Fig 2. Sorg OMT unit mounted on forehearth

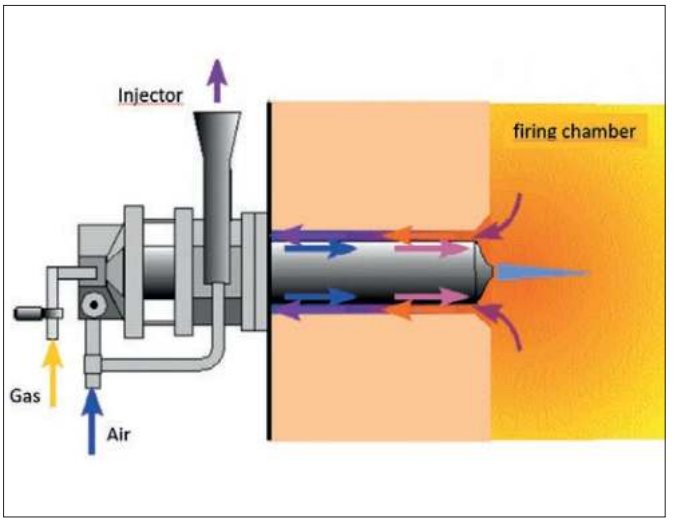

Fig 3. Recuperator burner. Source: Schunk Ingenieurkeramik GmbH, Willich, Andre˙ Hiemann

An often-underestimated factor is the optimal heating and cooling setting of the different forehearth zones. In many glass factories, there are no longer any specialists for working end or forehearth settings. The so-called "feeder man" has been rationalised away. Personnel is in short supply in many places nowadays. Often these jobs have to be done by the furnace or production staff.

But they usually lack the time, the detailed knowledge and the experience for this job. Therefore, it often turns out that in some control zones, cooling and heating are done simultaneously, which of course means unnecessary additional energy consumption.

The forehearth superstructure also leaks, resulting in the entry of false air, which leads to higher energy consumption.

This can lead to faulty air circulation, which disproportionately cools the glass. As the glass must be heated again, this results in additional energy consumption that is not insignificant.

Oxygen

Enriching the combustion air with oxygen saves primary energy through improved heat transfer with a simultaneous increase in the combustion chamber temperature by means of higher flame temperatures.

However, enrichment has several disadvantages, so this process is only used in exceptional cases. Also, the cost of adapting the normal heating system for oxygen and the cost of oxygen itself are high compared to the benefits.

Oxygenating the combustion air is not harmless because it increases the flame temperature (the burner block material must be suitable for such high temperatures) and the risk of backfire. The safety systems must be adapted for the use of oxygen. An additional control effort is necessary to add oxygen at a constant volumetric rate.

Oxygen-enriched combustion air with more than 25% oxygen content changes the applicable regulations.

The heating system must then be designed in accordance with EN746-2:2020 (paragraph 4.5.1) as for a pure oxygen system.

These points make oxygen enrichment usually no longer economically viable.

Reduction of energy consumption in new installations

As is usual in the furnace area, preheating the combustion air only makes sense if the air can be preheated above 700°C. Using the usual burner manifold heating in the forehearth zone is impossible (ignition limits natural gas). Preheating well below this temperature or slightly preheating with exhaust gases to a combustion air temperature of 60°C would theoretically only contribute to a small saving of 1%.

On the other hand, preheating is also very expensive to carry out, as the stations and all piping - as in a house heating system, for example - must be insulated. Amortisation of these additional expenses seems more than questionable.

The hot forehearth exhaust gases have often been discussed as a savings potential but are hardly feasible in practice.

Since the exhaust gases of the various heating zones on the forehearth or working end come out of many individual openings – in contrast to the furnace exhaust gas – the respective amounts of energy are too low for reuse. The many exhaust gas outlets would have to be combined in a pipe system to collect all exhaust gases, which cannot be implemented sensibly. The result would be pressure and control problems in the forehearth. Furthermore, there are problems with maintenance due to complexity and inaccessibility.

A complete enclosure of a forehearth is theoretically conceivable to collect exhaust gas.

However, this is hardly possible in practice, as many components on the forehearth (thermocouples, stirrers, etc.) would not withstand the temperature load in the enclosure and would have to be adapted.

Also, an impact on the various exhaust gas openings would pose a risk to the heating and cooling systems. A forehearth is expected to maintain a temperature constancy of +/- 1° at the most, so any intervention on the pressure conditions would be counterproductive. Likewise, the operation, maintenance and control of the installation or parts thereof are impossible or only possible with difficulty.

So far, Sorg is unaware of any benefit from using forehearth exhaust gases, except in the E-glass industry. The collection of waste gases from many individual zones has only taken place in some forehearths for E-glass.

Recuperator burners or other burner systems

As early as 1987, Sorg pioneered the field of glass conditioning in the working end area. The same heating and cooling systems used in the latest forehearths at that time have also been used in working

ends since then. Thus, the working end became a component of glass conditioning for the first time.

Before that, several large single burners were normal for heating; there were no cooling systems on the working ends; and the working end was basically a glass distributor, which belongs to the melting end. In most systems today, using the working end as preconditioning is mandatory.

However, at some installations it would be possible to reduce the number of burners and use the process heat of the waste gases with recuperative burners.

These burners work according to the heat exchanger principle. Part of the waste gas heat is transferred to the combustion air (***Fig 3***).

Preheating can save fuel. How much depends on the achievable combustion air temperature and the ratio of combustion air temperature to process temperature.

For some working ends, as mentioned above, it would certainly be possible to work with only a few single burners instead of burner manifolds, provided there is enough time for conditioning and homogenisation in the forehearth area. However, this would not result in significant energy savings, as there is usually little need for heating on working ends.

Electricity as a heating medium

Electrically heated forehearths are constructed either as directly heated forehearths with electrodes immersed in the glass or with electrical radiation elements (heating elements) above the glass bath.

A special situation arises in the spout area. Due to the confined space within the rotating tube in the spout, gas heating is the best and most practical solution for this area. Only if gas (or oil) is not available the spout should be heated electrically with heating elements.

Sorg has been supplying electrically heated forehearths since the 1970s, the first for tableware glass with heating elements above the glass bath. The first applications for electrodes were in C-glass and soda-lime glass. In the meantime, opal glass, borosilicate glass forehearths and working ends are also heated all-electrically with electrodes.

All-electric forehearths with immersed electrodes have been proven to save between 60% and 70% of energy as the power is transferred directly into the glass. Gas heating, as well as forehearths with electric heating elements above the glass bath, have to transfer the energy into the glass via heat radiation above the glass bath surface. Therefore, forehearths heated with these heating elements also save energy, but not to the same extent as directly heated forehearths.

Molybdenum electrodes are used in working ends and forehearths for amber and green glass. The use of soda-lime flint glass can sometimes be problematic, as reactions between the electrode material and glass can lead to seeds formation and dark streaks (molybdenum abrasion) in the glass. An alternative electrode material to molybdenum is tin oxide. Platinum electrodes are not an alternative for soda-lime glasses due to cost reasons.

In the case of high-quality flint glass, forehearths heated with heating elements are preferred as there is no foreign material (electrodes) in contact with the glass.

The advantages of electric heating are not only energy savings and no exhaust gases but also better thermal homogeneity. The disadvantages are, on the one hand, the considerably higher investment costs and, on the other hand, the expensive electricity prices at many locations in the world. These prices cause higher energy costs despite the energy savings. But the energy savings, the reduction in emissions, and thus the savings in taxes on emissions will soon make electric heating profitable. A compelling reason for installing electric heating by electrode is the enhanced performance and productivity obtained through better thermal homogeneity.

The installation of additional electrical heating in gas-heated forehearths (hybrid heated forehearth) is paramount. This usually serves to improve thermal homogeneity (***Fig 4***).

Use of oxygen

Sorg equips working ends and forehearths with oxygen heating. For this, important experience and knowledge were gained, besides practical experiences at a test stand in the Sorg technical centre. Oxygen burners of various designs were evaluated.

A heating system with oxygen and natural gas is completely different from the known systems with air and natural gas or LPG. All the necessary components such as stations, piping and burners on the forehearth must be designed entirely differently. For reconstructions or new systems, the entire equipment must be completely replaced or equipped accordingly.

Increasing the oxygen content from the usual 20.9% in the air to almost pure oxygen increases the flame temperature from approx. 1900° to approx. 2700°C. This must be considered in connection with the refractory lining of the combustion chamber, especially the burner blocks. Due to the higher flame temperature, this heating of the forehearth is especially

Continued>>

▲ Fig. 4 Hybrid-heated forehearth.

▲ Fig 5. Forehearth heated with oxygen/LPG.

suitable for glasses such as borosilicate or basalt, as very high combustion chamber temperatures are required (***Fig 5***). This is not necessary for classic soda-lime glasses, for example.

Many operating data show that, with the use of oxygen and gas as a heating medium, compared to firing with air and gas, the energy consumption is reduced by approx. 50% to 60%.

Despite all the advantages, for normal soda-lime glass the cost of the investment and currently the cost of the oxygen fuel are still too high. A quick amortisation is not achievable.

Use of hydrogen as a heating medium

For many thermoprocessing installations, conversion to electric heating is not possible, or not completely possible, if it makes any technical sense at all. That is why hydrogen is a much-discussed "bearer of hope" for the future, for the avoidance of greenhouse gases – in case green hydrogen is available. The combustion of hydrogen only produces water vapour, not CO_2. That is why many studies and projects are currently investigating the limits of this conversion from natural gas to hydrogen or the maximum enrichment of hydrogen in natural gas regarding pipeline networks, gas storage facilities and industrial burners.

However, the influence of hydrogen combustion on the melt and the glass is also being investigated.

In part, the existing gas supply infrastructure can be used to transport and store hydrogen. Before the conversion to natural gas, many gas grids used to be operated with so-called town gas, which consisted of up to 51% hydrogen.

The existing German natural gas network has so far been approved for the admixture of 10% hydrogen.

However, the new target is to allow up to 20%, and initial trials are underway.

Unfortunately, you cannot simply replace natural gas with hydrogen as a heating medium. Hydrogen has a different combustion behaviour. The flame speed is about eight times faster, and the ignition ranges much larger. The flame becomes more compact and hotter when hydrogen is added.

Backfiring prevention measures are important in installation parts, such as burner manifolds, pipe systems, etc. It is also essential that the air/gas mixture is perfect, but this is no problem for the Sorg VMC heating system. Extensive tests by the manufacturers have shown that the gas devices used up to now are functional even with a very high hydrogen content in the mixture.

Hydrogen can be produced in different ways. There are now different colours for labelling them. 'Green' hydrogen through electrolysis - from renewable energies - using green electricity naturally has the most significant advantages from an ecological and economic point of view.

We are at the beginning of a new era for the glass industry. Electricity cannot be used for all glass.

Therefore, it must be carefully examined what is necessary to replace natural gas or enrich it with hydrogen.

Summary

New insulating forehearths, better than the current standard ones, are rarely useful, if possible at all. Nowadays, great tonnage flexibility is required for the forehearth. This is only feasible if the heating and cooling systems are coordinated with the insulation.

Historically, there have been approaches to recover energy from the exhaust gases at the working end of a forehearth. These approaches are only possible to a limited extent because often the technology for this is not yet mature or efficient enough.

Or because, for example, the conversion of residual energy, e.g., for water heating is not a solution. In the middle of a glass factory, where there are often working ends and forehearths, nobody needs hot water! Moreover, if you have to transport this amount of energy 20 metres, it does not make sense from an energy point of view. The effort is disproportionate to the energy savings.

The most efficient method of reducing energy consumption is direct electrical heating with immersed electrodes. However, energy savings do not equal energy cost savings, especially for electrically heated systems.

Electricity costs much more than natural gas in most countries.

Environmental discussions may change this. Investment and maintenance costs must also be considered in addition to ensuring that this type of heating is suitable for the application.

The future of forehearth heating could be a mixture of electric and gas heating. Oxygen could play a more substantial role in reducing energy consumption and exhaust gases.

Replacing natural gas with hydrogen seems to be one of the most promising possibilities at the moment. However, we are only just beginning to gain experience of what the use of hydrogen can mean for the glass industry.

What makes the most sense is often also determined by the location of the installation. ■

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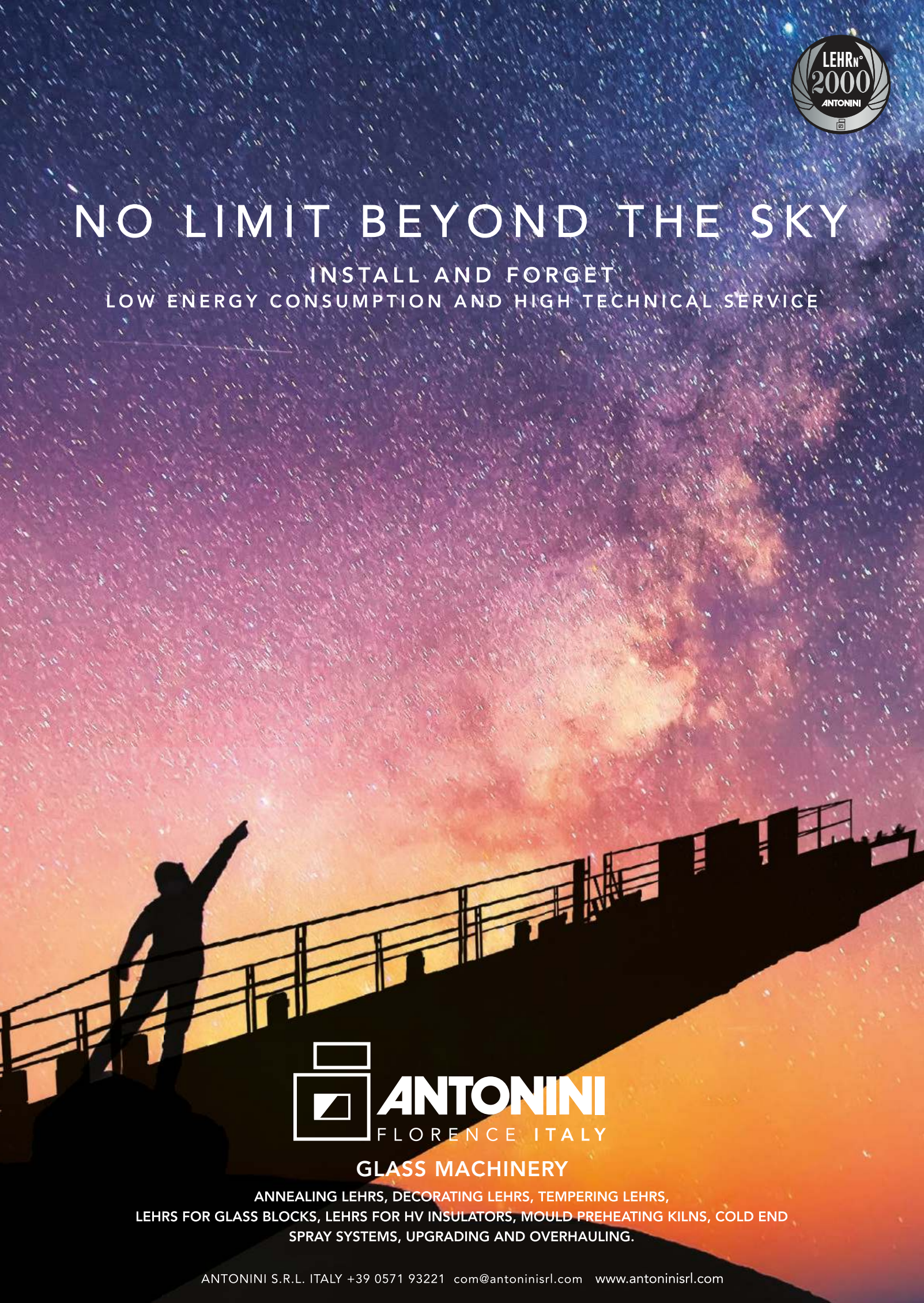
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A partnership for unsettled times

Joachim Ullrich, Director of Electrical and Process Automation at Zippe Industrieanlagen.

Joachim Ullrich*, Director of Electrical and Process Automation, provides an insight into how the partnership between Zippe and Siemens can help manufacturers during unsettled times.

Zippe had reason to celebrate in 2020, when it marked its 100th anniversary. Tell us about some of the milestones you're most proud of.

Ullrich: There are quite a few. We're proud of having put the first fully automatic container glass plant into operation in 1960. The first float glass plant followed in 1984. The more than 1,300 batch feeders we have supplied are also important. In the field of cullet systems, we're known for our scraper conveyors, which some of our customers also refer to as 'le Zippe'. That makes us proud. We were also one of the first companies to construct plants for heat recovery (batch and cullet pre-heating). In addition to our technical achievements, we're pleased to be an independent company that's still family-owned. But we're particularly happy about the fact we're a reliable and professional contact for our customers.

Have there been any highlights in the more recent past? As we know, the times have been challenging.

Ullrich: That's right. Even during the pandemic, we were able to continue with our customer projects and bring them to a successful conclusion. That was important to us. A particular challenge involved continuing our assembly and commissioning activities in distant locations in other countries, mainly by remote. We considered ourselves fortunate to also have local flagship projects in Germany which it was easier to travel to. Good examples are the projects for Wiegand-Glas in Schleusingen and for Noelle + von Campe in Boffzen, whose systems are now all in operation.

What was it that made these orders flagship projects?

Ullrich: Wiegand-Glas is a prominent customer with a particularly large and extensive plant in Germany. It has two independent weighing lines, a silo feed, a very extensive cullet return system with multiple scraper conveyors and a batch/cullet transporting system with 12 Zippe

belt scales, which were equipped with Siemens weighing technology. Working closely with Siemens, we finally put in place a very comprehensive and consistent automation and control concept.

At Noelle + van Campe, in turn, the new weighing line was put into operation, including the premix unit, cullet weighing, batch and cullet transport to the bath, and also the cullet return system, using the standard method with the Simatic PCS 7 process control system. For the safety system, S7 1500-series safety controllers were put in place for the individual areas. The OS control panels were virtualised by Siemens using SIVaaS (Simatic Virtualisation as a Service) so they didn't have to depend on specific hardware.

What do you believe is the common thread running through all these projects?

Ullrich: As a Siemens Solution Partner we are pleased that our customers have taken on board the philosophy of plant-wide, end-to-end automation and are going down the path of innovation with us. One common thread is that Zippe has represented continuity, reliability, and innovation through many generations. That creates trust. A lot of people also appreciate the extent of our vertical integration and our great flexibility.

What do you like about Siemens?

Ullrich: For us, Siemens is an important, reliable, and professional supplier and solution provider, which we've been working with successfully and on a partnership basis for many years. The top-quality consulting it provides enables us to make versatile technological solutions available. As a Siemens Solution Partner, we aim to build up a wealth of expertise among our employees. Sophisticated customer projects are the best way to do that. Siemens also supports us with workshops and recertification seminars. When we start using new technical solutions, sales employees and experienced technicians are there to help. And in the current global situation we can also count on Siemens.

What are the customer requirements that it's particularly important to satisfy at the moment?

Ullrich: Plant availability and security have a role to play, now more than ever. Some security principles need to be implemented even more rigorously. From the perspective of controller technology, that means network architecture and the selection of control systems and components enjoy higher priority as a way of being armed against potential cyber attacks.

Precise dosing and weighing solutions.

In addition, there are energy and sustainability aspects which enable us to concentrate on resource-saving and energy-efficient solutions. These include preheating technology and batch feeding systems for electrically heated baths.

We are constantly improving the electricity and energy consumption of our products. In the future, we will be adapting to all kinds of furnace heating technology to be best prepared for the future. That relates to our batch feeder technology for various furnaces and melters, in particular. Then there are the opportunities for digitalisation. We interpret digitalisation as meaning the implementation of plant-wide automation with a uniform operation and control concept. The result is a cross-departmental "look and feel," and it also makes the process control system more user-friendly. We were also able to implement mobile control concepts for projects here and there. Optimising the control system for our batch and cullet preheaters makes these increasingly energy-efficient.

Where does Zippe get this ability to adapt from?

Ullrich: That comes from our 100% focus on batch and cullet plants – which we've done for decades now. The experience built up by our long-term employees gives us a solid foundation for developing innovations in these areas. Right at the offer stage, we talk with the customers about the solution that's ideal for them, based on highly reliable and advanced technology. Our customers appreciate the fact that Zippe, as a supplier in the batch and cullet plant sector, can develop the entire process chain in-house – from consulting and engineering to software development, electrical and mechanical production, commissioning, maintenance, and service ■

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Zippe's batch plant with external raw material feeds.

A green way to produce glass

A co-operation between German companies Metaliq and the IGR could help solve a problem of the global glass industry, by using a novel way to produce soda and hydrogen production directly in the glass factory. Hans-Ullrich Werner* and Dirk Diederich** discuss.

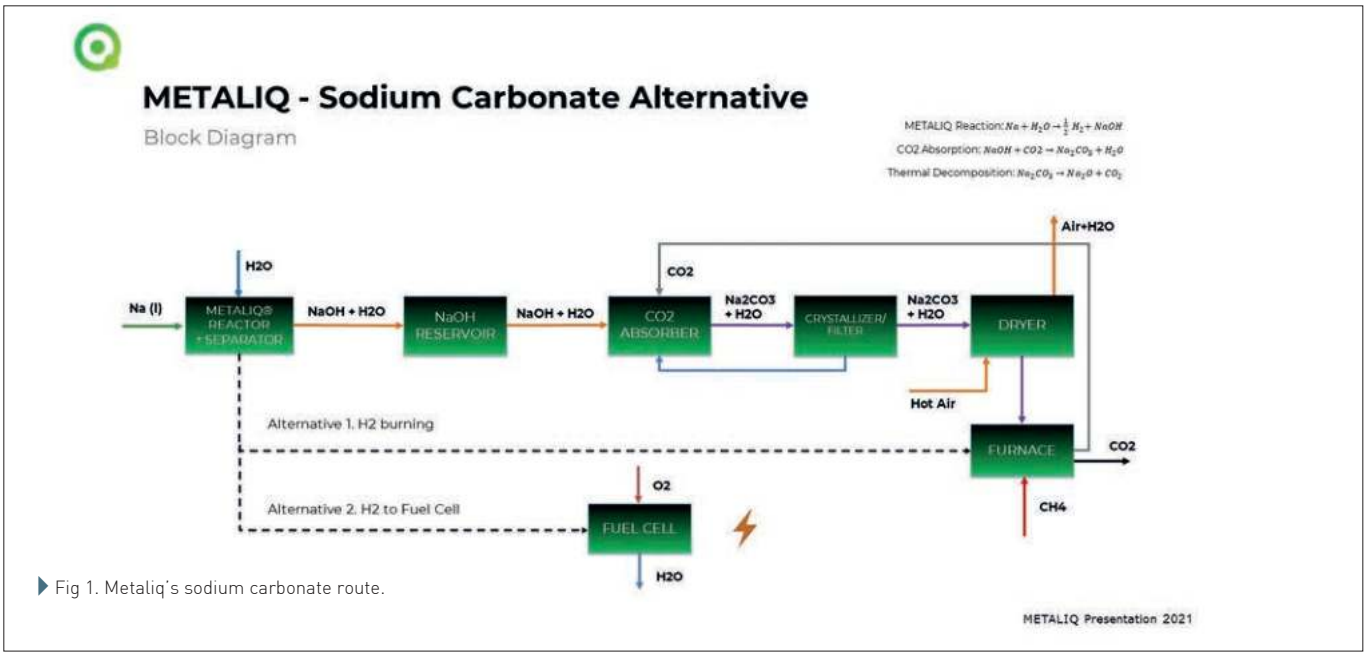

Fig 1. Metaliq's sodium carbonate route.

What is the biggest problem mankind is facing right now?
If not the biggest still definitely one of the top three is the climate change!

What needs to be done in order to stop this or at least slow it down?
Reduce the CO_2 exhaust. Or even better, remove CO_2 from the atmosphere.

We have the technology to do so and it's ready to be used now.

Why do we have that technology?
Because we have hydrogen for free!

Sodium hydroxide removes CO_2 in a natural reaction from glass industry exhausts, if you want. The resulting sodium carbonate is urgently used in Glass industry.

Why do we have this for free instead of having to spend lots of money to create it?
Hydrogen is the waste product of a technology, we invented, to produce NaOH on site, to use it for burning together with natural gas or in fuel cells and you don't have to transport hydrogen anymore, if you're using our technology.

How do we produce Sodium Carbonate on site?
That's thanks to our patented and already working Metaliq Hydroxide Generator, which uses Sodium, water and later, CO_2 too.

Where does Sodium come from?
As Sodium (Na) can be found in almost endless amounts in saltwater from the sea, sea water desalination in the future can be the solution for the urgent need for drinking water.

And the waste, the salt, will be split with electrical energy from the sun into sodium and chlorine, which then would be used for PVC Tubes for transporting drinking water and which is needed in big amounts in chemical industry.

What is Metaliq?
Metaliq is an international patented technology (Escudero, 2014) for the in-situ and on-demand production of green hydrogen for power generation in conjunction with fuel cells or as a substitute for hydrocarbons with complete elimination of the carbon cycle. It is based on the chemical water splitting reaction (CWSR) with alkali/alkaline earth metals (such as Na, Li, Mg, K, etc.) and water.

For industrial applications in glass works, only sodium is used as a raw material. Metaliq (Metaliq, 2021) has applied for further patents on this, focusing on on-demand and in-situ sodium hydroxide production (***Fig 1***).

How will it be realised?
For expansions or adaptations, all plant components are modular, scalable and thus have technical redundancy. This

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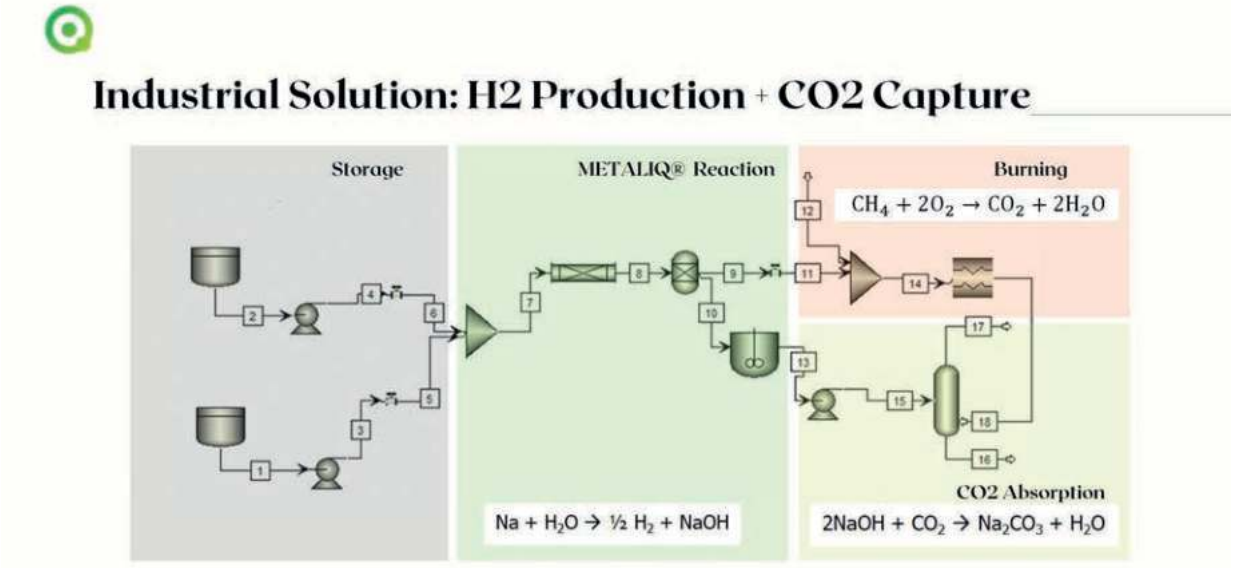

06 Fig 2. Overview of the full cycle.

ensures continuous production.

Why using Sodium?

Applications are well known in nuclear power plants for countless years already. Sodium is the energy carrier from which sodium hydroxide and, as a by-product, hydrogen, is produced without any further energy input.

Unlike gaseous fuels, solid sodium can now be stored indefinitely as a metal and procured at advantageous market prices.

What about Sodium Hydroxide?

Sodium hydroxide is used to capture CO_2 in order to produce sodium carbonate (soda ash) in situ. The special feature of this is that the crystal sizes of the salt can be designed for the subsequent batch.

How does it work?

Hydrogen as a by-product is produced at atmospheric pressure, mild temperatures and without any significant energy requirement and is used to heat the glass tanks by mixing it with the fuel natural gas (***Fig 2***).

Which costs will be less than before?

Because of the low cost of sodium, the cost of soda ash produced In-Situ is also low. The necessary CO_2 is waste from the chimney and free of charge. Due to the reduced consumption of natural gas and the quasi-free hydrogen CO_2 emissions are saved, as are the procurement costs for natural gas.

How much potential does this technology have?

In the next few years, the technology will allow the direct use of sodium hydroxide in batch production, more, soda ash will then no longer be needed. This will eliminate CO_2 emissions altogether. Hybrid plants (heating with natural gas and electricity) can be realised.

Hydrogen, as a by-product, is produced at atmospheric pressure, mild temperatures and without any significant energy requirement and can be used for electricity generation in conjunction with fuel cells.

Do you have more chemical details?

The reaction in equation 1 is carried out safely and smoothly thanks to an advanced algorithm for dosage control and an efficient heat removal system to avoid a temperature rise:

$Na(s)+H_2O(l) \rightarrow NaOH(l)+{}^1/_2 H_2$

The stoichiometric mass ratio is 23 kg sodium and 18 kg water to obtain 40 kg sodium hydroxide, releasing an energy of about 140 kJ/mol Na. The actual performance of the system is excellent, as the yield of the reaction is almost 98%.

In addition to sodium hydroxide (NaOH), 1 kg of hydrogen is produced.

Sodium Hydroxide is really the best CO_2 capturer?

Yes, it is. But the market price is high if you have to buy it. But we are producing it ourselves within the glass plant.

The reactive absorption of CO_2 in NaOH has proven to be an efficient way to retain greenhouse gas emissions in flue gas streams. In fact, the CO_2 capture capacity of NaOH is higher than that of conventional amine-based solvents, such as Mono-Ethanol-Amine (MEA), which is currently almost the only commercial process used in most post-combustion plants.

Do you have some more chemical details?

This simple reaction is used to make soda ash, equation 2. The stoichiometric mass ratio is 40 kg of Na and 44 kg of carbon dioxide, which produces nearly 53 kg of soda ash and water:

CO_2 (g)+2NaOH(l) $\rightarrow$ Na_2CO_3 (aq)+H_2O(l)

The strong binding energy associated with this reaction offers the potential for high CO_2 loads in a wide range of operating conditions and system designs.

What is in summary to say?

Each ton saved Carbon Dioxide produce 1.2 t soda ash and 'Green Glass'. ■

More information

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Promoting healthy packaging

Jane Muncke* explores recent findings on the transmission of chemicals to food and beverages, as well as how glass packaging could a provide healthier and more sustainable alternative to plastics.

Do we truly know what's in our packaging? With around 100,000 unknown chemicals in packaging materials, and only 12,285 known by scientists, there are some fundamental questions which need answering.

Innate materials like glass, reduce the risk of chemical migration, with only a few dozen chemicals present, and, with the work of manufacturers like Encirc, it also offers a sustainable, safer choice for consumers.

However, plastics, paper, and other materials often contain hundreds, if not thousands, of unknown chemicals that could have adverse side effects on both people and the planet. These form from impurities in those chemicals you start with, which react, creating up to 15 further un-intended chemicals which can further react.

What's in our food matters, and a lot of scientific and regulatory effort goes into ensuring that it doesn't contain anything that could be harmful to our health. However, the same level of thought sometimes isn't given to the packaging that contains it. Perhaps this is because we're so used to it being something that protects our food and so don't consider it a source of contamination. This needs to change.

The cost of complexity

The Food Packaging Forum (FPF) is a charitable, not-for-profit foundation created to bring together and communicate knowledge on the effects that food packaging can have on the food inside it.

One of the driving forces behind the creation of the FPF is the determination to uncover the things we don't know, and how any knowledge gap could be having a harmful effect both on the quality of our food and on our health.

The FPF informs stakeholders across the entire lifecycle of food products of the latest developments in scientific knowledge in the field – even if that means just letting them know how much more work there is still to do.

One of the primary goals of the FPF's Food Contact Chemicals and Human Health Project[1] is to track 'chemical migration' – the movement of chemicals from packaging materials into food. It's a broad term and it needs to be considered across the entire supply chain.

We're constantly demanding more from our food packaging, more durability, more functionality and more sustainability, and this means more complex manufacturing processes.

When we increase the amount and diversity of chemicals used in manufacturing, impurities in these

Continued>>

chemicals and unintended by-reactions which take place in the process cause more chemical migration.

This relationship will continue to be significant as long as we favour complex, chemical-heavy materials over simpler ones which emit fewer chemicals such as glass.

Alarmingly, researchers have now identified 12,285 chemicals in packaging materials used today, and there are another 100,000 which remain unknown.

The scale of the issue and the paucity of insight into the nature and origin of these chemicals sits in sharp contrast to a food industry subject to tight quality controls. How would we feel if, when asking what was in our food, came the response "we don't know"?

Tracking chemical migration

We created the Food Contact Chemicals Database (FCCdb)[2] to track and identify the chemicals used to make food packaging and have highlighted 608 as requiring further assessment and substitution for safer alternatives.

Establishing a public knowledge base on which manufacturers, regulators and consumers can make informed decisions is the beginning of our proactive strategy to prevent the migration of harmful chemicals, but the FCCdb is limited to the chemicals we're aware of and which are intentionally used in the manufacturing process.

To build a more comprehensive picture of chemical migration beyond the ones we put there intentionally, we've constructed the Database on Migrating and Extractable Food Contact Chemicals (it's a bit of a mouthful so it's known as FCCmigex for short).[3]

The systematic literature search used to compile the database and identify the chemicals showed that only one-third of the compounds found were previously known to be used in the manufacturing of food contact materials.

Not knowing where the other two-thirds come from, or at what stage they were introduced, presents a substantial barrier to remedying the situation.

Press coverage of the database centres on the potential long-term health effects of the chemicals we can identify, but the novelty of the problem means data on these simply aren't there yet.

The Guardian[4] emphasises just how much of an issue the knowledge gap poses in their reporting. Regulation requires certainty, and it's in search of this certainty that the FPF is going next.

We're currently in the process of gathering information for another database on the smaller number of chemicals for which we do have empirical data and tracking the course of those chemicals from food packaging into people.

The databases are a start; they can help us to better understand how manufacturing processes affect the final product, and increased awareness will help us to eliminate opportunities for contamination. But are we just kicking the plastic bottle further down the road?

Our constant re-engineering of these materials – even with the intention of making them more sustainable – only engenders more potential for chemical migration and creates bigger problems to solve in the future. Most pressing are the effects on health that these chemicals can have, most of which are still unknown.

Microplastics have been found in the lungs[5] and blood[6] of living people and the placentas[7] of unborn babies; it would be naïve to think that a similar investigation wouldn't also find food contact chemicals.

Compounds such as perfluoroalkyl and polyfluoroalkyl substances (PFAS) have also been found in food, which have been linked to various serious health conditions including cancer, liver damage and developmental issues.

An alternative solution

Moving away from materials with a high tendency for chemical migration such as plastic to more inert ones like glass will help break this vicious cycle.

Inert materials don't react with their environment; in the case of glass, the silicon dioxide molecules that make up most of the glass we're familiar with have very strong bonds between them, meaning they do not react with most substances and so don't release chemicals.

It's time to think about whether striving to make more complex packaging materials sustainable is worth it, when simpler, safer ones are readily available like glass and are already environmentally responsible. It's easy to prioritise inert materials when designing food packaging.

Manufacturers like Encirc are at the centre of this, producing and championing the material's sustainability and health benefits.

There are promising signs of progress in other areas of the industry too. SPHERE, a new sustainable packaging framework, includes Chemicals of Concern as a metric and recommends using the Understanding Packaging Scorecard co-created by the FPF and our partners.

We need to expand how we evaluate the performance of our packaging; the Scorecard is a guide to moving away from carbon tunnel vision to a holistic assessment of all the impacts our packaging has.

Frank interrogation will help us to think bigger about packaging solutions that don't involve increasingly complex manufacturing processes with more chemical migration.

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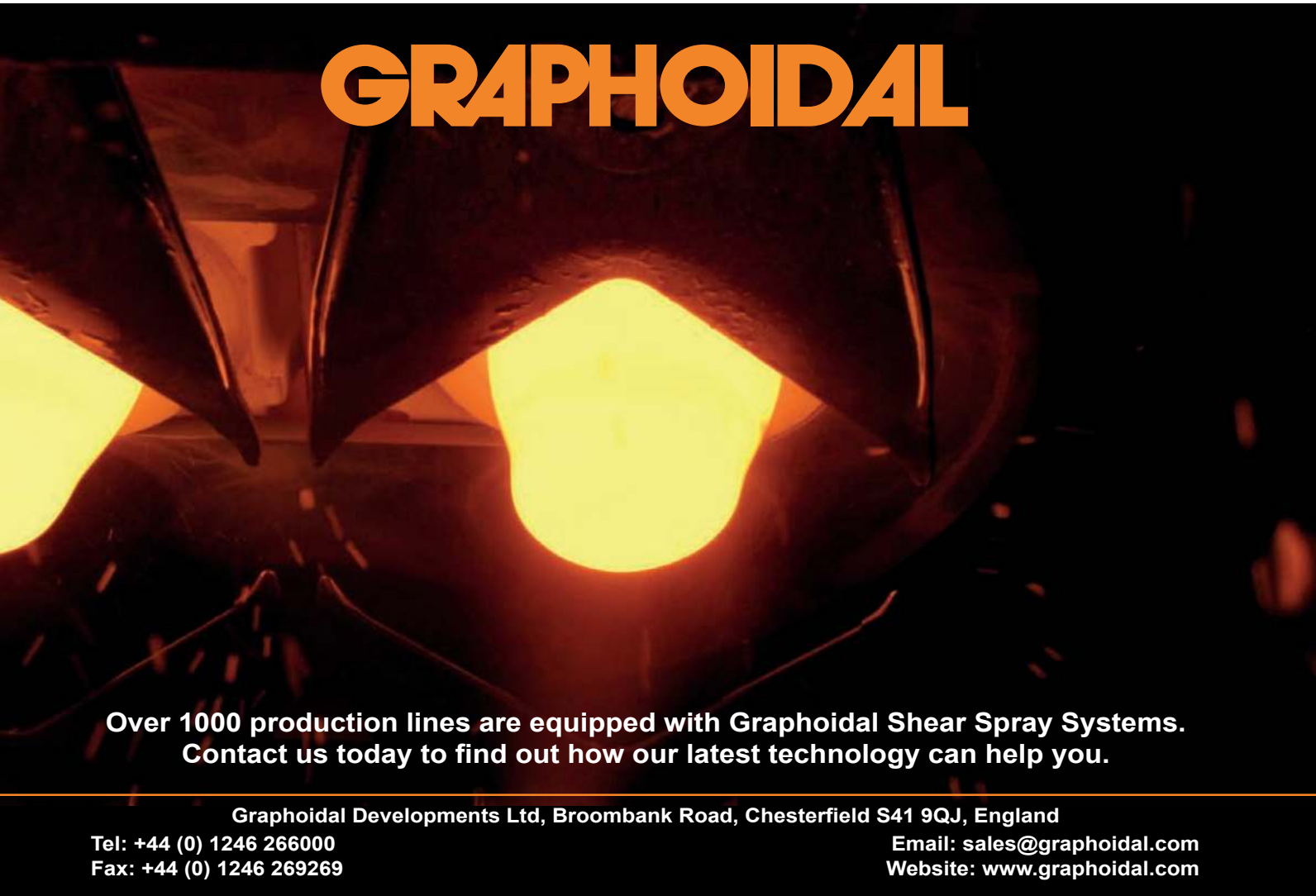

Circular economy

One way forward would be to move away from linear manufacturing processes and prioritise packaging materials which can be re-used without needing to be recycled into a completely new form.

The food and drink packaging industry lends itself well to circular business processes – containers made of inert materials could be returned and re-used, meaning no emissions from disposal and fewer containers produced overall.

Embracing the circular economy equally means an evolution of the role of manufacturers.

A unique property of glass is that tamper-proof digital identification codes can be etched on during production. As a consequence, individual products can be traced right back to their sources; manufacturers can no longer wash their hands of a product once it leaves the factory. Responsibility for the impacts of these products no longer begins at the cradle and ends at the gate, it's time to go cradle-to-cradle.

Creating a circular economy isn't a new goal, especially in the manufacturing industry, but the drive behind efforts to achieve it has primarily had net zero in its sights.

Concerns over the health effects of food contact chemicals are yet to become major voices in this sector, partly due to there being a vast number of different chemicals involved and the diversity of the potential health effects.

The FPF is working to change this by providing the most current information to stakeholders across the sector in a way that is accessible, comprehensible and allows them to make practical decisions. But this still requires stakeholders to work proactively to address food contact chemicals.

With this in mind, we're trying to make the links between the chemicals that migrate from packaging into food, the ones found in people, and the resulting health effects undeniable. We want to present these links in a manner that is accessible to stakeholders and consumers across the sector.

The FPF is constantly working to bridge the gap between science and policy in this area and mobilise regulatory power behind a public health issue of which we could lose control if we remain unwilling to face the damage it causes now and future consequences of inaction.

One of the first things we learn as children is that food can be healthy or unhealthy, and as adults, we have various methods of measuring just where on that scale foods fall – it's second nature.

The purpose of the FPF is to champion this understanding of food packaging; it is part of our food, and it can be unhealthy for both our planet and the people on it.

First, we need to know more, about what's in our packaging, how it was made, and how it affects our health. When we've got the full picture, we can make fundamental changes to how we choose materials and processes, rather than chase incremental improvements which mean bigger challenges in the future.

Let's start eating and drinking more healthily, in every way. ■

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https://www.foodpackagingforum.org/

Encirc, Elton, UK
https://www.encirc360.com/

References:

1. https://www.foodpackagingforum.org/fcch-project
2. https://www.foodpackagingforum.org/fccdb
3. https://www.foodpackagingforum.org/fccmigex
4. https://www.theguardian.com/world/2022/may/19/more-than-3000-potentially-harmful-chemicals-food-packaging-report-shows
5. https://www.theguardian.com/environment/2022/apr/06/microplastics-found-deep-in-lungs-of-living-people-for-first-time
6. https://www.theguardian.com/environment/2022/mar/24/microplastics-found-in-human-blood-for-first-time
7. https://www.theguardian.com/environment/2020/dec/22/microplastics-revealed-in-placentas-unborn-babies

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How glass manufacturers can start the decarbonisation journey

Philippe Kerbois* and Neil Simpson**, Independent Consultant - Simpson Combustion & Energy Ltd, discuss how a glass manufacturer could start the decarbonisation journey to achieve a sustainable solution.

Note: This article is based on the presentation by Philippe Kerbois, and Neil Simpson presented in Istanbul on 18th November 2022 at the 37th Sisecam International Conference.

▲ Philippe Kerbois and Neil Simpson present their paper at the recent Sisecam conference in Istanbul.

While the end goal of decarbonisation may be known, it is key to establish the starting point of the journey in order to ensure that the correct path is taken to achieve a sustainable solution in the glass industry.

Recent container and float glass case studies[1] illustrate how Near Infrared (NIR) In-furnace Thermal Imaging surveys can show the current position. The output provided is best interpreted as a CFD model which can validate a digital twin.

Typically, the initial process is to establish if the furnace thermal profile is optimised for the furnace design. Additionally, in parallel, any refractory hot/cold spots should be identified, and the top of the regenerators inspected. By utilising the patented reflection method, it is possible to show that the 'mirror' is, in fact, a micro-layer of foam which is insulating the heat transfer to the glass. Suppressing this foam can create energy cost savings in the region of up to six figures. By sealing the holes and reducing the parasitic air, operators can save 3-5% reduction in energy, plus a corresponding reduction in CO_2. By starting with the low-hanging fruit, validating models, and defining a path from a known starting point, furnace operators know where they are starting from, even if destinations may change.

In February 2020 Simpson C&E had to cancel a Training Course in Singapore due to Covid. A bespoke online training course for one of the companies who had planned to attend identified that they had a new furnace, but the energy was significantly above budget by several hundred thousand. Due to Covid travel restrictions, engineers couldn't travel to the location. However, the AMETEK Land NIR-Borescope-2K-Glass (NIR-B-2K-Glass) was sent to the location, and Global Field Service Engineer for Glass, Mark Briggs, provided online remote training to the site personnel on how to operate the equipment, while the customer engineering team made the physical measurements. The .erfx file data was transferred to Neil Simpson, who analysed

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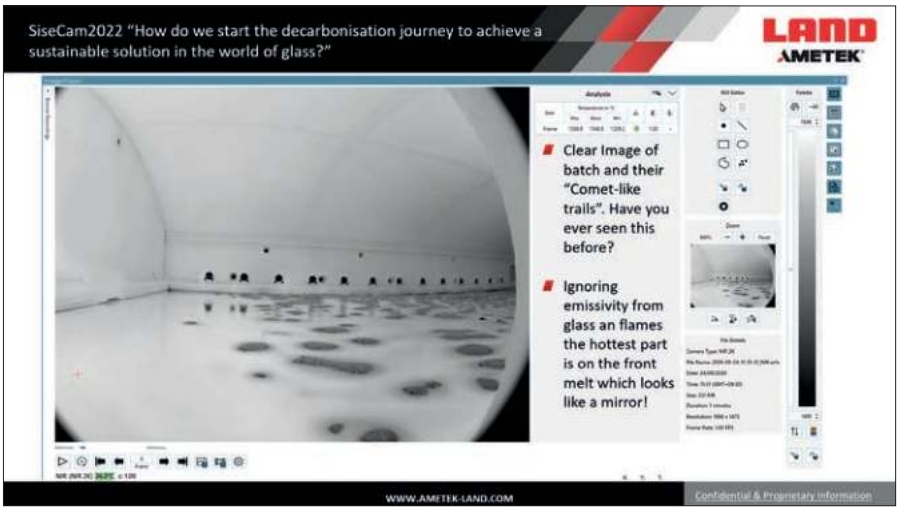
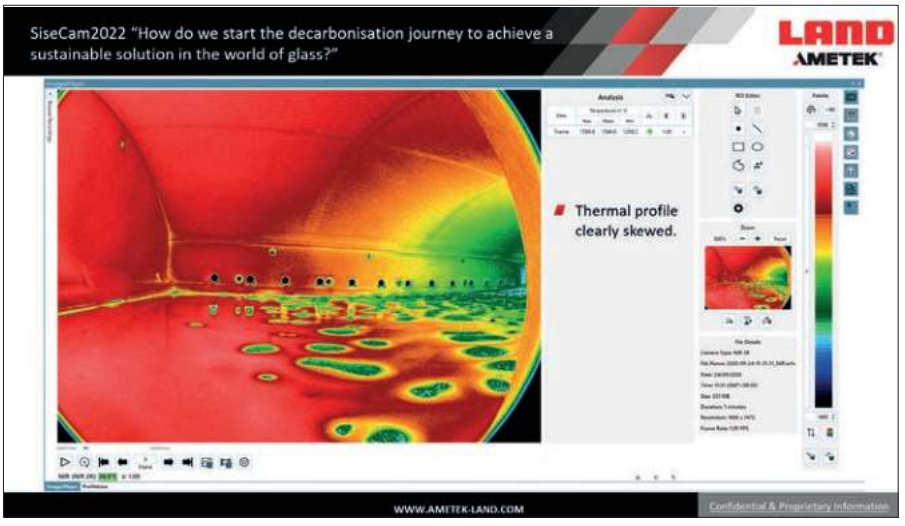


▲ Fig 1. Using the NIR-Borescope to review the peep-holes closest to the bridge wall



▲ Fig 2. Identification of pronounced skewing of the furnace profile.

it remotely in Scotland. There was an opportunity to use the time difference to have an analysis done overnight. By the end of the second day, the majority of the peepholes had been analysed. An initial view of the front melt surface suggested there was an open mirror.

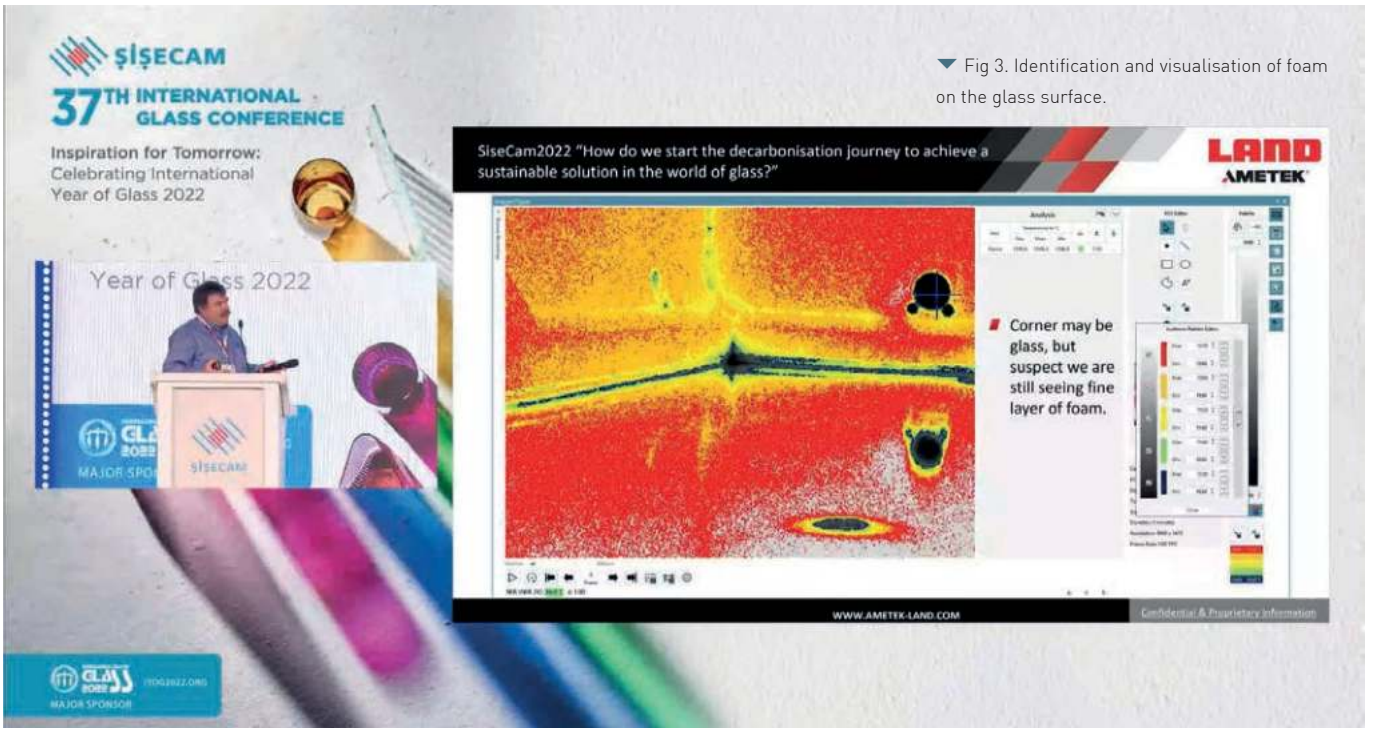
On the third day, the decision was made to make additional measurements on the peep-holes closest to the bridge wall (see ***Fig 1***).

There was a pronounced skewing of the furnace profile (see ***Fig 2***), but this was not sufficient to explain the high energy usage.

More detailed analysis of the images, and specifically the reflection on the glass surface, suggested that the surface temperature was too high to be open melt but was, in fact, caused by a micro-layer of foam which was reflecting the heat and not absorbing it (***Fig 3***).

Through a simple change in combustion, the foam layer was dispersed. The crown temperatures started to drop as the glass temperature started to rise, necessitating a reduction in energy. The budgeted energy and CO_2 were achieved, with hundreds of thousands saved!

This example of using thermal imaging for troubleshooting poses the question of whether we really know how to optimise a furnace. Clearly, a thermal survey can be used as part of the process to identify and fix holes or over-cooling to save energy and CO_2. By optimising flames and the thermal profile to suit furnace



▼ Fig 3. Identification and visualisation of foam on the glass surface.

throughput and improve yield a variance to the budget can be achieved. Permanently installing and integrating temperature data into an Industry 4.0 control system is also a great tool to help train, retrain and retain furnace personnel.

There are many lessons that can be learned from the past. Looking at a YouTube video which was made in 1950 to celebrate the 200th anniversary of making glass in O-I Alloa, UK an operator is seen using a disappearing filament pyrometer which was a forerunner of the Cyclops and the NIR-B-2K-Glass. Perhaps most relevant is the view of the Jubilee Furnace which was fired using on-site producer gas from coal. The gas composition was 55% hydrogen, so it would suggest that 55% H_2 firing will still be possible in the future.

Until 2028, there is the opportunity to recruit and develop process engineering personnel who can benefit from the information provided by the NIR-B-2K-Glass. It will also validate existing CFD models to develop new furnaces for new fuels and oxidant sources to improve yield and energy to reduce CO_2.

When it is understood what works and what the limits of operation are, alternative fuels and new furnace designs can be considered to achieve the 2050 decarbonisation goals.

Questions were raised following the presentation. Firstly, an academic asked if the technology existed to bring forward the 2050 goals to 2030.

The nature of the current furnace operation is to set a furnace life of 20 years in a float furnace which makes the glass industry conservative to change. It is not unusual for it to take up to seven years for a glass company to accept a new technology. Rarely does anyone want to be first to explore new methods.

Overall, new technical solutions will be found, but commercial challenges will likely be greater.

The second practical question was on which locations to consider installing a furnace camera on a float furnace. There are pros and cons for every location. The optimum location may differ from a new furnace to an old one. There is negligible cost to make provision in a new furnace for a camera. It is possible to core drill an AZS refractory block and use the core as a plug for the future. It is easy to justify up to eight or more locations where you can use the NIR-B-2K-Glass. ■

[1] Note: As part of the background case studies, reference was made to the following Glass Problems Conference Papers:

- 2017 – Cross Fired Furnace Optimisation for Record Pull – Through furnace thermal profile optimisation.
- 2018 – End Fired Furnace NOx Emission Reduction – Through flame heat release analysis and regenerator optimisation
- 2019 – Survey Tool and Glass Temp - Not Just a Pretty Picture – By identifying holes in refractory
- 2020 - Supporting Hot and Cold Furnace repairs – By helping to fix the holes and support heat-up and cool-down.
- 2021 – In-Furnace Thermal Imaging Survey of a Float Furnace for Combustion Optimisation.

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Decarbonising regenerative glass furnaces

Ernesto Cattaneo* and Annick Lachance Nyiringango** investigate how operating conditions affect the amount of CO_2 emitted by a regenerative glass furnace, while observing operating costs.

The glass industry contributes significantly to CO_2 emissions - 5% of European production according to European Union Emissions Trading System (EU ETS). Therefore, the industry is committed to participating in the global initiative to reduce them.

CO_2 emissions during glass production originate from two sources and only a small portion comes from batch chemical reactions. The remainder, easily more than 80%, is caused by fossil fuels. They are burned to heat furnaces, due to the high temperatures required to melt the raw materials used to make glass.

Though, in the process of designing a glass furnace, there are many unchangeable boundaries set by production needs which deeply affect the furnace performance, the designer has few but powerful operative leverages.

Several years ago, Stara Glass published an article describing how the process parameters impact the furnace consumption. In the light of the decarbonisation movement, we propose a similar evaluation, focused on the CO_2emission.

In this article, we will explore the influence of operating parameters on the CO_2 emissions, consumption, and operating costs. The parameters will be measured through FurnaceMaster, a software designed by Stara Glass. It allows the designer to precisely define all computing input and collect all the significant output.

Assumptions

For our study, the following consumption costs are assumed:

Fuel cost [€/Sm³]	0.8
Electric energy cost [€/kWh]	0.23
CO_2 [€/ton]	80

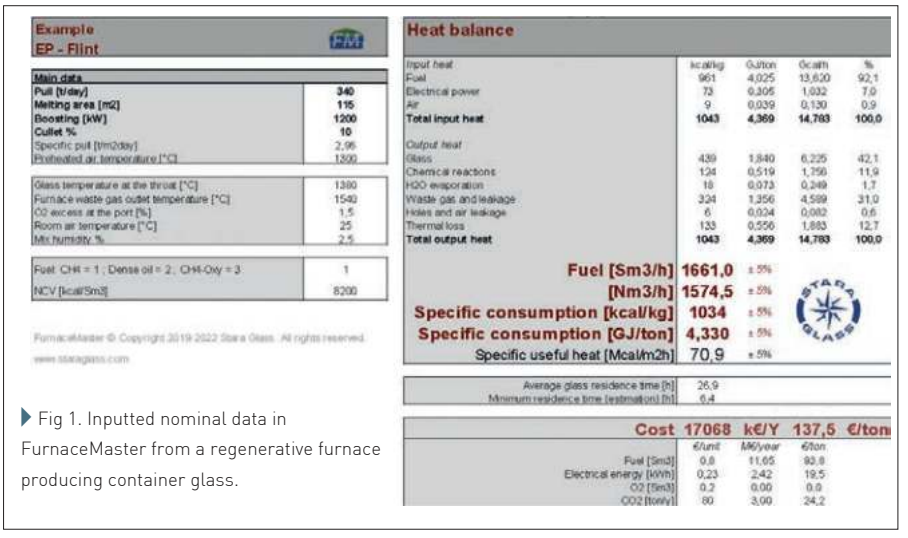


Fig 1. Inputted nominal data in FurnaceMaster from a regenerative furnace producing container glass.

Nominal data

Fig 1 shows inputted nominal data in FurnaceMaster, given a state-of-the-art regenerative furnace producing container glass. Since the glass is white, the cullet is considered to be 10 to 60%.

Studied Parameters

The parameters below (***table 1***) will be individually varied in the analysis; their impact on CO_2 emissions will be evaluated. We will also look at the fuel consumption, specific consumption, and production cost in ***table 2***.

Results

Pull

Figs 2 and ***3*** have been obtained by changing the pull while keeping the rest of the input parameters constant. We assumed the nominal point at 340 tpd and, for the purpose of this article, we did not change the electrical energy utilisation. Such parameters would have been changed in common furnace operational practice.

Results show that the more the pull increases, the more CO_2 is emitted and the more the consumption and operating costs are. Though, at the same time, specific consumption decreases together with quality expectations, which is connected to the minimum residence time rather than to the average, which is steadily defined by pull and furnace geometry.

We therefore observe that, to limit specific CO_2 emissions, we need to use large furnaces at their highest pull.

Oxygen content

Fig 4 considers the oxygen content in waste gas at the port. It shows that the higher the oxygen excess at the port, the higher the CO_2 emitted. Higher oxygen excess also means more consumption and operating costs.

However, the theoretical curve does not consider the following:

- At very low O_2 level, combustion is not complete, and a certain quantity of CO is formed.
- Different levels of O_2 correspond to different waste gas and air volumes.

Continued>>

Input

Parameter	Driver	Notes
Pull [t/day]	Set by the glassmaker based on production needs.	The more stable it is, the more efficient the furnace will be.
O_2 excess at the port [%]	Environment, materials, consumption, and quality.	It is used for balancing undesired productions of CO and NOx.
Boosting [kW]	Investment	It is always useful for quality and capacity but it also increases the production cost
Cullet %	Production and colour.	Remarkably impacts consumption.
Mix humidity %	Production, geographical position, storage method.	Remarkably impacts consumption.
Preheated air temperature [°C]	Available space / design	The higher, the better.

Table 1

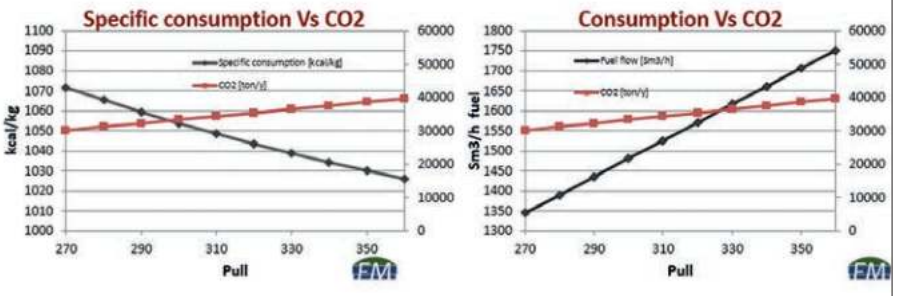
Output

Parameter	Notes
CO_2 Emission [Ton/Year]	It increases with energy consumption.
Gas consumption [Sm^3]	It increases with the pull.
Specific consumption [kcal/kg]	It decreases when the pull increases and with the usage of electrical power.
Production cost [€]	It decreases with a larger utilisation of electrical boosting.

Table 2

Pull [t/day]	Specific consumption [kcal/kg]	Fuel flow [Sm3/h]	€/ton	Specific useful heat [Mcal/m2h]	CO2 [ton/y]	Fuel [M€/year]	EE [M€/year]	CO2 [M€/year]	Total Opex [M€/year]	CO2/Nominal [%]	Opex/nominal [%]
270	1072	1345	144.7	56.1	30108	9.43	2.42	2.41	14.3	80.3	83.5
280	1065	1390	143.4	58.2	31164	9.75	2.42	2.49	14.7	83.1	85.9
290	1059	1435	142.3	60.3	32221	10.06	2.42	2.58	15.1	85.9	88.2
300	1054	1480	141.2	62.4	33277	10.38	2.42	2.66	15.5	88.7	90.6
310	1048	1525	140.2	64.5	34334	10.70	2.42	2.75	15.9	91.5	92.9
320	1043	1571	139.3	66.7	35390	11.01	2.42	2.83	16.3	94.4	95.3
330	1039	1616	138.4	68.8	36447	11.33	2.42	2.92	16.7	97.2	97.6
340	1034	1661	137.5	70.9	37503	11.65	2.42	3.00	17.1	100.0	100.0
350	1030	1706	136.7	73.0	38560	11.96	2.42	3.08	17.5	102.8	102.4
360	1026	1751	136.0	75.1	39616	12.28	2.42	3.17	17.9	105.6	104.7

▲ Fig 2. The table shows what happens to the parameters when the pull is changed.



▲ Fig 3. Results in the graph show that the more the pull increases, the more CO_2 is emitted.

■ The higher the volumes are in the chambers, the higher the heat efficiency will be, but the lower the temperature efficiency of the chambers.

Nowadays this parameter is more under the spotlight for its connection with NOx and CO production rather than for its energy implications, but energy implications are important as well. To contain consumption and CO_2 emission, we have to burn as stoichiometric as possible.

Boosting

Fig 5 shows the effect of increasing boosting from 600 to 2000 kW on the parameters.

The heat coming from the boosting is directly transferred to the glass heating it up with a better efficiency. Therefore, increasing boosting corresponds to decreasing the specific consumption, fuel consumption, and CO_2 emissions.

Some barrier boosting is usually beneficial for the right formation of two opposing convective cells in the glass batch. Nevertheless, overuse of boosting may compromise the correct thermal profile of the superstructure and production itself. Also, an increase in boosting means extra production costs.

While a high boosting decreases a furnace's CO_2 emissions, it has to be kept in account that the average fuel efficiency of a regenerative furnace is about 65%, while an average fossil power plant is 45%. Therefore, unless the electricity used in the furnace comes from renewable sources, more boosting means more CO_2 in the environment.

Cullet

Using glass cullet reduces CO_2 emissions as it reduces furnace consumption considerably. Cullet represents a portion of the glass mix that does not require the heat needed to transform raw materials into glass.

According to ***Fig 6***, using 90% cullet reduces CO_2 emissions by more than half. Less CO_2 is emitted because melting cullet requires less energy.

However, external cullet utilisation is not an option for high quality extra-white glass.

O2 excess at the port [%]	Specific consumption [kcal/kg]	Fuel flow [Sm3/h]	€/ton	Specific useful heat [Mcal/m2h]	CO2 [ton/y]	Fuel [M€/year]	EE [M€/year]	CO2 [M€/year]	Total Opex [M€/year]	CO2/Nominal [%]	Opex/nominal [%]
0	1022	1640	136.2	70.9	37239	11.50	2.42	2.98	16.9	99.3	99.0
0.5	1026	1647	136.6	70.9	37322	11.55	2.42	2.99	17.0	99.5	99.3
1	1030	1654	137.1	70.9	37410	11.60	2.42	2.99	17.0	99.8	99.7
1.5	1034	1661	137.5	70.9	37503	11.65	2.42	3.00	17.1	100.0	100.0
2	1039	1669	138.0	70.9	37602	11.70	2.42	3.01	17.1	100.3	100.4
2.5	1044	1677	138.6	70.9	37708	11.76	2.42	3.02	17.2	100.5	100.8
3	1049	1686	139.1	70.9	37820	11.82	2.42	3.03	17.3	100.8	101.2
3.5	1054	1695	139.8	70.9	37940	11.89	2.42	3.04	17.3	101.2	101.6
4	1060	1705	140.4	70.9	38069	11.96	2.42	3.05	17.4	101.5	102.1
5	1073	1728	141.9	70.9	38355	12.12	2.42	3.07	17.6	102.3	103.2

▲ Fig 4. The table shows that the higher the oxygen excess at the port, the higher the CO_2 emitted.

Boosting [kW]	Specific consumption [kcal/kg]	Fuel flow [Sm3/h]	€/ton	Specific useful heat [Mcal/m2h]	CO2 [ton/y]	Fuel [M€/year]	EE [M€/year]	CO2 [M€/year]	Total Opex [M€/year]	CO2/Nominal [%]	Opex/nominal [%]
600	1045	1743	133.1	75.3	38550	12.22	1.21	3.08	16.5	102.8	96.8
800	1042	1716	134.6	73.9	38201	12.03	1.61	3.06	16.7	101.9	97.9
1000	1038	1688	136.1	72.4	37852	11.84	2.02	3.03	16.9	100.9	98.9
1200	1034	1661	137.5	70.9	37503	11.65	2.42	3.00	17.1	100.0	100.0
1400	1030	1633	139.0	69.4	37155	11.46	2.82	2.97	17.3	99.1	101.1
1600	1027	1606	140.5	67.9	36806	11.26	3.23	2.94	17.4	98.1	102.1
1800	1023	1579	142.0	66.4	36457	11.07	3.63	2.92	17.6	97.2	103.2
2000	1019	1551	143.4	64.9	36108	10.88	4.03	2.89	17.8	96.3	104.3
2200	1016	1524	144.9	63.4	35759	10.69	4.44	2.86	18.0	95.3	105.4
2400	1012	1496	146.4	61.9	35410	10.49	4.84	2.83	18.2	94.4	106.4

▲ Fig 5. The table shows that increasing boosting corresponds to decreasing CO_2 emissions.

Cullet %	Specific consumption [kcal/kg]	Fuel flow [Sm3/h]	€/ton	Specific useful heat [Mcal/m2h]	CO2 [ton/y]	Fuel [M€/year]	EE [M€/year]	CO2 [M€/year]	Total Opex [M€/year]	CO2/Nominal [%]	Opex/nominal [%]
10	1034	1661	137.5	70.9	37503	11.65	2.42	3.00	17.1	100.0	100.0
20	1005	1610	133.0	69.1	35030	11.29	2.42	2.80	16.5	93.4	96.7
30	975	1558	128.5	67.4	32557	10.93	2.42	2.60	16.0	86.8	93.5
40	945	1507	124.0	65.7	30084	10.57	2.42	2.41	15.4	80.2	90.2
50	915	1456	119.5	63.9	27611	10.21	2.42	2.21	14.8	73.6	86.9
60	886	1404	115.1	62.2	25138	9.85	2.42	2.01	14.3	67.0	83.7
70	856	1353	110.6	60.5	22665	9.49	2.42	1.81	13.7	60.4	80.4
80	826	1302	106.1	58.7	20192	9.13	2.42	1.62	13.2	53.8	77.1
90	797	1250	101.6	57.0	17719	8.77	2.42	1.42	12.6	47.2	73.9
95	782	1225	99.3	56.1	16482	8.59	2.42	1.32	12.3	43.9	72.2

▲ Fig 6. The results show that using glass cullet reduces CO_2 emissions significantly.

Mix humidity %	Specific consumption [kcal/kg]	Fuel flow [Sm3/h]	€/ton	Specific useful heat [Mcal/m2h]	CO2 [ton/y]	Fuel [M€/year]	EE [M€/year]	CO2 [M€/year]	Total Opex [M€/year]	CO2/Nominal [%]	Opex/nominal [%]
0.5	990	1585	132.6	69.1	36536	11.11	2.42	2.92	16.5	97.4	96.4
1	1001	1604	133.8	69.6	36776	11.25	2.42	2.94	16.6	98.1	97.3
1.5	1012	1623	135.1	70.0	37018	11.38	2.42	2.96	16.8	98.7	98.2
2	1023	1642	136.3	70.4	37261	11.51	2.42	2.98	16.9	99.4	99.1
2.5	1034	1661	137.5	70.9	37504	11.65	2.42	3.00	17.1	100.0	100.0
3	1045	1680	138.8	71.3	37746	11.78	2.42	3.02	17.2	100.6	100.9
3.5	1056	1699	140.0	71.7	37989	11.92	2.42	3.04	17.4	101.3	101.8
4	1067	1718	141.2	72.2	38231	12.05	2.42	3.06	17.5	101.9	102.7
4.5	1078	1737	142.5	72.6	38474	12.18	2.42	3.08	17.7	102.6	103.6
5	1089	1756	143.7	73.0	38716	12.32	2.42	3.10	17.8	103.2	104.5

▲ Fig 7. The table shows that increasing mix humidity increases CO_2 emissions.

Overall, the higher the cullet, the lower the CO_2 emission.

Mix Humidity

Fig 7 shows the effect of increasing mix humidity from 1.5 to 5% on the parameters.

Increasing mix humidity increases CO_2 emissions caused by increased furnace consumption. This is because the batch mix water absorbs heat to become steam and reach waste gas temperature.

In fact, a covered storage area for raw materials can be a very beneficial investment. A low mix humidity, on the other hand, frequently promotes carry over problems.

Air Temperature

Fig 8 shows the effect of increasing air temperature from 1150 to 1350°C on the parameters.

An increase in air temperature means the reduction of consumption and CO_2. This temperature can be increased at the highest level possible to increase furnace efficiency.

A contemporary melting glass furnace needs a performing heat recovery system.

Glass Temperature

Fig 9 shows the effect of increasing glass temperature at the throat from 1340-1420°C on the parameters.

Increasing glass temperature obviously means more consumption and consequently more CO_2 emissions.

To reduce the CO_2 emitted, this parameter can be maintained at the lowest level possible depending on the type of production and glass colour desired.

Conclusions

Glass furnaces are complex systems. Their performance in terms of energy, environmental performance, and glass quality is dependent on a range of characteristics.

However, there is still room for the designer to affect the reduction of CO_2 they emit. For this transformation to be effective, it is critical to examine the desired glass quality as well as the cost of production.

To achieve decarbonisation, less energy should be consumed.

Among all the parameters that reduce energy consumption, cullet stands out as a parameter that can have a significant impact on the amount of CO_2 released by the furnace; the more glass that is recycled and used in the furnace, the more efficient the furnace is, and less CO_2 is emitted.

In fact, we have a message for glass producers: as humans, we surely prefer to drink our spirits and buy our perfumes in slightly green containers than to aggravate the climate emergency. ■

*Head of Innovation Department,
**R&D engineer for SGRPRO, a Stara Glass affiliate, Stara Glass, Genova, Italy
https://www.staraglass.it/

Preheated air temperature [°C]	Specific consumption [kcal/kg]	Fuel flow [Sm3/h]	€/ton	Specific useful heat [Mcal/m2h]	CO2 [ton/y]	Fuel [M€/year]	EE [M€/year]	CO2 [M€/year]	Total Opex [M€/year]	CO2/Nominal [%]	Opex/nominal [%]
1150	1128	1824	148.1	70.9	39574	12.79	2.42	3.17	18.4	105.5	107.7
1170	1115	1800	146.6	70.9	39277	12.63	2.42	3.14	18.2	104.7	106.6
1190	1102	1778	145.1	70.9	38987	12.47	2.42	3.12	18.0	104.0	105.5
1210	1089	1755	143.6	70.9	38704	12.31	2.42	3.10	17.8	103.2	104.4
1230	1076	1734	142.2	70.9	38427	12.16	2.42	3.07	17.7	102.5	103.4
1250	1064	1712	140.8	70.9	38156	12.01	2.42	3.05	17.5	101.7	102.4
1270	1052	1691	139.5	70.9	37891	11.86	2.42	3.03	17.3	101.0	101.4
1290	1040	1671	138.2	70.9	37631	11.72	2.42	3.01	17.1	100.3	100.5
1310	1028	1651	136.9	70.9	37377	11.58	2.42	2.99	17.0	99.7	99.5
1330	1017	1631	135.6	70.9	37128	11.44	2.42	2.97	16.8	99.0	98.6

▲ Fig 8. The results show that an increase in air temperature reduces CO_2 emissions.

Glass temperature at the throat [°C]	Specific consumption [kcal/kg]	Fuel flow [Sm3/h]	€/ton	Specific useful heat [Mcal/m2h]	CO2 [ton/y]	Fuel [M€/year]	EE [M€/year]	CO2 [M€/year]	Total Opex [M€/year]	CO2/Nominal [%]	Opex/nominal [%]
1330	1008	1616	134.7	68.4	36938	11.34	2.42	2.96	16.7	98.5	97.9
1340	1014	1625	135.2	68.9	37050	11.40	2.42	2.96	16.8	98.8	98.3
1350	1019	1634	135.8	69.4	37163	11.46	2.42	2.97	16.9	99.1	98.7
1360	1024	1643	136.4	69.9	37276	11.52	2.42	2.98	16.9	99.4	99.2
1370	1029	1652	137.0	70.4	37390	11.58	2.42	2.99	17.0	99.7	99.6
1380	1034	1661	137.5	70.9	37503	11.65	2.42	3.00	17.1	100.0	100.0
1390	1039	1670	138.1	71.4	37617	11.71	2.42	3.01	17.1	100.3	100.4
1400	1045	1679	138.7	71.8	37732	11.77	2.42	3.02	17.2	100.6	100.8
1410	1050	1688	139.3	72.3	37847	11.84	2.42	3.03	17.3	100.9	101.3
1420	1055	1697	139.9	72.8	37962	11.90	2.42	3.04	17.4	101.2	101.7

▲ Fig 9. The table shows that increasing glass temperature increases CO_2 emissions.

Making the impossible possible for MRF glass

Ground-breaking machinery can produce the same yield from combined collections as separated, making the 90% recycling target easily achievable, states Tim Gent*.

The UK boasts an impressive glass recycling rate of 68.8% and the glass industry is fully committed to pushing this further by increasing the target to 90% by 2030.

Recycling is positive; it's good for the environment and encourages sustainability but as rates increase so too does demand for good quality cullet for the manufacture of new glass bottles, jars and fibre glass.

When glass is recycled into new glass products, it saves around 246kg of CO_2 emissions for every tonne re-melted while reducing energy consumption and the need for virgin raw materials.[1]

The glass industry agrees that driving glass into remelt is essential and this is a priority in the Glass industry decarbonisation action plan.[2]

When it comes to packaging, glass is the ultimate material; it is incredibly sustainable being 100% recyclable and capable of being re-melted endlessly without any loss of quality.

MRF for remelt

When it comes to the issue of quality, MRF glass is often disregarded by reprocessors for being unsuitable and too contaminated for remelt but as new technology and sorting systems emerge, this no longer needs to be the case.

Glass from comingled collections is mixed with a variety of other materials, compacted, crushed, broken and delivered to the MRF. The process causes heavy contamination with paper, cardboard, metal, heat resistant glass, plastics, toys, ceramics, porcelain just some of the items regularly identified.

At the MRF everything that drops through the trommel (typically 40-50ml mesh) is considered 'glass' although it is often difficult for the naked eye to see any glass in the material at all. Historically this glass would have been rejected by reprocessors ultimately leading it to landfill or aggregate. However, today not only is it possible to use this material for remelt; it is possible to reprocess it to a standard comparable to that expected from clean, separated collections.

▲Tim Gent, Director, Recresco.

The impossible is possible

Innovative sorting and cleaning technology makes what was once an impossible task, possible. Ground-breaking machinery can produce the same yield from combined collections as separated, making the 90% recycling target more easily achievable.

The ability to reprocess MRF glass to this standard is beneficial for both the industry and the environment. It drives more glass into remelt over aggregate, resulting in less waste, fewer carbon emissions and reduced energy consumption. It also solves any issues of material availability for the industry.

Re-melt must be prioritised

The glass industry agrees that re-melt must be prioritised and welcomed the increase in re-melt over aggregate targets for 2021-22 to 72%. By investing in the technology and systems that make it possible for MRF glass to be included in the remelt market, the industry can help meet and even exceed this target.

The evolution of sorting technology makes it possible for glass recycling to enjoy both quality and quantity of material while meeting increased targets and exacting industry standards. Only by considering co-mingled material and investing in the technology to reprocess it effectively in a closed loop system, can glass be considered truly circular.

In terms of recyclability, glass has the ability to deliver a truly circular economy, turning waste glass into new bottles minimising the use of virgin raw materials and benefiting the environment. Recycling glass is one of the many ways we can help reduce pollution and waste. The economic and environmental benefits are obvious but it is imperative that businesses and Government make a firm commitment by educating consumers and investing in the processes and technology that make this possible. ■

***Director, Recresco, UK**
www.recresco.com

[1] www.britglass.org.uk/our-work/recycling
[2]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/652080/glass-decarbonisation-action-plan.pdf

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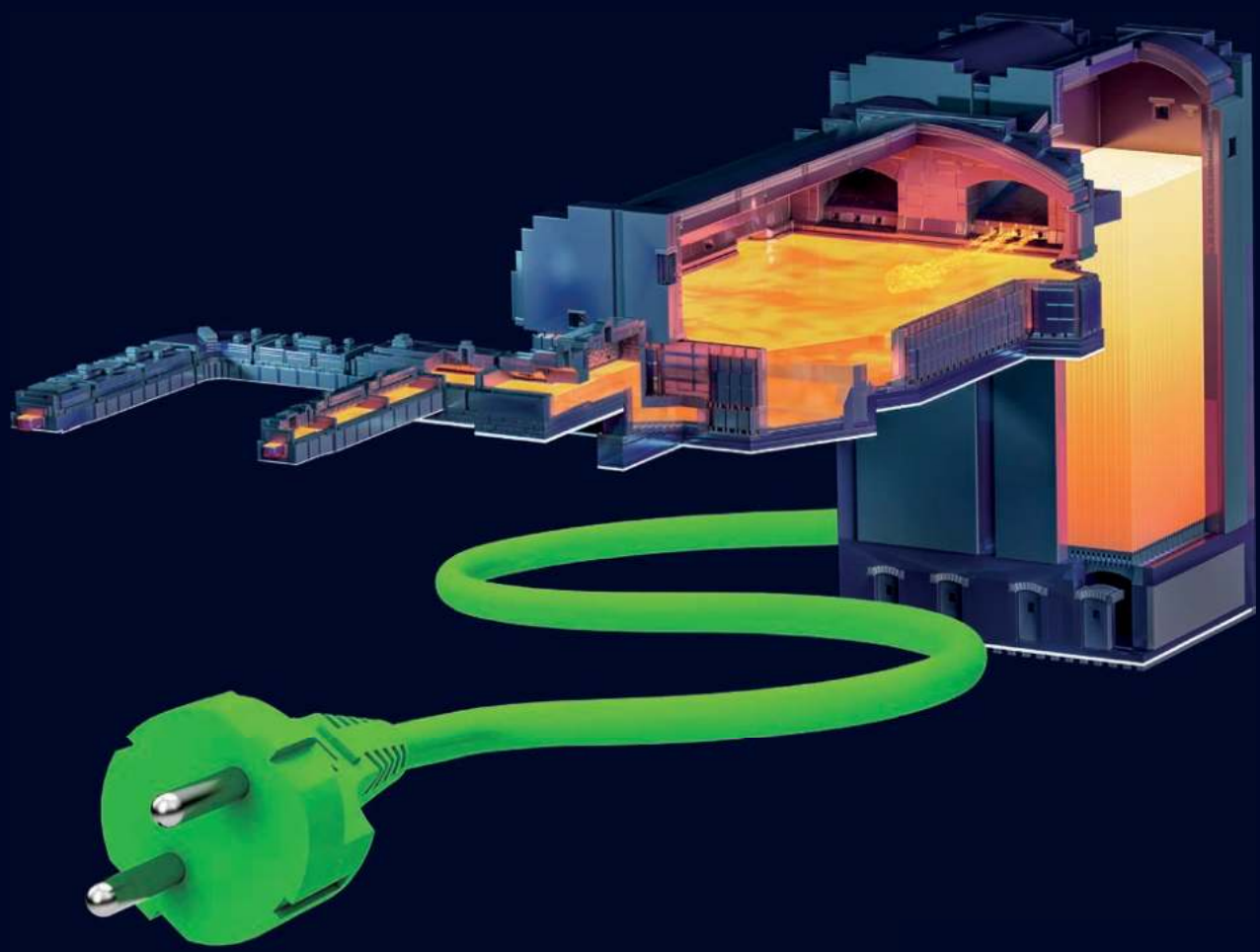

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Indian pharmaceutical investment

SGD Pharma India's Managing Director, Sardar Akshay Singh (below) discusses the company's recent Indian investment.

Glass International- Your company has recently invested in Unit- V in India. Can you share the details of this project? Can you also share the timeline and investment in this unit?

- Investment in Unit 5 started in 2019 and the initial plan was to ramp up the unit in next five years. Due to higher demand in domestic and export market we were able to prepone our investment and fill up the capacity of this new unit in 2022.
- Over the period of 2019 to 2022, we increased our tubular capacity from 250 million pcs to 900+ million pcs.
- The overall investment for this unit is approximately €25 million.

GI: the new unit meant for enhancing your existing production capacity or will it cater to a new sub-segment/s?

- The new unit is meant to enhance our capacity and support our significant growth in the tubular market in India and globally.
- Our mid-term plan is to also diversify into new value-added products that will further boost our customer and product base.

GI: How will this investment benefit your customers?

- This unit will give strong backup to our customers in terms of capacity as the majority of our clients are also increasing their production capacities worldwide.
- This investment has been made to meet the demand for high quality product for regulated markets and wider product portfolio.
- All our machines are fully automatic and are installed with 100% camera inspection technology. The products manufactured from these machines are packed in ISO class 8 clean rooms.
- To support our growing customer needs, we have invested on 21 vial machines, 10 ampoule lines, and 5 HPLC vial lines.
- This split of machines will help us to not only increase volume support but also offer a wider product portfolio to our clients.

GI: Has the investment led to the creation of new jobs?

■ Yes, about 250 employees both direct and indirect are employed of which 40% are female employees.

GI: Were any sustainability elements considered when deciding this investment?

We have focused on different types of vials machines to give flexibility on job changes; these lines are faster and denser productivity-wise which helps to emit lower CO_2/ton.

Apart from this the company has invested on 1MW of Solar panels to generate green electricity and also in-house oxygen generating plant to further reduce the CO_2 emissions.

During this period, SGD PI has planted more than 200 trees in its premises to increase our green cover to 45%.

GI: Can you comment on the role of technology suppliers for this investment?

■ The key components on forming are imported from Italy and for the rest, we have leveraged our in-house R&D and engineering facility to bring robotic handling, control systems and high resolution imaging for complete product inspection.

GI: What would be the overall capacity of SGD Pharma in India, post this expansion?

■ The overall capacity of SGD Pharma India would be more than 1.25 billion pcs/year of which 350 Million pcs/annum is of Type 1 moulded glass and 900+ million pcs/annum for tubular vials and ampoules.

GI: SGD Pharma's focus has been on Type 1 glass pharmaceutical products. Do you plan to diversify into lower grade of pharmaceutical glass in future?

■ SGD Pharma India's focus has always been on Type 1 glass in both moulded and tubular.

■ As for Type 2 and Type 3 glass vials, SGD has facilities in France, Germany and China to cater to the global needs including India.

GI: You have recently upgraded one of the furnaces at the Vemula plant. Can you share the expansion details?

■ Our furnace has gone through a regular process of repair in 2022 for which the overall cost was about €5 million.

GI: What is the total market value/ volume of total pharmaceutical container glass industry in India?

Our estimate of total market of pharmaceutical container glass industry in India is approximately €450 million.

SGD Pharma, France
https://www.sgd-pharma.com/

Marposs celebrates its 70th anniversary

Marposs has grown from a small company in Italy into a global supplier for glass container manufacturers, among other industries. Eleonora Bordini* discusses the company's past and its expansion into new markets.

Marposs was born from an idea: the production and sale of an innovative electronic device for in-process measurement during grinding.

Ten years after its foundation, the company's founder Mario Possati opened Marposs's first foreign branch in Germany.

In the early 1960s, operations were launched to provide technical and after-sales support in other countries, including Switzerland, Sweden, France, the United States and Canada.

The year 1970 marked the opening of Marposs to the Asian market, through the establishment of a Japanese office, followed by Korean and Chinese offices.

Since 2000, Marposs has embarked on a programme of acquisitions, with the aim of expanding its product portfolio. Acquisitions are directed towards strong, highly specialised companies to establish competence and production centres.

Today, the company is present with more than 80 offices in 34 countries with competence centres and production facilities worldwide.

▲ Marposs headquarters in Bentivoglio, Bologna, Italy.

New markets

Marposs is a market leader in measurement, inspection and testing, providing advanced solutions for quality control in the production environment of many different industries.

Its President said: "Marposs is successfully managing the major changes taking place in mobility technologies, accompanying major car manufacturers in the transition to electric mobility."

However, Marposs' portfolio is not limited to the automotive sector, but also includes solutions for the aerospace, biomedical, consumer electronics, glass and semiconductor industries.

New sectors for new ambitions, making this 70-year anniversary not only a milestone, but also a starting point for a future in which acquisitions will have an increasingly strategic role.

Managing Director Alessandro Strada said: "We have a set of objectives under consideration. Healthy companies with a good balance sheet; we are looking for companies that make strategic and complementary products to those we make that, i.e., allow us to enter new markets.

"These companies could use our commercial network to expand in the market. In addition, we are carrying out innovation projects: the idea is to integrate start-ups into the group, in order to acquire a particular technical know-how that we do not yet possess."

One of the strategic sectors on which the company is counting for its growth is glass packaging.

Marposs has been providing measurement solutions to the glass industry for over 20 years, both for the flat glass/automotive industry and for glass containers used as primary packaging.

Solutions for glass containers measurement include fully automatic or semi-automatic systems for installation in the quality control laboratory or close to the production line.

The solution with the highest level of automation is VisiQuick.

Continued>>

> “The strengths of Marposs that our customers appreciate are deeply rooted in the company’s culture”
>
> **Eleonora Bordini, International Industry Manager - Glass Packaging**

VisiQuick

VisiQuick is a fully flexible measuring system with automatic handling (***Pic 1***). It can integrate one or more measuring modules:

- External dimensions.
- Weight and pressure.
- Internal diameter and profile.
- Wall thickness.
- Profile of the labelling area (with a patented Marposs optical system).

Thanks to the patented labelling area profile measurement system, it is possible to detect and measure indentations and bumps in the labelling area, which can cause creases or bubbles when applying the label.

The VisiQuick is also available in a multi-conveyor configuration, to measure different batches of items without the presence of the operator. This solution guarantees the shortest return on investment.

▼ Perfumery containers measured on the VisiQuick machine.

Downstream of the VisiQuick, it is possible to add a machine to perform additional controls such as internal volume measurement or burst test.

Marposs can also provide solutions with a lower level of automation.

VisiQuick-mini is a semi-automatic system, with manual loading and unloading, for measuring external dimensions and, optionally, weight.

It is a compact solution, suitable either for the quality control laboratory or for installation close to the production line, to replace all external dimension gauges.

Both solutions (VisiQuick and VisiQuick-mini) are flexible and can measure any type of glass container, regardless of its shape, colour and use (e.g. food and beverages, perfumery and cosmetics, pharmaceuticals), without having to change stations.

Other products for glass containers are under development. Please see the link below for more information on Marposs’s solutions for the glass packaging industry.

Marposs today

Marposs is active in the glass packaging industry with a strong background, know-how and experience in metrology, gained through a long relationship with the automotive industry setting standards in quality control. The company has:

- A deep knowledge in the field of measurement.
- Reliability and technical integrity.
- Customer focus.
- Good after-sales service.

The company’s solutions use modern technologies and leverage the know-how and experience of all Marposs Group companies.

The company’s approach is to listen to customers and, based on the information gathered, to find solutions that not only meet the needs of a specific customer, but also solve a unique or novel problem, sometimes encountered by many potential customers in that market.

Eleonora Bordini, International Industry Manager - Glass Packaging, said: “The strengths of Marposs that our customers appreciate are deeply rooted in the company’s culture.”

Marposs does not design custom solutions, but flexible products that can potentially be supplied to all glass container manufacturers. It wants every new product to become a success and a reference in its field.

More than 200 service engineers are present in Marposs branches around the world, close to customers and speaking their language, ready to support them. ■

*** International Industry Manager for Glass Packaging, Marposs, Bologna, Italy**
https://www.marposs.com/eng/application/pharma-and-food-industry-bottles-and-glass-containers

The benefits of AI in glass inspection

Jean Luc Logel* explains how Iris Inspection machines' pioneering use of AI technology is bringing lower costs and higher satisfaction to glass makers around the world.

Many people talk of Artificial Intelligence as the future. Not Iris. AI is already an operational reality in everything we do. We pioneered the technology in our EVOLUTION NEO range which launched in 2018. We are now leaders in this technology with 10 operational lines in glass plants across the world.

At its heart, this technology increases repeatability and inspection accuracy, while offering a detailed defect classification into more than 30 defect categories. Artificial Intelligence allows a simple set-up for a fast job change with limited fine-tuning time.

Mainstream technologies rely heavily on the knowledge of cold end operators to identify what is a defect and what is not. EVOLUTION NEO AI, with embedded Artificial Intelligence, is able to detect and recognise a defect, while the operator decides solely on its size. Vitally, AI also provides accurate information about the defect itself, its origin and criticality level.

Yet, AI does not downgrade the role of the operator. On the contrary, it frees them to do what only the human eye and hand can do. It also improves their working conditions, something that is vital as glass makers compete for labour with other advanced engineering sectors.

All glassmakers know that no production run ever replicates the last exactly. That means inspection parameters must also differ each time. EVOLUTION NEO AI offers a multitude of different configurations which learn and evolve to match each job change.

Very similar defects often have different root causes and, most importantly, may have different levels of criticality for each customer. Inspection technology which differentiates automatically between inclusions, grease spots, surface blisters and hard blisters not only gives valuable information for the production experts but also ensures the rejection of those defects deemed critical.

▲ Evolution 16 and Evolution 5 powered with Artifical Intelligence.

The goal is improved production efficiency and, a hugely topical subject for all glassmakers, reductions in energy consumption. From an operational perspective, pack to melt is the key to efficiency and is based on three factors – repeatability, reliability and accuracy. AI from IRIS does not simply reject defective bottles, it helps anticipate and prevent future errors, boosting your Pack to Melt ratio.

The EVOLUTION NEO AI range

The Iris range of AI enabled inspection machines consists of the EVOLUTION 12 NEO for sidewall and EVOLUTION 5 NEO for finish and base. Thanks to AI, both are easy-to-deploy for an immediate efficiency, even for an unexperienced operator. Training is a key part of the Iris installation and service package.

EVOLUTION 5 NEO AI is a fully automatic machine for base, finish, base stress inspection and mould number reading. Operating with embedded artificial intelligence, it offers an accurate defect classification.

It also has other advances. If machines use standard optics, base inspection is restricted with some items, such as those with longnecks, flasks or cosmetic flacons. Iris has developed a dedicated wide-angle lens which allows users to inspect the complete base despite the large difference between finish and base diameters.

Furthermore, each inspection module is equipped with motorised high-definition cameras with automatic repositioning to secure repeatability and independence from human error. Without any mechanical and optical adjustments, all parameters are set through the machine interface. The latest generation of LED light sources ensures lighting from several angles to obtain a better image for inspection.

EVOLUTION 12 NEO AI performs a similar job for sidewall, stress and geometry inspection. It has a unique optical design to detect standard and low contrast defects through 360 degrees with all shapes and colours of glassware. It can detect and inspect up to six different articles simultaneously in a multi-gob production process.

These machines are augmented by a revolutionary new tool – the IRIS iBOT – which can monitor every inspection machine on each production line, around the clock. It uses this data to improve their settings and optimize the fine-tuning, just like an expert operator would.

Continued>>

▲ Evolution NEO AI provides accurate information about the defect itself, its origin and criticality level.

iBOT can also predict defects and alert the hot end to avoid producing future defects which may be section, mould or machine related.

Engineers can view all the data remotely via the Iris web app or a glass factory's MES.

Compatible with all EVOLUTION machines, iBOT is totally autonomous, alerts users in real time and can also be connected to the company's internal information system.

Universal compatibility and future-proof inspection

Although Iris is the pioneer of AI in the inspection realm, we are keen to spread its impact as far as possible. Therefore, we have designed our machines with total interoperability. It is not quite open source, but the next best thing. EVOLOTION NEO machines are compatible with all other inspection machines, with all plant MES systems and with all IS machines suppliers thanks to our use of standard communication protocols.

The purpose of our interoperability and openness is to allow a closed loop with production in a smart factory. Thanks to AI-based algorithms, data on every bottle is stored and analysed, enhancing the opportunity to predict systemic defects.

Our machines adapt too. We named the line EVOLUTION because their modular structure and AI enabled features evolve through time and never become obsolete. All existing IRIS machines can be upgraded with software and hardware innovations developed by our in-house experts. And they learn as they work, reducing dependence on human intervention. As a result, our customers benefit from cutting edge inspection technology during the whole lifetime of their EVOLUTION machines.

At Iris, we know the future of AI enabled glassmaking is already here. ■

***Managing director of IRIS Inspection Machines, Bron, France**
https://www.iris-im.com/

PENNINE®

INDUSTRIAL EQUIPMENT

GLASSMAN EUROPE 2023

8-9 February 2023, Istanbul, Turkey

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CONFERENCE PROGRAMME

WEDNESDAY, FEBRUARY 8 – MORNING KEYNOTE SESSION

10:30am
Tolga Uysal, Director of Melting Technologies and Engineering, Sisecam, Sustainable Glass Manufacturing

10:50
Dr Abdullah Gayret, General Manager, GCA

11:10
Mr Cetin Egri, Deputy General manager, Park Cam, A general view of Park Cam and its decarbonisation work

11:30
Mr Muhammed Yalçınkaya, General Manager, Basturk Cam, Bastürk Cam's New Investment and Its Contribution to Its Customers and Environment

11:50
Dr Abdullah Gayret, General Manager, GCA and FEVE Board member, The Future of Packaging – Glass: fit for the future?

12:10 Efe Çaglayan, Environmental Sustainability Manager, Glass Recycling and a Producer Driven Recycling System for Glass Packaging in Turkey

WEDNESDAY FEBRUARY 8 - AFTERNOON -

ADVANCING THE GLASS MANUFACTURING SECTOR

14:00
Dr. Sebastian Woltz – Sales Director; EME, and Matthias Haas – Associate Sales Director; Nikolaus Sorg, The Power of 3 – SORG GROUP – Single Source for the Hot End.

14:20
Steve Whettingsteel, CEO & Managing Director, Krysteline Technologies, Developing a Sustainable Glass Recycling System

14:40
Mr Hasan Copur, Associate Director-Soda Ash, Chemical Market Analytics, Global Outlook for Soda Ash

15:00
Thomas Sauer, President & CEO, Exxergy, A novel method improving the mechanical strength of glass

15:20
Ulas Topal, CEO, Vertech, Digitalization and data - the key to success for glass industry

15:40
Daniel Hilfiker, Owner, Pneumofore, Compressors and Pumps for Hollow Glass


Çetin Egri, Park Cam


Muhammed Yalçınkaya, Basturk Cam


Dr Abdullah Gayret, GCA and FEVE


Hasan Copur, Chemical Market Analytics


Gianluca Cera, BDF Industries


Stuart Hakes, FIC UK


Andrew Reynolds, Fives


Steve Whettingsteel, Krysteline Technologies

GLASSMAN EUROPE 2023
8-9 February 2023, Istanbul, Turkey

THURSDAY FEBRUARY 9 – MORNING -

ENERGY SAVINGS FROM GLASS FURNACES

10:30
Mr Stuart Hakes, Managing Director, FIC UK, The future of Glass Furnaces in a decarbonised world

10:50
Mr Gianluca Cera, Melting, Energy & Automation Manager, BDF Industries, Data collection to implement energy-saving strategies

11:10
Andrew Reynolds, Business Development Director, Fives Stein, All-electric melting technologies on the road to decarbonization

BREAK

11:50
Mr Mike Davies, Managing Director, TECO, Decarbonisation & how it affects TECO Furnace design

12:10
Philippe Kerbois, Global Industry Manager – Glass, Ametek Land, Combining IMAGEPro Glass with NIR-B-2K Thermal imaging to Improve Your Carbon Footprint and Reduce NOx Emissions in Glass Furnace Applications

12:30
Neil Simpson, Consultant and Managing Director, Simpson Combustion Ltd, How much CO_2 are glass furnaces producing and why you may want to measure?

12:50
Andries Habraken, Segment Leader Process Optimization and Oscar Verheijen, Segment Leader R&D and GlassTrend Chairman, CelSian, Energy Balance Simulations to Quantify Energy/Cost savings

Neil Simpson, Simpson Combustion

Philippe Kerbois, Land Ametek

Daniel Hilfiker, Pneumofore

Sebastian Woltz, EME

Mathias Haas, Sorg

Ulas Topal, Vertech

EXHIBITOR LIST

COMPANY NAME	STAND
A151 SRL	R1
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Agr International	G18
All Glass	E5
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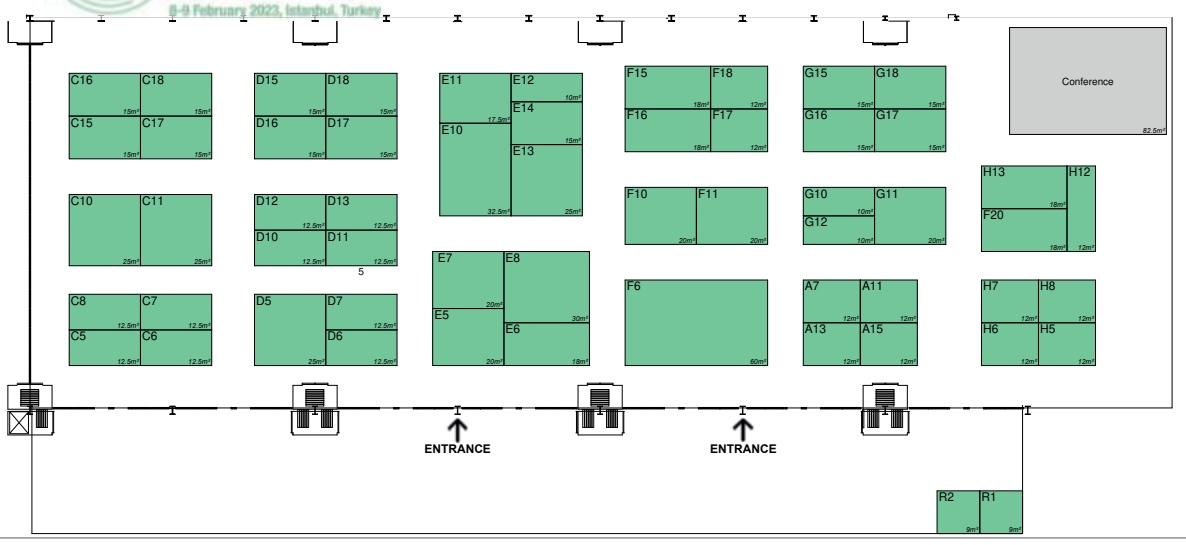
Chovet	H6
Commersald Impianti SRL	C17
Condat SA	H8
Electroglass Limited	A7
EME GmbH	H13
EMS Group S.p.A	F16
F.I.C. (UK) Limited	E6
Falorni Gianfranco SRL	C10
Fama	E10
Fermac SRL	D17
Fives c/o Fives Stein Ltd.	H7
FlammaTec, spol. s r.o.	E6
Flokontrol	C15
Fonderie Valdelsane S.p.A	D16
Forglass Sp z.o.o	E8
Futronic GmbH	A15
Gallus Ferd Rüesch AG	F18
Glass Global Group	R2
Glass International	
Glass Service, a.s.	E6
Glassworks Hounsell Ltd	D7
Heye International GmbH	D15
Horn Glass Industries AG	F10
Hotwork International AG	F20
Iris Inspection Machines	D18
Isimat	H5
Koenig & Bauer Kammann GmbH	F17

COMPANY NAME	STAND
Lattimer Limited	C18
LWN Lufttechnik GmbH	F15
MEGA ENTERPRISE	E14
Mimsan	F6
Olimerk	E11
Olivotto Glass Technologies S.p.A	E11
OMCO International NV	D5
Pennine Industrial Equipment	D6
Pneumofore	A11
Ramsey	G16
Rath AG	H12
Refmon Co. Ltd	D11
Renold Zincir Sanayi ve Ticaret A.S.	C6
Rondot Group	C11
ROSS EUROPA GMBH	C7
SATINAL S.P.A	D17
Sigma Group	D13
SIMAT GmbH Siebdruckmaschinen	H5
Sklostroj Turnov CZ, s.r.o	C16
Socabelec	G10
Sorg Group	H13
System Res SARL	E12
The Teco Group	G17
TKS International GMBH	E7
TME Engineering	C5
TotalEnergies Marketing USA Inc	C8
Vertech'	A13
Vetromeccanica SRL	G12
Waltec Maschinen GmbH	G11
XPAR Vision	D12
Zippe Industrieanlagen GmbH	G15
Zuccato Energia	D10

The list of exhibitors is correct at the time of printing



GUIDE TO EXHIBITORS

A151 SRL

Stand R1
Via Antonio Gramsci 57, Italy
SOCIAL MEDIA
https://www.linkedin.com/in/glass-industry-network-533182108/
A151 is the publisher of the international magazine Glass Machinery Plants & Accessories, of the annual Glass Industry Directory and of www.glassonline.com.

AGC Ceramics

Stand E7
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AGR INTERNATIONAL

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SOCIAL MEDIA
https://www.linkedin.com/company/agr-international-inc/
https://www.youtube.com/@AgrInternational
Agr International, Inc. offers a broad line of products and services specifically designed to help bottle manufacturers around the world produce high-quality containers while improving efficiencies, reducing costs and contributing to the responsible management of resources. Whether the need is for specialized testing equipment to support the quality of production efforts; a certified, independent laboratory to supplement your testing program or the assistance of expert consultants to better manage container filling and packaging related problems, Agr has a range of products and services that are uniquely designed to fit the needs of glass bottle manufactures as well as brand owners. Agr's product offerings for the glass industry consist of a broad array of equipment for the production line and the laboratory including on-line thickness management systems, automated gauging and sampling systems as well as an extensive line of laboratory products for coating measurement, pressure testing, strength testing, volume measurement, and dimensional gauging. Agr's American

Glass Research division offers a host of specialized consulting, training, and analytical services for glass packaging. Experts from the American Glass Research division work with container manufacturers and fillers to lightweight and optimize containers, improve quality and productivity, as well as provide specialized testing services and training to industry personnel worldwide. Agr International is a fully integrated supplier, from conceptual design to engineering, manufacturing, installation, training and support. Agr maintains worldwide operations with its headquarters in Butler, PA USA and worldwide satellite offices. Additional information can be found at www.agrintl.com .

ALL GLASS

Stand E5

Costantino Pecciarelli
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SOCIAL MEDIA
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https://www.facebook.com/AllGlassSrl/videos/
https://www.youtube.com/watch?v=QJy8gXKCzjc
https://www.instagram.com/allglasssrl/

All Glass Italy: Leadership in cold end conveyors and palletisers. Today, All Glass is recognised as a worldwide leading supplier of conveying lines and palletisers in the cold end of the glassworks industry. The numerous references in such installations for the most important international glassworks allowed All Glass to make a name for itself as reference partner in this sector. In last years, all the most important glassworks chose All Glass gaining a full satisfaction in terms of excellent performance, efficiency and service. Considering that the production of glass furnace never stops, in its machinery All Glass uses first-class components and long-term tested elements only. All Glass technical structure is organised to guarantee a constant assistance during all the steps of design, assembling and start-up and to assure a prompt after-sales support during the maintenance periods. Making use of consolidate synergies. All Glass is the ideal partner to entrust the service of complete engineering for turn-key new solutions and for retrofits or relocation of existing installations. The keys of All Glass team's success are the constant research in direct symbiosis with clients to develop taylor-made customised solutions and the natural bent to after-sales assistance and support, which makes All Glass be the ideal partner in terms of performance.

BDF Industries S.p.A

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Since 1906 BDF industries' nature and passion are the development and integration of complex technologies to help industrial progresses. Global market needs multi-tasking, multi-cultural and multi-competence approach. BDF Industries thanks to its synergic strategy, gives to the modern industry the possibility to overtake the techno-gap, as required today in its activities. The collaboration instinct of BDF Industries and the seriousness it has been demonstrated over 110 years of tradition offers to our worldwide customers, "our Family", the possibility to be part of the top technological group willing to challenge present and future business opportunities in terms of competitiveness, performances and reliabilities of products and processes. BDF Industries ranks among the four largest suppliers of engineering solutions and equipment to the glass industry worldwide: it is the sole player in the hollow glass market able to offer turn key plants from the engineering to the maintenance service. BDF Industries is an EPC company of plants and equipment, from food & Beverage to perfumery and pharmaceutical products. BDF Industries operates through three product lines focused on different activities as forming, melting and automation.

CHOVET

Stand H6

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Website: https://www.chovet-db2i.com/
SOCIAL MEDIA
https://fr.linkedin.com/company/chovet-db2i?original_referer=

CHOVET is a specialist industrial engineering company with an international presence, structured to carry out EPCM (Engineering, Procurement and Construction Management) and EPC (Engineering Procurement and Construction) projects in the fields of glass, cement, and industrial minerals and materials industry.

COMMERSALD IMPIANTI SRL

Stand C17
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Commersald Impianti is a leading Company in the production of welding machines, welding robotised equipments and complementary welding products based on the P.T.A .(Plasma Transferred Arc) process. Born as a branch of Commersald at the end of the 90' the company asserted itself rapidly in Italy, in Europe and all over the world obtaining extraordinary results. Commersald Impianti's success is owed to an extremely high form of specialization in the development of P.T.A welding with powder, obtained through constant investment in research and innovation added to prior experience coming from the Commersald Group as well as the ability to re-interpret the tradition of business in a new production-orientated company, with a high technological content. Almost all production is internally manufactured by Commersald Impianti itself, starting from machinery design to software programming, and ending off with the installation of the plant itself in the client's workshop. This way the company guarantees the total quality control of each component, as well as top customer service reliability. The Commersald Impianti technical service intervenes on-site directly from Italy throughout Europe, and through a network of qualified collaborators.

CONDAT SA

Stand H8
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https://www.youtube.com/@CONDATLUBRIFIANTS

Condat is an independent company with international presence, specializing in the field of industrial lubrication. For over 160 years, it has adapted its products to the specific needs of each market (drawing, cold heading, metal working, glass industry...) and has developed a wide range of soaps, greases, oils,... CONDAT lubricant range is recognized on the glass industry market, in particular for its wide range of lubricants. The company covers all glass processing needs, from glass container, flat glass to optical glass. It offers among others: shear spray oils, scoop oils, delivery coatings, graphited varnish for mold lubrication, graphite and graphite-free Swabbing mold compounds, IS machine maintenance oils and also float cutting oils, coolants cutting oils, flocculants for water treatment. CONDAT provides also lubricants for the maintenance of equipment such as hydraulic oils and greases, and suitable equipment to ease implementation of lubricants such as dosing equipment. On Glassman Istanbul Show, CONDAT company will exhibit with its local partner in Istanbul: Lubpart company / Baris MUSKARA / Téléphone : (90) 216 999 96 86

ELECTROGLASS LIMITED

Stand A7

Richard Stormont
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Email: info@electroglass.co.uk
Website:http://www.electroglass.co.uk/
Electroglass is an independent specialist in all-electric glass melting, conditioning, electric boosting and related systems. All Electric Furnaces ranging from 200kg to over 250 Tonnes/day provide operating economy and glass quality assurance. High efficiency Convection Current Control Boost systems improve furnace pull and glass quality and enable significant tonnage increases with simultaneous reductions in electrical consumption. All Electric Forehearths for both volatile and non-volatile glasses offer substantial energy cost savings compared with other all-electric and gas-fired designs. Electroglass high quality, insulated, water-cooled electrode holders are available for horizontal and vertical applications. Based in south east England we offer world-wide service to our customers in all five continents with local representation in many regions.

EME GmbH

Stand H13

Member of SORG Group

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SOCIAL MEDIA
https://www.linkedin.com/company/eme-gmbh
https://www.youtube.com/channel/UCul7q2mpnH9ch5cAOY6v2fw
EME is a world-leading batch and cullet treatment systems specialist. After more than a century of improving batch plants using the best technology available, we are dedicated to delivering greater reliability, quality, flexibility and longevity.

EMS Group S.p.A

Stand F16

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Website:https://www.emsgroup.com
SOCIAL MEDIA
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https://www.youtube.com/channel/UChZNwEJBJMLDP1iT07sQirA
Instagram: https://www.instagram.com/_emsgroup_/
EMS Group was born in 2018 from the merger of five leading companies in the handling, palletizing and storage of goods and materials. The Group quickly made its mark, becoming an industry standard on the global market. Thanks to a wealth of expertise and a vast capacity for innovation and design flexibility, EMS Group is able to support customers with integrated digital solutions geared towards enhancing competitiveness. Glass Division product range: - Robotic Unwrapping Systems - Depalletizing Systems - Pallet Control Automatic Systems - American Carton Packaging Lines - Packers and Decraters - Palletizing Systems - Robotic Labellers - AGVs - Vertical Automated Warehouses - Stacker Cranes - RFID Tracking

F.I.C. (UK) Limited

Stand E6

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Website: https://www.fic-uk.com
F.I.C. (UK) Limited design and supply all-electric furnaces as well as boosting systems for a wide range of glass types and manufacturing processes including float, fibre, container, and borosilicate. In addition we offer a number of glass conditioning options such as our Isothermal unit for glass conditioning in the forehearth or distributor to eliminate top-to-bottom and side-to-middle temperature differences. This system will significantly improve thermal homogeneity in coloured glasses and high productivity forehearths in flint glass. We also offer heat extraction systems to extract heat out of the glass to aid glass conditioning and reduce gas consumption by the use of removable water-cooled bubblers. These tubes can be placed anywhere from the throat through to the back of the forehearth. Within the range of electrode holders manufactured by FIC is our unique High 'Q' holder in which the cooling circuit is replaceable in under 10 minutes. Our Maxi 'Q' holder is a weld-free type with no critical welds within the furnace refractory structure. We can supply all-electric forehearths offering major energy savings as well as other glass conditioning options such as our Isothermal unit for glass conditioning in the forehearth or distributor to eliminate top-to-bottom and side-to-middle temperature differences.

FALORNI GIANFRANCO SRL

Stand C10

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https://www.facebook.com/falornitech
https://www.youtube.com/user/fornifusori
60 years serving the glass industry energy savings, lower emissions and environmental impact are critical factors for the industry which want to improve their competitiveness. Analysing these new challenges, Falorni Tech has focused its mission on helping glass producers to maintain their competitiveness and at the same time, complying with environmental law-restriction. Falorni Tech combines engineering, installations and tailored customer service with particular focus on delivery, timeliness, information, professionalism and staff attitude. Solutions: melting furnaces (regenerative, recuperative, oxy fuel from 20 to 350 ton/day) ancillary equipment (batch charger, combustion systems, burners, recuperators, reversal system etc) complete working ends for high capacity plants colouring forehearths, Services: glass engineering; turn key glass plant solutions and greenfield project; engineering service to study and define the solutions corresponding to the specific needs of every single customer with 2D and 3D layouting; project management & consultancy; full service for furnace installation; start up; preheating and furnace rebuilding; renovating service; oxy conversion; refurbishment of existing batch plants; workshop (we produce ourselves equipment as furnaces, heat recuperators, batch charging, furnaces controllers etc), glass defects; batching and raw materials analysis; technical assistance & supervision (preheating and start up).

FAMA

Stand E10

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https://www.instagram.com/famabyvitro/
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FAMA by Vitro With 80 years of experience in the glass industry, FAMA now expands its products and services to the world offering integral solutions for glass manufacturers. We have a specialized workforce and high quality standards and services that will bring solutions to enhance our customers' success into their operations. Our wide range of products and services can be classified into Machinery & Services for the glass industry, Automation and Metal Mechanics. Our installed capacity makes us the second largest mold manufacturer in Latin America and the only IS machine manufacturer in America.

Continued>>

FERMAC SRL

Stand D17

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Website: https://www.fermac.it

FERMAC Srl, founded in 1993, design, manufacture and serve decoration systems on hollow glass items. Systems include traditional screen printing units for ceramic enamels and UV inks together with new technological applications, suc as Digital Printing systems. The offer is completed with accessories for decorating lines and analysis for factories lay-out and installations. FERMAC is now active in more than 40 Countries through sales network and subsidiaries in North America.

FIVES C/O FIVES STEIN LTD.

Stand H7

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SOCIAL MEDIA
https://www.linkedin.com/company/fives/mycompany/
https://twitter.com/fivesgroup
https://www.facebook.com/groupefives
https://www.youtube.com/channel/UCioQtju1rKUe7BXgloulqsQ
https://www.instagram.com/fives_group

Fives is an international engineering group that designs and supplies machines, process equipment and production lines for the world industrial leaders. In glass, we are most renowned for high efficiency glass making solutions: melting, forming and conditioning technologies to increase energy efficiency, lower emissions and enhance campaign and operating life. It's time to Get Greener Fives provides innovative technologies for greener glass manufacturing from fully electric furnaces to advanced forehearth design: - All-electric melting solutions - Hybrid solutions - Electric forehearths - Optimized design As a recognized market leader in all-electric melting technologies, Fives is an ideal partner for glassmakers in their ambitious environmental commitments.

FLAMMATEC, SPOL. S R.O.

Stand E6

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Website: https://www.flammatec.com/

FlammaTec, spol. s r.o. (Czech Republic) and its daughter company FlammaTec GmbH (Germany) have become leading suppliers of advanced burner technology for glass furnaces. FlammaTec was founded by two partner companies (STG Combustion Control GmbH & Co KG, and Glass Service, a.s.) as a joint venture. The long term know-how of how to supply optimal and flexible heat into the glass can be found back in the advanced burner concepts. After 14 years since its start in 2008, FlammaTec has already supplied well over 6000 burners to over 250 projects on float, container, tableware, and special glass furnaces. Such a strong reference clearly shows the benefit of this innovative combustion technology that offers high performance solutions to the FlammaTec customers. FlammateTec burners improve heat transfer from combustion to the glass melt and thus also improve furnace efficiency and lower emission when replacing conventional burners. FlammaTec offers the following advanced LoNOx burner types: • Underport Gas Injector, Flex or Freejet • Underport Gas/Oil Dual Injector, Flex of Freejet • Underport Heavy Oil Injector (also can be used for backup solutions) • Sideport Gas Injector, Flex • Oxy/Gas Burner • New Hydrogen Carbon Free Burner

FLOKONTROL

Stand C15

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Established in 1997, Flokontrol is a customer-oriented materials handling and robotics integrator providing automated solutions around the world. Flokontrol seeks groundbreaking innovative technologies with its highly skilled team of professionals. For the container glass industry, Flokontrol offers swabbing robots, robots for sampling, mould exchange and bottle handling.

FONDERIE VALDELSANE S.p.A

Stand D16

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Fonderie Valdesane casting special iron and bronze alloys for glass moulds since 1961. More than 60 years ago, a small foundry in the hearth of Tuscany made a revolutionary decision: to specialize exclusively in glass moulds. Since then, Fonderie Valdelsane and hollow glassware would have been indissolubly tied. Our success in international markets owes to the glass manufacturers, as well as themselves benefited from the presence of a pioneer company devoted to the production and development of special alloys, to give higher and higher performances to the glass moulds. Nowadays more than ever, greater demand of glass containers urges the industries to increase their outputs, by building new glass plants and of course, by producing more bottles in the existing ones. Second option is being achieved, thanks to state-of-art facilities and extremely advanced technologies. Within this framework, selection of K 250 cast irons and special copper alloys produced by Fonderie Valdelsane is no more than a simple guarantee that moulds will comply with their important job at the best of their possibilities. A guarantee that is internationally acknowledged. A wide range of laminar, nodular and vermicular cast irons and bronzes serving the most ambitious goals of the glass industries.

FORGLASS SP Z.O.O

Stand E8

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SOCIAL MEDIA
https://www.linkedin.com/company/forglass/
https://www.facebook.com/Forglassspzoo
https://www.youtube.com/@ForglassPoland

Forglass is a technology company, specialising in the design and construction of glass furnaces and batch plants for producers of all types of glass, including packaging, tableware, sodium silicate and fibreglass. The company's business activities involve designing, computer modelling and testing of glass furnaces that answer the demands of glass producers, not only today, but decades into the future. Forglass also designs innovative mechanical systems and automation for batch plants, including their auxiliary equipment. Additionally, the company provides servicing and repairs of furnaces and batch plants. Forglass employs teams of experts that include master engineers with decades of experience and young engineers with the most modern approach. Together, they move the glass industry forward by providing greater efficiency of glass melting, reducing its impact on the environment and allowing more flexibility in production.

futronic GmbH

Stand A15

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https://www.facebook.com/futronicGmbH/
https://www.youtube.com/channel/UCqye3qMCD4PzsPpNuw_sKKA
Instagram:https://www.instagram.com/futronicgmbh/

In the course of more than four decades,

futronic has gained a reputation for innovative and reliable controls and drives for container glass machines and equipment. Over a thousand of our systems are currently in action around the globe. Many of them have been performing impeccably for twenty years or more now, living up to even the highest client expectations day by day. Our specialists can draw on extensive control engineering expertise, a profound understanding of the production processes in the glass industry and considerable practical experience

GALLUS FERD RÜESCH AG

Stand F18

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Gallus SCREENY® - the must-have flat screen-printing solution Gallus Ferd. Rüesch AG, a subsidiary of Heidelberger Druckmaschinen AG, offers an end-to-end solution for industrial glass-container screen-printing. The Screeny® printing-plate and an easy-to-use frame system set new standards in cost-efficiency, productivity and reliability. Due to a manufacturing process whereby the printing plates are nickel-plated and pre-coated with polymer emulsion, Screeny® offers substantial advantages compared to conventional printing methods: • Reliability: Industrialized screen-making process based on decades of manufacturing experience and know-how. • Quality: Outstanding print quality thanks to an industrialized process of polymer coating. • Productivity: Higher durability of the printing plate; less machine downtime; time saving in silk-screen preparation. • Repeatability: Consistently high standard of quality in all batches. Screeny ® printing plates are suitable for all thermoplastic, UV, solvent and one and two-component ink systems. Screeny ® is ideal for CtS (computer to screen) imaging and can be used with all conventional imaging systems as well. The Screeny ® glass decoration system comes with the ingenious Gallus Fast Tension Frame (FTF). The system impresses by its easy and quick assembly, almost unlimited re-use of the frame and high-quality printing results.

GLASS GLOBAL GROUP

Stand R2

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www.glassglobal.com world's leading e-commerce portal website for the international glass industry with over 360,000 visitors per month and 8.2 million page impressions. Plants: plants.glassglobal.com, comprehensive summary about glass makers and their furnace details, market outlook and statistics Studies and Technical Consultancy: Market and Feasibility Studies as well as Bankable Business Plans on glass industry projects, covering PV Glass, Float Glass, Container Glass or other, as well as technical expertise in all fields of glass production and glass markets from raw materials to solar glass. Directory: Special International Company Database Up-to-date, multi language company directory for flat and hollow glass, technical glass, tableware, traders, buyers and associations etc. Trade: Machine and products trade section for sell and buy Trade section for glass or new / 2nd hand equipment. The Trade Market is divided in two main features (Machines / Glass Products – offers and requests). News: Daily multi-language News section with information on all segments of glass making, processing and new technologies. Jobs: Expert Job Market - international glass specialists, machine workers, representatives etc. Projects: project information: any kind of project in a glass factory regarding investments in a greenfield project, factory renovation, restructure, maintenance, repair or purchase of factory equipment and machinery. Technology: Special consultancy for glass producers and processing companies The "Glass Technology Area" provides information on specialized suppliers for hollow and float glass production, technical and tableware glass as well as the new upcoming technology for solar glass production. (The areas cover the whole production process from batch supply to the melting and production technology until packing and storage at the "cold end".)

GLASS INTERNATIONAL

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Glass International offers readers the latest news from the hollow, container, flat, and speciality glassmaking industry and is the official media partner for the global Glassman events. The magazine focuses on industrial, economic and environmental issues affecting the industry and includes articles discussing the latest developments, trends and challenges in glass manufacturing. Regular features comprise of global news and events, company and country profiles, and previews and reviews of important industry conferences and exhibitions. Its weekly newsletter is emailed to the industry every Wednesday and contains the very latest updates from the sector.

GLASS SERVICE, a.s.

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Glass Service (GS), headquartered in the Czech Republic with offices in the Netherlands, USA, Japan and China, is a leading global consultant for glass melting/conditioning furnace and forehearth design, control, operation and troubleshooting. GS programmers have developed in-house mathematical modeling software enabling the optimization of glass melting and combustion processes in glass furnaces and forehearths. More than 700 different projects have been completed using GS software. Presently a new version of furnace modeling software (GFM 5.0) is being developed. GFM 5.0 uses a new generation of non-orthogonal mesh which enables proper representation of all geometric features and local refinement. GS has its own laboratory for glass defect analysis and analyzes more than 4,000 defects yearly. Additional testing capabilities utilize basic and applied research in the field of glass melting. GS has invested considerable effort into developing a new technology called a "Supervisory Advanced Control System" using our proprietary software known as the Expert System - ESIII. More than 330 installations have been successfully deployed worldwide. The high-resolution infrared/visual camera with unique AI software, paired with ES III, allows furnace operators to tap into Industry 4.0 standards. It provides fully automatic monitoring and control of temperatures and the batch blanket. GS supplies high quality selected raw materials to the glass industry.

GLASSWORKS HOUNSELL LTD

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Glassworks is a global supplier of all types of batch charging and feeding equipment for furnaces of all glass types, sizes and shapes. With a wealth of knowledge and experience combined with in house manufacturing Glassworks offers glass specific and bespoke charging equipment with associated control systems. Glassworks is also supplies of Tin Oxide (SnO2) electrode melting systems for use in electric melting and special glasses.
As a precision manufacturer we can offer bespoke engineering for individual glass plants as well as a global supplier of linear actuator systems for multiple industrial applications.

Continued>>

HEYE INTERNATIONAL GMBH

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We are Glass People – with experience and passion heading for highest results. Our mission stands for customers' satisfaction, our experience in glass and for the glass experts at Heye International. For 50 years Heye International sets the standards in container glass technology. From complete glass plants to technical assistance during production, from high speed equipment in hot end to secure inspection in cold end, deeply involved in the process we understand. Reliable solutions for glass people by glass people.

HFT

Stand E13

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HFT is a world leading full spectrum design-bulid EPC (Engineering, Procurement and Construction) Contractor focused on providing reliable project solutions in the glass, industrial, power generation and controlled environment agriculture markets. Over the past 75 years, we have forged strong partnerships and designed and built state of the art, sustainable efficient and performance forcused industrial processing facilities around the world. We have become solutions focused and support all stages of a project from the initial concept development phase and unique financing options, through preconstruction, eqipment and material procurement, to design-build general contracting and project execution. Headquartered in Pittsburgh, Pennsylvania, with regional offices in the UK, China, Philippines and Singapore, we employ engineering and construction professionals, and craftsmen worldwide with the commitment, expertise and passionate work ethic that is the cornerstone of the company's success and continued growth. With over $13.5 billion in installed value for our clients and business partners, in 47 countries, we take great pride in our reputation and will continue to imporove the innovate to align with the evolving expectations of our clients. We take great pride in our reputation and expect to continue to improve and innovate as engineers and contractors.

HORN GLASS INDUSTRIES AG

Stand F10

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HORN Glass Industries AG plans and makes glass melting technology and turn-key projects for the float and container glass industry. With more than 135 years of experience, HORN has been the specialist and expert in the field of the construction of glass melting furnaces for many years. However, since many years this has changed and HORN is now one of the industry leaders in the implementation of turn-key projects.

Hotwork International AG

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Hotwork celebrated its 60th anniversary this 2022. Although it was in 1986 that Hotwork International became fully family owned, we can trace our roots further back to the foundation of the Hotwork Ltd. in England, year 1962. At the present, we are an innovative and market leading company with a team of 450+ professionals backed up by senior engineers with over 35 years of experience. As we continued to grow and develop our reach globally, we are proud to be in operations in over 65 countries worldwide, one of which is Turkey. Hotwork International supplies: Furnace Glass Drain (water Recycling option) Furnace Cool Down Furnace Heat Up Thermal Regenerator Cleaning Regenerator Repair without Production Loss Air-Fuel Combustion Technology (Gas/Oil/Bio Fuel/Hydrogen) Oxy-Fuel Combustion Technology (Gas/Oil/Bio Fuel/Hydrogen) Electric Boosting and Melting Bubbling

Hunprenco Ltd

Stand C18

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The World's Leading Manufacturer of high quality Plungers and Coolers for the Global Glass Container Manufacturing Industry.

IRIS INSPECTION MACHINES

Stand D18

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https://www.youtube.com/@irisinspectionmachines8322

IRIS is recognized as a leading and innovative supplier of glass container camera inspection. IRIS is the pioneer of AI in the inspection realm, offering Evolution NAO AI range inspection machines. Evolution machines increase repeatability and inspection accuracy, while offering a precise information about the defect's origin and criticality level. AI based algorithms can also predict defects and alert the hot end to avoid producing future defects which may be section, mould or machine related. A reactive multilingual IRIS service team speaks 17 languages and is based on 5 continents worldwide. IRIS customer service ensures installations, trainings, assistance, and servicing Evolution equipment during the entire life cycle of the machines.

ISIMAT GmbH Siebdruckmaschinen

Stand H5

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The more than 60 years of experience and definitive engineering skills of ISIMAT, based in Ellwangen in Germany's southwest, are paired with the global strength and innovative energy of the KURZ Group. ISIMAT's expertise, combined with a service and sales network that covers Europe, Asia and America, opens up unique market opportunities and competitive advantages for customers from the packaging, glass, plastics and cosmetics industries around the globe. Its machine portfolio, e.g. the I-Series, covers printing technologies such as the classic screen printing process, but also flexo and digital printing as well as the various foiling processes, including conical inLINE FOILING® for finishing conical-shaped articles. ISIMAT regularly succeeds in making the seemingly impossible possible: ISIMAT was the first manufacturer ever to develop a patented decoration option it calls inLINE FOILING® that allows products such as glass bottles, glass drinkware, jars and tubes to be finished with durable, absolute top-quality metallic decors in a simple, fast and cost-effective way.

KOENIG & BAUER KAMMANN GMBH

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https://www.youtube.com/channel/UC6FsS1erFRaxA_AoYyWxHZw
A leading manufacturer of screen and digital printing machines onto glass.

LATTIMER LIMITED

Stand C18

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Manufacturing high quality products for the glass container manufacturing industry. Lattimer have an unrivalled expertise in the design and manufacture of standard and bespoke IS variable equipment for all machine manufacturers and machine sizes. Lattimer supply mechanisms and components with significant technical benefits to Glass Container manufacturing plants in all parts of the world.

LWN Lufttechnik GmbH

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LWN is world leader in engineering and production of cooling systems for glass industry. We are producing and assembling worldwide complete air cooling systems for all kind of glass production (from float glass trough container and tableware to special glass and glass processing). LWN innovative approach to fans and cooling system selection is helping to save up to 40% of used energy against standard solutions. LWN is providing turnkey solutions for cooling systems which is including fans, ducting, valves, electric drives and automation and worldwide installation and installation supervisor services.

MEGA ENTERPRISE

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Your Partners for Top Quality refractories catering to the Major Glass companies in Europe, Japan, the Middle East and Africa, MEGA Enterprise offers first class tested and certified refractory materials for the Glass Container, Float and Table Ware industry. Contact: Sherif Shawi shawi@megazfco.com +41797551818

MIMSAN KONVEYÖR SISTEMLERI AS

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https://twitter.com/MimsanSystems
https://www.facebook.com/mimsanconveyorsystems
https://www.youtube.com/channel/UCzoHzXmiVvp5PbZ0AQj7j1w/featured
MIMSAN, was founded in 1977 to design and produce conveyor systems in its production facility on an area of 7500 square meters, located in Istanbul,. MIMSAN is the leading conveyor company in its country and Pioneer at the international arena. It is a global project-based manufacturing company, providing the turnkey solution for "Cold-End Line" projects. For more than 40 years, MIMSAN has completed several successful "Cold-End Turnkey" projects in Europe, Asia and Africa. Our "Cold-End Line" product portfolio for the Glass Industry involves different types of conveyors from the beginning of the LEHR to the end of the Warehouse. Our successful strategic project management notion is based on the principle of fullfilment customer demands and project requirements. www.mimsan.com.tr

OLIMERK

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Olimerk Makina was established in year 2007 and based in Istanbul Turkey.
It is a company of Olivotto Glass Technologies corporate (leading company in the production of machines and Equipment for Tableware, Technical glass and Pharma tubing).
Starting from the year of its establishing, Olimerk expands its business over the years thanks to many different ranges of products and services.
Equipment and semi-automatic machines: linear and rotary fire polisher, belt conveyor, push bar stackers, transfer systems, semi-automatic spinning and many others.
Technical assistance service of experts specialized in the commissioning and optimization of new and existing production lines: automatic pressing forming Press, press & blow forming,
Stemware (two pieces and one piece), Spinning machines and others.
Design and sales of molds and production equipment for different types of machines and the most common existing process used in tableware and technical glass fields.

Continued>>

OLIVOTTO GLASS TECHNOLOGIES SPA

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Since 1946 a long way, from the first rotary blowing machine up to the acknowledgement of one of the major realities in the world of glass.

A way sprinkled with international performances and success stories, also through the acquisition of different brands such as ANTAS, LYNCH SYSTEMS and LINDNER, which led OLIVOTTO GLASS TECHNOLOGIES to be a global reference for the production of hollow glass.

For over 70 years, we are – and have been – leader in design, realization and implementation of complete plants for the production of hollow glass providing highly customized solutions for all kind of needs.

Highly skilled motivated engineers and technical teams that represent OGT, the recognition of the market and our peculiar and constant propensity to innovate, give us the chance to be
competitive in all sectors.

To anticipate the expectations of Customers and Markets, OGT organizes its activities through four Business Unit:

- HOLLOW GLASS
- PHARMACEUTICAL PACKAGING
- MINERAL WOOLS
- SOLAR

Each BU is structured as a team of highly qualified professionals and engineers.

The supply of plants and integrated lines is completed by the production of tools, accessories and spare parts and by our well-known dedicated Service.

OMCO INTERNATIONAL NV

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Glass container mould supplier. Serving the glass industry around the world more than just moulds! For more details visit us at: https://www.omcomould.com/ https://www.linkedin.com/company/omcomoulds/

PENNINE INDUSTRIAL EQUIPMENT

Stand D6

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Pennine Industrial Equipment have specialised in the manufacture of inverted tooth silent conveyor chain for the glass industry for over 30 years. As the demands of the production processes have increased Pennine have constantly developed conveying solutions that innovate and deliver, helping you to succeed in your role, making glass. Visit us at booth D6 to learn about our ranges of chain including Calibre™ 2 pin chain for high speed modern production and our newest development; Skeleton™ lightweight chain for increased energy efficiency.

PNEUMOFORE

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https://www.facebook.com/pneumofore
https://www.youtube.com/pneumofore
Instagram:https://www.instagram.com/pneumofore/

Founded in 1923, Pneumofore has 100 years of experience in manufacturing vacuum pumps and air compressors for industrial applications worldwide. The company supplies the hollow glass industry with centralized vacuum and compressed air systems, designed for the pneumatic requirements of the IS machines. Pneumofore compressors and vacuum pumps are found worldwide, whenever customers require extraordinary reliability and constant performance. Leader in Rotary Vane technology, Pneumofore solutions focus on efficiency, durability, minimal Life Cycle Cost, and high environmental respect. At Glassman Turkey, the company presents the UV Series vacuum pumps, ranging in capacity from 250 to 7160 m3/h with 0.5 mbar(a) residual pressure, and the A Series single-stage, air-cooled compressors up to 5360 m3/h with pressures from 2.5 to 10 bar(g). Many options are available, like the Variable Speed drive, and remote controls or connections to any PLC system. Each option facilitates heat recovery and air cooling even in harsh environment up to 50°C.

RAMSEY PRODUCTS CORPORATION

Stand G16

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Ramsey Silent Chain. Ramsey is a worldwide leading manufacturer of silent chains (inverted tooth chains) for conveying and power transmission applications. Ramsey offers the world's widest range of top quality silent chain products, the highest level of service, and competitive prices. Ramsey works with glass manufacturers in every part of the world, providing conveyor chains that can run at faster speeds, operate more smoothly, and deliver longer life than ever before. New Products: Sentry chains combine the best features of Ramsey's established wear protected chains with features developed for high speed power transmission chain. Ramsey's RKO tool provides for easy connection and disconnection of Wear Protected chains and holds a US and a European patent. Other Unique Products: Wear Protected Chains: Lifeguard – with three US patents and a European patent, and Allguard FX feature recessed pin heads for maximum wear protection. R-Select, with highly wear resistant chromium alloy links only in the parts of the chain that wear the most, holds a US patent. Other industry favourites: Ultralife and PRV silent chain exemplify Ramsey's focus on developing conveying chain products that serve the exacting requirements of glass production.

RATH AG

Stand H12

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A GLASS OF ITS OWN – Refractories and Hot Gas Filtration for high demands Your benefits: Refractories for the entire production chain Highest refractory quality – for crystal-clear results Tailor-made solutions for your requirements Advisory expertise in industrial glass applications

REFMON Co. Ltd

Stand D11

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Refmon has already been worldwide known as one of the most challenging companies, producing especially refractory expendables since 1997. Refmon presence in the world of glass by its vibrocast as well as pressed refractories make it possible to serve its customers in 5 continents already supplying expendables to over 150 customers in packaging, table ware, technical, float, luxury and fancy glass manufacturers. Refmon name and behind is the guarantee for top quality products and service, Refmon wish to be partner to the glass manufacturers, something more than a supplier. Worldwide competition is known for all refractory manufacturers in the world of glass, but could not be on top without continuous developments as well as focusing on long term partnership with our highest quality raw materials suppliers. 2010-2011 Refmon has been integrated into German-owned companies and keep going on the way of developments and investments by doublizing its manufacturing capacity as well as entering to brand new industries like ceramic and biomass, too December 2017, Refmon just recently opened its new manufacturing hall further significant support to glass industrial products manufacture by strengthening its

presence in the world of glass for long term. Refmon Refractories = quality & flexibility.

RENOLD ZINCIR SANAYI VE TICARET A.S.

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https://www.youtube.com/@Renoldplc
Renold Tooth Chain Produces a wide range of Inverted Tooth Chain for Drives and for Conveying applications. As part of Renold PLC, we deliver high precision engineered and power transmission products to our customers worldwide.

RONDOT GROUP

Stand C11

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For over 50 years, RONDOT has been an Innovation Hunter and market leader in the hollow glass industry. The company´s mission is to provide service to bottle makers & Engineers alike, directly in the factories, all over the world. • Specialist in the field of IS machine delivery • Supplier of all types of consumables and spare parts for IS machine • Historic actor in pyrometer, hot vision and portable measurement devices • Expert in specialised maintenance in the glass industry

ROSS EUROPA GMBH

Stand C7

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ROSS® - Paving the Way to Modern Pneumatics. In 1917 Charlie Ross, a master mechanic living in Detroit/USA, manufactured the very first ROSS-poppet valve using Chevrolet engine tappets, springs and other components. Soon after he filed his first patent. In 1921, Charlie Ross together with StClair Cameron and four others incorporated the „Ross Operating Valve Company". Today, ROSS CONTROLS® proudly continues as a private company owned by the Cameron family. The spirit of ingenuity and appreciation for state-of-the-art designs still are essential ingredients to our corporate culture. Around the world we are acknowledged to be highly capable problem solvers in all major industries, where our technology offers our customers distinct advantages. Our customers are the experts on what they need for their manufacturing processes. It is our goal to transform ideas into physical products, and we like challenges. We listen to our customers as they "pull" us into new fluid power applications. As a result, ROSS continues to introduce a host of innovative pneumatic solutions. With our unique customer-driven ROSS/FLEX®- development process, we are revolutionizing the fluid power industry. ROSS is a truly global group of companies, including ISO 9000 certified facilities and/or sales offices in the United States, Brazil, Japan, China, India and Europe. In addition, a distribution network of over 150 stocking representatives and distributors worldwide makes sure that ROSS products and know-how are accessible around the globe. Without understating the importance of technology, the people of ROSS are our biggest asset. We have a rich heritage of pneumatic valve expertise, and employ not only experts in fluid power, but also engineers from our focus industries. Our worldwide distributor network has some of the best minds in the fluid power industry. ROSS is dedicated to developing matchless fluid power solutions to improve the efficiency and effectiveness of our customers' equipment and operations. With our outstanding design, sales, service, and highly trained worldwide distributor network, we have GLOBAL reach with a LOCAL touch ready to provide you with our very best anywhere.

SATINAL S.P.A

Stand D17

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SATINAL is an Italian brand recognized as a global leader in the production of frosting chemical compounds (performance materials) and frosting machinery for the glass industry – hollow glass and flat glass. Our wide range of solutions is delivered, above all, to the cosmetics, lighting and beverage industry – with the capability of creating bespoke formulations to meet the peculiar requirements of customers all over the world.

SIGMA GROUP

Stand D13

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SOCIAL MEDIA
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Despite its rapid growth with the recent opening of the fourth facility in Plovdiv, Bulgaria, SIGMA is and remains a family-owned and managed company. Passion, know-how, specialization and high reactivity in both manufacturing facilities allow Sigma to offer a quick response to Customers' both programmed and urgent requirements. In step with the times, SIGMA has also recently upgraded its E-commerce Refractory Shop to offer an easier and faster way of acquiring products. Moreover it enables to be continuously updated with regards to product availability, special offers and technical innovation.

SKLOSTROJ TURNOV CZ, S.R.O

Stand C16

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Sklostroj is a family-owned engineering company which has been specializing in the production of hot end container glass lines for 70 years. We produce IS machines, timing and drive systems, standalone systems such as pushers, stackers, feeders, shears, gob distributors and other related products and services.

Socabelec

Stand G10

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Socobelec invented the first swabbing-robot on the fly able to work on IS machines, with cavity rate up to 16 cycles/min/sections. We are able to swab blanks on the fly, blanks+neck ring, blanks+neck-ring+baffles. Our robot can be installed on Emhart, Heye, Bottero, BDF, O-I, Sklostroj or GPS IS machines. Production NNPB, BB, PB in SG DG, TG, OG. Increase of productivity from 2 up to 4% depending of production, payback time, from 6 to 18 months depending on added-value of the products. Our Socabelec Swabbing-robots, are installed already in Europe, Asia, Australia, Norther America, Mexico.

Continued>>

SORG Group

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https://www.facebook.com/SorgGlass
https://www.youtube.com/@sorgglass

SORG presents security, stability and ultimate performance to glassmakers in over 80 countries. We're a family business founded in 1872 that is still owned and managed by the Sorg family, now in its fifth generation. We produce highly-sophisticated glass furnaces that deliver performance, endurance, efficiency and sustainability in equal measure. In the continued pursuit of innovation to provide our customers, industry and planet with ever-improving solutions, we believe in creating partnerships that last for decades, built on enduring respect and trust. This has been our approach for the last 150 years and we are committed to this for the next 150. The future of the glass industry is already taking shape. See it for yourself. Our Services: Installation & commissioning Raw materials & batch Optimisation and auditing Defect analysis Remote service Training & aftersales service Lifecycle services.

SYSTEM RES SARL

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THE TECO GROUP

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As part of the TECO Group, Toledo Engineering, Tecoglas and KTG Systems can offer complete capabilities in glass furnaces of all types, with KTG Engineering supporting this facility as glass plant equipment manufacturers. Zedtec are the TECO Group specialists in forehearth and working end technology. EAE Tech, the latest addition to the TECO Group, provide high quality industrial automation engineering services and custom control systems.

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Kleenmold is the brand that's been trusted for glass lubricants for over 85 years. TotalEnergies' Kleenmold product line includes lubricants and coatings for all applications. Kleenmold products are manufactured under strict quality control guidelines to ensure consistent, high-quality products every time. Many products have NSF (food grade H-2 or H-1) approval. With Kleenmold, you get an entire team dedicated to helping you reduce costs, increasing productivity, and meeting the changing demands of the glass container industry. The Kleenmold range has grown with the glass industry and currently offers many different lubricants, coatings and release agents from shear sprays to cold end coatings. Kleenmold Swabbing Compounds are recognized as the industry standard worldwide. In addition to Kleenmold, TotalEnergies USA offers a complete range of hot end lubricants with brand names such as Biosol, Kleenkut, Glassflow and Kleenoil. Our lubricants and coatings have a significant impact on productivity and percent pack. Through cooperation with the worldwide glass industry, we have been able to test and refine all of our products to lubricate cleanly, eliminate defects and meet the demands of the evolving industry.

VERTECH'

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https://www.youtube.com/@vertech1040/videos

For more than 25 years, the French company Vertech' has been the reference provider of software solutions for the glass industry. With a wide range of products, SIL provides glassmakers with very precise, real time KPIs on the performance of whole plants. Thanks to all this shared data and the full traceability of products, production rates improve, losses decrease and customer risks are reduced. With 25% invested in R&D yearly, Vertech' is constantly innovating and adapting SIL to current industrial needs. More than 750 production lines have been equipped with SIL so far in 32 countries all over the world. SIL is a Manufacturing Execution System (M.E.S.) intended for glassmakers producing: • Hollowware • Tableware • Tubes • Decoration With its six modules, SIL can be installed everywhere in the glass plant, but also at the headquarters from where all KPIs of several plants can be viewed simultaneously. Trustful collaborations with partners and customers Thanks to trustful collaborations with partners, SIL is an independent system able to be connected to any production and inspection machine available on the market. As well as being a very complete system, SIL also includes an individualized followup, an annual maintenance contract, on-site installation and customer service. Vertech' is there every step of the way from the first technical visit and the installation process to full system implementation and on-site and off-site training. Vertech' customer support is available during office hours (GMT+1), with an optional subscription to the 24/7 hotline for technical support. For long-term system optimization, Vertech' offers expert maintenance service on-site with yearly updates.

VETROMECCANICA SRL

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https://www.youtube.com/user/vetromeccanica?app=desktop

Vetromeccanica, established in 1992 in the province of Parma, the heart of the Italian packaging area, has been an important industrial international player right from the very beginning. With 30 years of expertise in containers handling, Vetromeccanica is a reliable partner during all the phases of the process: from feasibility studies, executive engineering, the choice of the best supplies, right up to the supply of innovative, patented and competitive handling and automation solutions to meet specific needs. In-house management of all the phases of the production cycle guarantees high quality products 100 % Made in Italy, short delivery times and competitive prices. Vetromeccanica's aftersales service offers the best support in any situation with its prompt response thanks to a well-stocked spare part warehouse. Vetromeccanica offers Cold End Lines from lehr exit up to palletizing units for the handling of glass containers of different sizes and shapes. Range of our products: Cold end lines stacker units columnar palletizers/depalletizers beam palletizers/depalletizers robotic units tray formers labelling systems emtpy pallets dressing line shuttle cars sorting & decorating.

WALTEC Maschinen GmbH

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https://www.youtube.com/@waltecmaschinengmbh3652

Our family-owned company is a leading manufacturer of fully automated and electronically controlled production lines – from feeder up to annealing lehr. Guaranteed quality through in-house manufacturing safeguards the best possible result, driven by our family heritage. Over time we have been successfully migrating our state of the art pressing, blowing, spinning, handling and fire polishing solutions into more than 250 manufacturing locations around the globe. Driven by innovation, our teams work around the clock to reengineer and upgrade your glass forming processes using the latest available machine and process technologies. Transforming your Hot End operations through improved resource efficiencies, reduced energy consumption and higher efficiencies is our key challenge. Our team of experienced engineers and fitters delivers worldwide support for process design, machine development, productivity improvement, commissioning and start-up services.

XPAR Vision

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XPAR Vision develops, installs, implements, services and maintains innovative technology for hot end inspection, process monitoring and quality control. Our products and services help to improve the quality selection, quality control and automated process control for the global container glass industry. XPAR Vision is committed to assist container glass manufacturers in meeting the increasing customer demands and improving their product quality, whilst increasing efficiency levels and also reducing energy levels and carbon emission.

ZIPPE INDUSTRIEANLAGEN GMBH

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https://www.facebook.com/pages/Zippe-Industrieanlagen-GmbH/
https://www.instagram.com/zippe_industrieanlagen.gmbh/

Zippe is the world's leading company in the batch and cullet system sector for the international glass industry. Focusing and specializing on batch and cullet systems, we have gained extensive specialist knowledge and a great wealth of experience. With six subsidiaries and 30 representatives worldwide, our presence extends to all key markets in the glass industry and every project comes with its own requirements, with no two technical solutions being the same. Zippe batch plants ensure that the batch for every glass type is fed fully automatically into the furnace with the exact consistency and homogeneity required, at the required amount and at the right point in time – 24 hours a day, every day. Your system, exactly to size, no matter what size. Leading global companies place their trust in our professionalism and experience because we channel all our energy and effort into continual development, innovation and safety.

ZUCCATO ENERGIA

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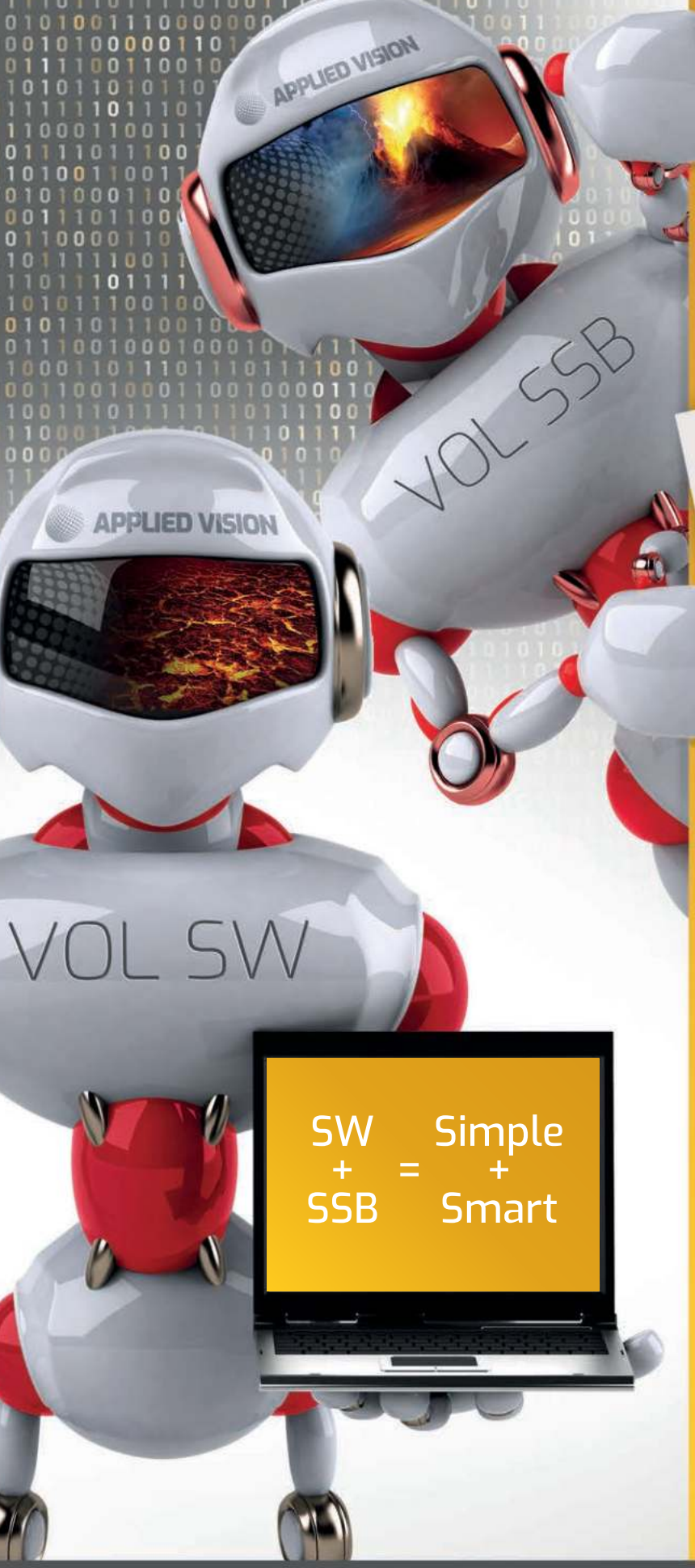
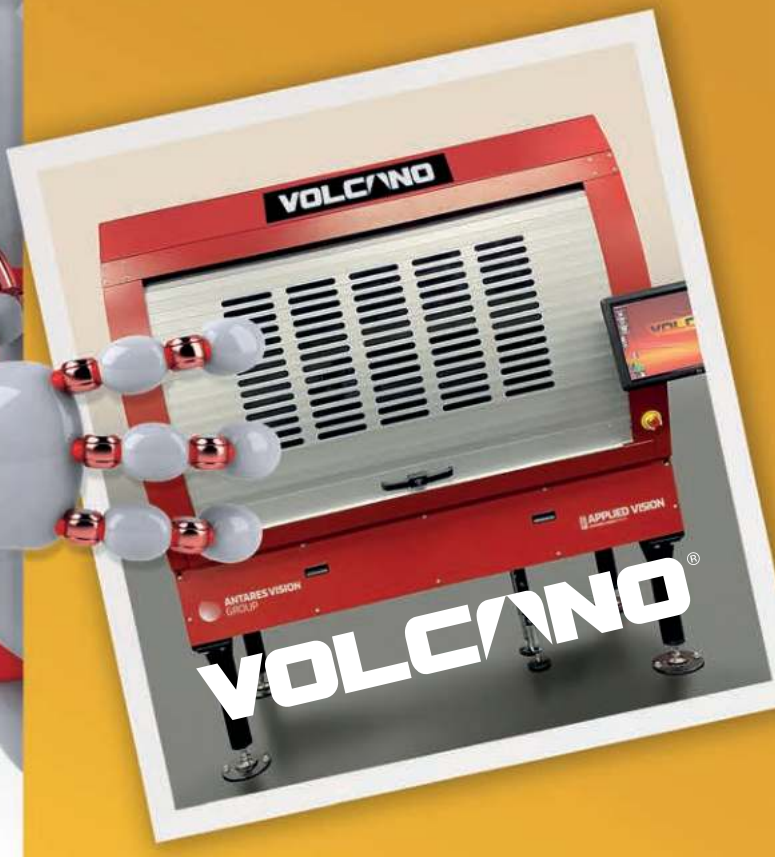


Dynamic Duo



Meet Vol SW and Vol SSB.

Side Wall and Sealing Surface & Base

Take the smart approach to glassware inspection with SW and SSB, our tandem Volcano team. These units incorporate durability, defect detection and ingenious color analytics with best-in-class after-sale solutions. And now, Antares Vision Group offers track & trace, digital factory and supply chain transparency to complement our inspection capabilities. Solve your toughest production issues with the power of our adaptive technology and innovative machine vision.

Applied Vision Corporation now doing business as ANTARES VISION GROUP