

Kañch



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Quarterly Journal of The **All India Glass Manufacturers' Federation**

Bi-lingual



AIGMF Drawing Competition 3.0. 'Glass Protects' (2020)
3rd Prize: S. Christy Laura (14 years)
9th Class student, Sri Akilandeswari Vidyalaya, (Trichy) Tamil Nadu

Special Feature

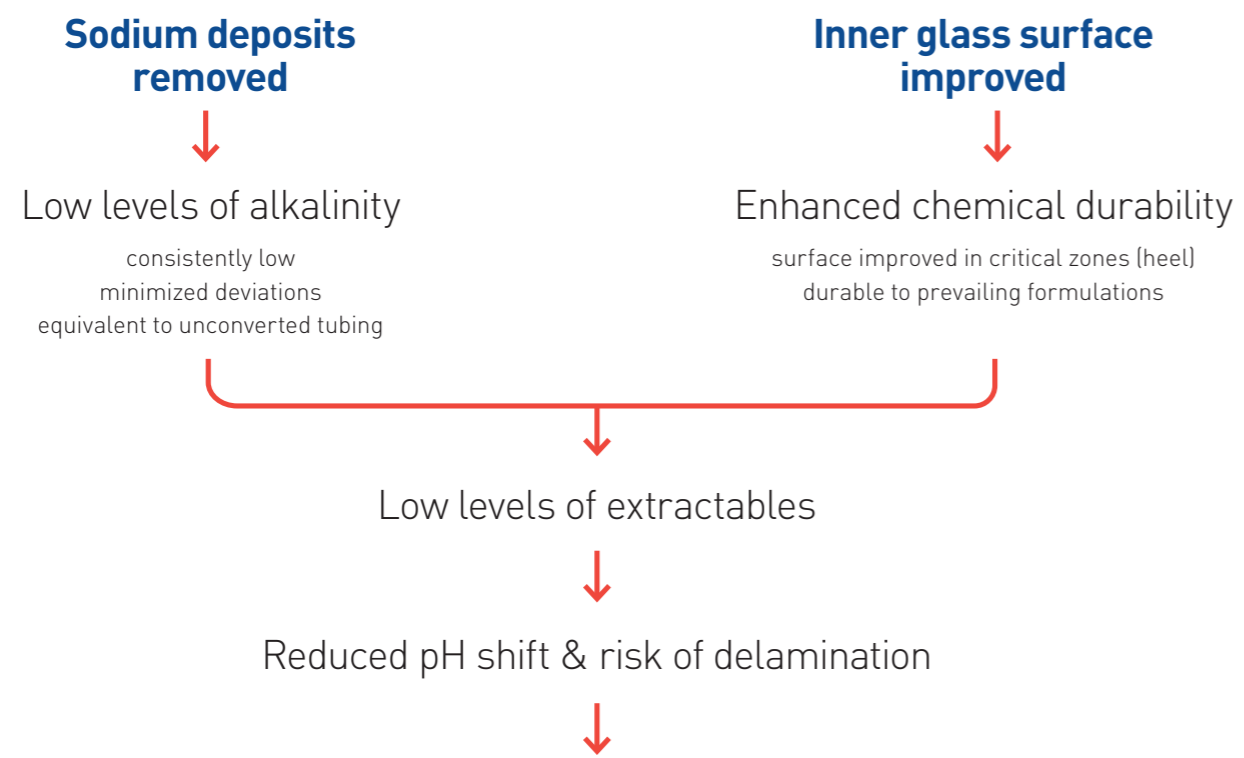
- *Glass News*
- *Diversification that Pays Dividends*
- *Resources to Mitigate Bird Collisions for Bird-safe Glass*
- *Single Sustainability Vision for European Glass Packaging Specialist*
- *SmartLine 2 – Advanced Evolution of Glass Container Inspection*
- *Glass Packaging Giant Shares Global Sustainability Strategy*
- *30 Years of Press and Blow Machines*
- *Application of Laser Ablation-Inductively Coupled Plasma-Mass Spectrometry to the Glass Bangles from Hirapur Megaliths in India*
- *Thermal Imaging Hots Up*

Upcoming Events

- *Virtual Executive Committee Meeting (June 25, 2021)*
- *Glasspex and Glasspro India at Mumbai (March 3-5, 2022)*
- *14th International Conference of the AIGMF at Mumbai (March 3, 2022)*



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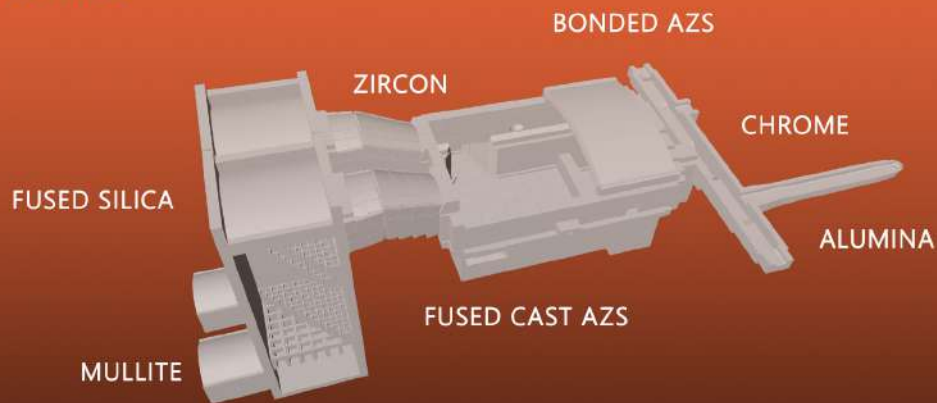
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Quarterly Journal of **THE ALL INDIA GLASS MANUFACTURERS' FEDERATION**

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Contents

From President's Desk	5
Advertise in Kanch	6
Glass News	7
Diversification that Pays Dividends	19
Resources to Mitigate Bird Collisions for Bird-safe Glass	23
List of Advertisers	24
Single Sustainability Vision for European Glass Packaging Specialist	26
New Members	33
Membership of the Federation	33
SmartLine 2 – Advanced Evolution of Glass Container Inspection	35
Glass Packaging Giant Shares Global Sustainability Strategy	38
30 Years of Press and Blow Machines	42
in Kanch Werben	44
Application of Laser Ablation-Inductively Coupled Plasma-Mass Spectrometry to the Glass Bangles from Hirapur Megaliths in India	46
Thermal Imaging Hots Up	55



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From President's Desk



Mr. John Wallis, Editorial Consultant and a dear friend of AIGMF was remembered at the virtual AIGMF Executive Committee Meeting held on April 20. The sad news of his departure on April 11 at the age of 64 was shared with Members. As a respect, brief silence was observed at the start of the meeting.

We feel privileged to share that Tanuj Samaddar, AIGMF's drawing competition 3.0 winner has been awarded the Rashtriya Bal Shakti Puraskar 2021 (*National child award*) under 18 years of age in the category of Arts and Culture this Republic Day. Tanuj's winning entry was included in the AIGMF calendar 2021 (*in the month of January*) available at www.aimf.com

In view of the uncertainty during these pandemic times, postponement of glasstec was announced by the Messe Dusseldorf from June 2021 to September 20-23, 2022 to be held at Dusseldorf, GERMANY. Messe Düsseldorf India has also decided to reschedule the combined events of Glasspec India, Glasspro India and Fenestration-pro India originally scheduled from September 2021 to March 3-5, 2022 at Bombay Exhibition Centre, Mumbai, INDIA.

The Secretariat continued to work closely with the Department for Promotion of Industry and Internal Trade, Ministry of Commerce, Ministry of Finance, Ministry of Transport, Ministry of New and Renewable Energy, Ministry of Environment for matters related to the support, relief, etc., sought by the industry members in the current COVID situation.

New AIGMF Members; M/s SynThera Biomedical Pvt. Ltd. (*start-up developing speciality glass and glass ceramic products for healthcare and hi-tech industries*) and M/s Haldyn Heinz Fine Glass Pvt. Ltd. (*manufacturers of high-quality cosmetic and perfumery glass bottles*) were formally welcomed at the Executive Committee Meeting on April 20.

The next virtual meeting would be held on June 25. All Members are requested to participate and be a part of some interesting discussions. ■

A handwritten signature in blue ink, appearing to read 'Rohit Samaddar'.

President AIGMF
and Vice - President, HNG & Inds. Ltd.

April - June 2021 - Issue

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GLASS News

JOHN WALLIS REMEMBERED

Mr. John Wallis, Glass Worldwide's Editorial Consultant, passed away on April 11 at the age of 64.

Mr. Wallis had many friends within the Indian Glass industry and everyone was shocked to hear about his sad demise.

Mr. John Wallis, who will always be remembered as a dear friend of AIGMF, said Mr. Vinit Kapur, Secretary.

As a respect, brief silence was observed at the virtual AIGMF Executive Committee Meeting held on April 20.

AIGMF's DRAWING COMPETITION 3.0 WINNER, AWARDED THE RASHTRIYA BAL SHAKTI PURASKAR 2021

Tanuj Samaddar aged 16 years, 10th class student of SERS Public School (District Kamrup, ASSAM); winner of the AIGMF's drawing competition 3.0 on the theme 'Glass Protects' was awarded the Pradhan Mantri Rashtriya Bal Shakti Puraskar 2021 (National Child Award) under 18 years of age in the category of Arts and Culture this Republic Day.

Tanuj holds 18+ international awards and 46+ national level awards and more than 250 state and regional level awards in this field. From an early age of one and a half years, he started drawing and painting.

Prime Minister Narendra Modi tweeted "here is Tanuj Samaddar, a young artist from Assam whose works



John Wallis, second from the right with Team Glass Worldwide at glasstec 2018

With a glass industry association dating back more than 40 years, Mr. Wallis worked as Deputy Editor, Editor, Managing Editor, Editorial Director and Business Sector Manager of Glass and Glass International and was instrumental in launching associated events before joining Glass Worldwide in 2010.

He also provided editorial and marketing services to several leading suppliers and glass industry bodies.

On behalf of the Glass Worldwide team, Mr. Dave Fordham commented: "John was a highly respected figure in the international glass community for many decades and will be sorely missed by his colleagues and friends throughout the world. Our sincere condolences are with his family at this very sad time".

"I was saddened to hear about the passing away of John Wallis. We met once or twice in 2 years. I had great respect for him. I consider it a personal loss. We knew each other for 3 or 4 decades. May his soul rest in peace." said Mr. Mohan Lalvani of Mascot Engineering Company.

"I knew John for many decades, he was humble and knowledgeable person. I just lost a good friend." said Mr. Sanjay Somany, CMD, HNGIL Ltd.

We are very sad to hear about the demise of



have been exhibited in art galleries across the world and appreciated. Congratulations on winning the Rashtriya Bal Puraskar, Tanuj. May your art keep enriching our lives and may you attain more success.”

To commemorate International Youth Day, AIGMF invited online entries from children between 7-16 years to participate in the 'Drawing Competition 3.0', wherein over 3000 students participated from across India. On Sept 15, 2020, Chief Guest Prof. Alicia Durán (Research Professor CSIC-Spanish National Research Council) and President of the International Commission on Glass, Madrid, SPAIN unveiled a touring exhibition on 'Glass Protects'. Top 3 winners were given cash prizes. Later, select drawings were borrowed and released as a 2021 calendar. Winning entries and calendar are available at www.aigmf.com

BOROSIL RENEWABLES TO DOUBLE SOLAR GLASS CAPACITY INVESTING ₹ 500 CRORES

Borosil Renewables, the sole domestic manufacturer of solar panel glass, is doubling its capacity to 900 tonnes per day with an investment of ₹ 500 crores.

A part of the Borosil Group that is the market leader in laboratory glasses and other consumer glasses, currently has a 450-tonnes per day solar panel glass capacity at its Baruch plant, which is enough to power 2.5 GW of solar power plants.

With the brown field expansion at the Barauch plant in Gujarat, the capacity will jump to 900 tonnes per day or 5 GW of installable capacity of solar power plants.

“The new plant, at an investment of ₹500 crores, should be up and running by July 2022, and this is the second doubling of its capacity in the past five

years”, said Mr. Shreevar Kheruka, the Managing Director of Borosil Group.

Mr. Kheruka, who was recently enlisted into the World Economic Forum's young global leaders list for 2021, said the solar panel glass business was loss making for a long and it was only in the recent months it has turned around.

Borosil Renewables is in a unique position not only for being the sole domestic manufacturer of solar panel glasses but also its business is protected from an anti-dumping duty on its only competition-- imports and thus not having any price setting power. Since the anti-dumping duty was slapped its share price has soared around 500 per cent from its 52-week low in March 2020.

Borosil manufactures around 600 consumer and laboratory glass products at its Jaipur, Nashik, Pune and Tarapur plants.

In the solar panel glass business, which is globally controlled by China with around 90 per cent market share, Borosil meets 40 per cent of the domestic demand of 650 tonnes glasses per day, while the rest is imported from China and Malaysia.

Mr. Kheruka said the company exports almost 20 percent of its present solar panel glass capacity to Europe, with primary focus being Germany, Spain, Portugal Russia and Turkey, and also the US.

AGI GLASPAC INVESTS ₹ 55 CRORES IN SPECIALTY GLASS DIVISION

Manufacturer of integrated container glass, AGI glaspac announced its partnership with a Germany tech giant Horn Glass Industries AG to build a new furnace for the company's

Bhongir plant in Telangana.

The technology will cost ₹ 55 crores and it is a part of the recent ₹ 220 crores investment raised by AGI glaspac from its parent company HSIL Limited.

The facility will comprise end-fired furnaces with six forehearths for production. With the setting up of this new furnace, the company's Bhongir plant will be able to produce 154 tonnes of premium flint and other different colours.

Mr. Rajesh Khosla, President & CEO, AGI glaspac, said, “Our investment in German technology is aimed at strengthening our units to make products more efficiently out of India for global markets.”

This high-quality speciality glass produced will cater to industries such as carbonated water, sparkling wine, pharmaceuticals and beauty products, among others.

SUNRISE GLASS TO INSTALL 240 TPD CONTAINER FURNACE

Sunrise Glass Industries Pvt. Ltd., is adding a new furnace with an installed capacity of 240 TPD. The company currently operates two furnaces with a combined installed of 380 TPD.

Mr. Gaurav Thakkar, Executive Director, told: “Sunrise Glass is part of the Astron Group and at present we have two furnaces with a capacity of 210 MT/day and 170 /day”.

“We are coming up with a third furnace of 240 Mt/day capacity. We started our glass business in 2011 and with three furnaces in span of 10 years it makes us one of the fastest growing container glass manufacturers in the country. The furnace will have four lines with three AIS 10 triple gob (TG) Emhart Machines. All the lines will have EVM (Inspection

Machines) and along with this we have installed an automatic cullet sorting plant that has been imported from Austria. The container glass plant was expected to start in November 2020 but it got delayed due to Covid. We will commence the commercial operations by April 2021. We will be catering to the same customers and major focus will be liquor. We have started focusing on exports to the USA and Europe for food grade jars. Not from the new furnace but overall, we have started developing the food grade market for jars and bottles.”

He added: “The Indian glass industry was growing marginally since the last 3-4 years. But COVID has had a big impact on demand for liquor and due to that glass has impacted badly. We faced a 20-25% downfall in supply since the pre-covid scenario. “Yes, slowly but industry has started recovering from the Covid shock and as the tourism has started and people have started travelling, we are hoping that demand of glass will increase and it’ll reach to a pre-Covid level.”

Based in the city of Surat in the state of Gujarat, Sunrise Glass has a logistical advantage in serving domestic and international clients. Proximity to some of the best seaport in the country, has enabled the company to export a significant part of total output.

MESSE DÜSSELDORF CALLS OFF GLASSTEC IN JUNE 2021

The glasstec trade fair will not be held as planned due to the sustained pandemic and continued global lockdown measures as well as international travel restrictions. In close coordination with associations and partners Messe Düsseldorf has decided to cancel glasstec scheduled from 15 to 18 June 2021, which had already been postponed from 2020 to

INDUSTRY MEMBERS TAKING VACCINATION JABS.....



Mr. Prem Malhotra, Special Correspondent KANCH & Affiliate Member, Glacera Engineers, Pune



Mr. Ashok Dholakia of Gopal Glass Works Ltd., Ahmedabad

2021. The next glasstec will be held in line with its accustomed scheduling from 20 to 23 September 2022.

Commenting on this Mr. Erhard Wienkamp, Managing Director of Messe Düsseldorf, said that holding the event successfully on the planned dates in June could still not be guaranteed under the given circumstances: “As of March 3 the German Federal-State Conference has decided to further extend the nationwide lockdown. Based on this decision and due to the current level of infection rates and the associated international lockdown restrictions we cannot guarantee holding the event in the accustomed format and quality. Especially as a result of the travel restrictions, glasstec with its high percentage of international exhibitors and visitors would not be able to live up to its standing as the world’s leading trade fair for the glass industry. We have re-assessed the situation with our partners and jointly opted in favour of cancelling glasstec in June. The planning certainty of our exhibitors, visitors and service providers is our highest priority. All activities will now centre on the successful holding of glasstec 2022.”

“glasstec has been and still is the most relevant global event for the glass industry, machinery producers

and skilled crafts, and it brings together people from all over the world. A glasstec held in 2021 can, unfortunately, not fulfil this expectation. Business has already started to pick up for the glass sector and will make glasstec an international festival for the glass industry again next year,” says Mr. Egbert Wenninger, Chairman of the glasstec Advisory Board and Chairman of VDMA’s Glass Technology Forum.

For 2022 organisers are additionally working on a hybrid trade fair experience with a view to also allowing digital participation in conferences and Special Shows such as glass technology live. glasstec 2022 will open its registration portal for interested companies in June of this year. The glasstec team is available to answer any questions from all exhibitors, visitors and media. For current information revolving around the leading international trade fair for the glass industry go to www.glasstec-online.com

At the same time, Messe Düsseldorf partner Reed Exhibitions is also cancelling the leading European trade show for the promotional product industry PSI which was planned for May.

MAHARASHTRA GETS INDIA'S FIRST FLOATING LNG STORAGE AND REGASIFICATION UNIT

India's first Floating Storage and Regasification Unit (FSRU) has arrived at H-Energy's Jaigarh Terminal in Maharashtra. A statement from H-Energy said the FSRU Höegh Giant, which sailed from Keppel Shipyard, Singapore, was berthed at Jaigarh terminal in Maharashtra.

This will also be the first year-round Liquefied Natural Gas (LNG) terminal in Maharashtra, the statement added. The LNG terminal is located at JSW Jaigarh Port in the Ratnagiri district of Maharashtra, on the west coast of India. The port is the first deep water, 24x7 operational private port in Maharashtra.

"The 2017-built Höegh Giant has storage capacity of 170,000 cubic metres and installed regasification capacity of 750 million cubic feet per day (equivalent to about six million tonnes a year). H-Energy has chartered the FSRU for a 10-year period," the statement said.

"Höegh Giant will deliver regasified LNG to the 56-km long Jaigarh-Dabhol natural gas pipeline, connecting the LNG terminal to the national gas grid. The facility will also deliver LNG through truck loading facilities for onshore distribution, the facility is also capable to reload LNG onto small-scale LNG vessels for bunkering services," it added.

H-Energy said that it also intends to develop small-scale LNG market in the region, using the FSRU for storage and reloading LNG onto smaller vessels.

Commenting on the development, Mr. Darshan Hiranandani, CEO, H-Energy said "FSRU based LNG Terminals aim at providing the ability to enhance the pace of natural gas import capability in an environment friendly and efficient manner".

"With the berthing of the FSRU Höegh Giant, the LNG regasification terminal will be ready to start testing and commissioning activities soon, he said.

FIVE SGD PHARMA COLLEAGUES RECOGNIZED BY CHINA JIANYIN INVESTMENT LTD (JIC)



Traditionally, around the Chinese Lunar New Year, SGD's Shareholder, China Jianyin Investment Limited (JIC), conducts a group management meeting in Beijing to present operational and financial results for the year. The conference culminates with a lavish employee talent event and presentation of The Golden Ploughshare Awards, which are given to employees selected in recognition of their exceptional performance and commitment.

This year, due to Covid-19 pandemic, the conference was cancelled but JIC maintained the employees' recognition. For 2020, awardees were:

- Mr. Emmanuel Lepitre - Quality Manager, SQLM
- Mr. Mukul Kumar Sonthalia - Finance Director, India
- Ms. Najet Mebarki - Senior Product Manager
- Mr. Nishant Desai - Sales & Marketing Director, India
- Ms. Tracey Luo - Procurement Director, China

FURNACE FOR THE FUTURE PROJECT SELECTED FOR STAGE 2 OF THE EU INNOVATION FUND

The European Container Glass Industry project has been selected as one of the top 70 proposals rated as highly strategic to the achievement of the Paris Climate Agreement.

The Furnace for the Future (F4F) has been selected out of 311 projects to progress to the second phase of the EU Innovation Fund, one of the world's largest funding programmes for the demonstration of innovative, low-carbon technologies.

The F4F project is a breakthrough technology, which will enable the industry to switch to renewable electricity and cut CO₂ emissions by up to 60% in the furnace (50% for the whole factory). Container glass production currently uses a mix of roughly 80% gas and 20% electricity. By inverting this to have a mix of roughly 20% gas and 80% renewable electricity, the carbon footprint of glass packaging will be dramatically reduced.

"We are honoured to be among the 70 projects considered by the European Commission as strategic to a climate-neutral Circular Economy. This brings us great pride as we prepare to enter the second round of the application and make the F4F a reality as soon as possible" comments Mr. Michel Giannuzzi FEVE President. "The Furnace for the Future represents a key step towards a sustainable future for glass packaging. With this project we will address the priorities of our customers and strengthen our relationship with them", adds the FEVE President.

Electric melting already exists but is limited to small-scale furnaces for clear glass with limited recycled glass content. The F4F will make electric melting work in a large-scale, industrial hybrid oxy fuel furnace, running on 80% renewable electricity, for all glass colours, using high amounts of recycled glass.

The F4F project is technically and financially supported by 19 container glass companies who have signed a binding agreement and who, together, represent over 90% of production in Europe. Ardagh Group has been selected to build the furnace at their Obernkirchen site in Germany and will make the application as the beneficiary, strongly supported by the industry-wide consortium. Each of the industry partners will co-fund the project and in return will have access to the technology and know-how. Working as a sector has many advantages for the subsequent roll out and scalability of the technology.

“We are strongly committed to making our industry transition to a resource-efficient and low-carbon economy” concludes Ms. Adeline Farrelly, FEVE Secretary General. *“We welcome the support from public institutions and from our partners, which will help us make this transition real.”*

GSI-TERI SIGN MoU TO OPTIMISE RESOURCES, ADD THERMAL-VISUAL COMFORT IN BUILDINGS

The Energy and Resources Institute (TERI) and Glazing Society of India (GSI) signed a Memorandum of Understanding (MoU) on February 23 to augment the application and implementation of high-performance glazing systems (façade & fenestration) in buildings, through mainstreaming of reliable testing and performance assessment protocols. TERI and GSI share a common vision of promoting



sustainability in the built environment through efficient building design & optimal use of resources.

The MoU was signed between Mr. A. R. Unnikrishnan, Chairman, GSI and Mr. Sanjay Seth, Senior Director – Sustainable Habitat Programme, TERI in the presence of Dr. Ajay Mathur, Director General, TERI; Dr. Vibha Dhawan, Designate Interim Director General, TERI; Mr. Gopal Ganatra, Treasurer, GSI and Mr. G N Gohul Deepak, Executive Director, GSI.

The MoU envisions to promote applied research around glazing systems and their implementation in building envelopes. The partnership would also help produce a cadre of skilled professionals, specialized in glass façade & fenestration design and selection. Speaking on the occasion, Dr. Ajay Mathur said: *“The collaboration and enhanced cooperation between the two organizations will help improve resource & energy efficiency in buildings, ensuring thermal & visual comfort, while paving the path towards sustainable and carbon neutral infrastructure development.”*

“GSI has been working over the years on building standards, testing and certification eco-system in the country for Glass and glazing. The collaboration with TERI would take this journey to the next orbit in ensuring sustainable development in a growing economy like India”, said Mr. A R Unnikrishnan, Chairman, GSI on the occasion.

TERI is committed to provide expert technical assistance to GSI, to develop performance evaluation procedures for glazing materials and standardise benchmarking protocols. This would enable end-users to understand the energy saving potential by application of glazing systems, through informed decision making leading to value addition in building design.

SCHOTT REACHES COVID-19 MILESTONE: VIALS FOR 1 BILLION VACCINE DOSES DELIVERED

Global specialty glass leader and pharmaceutical packaging supplier SCHOTT has delivered vials to provide more than 1 billion doses of COVID-19 vaccines. SCHOTT remains well on track to deliver vials for more than 2 billion vaccine doses through 2021.

The vials were delivered to projects around the world, with a focus on the US, Europe, and Asia. Approximately 90 percent of approved vaccines rely on SCHOTT vials.

“The reaction of the pharmaceutical community to COVID-19 is a testament to the power of scientific progress,” said Dr. Frank Heinrich, CEO of Germany headquartered SCHOTT AG. *“In just under a year, all previous records for vaccine development have been shattered by not just one, but several research groups. The entire industry is successfully working together to ensure an adequate supply. We’re also*

working with our government partners to evaluate ways to improve the supply chain and expand production capacity.”

SCHOTT is one of the world's leading producers of pharmaceutical containers made from borosilicate glass, the most proven and most widely available material used to store and deliver vaccines and other sensitive medications. SCHOTT's global manufacturing footprint includes five sites dedicated to the manufacture of type-I borosilicate glass tubes and another 16 plants converting the tubes into vials.

SCHOTT's plant in Jambusar, Gujarat is one of the five flagship pharmaceutical tubing production sites, responsible for catering to the vast demand in India and Asia. Owing to the soaring demand for quality glass packaging products, SCHOTT expanded its local tubing production capacity by 20,000 tons within one year. This translates into enough glass for over 3 billion vials. SCHOTT also has a 50-50 Joint venture in India by the name of SCHOTT-KAISHA, who is a market leader for manufacturing and supplying pharmaceutical packaging products in India.

“This past year, we have together witnessed the global pharmaceutical industry's resilience and dedication to fight the novel Coronavirus,” said Mr. Pawan Kumar Shukla, President SCHOTT Glass India. *“We are proud to be a part in this fight from India, as a leading contributor of quality glass to ensure successful and safe administration of the Covid-19 vaccines. Despite the challenges faced, our India plant has operated in full capacity within strict safety guidelines, while supporting our global clients and growing workforce.”*

The success of the COVID-19 response is supported by the company's multi-year, \$1 billion global

investment in pharmaceutical glass and packaging facilities announced early 2019 in response to rising worldwide demand for safer drug packaging. Despite the pandemic, all expansion projects are on track.

SECOND WEBINAR ON INDIAN STANDARDS FOR GLASS AND GLAZING



Bureau of Indian Standards (BIS), Glazing Society of India (GSI), Indian Institute of Technology (IIT) Madras and CSIR – Central Glass and Ceramic Research Institute (CGCRI) successfully organised the second webinar on Indian Standards for Glass and Glazing on Feb 26.

Dr. Suman Kumari Mishra, Director CSIR-CGCRI delivered the Inaugural Address in the webinar and said that India should be self – sufficient in terms of standards, policies and testing capacities for all types of glass including the speciality glasses. She also invited the Industry to work with CSIR – CGCRI and GSI on the research, testing and standards for glass and its related products. Mr. J R Chowdhury, Deputy Director General, BIS, delivered the Keynote Address and emphasised the importance of Indian Standards

and its need for the country. Mr. A R Unnikrishnan, Chairman, GSI in his welcome address briefed the importance of having the knowledge and execution of the standards. He also said that India has the complete manufacturing capacities, technology and resources for the supply of all types of glass for India and all other global countries. Dr. K Annapurna, Senior Principal Scientist, CSIR-CGCRI briefed the objective for the webinar. Mr. Ajay K Lal, Head, Chemical Department, BIS in his special address, updated on the various Indian Standards available for Glass and assured that BIS will come out

with Standards for all types of glasses in India. Mr. G N Gohul Deepak, Executive Director, GSI delivered the Vote of Thanks.

The Technical Session had 5 expert speakers including Dr. K Annapurna, Senior Principal Scientist, CSIR-CGCRI; Mr. Tariq Kachwala, Member, GSI; Mr. Mohit Garg, Member Secretary, CHD 10, BIS; Mr. Gyan Prakash, Scientist 'B', Central Marks Department -II, BIS; and Ms. Ankita Srivastav, Scientist 'C' ITS Department, BIS making presentation on various topics on Glass and Glazing.

The webinar was attended by participants comprising of Architects, Civil Engineers, Builders, Developers, Consultants, Contractors, Glass Processors, Manufacturers, Government Officials, Academia and Other professionals. There was

an interactive question and answer session between speakers and the attendees at the end of the session. The webinar was well appreciated by the participants.

FOUNDATION INDUSTRIES WORK TOWARDS INDUSTRIAL SYMBIOSIS

Bringing together partners from across the foundation industries, the EnviroAsh project aims to investigate waste ashes, slags and mineral by-products as a source of secondary raw materials.

The project team led by Glass Technology Services, consisting of partners from across the foundation industry supply chain and academia, hosted an interactive workshop to discuss opportunities for reusing waste materials, identify the barriers associated with secondary raw materials, and address factors implementing application.

The event was widely attended by the colleagues from across the six foundation industries (glass, ceramics, steel, paper, cement and chemicals) as well as representatives from academia, government agencies, and the energy sector.

Mr. Chris Holcroft, Principal Technologist at Glass Technology Services provided an insight into circular economy and industrial symbiosis, as well as progress on the EnviroAsh project:

“In a circular economy we are moving away from the linear manufacturing model of take, make and dispose towards a future where waste that can be recycled is injected back into the economy and manufactured as secondary raw materials.

“This process across multiple manufacturing industries, creates industrial symbiosis and is vital in reducing waste to landfill, as well as

reducing requirements for virgin raw materials, and in some cases energy.

“When there is increasing pressure on brands, retailers and the wider industry to become more sustainable, there’s no better time to look into solutions to expand circular economy and the availability of secondary raw materials through industrial symbiosis.”

The EnviroAsh project expands upon an established consortium who have investigated the use of biomass ash as a raw material for glass manufacturing. Bringing together partners from across the foundation industries, events such as this one is the perfect opportunity to gather and share expertise, best practice, and inspiration.

“The event was well represented by individuals from across the foundation industries, providing a stimulated and useful discussion around the use of secondary raw materials. Identified barriers included the quality and quantity of waste available, high costs for waste materials, and permit requirements around the processing of waste.

“The appetite for moving the project forward was very strong and it was recognised that finding a home for these waste materials will drive us forward on our journey towards a circular economy and industrial symbiosis.

“The project will go beyond the simple proof of principle that these materials work and will look to develop processes to deliver consistent quality materials in sufficient quantities and in a commercially viable way. This will help to develop the supply chain for these materials to encourage take up.

“It was fantastic to see so many industry representatives present and to facilitate an excellent discussion around waste products as raw materials. The consortium will be hosting another event in September 2021 to give an update on our progress.”

To be kept up to date with the EnviroAsh project, the next event or to get involved contact m.grattidge@glass-ts.com

Led by Glass Technology Services, EnviroAsh – Development of new waste-derived raw materials for the Foundation Industries, is funded as part of the Innovate UK ‘Transforming Foundation Industries: Fast Start Projects’ funding call. Other project partners include Sheffield Hallam University, The University of Sheffield, Power Minerals, Glass Futures, Encirc, Saica Paper, Drax Power, Hanson Cement and Wienerberger.

VERESCENCE ANNOUNCES ACQUISITION OF MAJORITY STAKE IN PACIFICGLAS

Verescence, a global leader in luxury glass packaging for the Perfumery and Cosmetics industries, announced the acquisition of a majority stake in Pacificglas, the Korean leader for glass packaging in Cosmetics industries and a long-term partnership with Amorepacific.

For over 120 years, Verescence has been a privileged partner to the biggest perfume and cosmetics brands due to its extensive know-how and expertise. Verescence produces 500 million bottles per year in its three glass production sites and its four decoration sites in Europe and North America. In 2019, the company employed 2,300 people worldwide and achieved sales revenue of 309 million EUR.

Mr. Thomas Riou, CEO of Verescence, said, “We are delighted with the acquisition of a majority stake in Pacificglas and the long-term partnership with Amorepacific. This is a major step in our Strategic Plan, Verescence 2022. Amorepacific will become a top customer of Verescence group and with Pacificglas, Verescence

will reinforce its leadership in high-end Perfumery & Cosmetic glass packaging. From this strong base Verescence plans to become a pan-Asian leader and will invest in technology and capacity to meet growing demand of high-end glass.”

AIS GLASS DESIGN OLYMPIAD GRAND FINALE HELD SUCCESSFULLY

Asahi India Glass Limited (AIS), India's leading automotive and building glass company, offering end-to-end solutions across the automotive and the architectural glass value chain has always believed in reshaping the architectural landscape.

AIS held the Grand Finale of the 2nd season of AIS Glass Design Olympiad on 30th January. This was a virtual event held on a live portal which was witnessed by students, principals & faculty members of architectural colleges, Architects and other people across India in large nos. The 2nd edition of 'AIS Glass Design Olympiad' (GDO), was aimed at 'Reimagine Housing' keeping in mind the Pradhan Mantri Jan Awas Yojana which is an initiative by Government of India in which affordable housing will be provided to the urban poor with a target of building 20 million affordable houses by 31 March 2022. The students were also asked to include pandemic driven changes in their designs, which was one of the important parameters on which their designs would be judged.

The 10 finalists presented their designs to a Jury Panel of 4 Architects – Ar. Vivek Bhole – Principal Architect at Neo Modern Architects Mumbai (Curator & Juror), Ar. Prashant Sutaria – Principal Architect at PSA Mumbai, Ar. C S Raghuram – Director at CRN Architects Chennai and Ar. Karl Wadia- Senior Associate at Hafeez

Contractor Architects Mumbai.

This event was graced by Ar. Habeeb Khan (President at Council of Architecture, India) as a Chief Guest and Mr. Sanjay Seth (Sr. Director at The Energy and Resources Institute (TERI) & CEO of GRIHA Council as the Special Guest.

The awardees were as follows:

- 1- Divyanshi Gupta & Chaitanya Joshi (team) – Bharati Vidyapeeth College of Architecture, Navi



Chaitanya Joshi



Divyanshi Gupta

Mumbai

- 2- Sakshi Baheti, Ankita Dhanke & Gaurav Karkande (team)– Sir J J



Sakshi Baheti



Ankita Dhanke



Gaurav Karkande

School of Architecture, Mumbai

- 3- Prithvi V, Krithika Ravisankar & Hridhaya Subramaniam (team)–



Prithvi V



Krithika Ravisankar



Hridhaya Subramaniam

NIT, Tiruchirapalli

The winners received exciting cash prizes, certificates and trophies from AIS.

Speaking at the occasion Mr. Vikram Khanna, COO – Asahi India Glass Ltd said, “It’s been an honour and privilege for us to organize the AIS Glass Design Olympiad. I would like to take this opportunity to thank all the Jury members and students who made this event successful. I hope this event will

be a great learning experience for all the participants, and they become richer in knowledge, and take back with them good memories of the event.”

Ar. Vivek Bhole, Curator – GDO said, “It was great associating with AIS GDO as a Curator and Jury member again in its 2nd consecutive year. I thoroughly enjoyed this journey with AIS team and hope to be part of many more GDO events in future.”

Ar. Habeeb Khan, who was Chief Guest at the GDO Finale said, “I congratulate AIS for holding an event like for architectural students, where they are challenged to think beyond ordinary, helping them in bringing out the best of their skills on a national level platform and in front of industry leaders. This is a great platform for getting exposure.”

LAUNCH EVENT OF R SUBRAMANIAN (RS) FELLOWSHIP AWARDS

The R Subramanian (RS) Fellowship Awards, in memory of Late Founder Chairman GSI, Mr. R Subramanian was launched on March 6 via Video Conferencing in the presence of Mr. Alok Modi, Gujarat Guardian Limited; Mr. Sanjay Labroo, Asahi India Glass; Mr. B Santhanam, Saint Gobain India Pvt. Ltd.; Mr. A R Unnikrishnan, Chairman, Glazing Society of India; Mr. Gopal Ganatra, Treasurer, Glazing Society of India; Prof. Arul Jayachandran, IIT Madras; Dr. K Annapurna, CSIR-CGCRI; Prof. Rajan Rawal, CEPT University; Mr. Saurabh Kankar, Secretary, Glazing Society of India; Mr. Gohul Deepak, Executive Director, Glazing Society of India and other dignitaries from Industry, Academia and Government.

Mr. Alok Modi, Mr. Sanjay Labroo and Mr. B Santhanam made special addresses in the event and were reminiscing the contribution and



work of Mr. R Subramanian to the Indian Glass and Glazing Industry. Prof Arul Jayachandran, Dr. K Annapurna and Prof. Rajan Rawal shared their memories about RS in the event. Mr. Gopal Ganatra made a presentation on the RS Awards initiative. Mr. A R Unnikrishnan made the welcome remarks and Mr. G N Gohul Deepak delivered the vote of thanks. The R Subramanian Fellowship Awards Logo was unveiled by the Treasurer and Secretary of GSI on behalf of the entire Glass and Glazing Fraternity.

The main objective of the award is to encourage and build research and study on glass, profiles, façade, fenestration, and its associated materials in India. The research and study would be focussing on the quality and performance of materials and on the application and functional aspects of the same in buildings in India.

The R Subramanian Fellowship Awards is supported by the entire Glass and Glazing Industry, Indian Institute of Technology Madras (IITM), CSIR – Centre for Glass and Ceramic Research Institute (CGCRI) and CEPT University.

The Award will be initially rolled out for Students and Research Scholars in the areas of Architecture, Engineering and Technical Studies. The Award comprises of both monetary support (cash award) and technical support.

The RS Fellowship Award will provide an immense opportunity for the students / research scholars to work closely with the industry.

The RS Fellowship Award focuses on the following areas:

- Glazing Materials: Glass, Profiles, Glass Façade and Fenestration and Associated materials (sealants, interlayers, etc)
- Glazing Buildings
- Construction
- Functional Performance like Safety, Structural Integrity, Energy Efficiency, Fire Resistance and Sound Insulation

FISME OFFICIALS CALLS ONTO AIGMF

The Covid-19 pandemic and other geopolitical developments have highlighted the need to build domestic manufacturing and reduce our reliance on imports. Focusing on 'Atmanirbhar Bharat', (self-dependent India) the Federation of Indian Micro and Small & Medium Enterprises (FISME) initiated a program with Small Industries Development Bank of India (SIDBI) and Centre for WTO Studies (IIFT, New Delhi) for 'Creating a Roadmap for Substituting Chinese

Imports by Building Manufacturing Capability in 15 Identified MSME Clusters'.

Glass Chandeliers including other electric ceiling or wall lighting fittings is one set of the items chosen for the study and intervention as these are being imported from China. The study's overall objective is to identify what would it take to manufacture these items in India and out-compete Chinese imports. Following the study, SIDBI along with FSME, AIGMF and other institutions will endeavour to provide the financial, technical, Government Policies and marketing support needed by the cluster.

Mr. Anil Bhardwaj, Secretary General, FISME, Mr. D. Bandyopadhyay, Consultant, FISME, Mr. R P Singh, Director, FISME, Mr. Afaq Hussain, Director, Bureau of Research on Industry & Economic Fundamentals (BRIEF) and Ms. Supriya (BRIEF) met Mr. Mukesh Kumar Bansal, Treasurer AIGMF, who also happens to be a leading exporter of glass items from Firozabad to all over the world.

Discussions were held on how self-dependency could be achieved for manufacturing of chandeliers and other lighting fittings.

As a goodwill gesture, Mr. M K Bansal presented Swachh Bharat Abhiyan (clean India campaign) logo encrypted glass bottles (*specially made by HNG & Industries Ltd.*) made out of 100% recycled glass to the visiting guests ■

(News Source: AIGMF Research Team / World Wide Web)



कांच निर्यातकों को अब तमाम सहूलियतें दिलाएगी सरकार

योगी सरकार सुहागनरी के कांच निर्यातकों को कई तरह की सहूलियतें मुहैया कराएगी। निर्यातकों को अब सार्क देशों को माल निर्यात करने पर अमेरिका व यूरोपीय देशों को किए जाने वाले एक्सपोर्ट समान पर सरकारी रियायतें निर्यातकों को मिल सकेंगी। जिससे ग्लास एक्सपोर्ट को बढ़ावा मिल सकेगा। वहीं निर्यातकों को कोरोना काल में होने वाले आर्थिक नुकसान की काफी हद तक भरपाई हो सकेगी।

फिरोजाबाद के भाजपा विधायक मनीष असीजा के साथ कोषाध्यक्ष, दि ऑल इंडिया ग्लास मैनुफैक्चरर्स फेडरेशन एवं ग्लास मैनुफैक्चरर एंड एक्सपोर्ट एसोसिएशन के चेयरमैन मुकेश बंसल (टोनी) ने 2 मार्च को लखनऊ पहुंच कर प्रमुख सचिव एमएसएमई एवं निर्यात प्रोत्साहन से मुलाकात की। इस दौरान उन्होंने प्रमुख सचिव नवनीत सहगल को सुहाग नगरी के ग्लास एक्सपोर्टों का दर्द बयां किया। निर्यातक इकाईयों की अनेक समस्याएँ बताईं।

मुकेश बंसल जी ने अवगत कराया कि कोरोना



प्रमुख सचिव लघु एवं निर्यात प्रोत्साहन नवनीत सहगल से लखनऊ में मुलाकात कर कांच निर्यात की समस्याओं को लेकर ज्ञापन सौंपते विधायक मनीष असीजा के साथ कोषाध्यक्ष, दि ऑल इंडिया ग्लास मैनुफैक्चरर्स फेडरेशन एवं ग्लास मैनुफैक्चरर एंड एक्सपोर्ट एसोसिएशन के चेयरमैन मुकेश बंसल टोनी।

काल में फिरोजाबाद ग्लास एक्सपोर्ट को अनेक समस्याओं का सामना करना पड़ रहा है। वैश्विक मंदी और माल के काफी आर्डर रद्द हो जाने से निर्यातकों को काफी अधिक नुकसान झेलना पड़ रहा है। वहीं दूसरी ओर सार्क देशों में जैसे नेपाल, भूटान, बांग्लादेश, पाकिस्तान व श्रीलंका में निर्यात करने पर

सरकार द्वारा कोई रियायत नहीं दी जा रही है। जैसे कि अमेरिका व अन्य यूरोपीय देशों में एक्सपोर्ट करने पर दी जाती है। जिस पर मुख्य सचिव सहगल ने सहमति जताई। उन्होंने मौके पर संयुक्त निदेशक निर्यात को फिरोजाबाद के ग्लास एक्सपोर्टों को उपयुक्त रियायतों दिलाए जाने के निर्देश दिए।

प्रमुख एक्सपोर्टर के पुत्र के विवाह में केंद्रीय मंत्री सहित कई हस्तियों ने की शिरकत



फिरोजाबाद नगर के प्रमुख ग्लास एक्सपोर्टर उद्यमी मुकेश बंसल टोनी के पुत्र श्रेय का विवाह समारोह 16 फरवरी को आगरा फतेहाबाद रोड स्थित केएनसीसी (कुंज महल कन्वेंशन सेंटर) में धूमधाम से सम्पन्न हुआ। विवाह समारोह में राजनीति, उद्योग,

मीडिया जगत से तमाम हस्तियों ने शिरकत की। प्रमुख रूप से भारत सरकार के जल एवं मानव संसाधन मंत्री रतन लाल कटारिया एवं पूर्व सांसद कांग्रेस के वरिष्ठ नेता सिने अभिनेता राज बब्बर ने विवाह समारोह में पहुंचकर वर-वधू को आशीर्वाद



विवाह समारोह में मुकेश बंसल टोनी के साथ मौजूद केंद्रीय मंत्री रतन लाल कटारिया एवं पूर्व सांसद एवं बॉलीवुड अभिनेता राज बब्बर

दिया। कई घंटे विवाह समारोह में रुककर वहां मौजूद लोगों से बातचीत की। वहीं फिरोजाबाद नगर विधायक मनीष असीजा, फिरोजाबाद शहर के प्रमुख उद्योगपति प्रदीप गुप्ता, राजकुमार मित्तल, युवा उद्यमी हेमंत अग्रवाल बल्लू, डॉ. मयंक भटनागर, हरवंश शर्मा, वरिष्ठ पत्रकार सौरभ उपाध्याय भी विवाह समारोह में शामिल थे।

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Diversification that pays dividends

A leader in the Indian glass industry, Emerge Glass has not simply rested on its laurels. As part of its strategy for growth, the flat glass manufacturer has taken the step of diversifying into the container market. In an exclusive interview with *Glass Worldwide* (preferred international journal of the All India Glass Manufacturers' Federation), Managing Director Sumit Gupta discusses the launch of Emerge's hollow glass plant and why he believes it will give the company a global presence.



Sumit Gupta has used his 15 years of experience to bring momentum to the Emerge Glass brand.

Armed with an MBA from a reputed institute, in 2004 Sumit Gupta began his journey into the Indian glass industry with aluminium composite panels (APC), which was followed by further projects and a foray into WPC, silicone sealant and sheet glass. By successfully instituting a manufacturing unit in Dubai for non-combustible metal composite panels, he set a precedent for the industry.

As Managing Director of Emerge Glass, Mr Gupta has used his 15 years of experience to bring momentum to the brand, one of the leading manufacturers of facade and glass solutions.

Part of the Alstone Group, Emerge Glass established a manufacturing



The Emerge Glass site in Rajasthan houses a recently completed glass container factory.

unit in Rajasthan to cater for the needs of flat glass in the Indian Industry. The factory produces sheet glass ranging in thickness from 1.2mm to 10mm and uses Glaverbel drawing technology to produce ultra-thin clear glass (1.2mm to 2mm). The company is "the only manufacturer in India with the capability of producing three different thicknesses of clear flat glass at a time – we enjoy an upper hand in market competition" says Mr Gupta. "In sheet glass, we are number one" he notes, commenting on Emerge's position in the Indian flat glass industry.

Emerge also manufactures environmentally-friendly (free from copper and tin) aluminium-coated mirrors, produced on a horizontal sputtering magnetron line for enhanced image and clarity, ranging from 1.5mm to 5mm thicknesses. In addition, the company offers a glass frosting service, sandblasting clear sheet glass to make it suitable for privacy

applications in bathrooms, conference rooms etc.

"Since our inception in 2013, we (have) earnestly ensured to manufacture the highest standards of glass solutions and constantly strived ▶



Emerge Glass produces sheet glass ranging in thickness from 1.2mm to 10mm and uses Glaverbel drawing technology to produce ultra-thin clear glass (1.2mm to 2mm).



China-based Qinhuangdao Batch Technology has provided batch systems for the container project.



Four advanced IS machines have been acquired from Shandong Sanjin Glass Machinery Co Ltd.

to match industry practices” Mr Gupta says. “Powered by innovative capability and engineering expertise, our customised glass solutions are done as per customers’ needs.”

Emerge Glass has 210 permanent employees and approximately 200 personnel on a contract basis for temporary/non-permanent jobs. The average level of experience is seven to ten years of knowledge.

The company’s three main customers are M/S Ajanta Clock, M/S Sonam Clock and M/S Rohim Industries, according to Mr Gupta, who reports that Emerge’s business is mostly domestic, with approximately 10% exports.

Although the firm is happy to source technology from both Indian suppliers and international companies, currently complete technical knowhow and supplies are from CTIEC China.

Made in India

Sumit Gupta identifies the ‘Vocal for Local’ campaign spearheaded by India’s Prime Minister Narendra Modi as one of the biggest opportunities for Emerge in the flat glass industry. This vision for localisation emphasises self-reliance, calling for more products to be made in India but also for the promotion of local brands, manufacturing and supply chain – with the ultimate goal that ‘made in India’ products become competitive with global brands and establish their own presence worldwide.

An ongoing challenge for Emerge is the quantity of imports still coming from China. However, the company’s website reiterates the message that “international quality of flat glass is available right here in India... now, you don’t



Annealing lehrs during installation at the Behror glass container plant.

have to place the order in bulk and wait for a month for the shipment to be delivered from abroad.”

Mr Gupta cites producing ultra-thin glass as a major focus for Emerge’s immediate future. Longer term, the company seeks to achieve 10%-12% growth and add further value with products such as mirrored glass. He describes the current status of the Indian float/flat glass sector as ‘encouraging’.

Operating from a fuel-efficient manufacturing unit with a long-life furnace, Emerge has an environmentally-friendly ethos and places great importance on recycling 100% of its water, optimum usage of cullet, using green energy and energy-efficient equipment, along with optimising power usage.

The role of the AIGMF

As a member of the All India Glass Manufacturers’ Federation (AIGMF) – the sole representative body of all segments of the Indian glass industry consisting of large, medium and small-

scale manufacturers – Mr Gupta is involved in active participation in all glass promotional events, working for the growth of glass. Access to federation resources to help earn and maintain an edge over non-member competitors is a key benefit of membership, he says, along with potential cost savings for increasing profit margins through collective and joint efforts; inside access to innovations and new developments; legislative representation to advocate for legislation on behalf of glass business and valuable industry networking.

Commenting on the importance of the AIGMF’s role in the furtherance of the Indian glass industry, Mr Gupta cites figures from the Asian Development Bank, indicating that economic growth in developing Asia is expected to rebound sharply to more than 6% in 2021.

“As a result, Asia Pacific is likely to register comparatively stronger market growth in the forthcoming years” he says. “In Asia Pacific, India is predicted to witness the fastest CAGR in the ▶



The Emerge container business will employ 350 people and cater to the premium end of glass packaging in the food and liquor sectors.



Along with the four container forming lines, Emerge has invested in forehearths from Shandong and Glass Era, who has also supplied furnaces.

next five years. Western economies in North America and Europe plan to invest in making their manufacturing bases in India, resulting in expected significant growth over the forecast period. This will lead to rising consumer disposal income, resulting in improved demand for glass products in infrastructure and in packaging due to extensive demand for packaged consumer goods; particularly in emerging economies like India.

“As the glass industry in India is also expected to witness substantial growth leading to increased need, the role of the AIGMF becomes extremely important to ensure gain to the glass industry in India” he adds.

Diversification

Motivated to pursue potential growth, in March 2021 Emerge Glass begins commercial production of container glass at its hi-tech plant, spread across 25 acres in Behror in the western state of Rajasthan.

“We have ventured into the premium glass packaging segment by manufacturing container glass in three categories from design to production, ornamentation of premium glass containers” Mr Gupta explains.

The Emerge container business will employ 350 people and cater to the premium end of glass packaging in the food and liquor sectors, with a view to capitalising on a supply-and-demand gap that has caused Indian producers to rely on foreign imports.

“With four advanced IS machines from Shandong Sanjin Glass Machinery Co Ltd, a Bucher Emhart Glass company, we will soon be producing 210 tons of high quality container glass per day” Mr Gupta confirms.

Along with the four container forming lines, Emerge has invested in forehearths from Shandong and Glass Era, who has also supplied furnaces. China-based Qinhuangdao Batch Technology has provided the batch systems, lehrs are from Amcet and cold end handling and palletising equipment has been sourced from AE Systems, Subline Engineering and MSC.

Premium products and service

“Emerge will target multi-national and reputed Indian companies in the following markets: Liquor and alcoholic beverages, food processing, beverages, pharmaceutical and cosmetic” Mr Gupta confirms, listing M/S Globus, Pernod, USL, Nicols, Dabur, Mohan Meakins and Tops as potential

customers. “Increasing demand for alcoholic beverages, coupled with rapid growth of food processing, pharma and the cosmetic industry in India is expected to augment segment growth” he adds.

To differentiate itself from other glass container manufacturers in India, Emerge intends to focus on quality and service. Actual and perceived differences in product features will be prioritised, along with “customer service/delivery/ease of ordering; availability and higher level of customer or technical service; and demonstrated competence, courtesy, credibility, reliability and responsiveness” says Sumit Gupta. Suppliers must demonstrate their own capability, quality and adherence to timeframes to be considered suitable candidates for supporting the new business.

“Emerge Glass through its sincere effort shall strive to delight users with its products and services, ensuring overall growth in all segments” Mr Gupta attests.

Future investment will be split between Emerge’s two divisions.



Operating from a fuel-efficient manufacturing unit with a long-life furnace, Emerge has an environmentally-friendly ethos.

“Flat glass is expected to register significant growth from 2020 to 2027 and possibilities for expansion will be suitably explored based on potential growth” while Emerge has “aggressive plans” for container glass and will invest in augmenting capacities by bringing in furnaces to produce cosmetic and coloured glass” says Mr Gupta.

The glass company is confident that its diversification will quickly pay dividends. “Soon we are going to emerge as a significant specialist player in glass manufacturing, not only in India but across the globe” Sumit Gupta concludes. “Our glass containers will adorn shelves around the world.” ●

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There is confidence that the Emerge container business will quickly pay dividends.

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Resources to Mitigate Bird Collisions for Bird-safe Glass

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Abstract

In the city landscape, we only watch a jungle of buildings where we could hardly expect to see any bird or some other natural species that pleases our eyes. Since the advent of various conventions on climate change, people have been asking for cleaner environment, better waste management, etc. in the city limits wherein we would be able to watch birds, but that becomes difficult as the time progresses, In the Figure 1, we could see a nice bird in a city where there are more trees. With more birds in the city landscape, there are some problems too. Our buildings are mostly made of glasses in the exterior so that glass-bird interaction, or rather collision takes place. This has to be reduced with an eye on design considerations. Some aspects are discussed here in this article.

INTRODUCTION

In any topic of discussion on safety glasses, we think of immediately about sheet or float glass, as discussed in many articles in Kanch in the past [1,2]. Bird-safe glasses is one such topic of importance. Bird-safe glass is a relatively new area in the architectural design of glass facade. One important point is that if the density of bird population is very high, the possibility of glass-bird collision will be relatively high so that the buildings in the locality have to be designed accordingly. Bird-collision with glass causes the deaths of a Billion birds/year, according to the Bird Conservation Society in the USA.

In the USA, there is an association called “The American Bird Conservancy” that - in the Western World’s Hemisphere’s bird conservation specialist – the only organization with a single and steadfast commitment to achieving conservation results for native birds and their habitats throughout the Americas. With a focus on efficiency and working in partnership, the

American Bird Conservancy (ABC) takes on the toughest problems facing birds today, innovating and building on sound science to halt extinctions, protect habitats, eliminate threats, and build capacity for bird conservation. It is observed that most people have seen or heard about a bird hit a window, they often believe it to have been an uncommon event. However, the occurrence is more usual than people might think. As said above, there are organizations like ABC, to take a national approach to solving the glass collision problem. ABC educates and informs architects, planners, and developers about the issue and solutions; advocates for legislation to require use of bird-friendly materials; and develops and evaluates new materials and products.



Fig. 1: A bird on the skyline creating beauty [3]

ABC’s “Bird-friendly Building Design” guide, built on the pioneering work of New York City Audubon, adds a review of the science behind available bird-friendly solutions and provides many visual examples of how those solutions can be applied to new construction and existing buildings [4.5].

FACTORS AFFECTING COLLISIONS

In general, a bird cannot understand or grasp the concept of glass – its transparency, reflectiveness, or the cues humans see to acknowledge

glass by context, such as millions or frames – and therefore fly into the deadly surfaces. Every site and building combine for a unique set of risk factors. These risk factors are related to geography, ecology, and migratory patterns that may be difficult to adjust. However, many problems can be mitigated through building design. According to ABC, glass causes virtually all bird collisions with buildings. Studies based on monitoring data have shown a direct relationship between the amount of glass on a building and the number of collisions at that site. Mirrored glass proves especially deadly. Various design strategies are discussed and consolidated into a compact design criteria. Bird-friendly design strategies fall into three general categories, any or all of which could be combined on a single project:

- Use minimal glass
- Place glass behind some type of screening (e.g. netting, screens, grilles, shutters, exterior shades)
- Use glass with inherent collision-reduction properties (e.g. patterns, frits, films, opaque and translucent glass).

While ABC recommends minimal glass as one option, Architectural Glass Institute (AGI) encourages the second two strategies.

BIRD-SAFE GLASS

Building codes, standards and green certification programs increasingly call for bird friendly design (and bird glass). According to the National Audubon Society, “bird-safe glass is specially designed to make glass a visible obstacle to birds.” Audubon cites approaches such as fritting, silk-screening, or ultraviolet (UV) coating to create patterns that break up the reflectivity of glass.

“More important than the technique used to create the pattern is its spacing. Testing has shown that the ‘2 x 4 rule’ is most effective – meaning that the silk, coating, or markings are added across the pane, spaced two inches apart horizontally and four inches apart vertically. Research has shown that birds will not fly through spaces less than two inches high or four inches wide.”

BIRD-FRIENDLY BUILDINGS

A bird-friendly building is described as one with:

- At least 90% of the material in each exposed facade, including walls around inner courtyards, from ground level to about 23 meters (the primary bird collision zone) has a threat score of <30, as defined by the ABC rating system.

- At least 60% of material in the exposed facade above the collision zone meets the above standard.
- There are no “see through” passageways or corners (i.e. where two areas of untreated glass meet in a corner) in collision zones from ground level to about 23 meters.
- Building lighting meets International Dark Sky Association standards.
- Building monitoring for collisions occurs on a regular basis and areas causing collisions are remediated.

NGA RESPONSE

Very recently, in February 2020, the National Glass Association (NGA) announced publication of Bird-Friendly Glass Design Strategies, one of six new Glass Technical Papers (GTPs) written to reflect the latest industry developments and trends. This is a very interesting effort and many people would like to follow it properly.

The GTP addresses the background of bird-friendly building design and provides key definitions and surface orientations specific to the application. Visual markers, reflections, and the impact of light are discussed, as well as the latest legislative and regulatory developments with respect to material use, local ordinances, and zoning requirements.

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USGBC PILOT CREDIT

The U.S. Green Building Council (USGBC) has also addressed bird safety by adding a Pilot Credit, Reducing Bird Mortality, to the LEED rating system. "Until recently, this problem has been almost unrecognized as an issue of sustainability," explains the USGBC. "Moving into the future, it will be increasingly necessary to design structures with impact on birds in mind."

The Pilot Credit 55 aims to "reduce bird injury and mortality from in-flight collisions with buildings," by requiring compliance with building facade and site structural design parameters, exterior lighting guidelines, and a performance monitoring plan.

USGBC RESOURCES

USGBC offers educational programming, case studies, slides, and a calculator to illustrate bird hazards in the built environment, identify available strategies for reducing bird mortality, and show how bird-safe



Fig. 2: Birds in the skyline

design can contribute to heat and light controls and security [6].

CONCLUSIONS

On Bird Collision, it is desirable to create 'Threat Rating Calculation Spreadsheets' and use them properly. It is a question of 'glass architectural design' that could minimize the bird-glass collision. This could also be the beauty of the bird-friendly buildings. AIGMF could also start some initiatives like the present approach for the future of hi-value glass architectural design. A lot of efforts are being made in the USA, particularly in New York City and Portland. Finally, a touch on the sky with birds flying around (Fig. 2).

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Single sustainability vision for European glass packaging specialist

When it bought UK-based Encirc in January 2015, leading Spanish glass packaging producer Vidrala acquired a business with a record of conscious sustainability. Now with a strong collective strategy across the entire group throughout Europe, Vidrala is focused on reducing environmental impact and determining the fuel of the future. Fiacre O'Donnell, Director of Sustainability spoke exclusively to *Glass Worldwide* (preferred international journal of AIGMF) about how the firm plans to achieve its targets.



Fiacre O'Donnell is Director of Sustainability at Vidrala.

Vidrala's Director of Sustainability, Fiacre O'Donnell is responsible for integrating a uniformed approach to sustainability throughout the entire Vidrala Group, which acquired Encirc (formerly Quinn Glass) in January 2015.

"My role is as an invigorator, an agitator, a reminder or something like that" Mr O'Donnell clarifies. "I can pose questions to our technical department, focusing on energy and carbon emissions – not to the exclusion of everything else but from a glass

industry perspective – they are things that really need to be tackled now."

As Encirc's Head of Strategic Development (November 2015 – May 2020), Mr O'Donnell identified what the newly consolidated group wanted to achieve in the future, with a serious look at its impact on sustainability and how it could be integrated into a much stronger role moving forward.

"It's no good if one factory is doing it, we need to get the whole sustainability initiative throughout the group" he stresses. "There are different cultural perceptions [within Vidrala]; the focus has always been there but now has a collective strategy around it. Every stakeholder that we have in the business is now aware that we have opened the sustainability box and everybody is contributing."

A programme that works in the background called Vidrala Operating System (VOS) provides uniformity across the entire group and a platform to share developments and drive continuous improvement and innovation. This harmony and cohesion is essential to progress: "One of the big things about sustainability is that you need to share developments!" Mr O'Donnell emphasises.

The four Ps

Vidrala's sustainability strategy is structured about the Four Ps, each attached to relevant sustainability goals: People (development, health and wellbeing, equality, diversity and inclusion); Place (community liaison, customer and supplier partners and biodiversity); Planet (energy, transportation and resource efficiency); and Prosperity (marketplace responsibility, stakeholder engagement and responsible leadership).

"To keep the cycle going, we have to create profitability in our business so that we can focus on our people, planet responsibilities and the work we can do in the place" summarises Mr O'Donnell. "As a group, we are really starting to see real benefits of that."

"We have normal targets you'd expect in terms of water usage, resource usage and so on" he continues "but we are currently working very closely with a business partner to review our emissions data from all levels in gas, electricity and supply chain."

"To see what we could do for the Science Based Targets initiative, we knew, for example, that to meet the 1.5 degree target, it's something like a 50% reduction in carbon emissions and we are now months away from deciding exactly how we will commit to that" he reveals.

Mr O'Donnell has a multi-layered vision for the group's approach to sustainability in the future.

"In a short-term perspective, one of the things we need to understand is materiality – what do our stakeholders really want to know and are we focusing on those? So while I'm suggesting we have the Four Ps programme containing the main factors, we can extend beyond those and develop them."

"Medium-term from a group perspective again, we will complete the furnace rebuild programme over the next couple



The Vidrala Group is one of the world's most sustainable packaging manufacturers.



People is one of the Four Ps in Vidrala's sustainability strategy, the others being Place, Planet and Prosperity.

of years, meaning plants across the whole group will have new furnaces, which from a glass manufacturing perspective is unrivalled.

“Long-term, while we can work on customer and supplier relationships, biodiversity, resource efficiency and so on, it really has to be what is the fuel of the future for glass container manufacture and how do we positive-impact our carbon emissions? It’s our most important challenge.”

Supporting sustainability

Vidrala is a founder member of several initiatives addressing the fundamentals of glass manufacturing that will be important in shaping the group’s future sustainability. One of these is Glass Futures – the not-for-profit research technology organisation intent on revolutionising glass manufacture and increasing its use throughout society. “We need an organisation to develop all these initiatives for us such as fuels of the future and raw materials etc and that’s where Glass Futures kicks in” Mr O’Donnell attests. “The glass industry has to find solutions collectively and Glass Futures is a great conjunct for this. Alternative packaging materials that gain a march on us could be devastating for the glass industry.”

Similarly, Vidrala supports FEVE’s ‘Furnace of the Future’ project to reduce the carbon footprint of glass packaging production by developing a hybrid oxy-fuel furnace to run on 80% renewable electricity. “Ideally the fuel of the future could be, for example, electricity generated from wind or sea with no impact on the atmosphere at all” theorises Mr O’Donnell. “But it has to be feasible and if it can’t necessarily be all-electricity, there needs to be another option. So it’s important to get the Furnace of the Future initiative up and running and further evaluate what the challenges are going to be.”

Fiacre O’Donnell is also on the committee of FEVE’s ‘Close the Glass Loop’ platform to increase the quantity and quality of available recycled glass. “The aspirations behind ‘Close the Glass Loop’ are very important for sustainability and the future prosperity of the industry” he notes. “The more cullet we can get back, the less carbon-intensive we will be.”

Bio-fuel trial

In 2021, Encirc’s Derrylin plant in Northern Ireland will trial the use of bio-fuel in one of its own furnaces, partnering with Glass Futures to create the world’s most sustainable glass bottle and reduce the impact of glass manufacturing in the UK.

“We were used to using liquid fuels in Derrylin until last year when we switched to gas, so our team is a good position to handle this” Mr O’Donnell explains. “Bio-fuel is of course a potential fuel for the future with a less carbon-intensive footprint but for it to replace natural gas in glass manufacturing, we have to understand how it will work in our furnace and this

is exactly what Glass Futures is all about – trying out an alternative and seeing if it works. And bio-fuels could also potentially address criticism of how glass is transported.”

Vidrala will complete its second furnace rebuild in Derrylin to change from fuel oil to gas next year.

Progressive partnerships

Developing glass manufacturing practices can hinge on technological advances from suppliers, particularly if there is an educated link the whole way through the supplier chain. Vidrala is very good at adopting technology, believes Fiacre O’Donnell. “At some point, you have to step on the ladder and go for it to see what the technology can offer. For example, we didn’t know whether 12-section quad gob production was possible but we did it with Bucher Emhart Glass. We didn’t know whether the type of huge furnaces we




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'Women in Manufacturing' is an important initiative for the group.

wanted in Elton could be done but we put faith in SORG and it was possible.

We also have the world's first intelligent glass lines at our Elton and Crisnova factories with Emhart's End to end concept. Another advantage for Elton is its proximity to the north west's HyNet project producing hydrogen from natural gas. The plant also benefits from a strong supply chain comprising glass, beverages, storage and distribution network.

To support sustainability efforts moving forward, suppliers need to be thinking about the challenges of the future and how technology will play a part, Mr O'Donnell stresses. "We know already that the future will be decarbonised, so how do we get to that point? Partnerships with suppliers will be totally crucial."

Prioritising people

Nurturing its employees is a strong part of Vidrala's business' development and the Health and Wellbeing framework that it operates in the background. "You really have to focus on your people and then you can reap the benefits" says Mr O'Donnell. Frustratingly, Covid-19 has impeded his ability to visit sites and discover and share learnings with the group. However, "the pandemic has made us focus really on the people that we have" he says. "With the challenges of currently being in the workplace and at home, we are providing activities and support including mindfulness sessions."

Looking to shape and develop the workforce of the future, Vidrala has diversity initiatives that extend right back to primary schools, according to Fiacre O'Donnell. "Our Social Responsibility Programme is very important too" he maintains "and we have liaison committees and lots of activity right through the group. For example, at

Vidrala's Castellar [Barcelona] plant, we did a programme with the local school on waste and in Derrylin, we did a programme on bio-fuels with local school children contributing. At Elton, we have links back into universities and schools and such engagement feeds back into current employees because kids talk to their parents that work in our factories."

As part of Vidrala's diversity drive, the company launched an initiative called Women in Manufacturing, using a charter to work with females in the business on paths they can take for development. "Three of our five shift managers in Derrylin are female" says Mr O'Donnell. "Not because we have set targets but because they were the best people for the job."

"We were a part of the graduate programme at The Cheshire Energy Hub, an energy sector support organisation and the quality of the people coming in was phenomenal" he continues. "Lara Edison was one of those and as a 27-year-old female, she is now the Batch and Furnace Supervisor for the world's two biggest glass container furnaces and just won Rising Star at this year's Glass Focus Awards. We are approaching people diversity in the overall context of sustainability and have a strong foundation to develop it."

Biodiversity

Aligning with the aspirations of its customers – and their customers – biodiversity is an important issue to Vidrala. "As we are in the food and beverage industry with a reliance on natural products being available to us, we need to promote and protect biodiversity" Mr O'Donnell confirms. Accordingly, the site in Derrylin has been accredited to platinum level



The Elton plant featured heavily in an investment programme of approximately €275 million across Encirc's three production sites in 2020.

in the Business & Biodiversity Charter by Business in the Community. Vidrala's Crisnova plant in Spain has taken on a large area of ground from the City Council of Caudete to plant and maintain. The group has also signed up to the ForestNation initiative, which has many links to sustainability goals.

Joining green initiatives scheme

As part of Vidrala's commitment to support the fight against climate change, the group has invested £5 million in HSBC UK's Green Deposits scheme, which uses deposits to finance green initiatives and environment-friendly projects. Interest accrued will be directed to environmentally progressive projects such as those focused on renewable energy, energy efficiency, pollution control and biodiversity conservation. The project will be set up by HSBC UK to use funds from Encirc, which will receive a quarterly, portfolio-level review of how its funds have been distributed across different sustainable projects.

"Our investments in HSBC's Green Deposits scheme will allow us to support environmental projects that aren't directly related to our industry, while we continue to throw our support behind boosting sustainability in our own sector" Mr O'Donnell explains. "We pride ourselves on placing sustainability at the heart of our operations. As a business, we understand that we have a responsibility to invest in a greener future, which is why we are always looking to go the extra mile and find new ways to have a positive impact on the planet." ●



Fiacre O'Donnell: "You really have to focus on your people and then you can reap the benefits".

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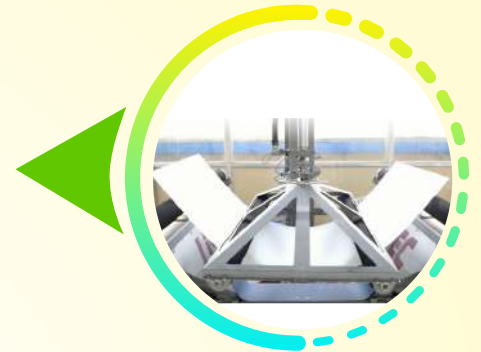
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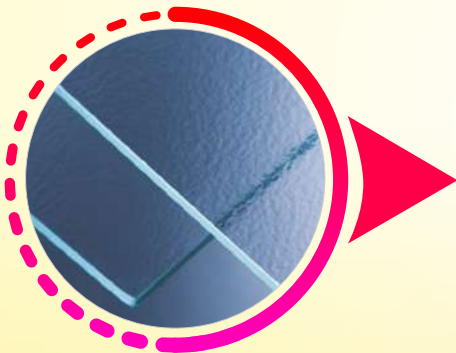
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Welcomes it's New Members

S. No.	Company	Products/Services
1	M/s SynThera Biomedical Private Limited 100, NCL Innovation Park Dr. Homi Bhabha Road, Pune 411008 Contact: Dr. Nilay J. Lakhkar Founder and CEO Tel: 9067030253, 9892859665 Email: nilay@synthera.in www.synthera.in	Startup developing specialty glass and glass ceramic products for healthcare and hi-tech industries.
2	M/s Haldyn Heinz Fine Glass Pvt. Ltd. B-1202, Lotus Corporate Park, Off Western Express Highway, Goregoan East Mumbai 400063 Contact: Mr. Kapil Rathi Country Director +91 22 4287 890, 261 6714508 Email: krathi@haldynheinz.com www.haldynheinz.com	Manufacturers of high quality cosmetic and perfumery glass bottles.

Membership of the Federation

Members of the Federation are classified into two categories; manufacturers of primary glass articles are enrolled as **Ordinary Members** of the Federation and suppliers to glass industry viz., suppliers of machinery, raw materials, consultants and others connected with glass industry are enrolled as **Affiliate Members**.

Foreign Companies supplying machinery etc., to glass industry are also enrolled as **Affiliate Members**.

Membership forms can be downloaded from www.aimf.com/membership.php

Members of the Federation are enrolled on the recommendation of Zonal Associations viz.:

- Eastern India Glass Manufacturers' Association (EIGMA)
- Northern India Glass Manufacturers' Association (NIGMA)
- South India Glass Manufacturers' Association (SIGMA)
- Uttar Pradesh Glass Manufacturers' Syndicate (UPGMS)
- Western India Glass Manufacturers' Association (WIGMA)

ADMISSION FEE / ANNUAL SUBSCRIPTION

Ordinary Members:

- Admission fee ₹ 5,000/-
- Annual subscription: Single Unit: ₹ 27,500 + GST as applicable
- More than one Unit: ₹ 1,10,000 + GST as applicable
- Applicants for enrollment for a period of five years may pay a consolidated amount of ₹ 1,25,000 for a single Unit and ₹ 5,00,000 for more than one Unit + GST as applicable

Affiliate Members:

- Admission fee ₹ 5,000/-
- Annual subscription: ₹ 11,000 + GST as applicable
- Applicants for enrollment for a period of five years may pay a consolidated amount of ₹ 49,500 (including admission fee) + GST as applicable

Affiliate Members from countries other than India:

- Admission fee US \$ 200
- Annual subscription: US \$ 440 + GST as applicable
- Applicants for enrollment for a period of five years may pay a consolidated amount of US \$ 1,650 (including admission fee) + GST as applicable ■

India's first online nationwide, delivery-based gas exchange.

Transparent, flexible procurement and competitive prices with diverse spectrum of hubs and contracts.

Active participation of Glass Industry

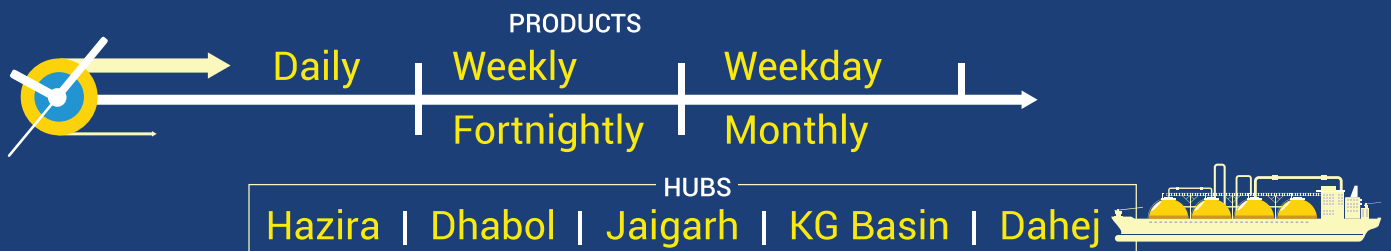
17 Registered Clients from Glass Industry

Cumulative of over 2 lakh MMBtu /52.79 lakh scm traded by Glass Industry

Competitive weighted average price of Rs 452/MMBtu*

*Jun '20-Apr '21

DIVERSE SPECTRUM OF PRODUCTS AND HUBS



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SmartLine 2 – Advanced Evolution of Glass Container Inspection

Where special becomes normal -the SmartLine 2nd generation starwheel inspection successfully combines speed, reliability and flexibility to deliver accurate results. Special operations like mini-ware and non-round containers are now standard with SmartLine 2. Customers award top marks for Heye's SmartLine 2 with the camera based check inspection system Ranger 2.

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

CAMERA CHECK INSPECTION BY RANGER 2

Equipped with the best in market camera based check inspection system Ranger 2, customers all over the world have confirmed the SmartLine 2 robustness and reliability.

Proved in multiple cases, Heye's Ranger 2 detect more than 99.8% of all critical defects.

Ranger 2 is now able to inspect **pharmaceutical mini-ware**. With this evolution the system can fulfill all customer requirements to container sizes and shapes.



HOW RANGER 2 WORKS

Each system inspects independently and does not have to be synchronized with others.

So there is no influence between the systems and there is no need to compromise one system in favour of another. This allows an individual optimisation of all settings, e.g. lighting, camera position etc., on the respective type of crack. If one system is not available or is not optimally adjusted, the others are still fully functional.

Every container produced must be considered as a unique object and every concept of a crack test must take this into account. Therefore,

the Ranger 2 uses the concept of "**Intelligent Cloud Masking**", which makes any kind of "teaching" superfluous after a job change.

Assuming that each container is unique, the Ranger 2 inspects each container for itself and sets one mask for each single container. Therefore, each container is its own reference and has no negative influence on the following ones. So the zones are



subject inspection of high dynamics and can immediately adapt to changes that occur during production.

NON ROUND – OUR CORE COMPETENCE

Container shapes, which differ from the standard *round* container, are one of the most common tasks in the glass container inspection industry. Heye masters this “non-rounds” with the known excellence.

The range of inspectable container sizes and shapes is above the average, inspection is possible with almost all imaginable shapes, no matter if they are angular, oval or simply round.

With this huge range of testable container sizes and forms, the SmartLine 2 matches the market approach to be a real universal check inspection machine.

IMPROVED JOB CHANGE TIMES

The application of servo technology results in a high degree of flexibility. Fast and easy changes to an item’s indexing positions and optimal use of the servo torque for up to four rotation stations are possible. Optimised motion sequences allow faster reactions to changing process parameters. The equipment’s innovative design and its large and easy-to-open hood provide more working space between the inspection stations. Job changes become much easier.

The maximum article height accommodated is up to 450 mm, with angular, oval and round containers processed. Thanks to the servo-driven starwheel, indexing positions from six to 48 are possible.

STATE-OF-THE-ART USER INTERFACE

The new design of the graphical user interface of SmartLine 2 has been conceptualised in cooperation with a specialised engineering service provider. The main goal of the development was a practicable and fast operating interface. Orientation for the development amount is coming from our customers. The two-click-management is only one of many advantages next to smart configuration and a great overview over all statistics an operator needs for easy-to-use handling.

EASY CONFIGURATION OF KNOWN CONTAINERS WITH THE JOB HISTORY

Job history is even customised for

- Quality requirements
- Setups
- Reproducibility data



POSITIVE FEEDBACK

Feedback generated from Heye International customers has confirmed the SmartLine equipment’s robustness and reliability. The mechanical design and drive system in particular are highlighted for their robust design, while the control system is praised for its reliable operation.

About the author

Hans Renders is Head of Product Management at Heye

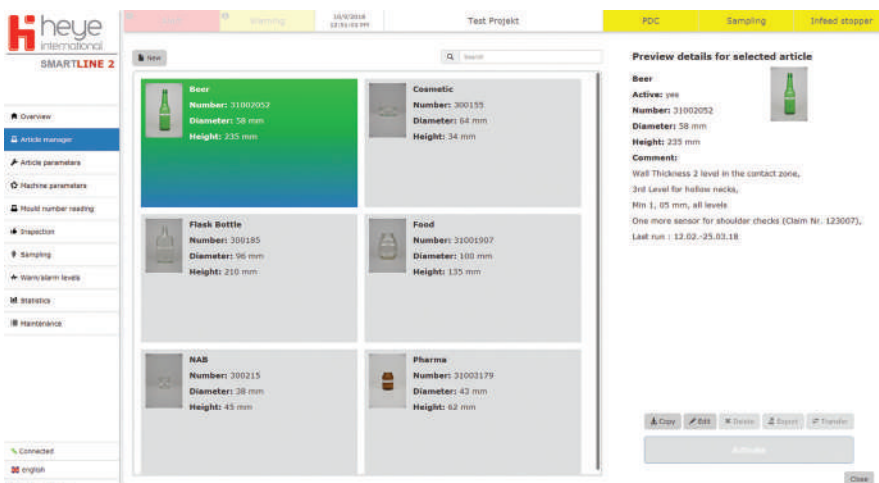
ABOUT HEYE INTERNATIONAL

Based at Obernkirchen, Germany, Heye International GmbH is one of the international glass container industry’s foremost suppliers of production technology, high performance equipment and production knowhow. Its mechanical engineering has set industry standards for more than five decades. Extensive industry expertise, combined with the positive attitude and enthusiasm of Heye International employees is mirrored by the company motto ‘We are Glass People’. Its three sub-brands HiPERFORM, HiSHIELD and HiTRUST form the Heye Smart Plant portfolio, addressing the glass industry’s hot end, cold end and service requirements respectively ■

Further information:

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WEB: www.heye-international.com

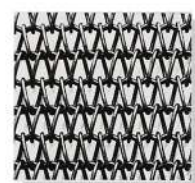
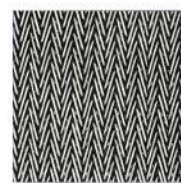




Mr. M.D. Farooq, the founder of Umda Engineering, brings to the table more than 35 years of expertise in the manufacturing industry. Starting from humble beginnings, today more than 350 of Mr. Farooq's Lehr machines are successfully installed around the world.

Mr. Farooq is best recognised as one of the co-founders of TNF Engineering, a company known across the industry as not only the leading manufacturers of Metallic Wire Conveyor and Lehr belts but also of Glass Plant Equipment. This mantle of superior performance and expertise has now been passed on to Umda Engineering.

Belts



Office & Works



Focus USA

O-I is focused on advancing its sustainability agenda by reducing energy emissions, increasing recycled content in containers and investing in the communities served.



Glass packaging giant shares global sustainability strategy

The world's leading glass container manufacturer, O-I Glass has a huge task implementing a cohesive sustainability agenda across 72 plants in 20 countries, with joint ventures in China, Italy, Malaysia, Mexico, the USA and Vietnam. Randolph (Randy) Burns, O-I's Chief Sustainability and Corporate Affairs Officer spoke exclusively to *Glass Worldwide* (preferred international journal of AIGMF) about this challenge and how the company intends to become the most sustainable producer of the most sustainable rigid package.

Previously O-I's Vice President of Global Government Affairs, Randy Burns' current role as Chief Sustainability and Corporate Affairs Officer was created by the company in May 2020 to elevate sustainability into a senior level of management and drive the agenda deep into the organisation.

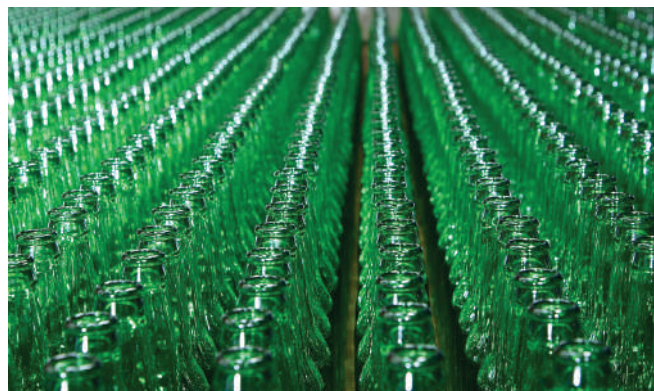
Leading O-I's Sustainability and Social Responsibility, Government and Public Affairs and Corporate Communications strategy, Mr Burns' role also entails connecting the

company with external stakeholders.


"Sustainability has always been important to the business but the improved approach helps broaden our horizons" explains Randy Burns. ▶



Randolph (Randy) Burns is O-I's Chief Sustainability and Corporate Affairs Officer.



Now more than ever, consumers are demanding safe and healthy packaging.

Originally published in Glass Worldwide, preferred international journal of 





O-I is committed to the consideration of sustainability from a manufacturing point-of-view.

Recognising that it does business uniquely in each geography in which it operates, O-I's business structure enables top line global scale functions such as R&D and operational skills to be deployed locally. Elevating sustainability to the same hierarchy in the company makes it easier to replicate success and leverage opportunities in different countries by unifying the sustainability reporting.

"Having a global leader drive the sustainability agenda across all countries with this structure means we can function at maximum impact" Mr Burns believes. "And of course, having sustainability at the highest management level demonstrates the company's commitment to driving this agenda globally. We are certainly elevating our sustainability ambitions."

Global matrix

Co-ordinating sustainability across O-I's international operations is a challenging prospect and part of Randy Burns' role is to build the infrastructure to accomplish sustainability goals in all corners of the company.

"We looked at various structures to create a global matrix organisation" he confides. "As an analogy, a plant manager in our business doesn't make glass, he oversees glass being made. And that's the same with my role in sustainability... there's a lot of work to do but with the function at global level, we have a matrix organisation with the necessary resources in place on a global scale to deploy sustainability easily into the fabric of our existing infrastructure."

Clear road ahead

O-I's vision for the group's approach to sustainability in the future is to create the most innovative and brand-building packaging company— as well as the most sustainable, according to Randy Burns.

"Our priority will be to continue on the path of reducing emissions, looking at our energy usage differently and exploring ways in which to increase recycling, while paying attention to all other variables that factor into being a sustainable manufacturing company, such as for example, community engagements, water usages etc" Mr Burns

clarifies. "To follow up our previous CSR report, soon we will publish a comprehensive sustainability report to outline our agenda" he adds.

According to Mr Burns, the Covid-19 pandemic won't prevent O-I from pursuing goals already articulated by the company but it has interrupted consumer recycling trends in some geographies, particularly in North America. The combination of a change in consumer patterns due to people staying at home, along with changes to collection services etc, are a challenge to recycling infrastructures in some regions and to manufacturers with recycled content in their supply chain, he cautions, noting that O-I was "very active in drawing attention to this at the beginning of the pandemic."

Rebooting recycling

Recycled content is a very important component to sustainability for O-I and improving the recycling infrastructure in North America is a priority for the company. Seeking industry-wide initiatives for long-term solutions, O-I is a member and supporter of the Glass Packaging Institute (GPI), the US trade association that promotes glass as a packaging choice, advances environmental and recycling policies, advocates industry standards and educates packaging professionals.

"Industry collaboration is addressing recycling inefficiencies in North America and GPI has studies underway to determine how best to improve" says Randy Burns. "There will be developments on that in the coming year that will align with major effort from the GRC" [Glass Recycling Coalition, which promotes glass as a core recyclable]. In the know will be Jim Nordmeyer, O-I's Vice President of Global Sustainability, who is a board member of the GRC.

Think big

"North America is a priority but we need to look globally for solutions and the best recycling infrastructures" Randy Burns continues. "For example, our Estonian plant uses waste heat to supply energy to neighbouring towns, so it can't just be about recycling when we are integrating our operations in a sustainable way into the communities in which we operate. It's as much about balancing people and the prosperity of our operations as it is about what comes out of our factory; part of that is what you make but also how you make it and how that fits into the community."

With its own focus on containers that will provide the most circulatory potential, O-I looks to Europe as a "great example of how glassmaking can be very circular" according to Mr



Headquartered in Perrysburg, Ohio, O-I operates 72 plants in 20 countries.

Burns. "Technology advancements in glass melting will play a major role moving forward to reduce carbon to required levels" he affirms.

O-I is pushing for progress with its Modular Advanced Glass Manufacturing Asset (MAGMA) project to enable a flexible, modular, expandable glassmaking process that does not require the resources of a traditional furnace. The company is currently operating both a prototype and pilot.

"O-I has always been an innovator in glassmaking, inventing the first mass bottle making machine over 100 years ago and with MAGMA, we are reinventing how glass packaging is made" claims Randy Burns. "We want to innovate our way to a better future because that is what O-I stands for.

"In addition, we are looking to innovate collaboratively with the industry on different types of furnace technology. With our more sustainable view to operations, we need to make glass with different technology. Like the rest of the glass industry, we are investing and are anxious for results but our strategy is holistic and doesn't favour or exclude any options; we want to capture the very best of what's available on the marketplace."

Founding initiatives

By supporting initiatives such as those co-ordinated by Glass Futures and FEVE, O-I shows its commitment to the consideration of sustainability from a manufacturing point-of-view. O-I is one of the founding members of Glass Futures and Ludovic Valette, Vice President of Global Technology at O-I, represents the company as part of the Board of Directors, focused on the decarbonisation of the UK glass industry.

In addition, O-I co-founded and supports FEVE's 'Furnace of the Future' project to develop the world's first large-scale, hybrid oxy-fuel furnace to run on 80% renewable electricity. The venture is "a fundamental milestone" in the industry's decarbonisation journey towards climate-neutral glass packaging, replacing current fossil fuel energy sources and cutting CO₂ emissions by 50%, according to Randy Burns.

Working conditions

A crucial element of the company's research and development programme towards increased sustainability is O-I's Innovation Centre at its global headquarters in Perrysburg, Ohio. The 24,000ft² building, which recently



The workforce is a key part of O-I's sustainability strategy.

celebrated its seventh anniversary of producing glass, features a quarter-sized furnace and two small production lines that allow the company to trial new processes and prototype new product designs without interrupting the factory lines.

"We are able to recreate the challenges of the plants themselves and safely address them in a controlled environment" Mr Burns explains. "For example, we can look at ways to make the process more efficient, and safer, and can experiment with different inputs to address some of the aspirations of our customers."

O-I is also keen to safeguard a key part of its sustainability strategy;

its workforce. "Our people are what makes sustainability happen" says Randy Burns. "We are completely focused on making sure our workforce mirrors the surrounding communities and it's always been a priority to have an inclusive workplace. Our employees are passionate about sustainability and are working at it every day; it's very important to keep them engaged on the subject matter to fuel their enthusiasm."

Something to shout about

Although customers and consumers have their part to play in influencing a drive to sustainability, in O-I's case the goal has constantly been in sight, Mr Burns believes. "Sustainability has always been a major part of O-I's business, not just because of the nature of what we produce but because we felt in every corner of the globe there was heightened interest in ensuring our operations fit in with their communities and economies etc.

By elevating sustainability to the top level, we can now demonstrate our commitment of being completely aligned to the needs of our communities, customers, investors and external stakeholders etc."

O-I's sustainability message is now coming across, loud and clear. ●

Further information:

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Recycled content is an important component to sustainability for O-I.



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Hey!
(Health, Environment & You)

30 years of press and blow machines

Renowned for its engineering, manufacturing, installation and commissioning of hollow glass plants, systems and machines, Olivotto Glass Technologies Group recently celebrated the 30th anniversary of its O.90 press and blow machine. Originally published in *Glass Worldwide* (preferred international journal of AIGMF), Massimo Pucci delved into the company's history.



Massimo Pucci, Olivotto's Sales Area Manager has worked with the company since 1998.

In 1980, Olivotto introduced the first proprietary electronic control systems on automatic forming machines (dedicated to the production of glass bulbs for lighting). Until then, almost all automatic machines had mechanical cam handling systems, with limited operating and production flexibility.

Olivotto decided to invest in the research and development of electronic control systems that could be used on its machines. The systems developed allowed greater production



Two O.90 28 section TR28 models, recently installed.

flexibility and a significant reduction in operating costs, with important streamlining of machine management, as well as an increase in production line output. The doors were opened to a technological development that would never stop and that strongly

contributed, after a few years, to the creation of the first fully electronic press and blow machine.

In the second half of the 1980s, knowledge acquired through the development of proprietary electronic control



The first O.90 press and blow machine – still going strong 30 years on.



The O.90 18 section enlarge model in production.

Development and evolution of the Olivotto press and blow

1990 Standard model

Designed to increase the dimensional range produced by existing press and blow machines. First press and blow automatic machine fully electronically controlled with full servo substitution mechanisms.

1993 Compact model (12 and 18 working sections)

Designed for the production of small to medium size glassware at high production speed.

1995 Enlarge model (18 working sections)

Designed for the production of big glassware. Total machine weight of 34 tons, mould centre diameter of 3800mm.

The largest press and blow process automatic machine ever made.

1996 TR28 model (double gob; 28 working sections)

Designed for the production of small glassware at very high production speed.

The only double gob press and blow process automatic machines existing in the world.

Production speed up to 210 pieces per minute.

1999 PSL model (in line section machine; two working sections)

Designed for the production of medium/large glassware at low production speed.

The first press and blow automatic machine designed with independent fully servo (brushless motor actuated) blank mould and plunger mechanisms.

2003 Electronic control system upgrade aimed to increase the machine's performance

Scaleable electronic control architecture consisting of worldwide brand components: Multitasking PLC with motion axes integrated system, HMI interface and high speed deterministic field networks for major improvements on the machine process control repeatability.

The control system upgrade was an important milestone of the O.90 machine technological development. Some of the features introduced with the control system were:

- Independent neck ring electric speed control including special rotation cycles specifically designed for the improvement of the glass distribution and glassware forming.
- Individual automatic temperature controls (closed loop) for blank moulds and plungers.
- High accuracy full servo tracking gob delivery system with independent gob loading timing adjustment for each working section.
- Independent electronic servo substitution; brushless motors actuated for the bottom forming improving and parison elongation control.
- High accuracy camera system for the parison elongation closed loop control.

2007 HQS type (12 and 18 working sections)

Specifically designed for the production of high quality stemware.

2016 OGT 4.0 approach

Applied to all OGT group products and technologies – an innovative global approach centred around engineering, manufacturing, sales and after sales.

The OGT 4.0 approach applied to the press and blow process combines the best existing and well proven technical solutions with innovative functionalities.



The O.90 12 section compact model in production.

systems and based on contingent market needs led Olivotto to focus on the development of an automatic machine suitable for the press and blow process.

The company's engineering team concentrated on the design of a fully electronically controlled machine that would be able to overcome production limitations at the time.

Small changes were made to the technological process and thanks to the application of proprietary electronics, control of the process was substantially improved.

30 years of operation

Olivotto made its first fully electronic automatic 'O.90' press and blow machine in 1990. It was a modular



An O.90 press and blow in production.

rotary machine consisting of 12 working sections, each equipped with independent electronic control of the movement, electric motors for the neck rings rotation and electric servo substation for the parison elongation control.

The O.90 was installed and put into production by an Italian customer who agreed to start a pioneering technical collaboration with Olivotto. Objectives were set during the development phase and customer expectations were completely satisfied.

That machine was the first of a long series of press and blow machines that Olivotto would go on to produce. The fact that after 30 years, the first installed O.90 machine is still fully functional and still in production at the same customer's site is testament to its workmanship and design.

Reliable high performer

Well-established knowhow of the electronic control systems, together with experience derived from the production of many machines over the years, ensure that the Olivotto O.90 is a high performance and extremely reliable machine. Thanks to hundreds of successful installations the press and blow system has effectively completed a technological 'self-learning upgrade'.

In 2020, the O.90 stands as an innovative machine with high technological content, performing in a reliable and user-friendly manner, with minimal maintenance requirements.

A tailored approach

The O.90 is a versatile machine which, thanks to the different models available, is capable of producing a wide range of products according to customer-specific needs, such as: Tumblers, large vases, one-piece and two-piece stemware. Accordingly, the company is able to offer different consolidated technologies in terms of equipment and services.

As well as electronic equipment, Olivotto Glass Technologies can design and manufacture moulds according to customer requirements. The company has a 'production expert team' for each production

process. Each team is composed of a production supervisor and senior operators with proven experience in the field. Customer after-sales service is available at any time. ●

About the author:

Massimo Pucci is Sales Area Manager for Olivotto Glass Technologies

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email: info@olivotto.it
web: www.olivotto.it



Olivotto's OGT 4.0 approach applied to a press and blow automatic forming line.

in Kanch Werben

April - Juni 2021

In der Ausgabe wird ausführlich über die Sitzung des AIGMF-Vorstands, technische Artikel, Glass News, andere verbundene Veranstaltungen und vieles mehr berichtet.

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Es wäre ideal, wenn Sie Ihre Anzeige im

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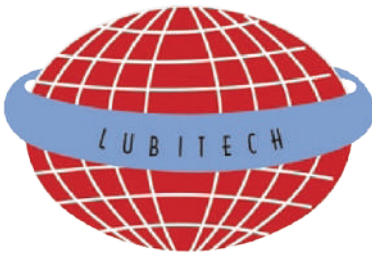
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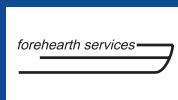


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Application of Laser Ablation-Inductively Coupled Plasma-Mass Spectrometry to the Glass Bangles from Hirapur Megaliths in India

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Inputs & coordination by Prem Malhotra, Special Correspondent Kanch and Affiliate Member AIGMF (Glacera Engineers, Pune)

Abstract

In the present paper an attempt has been made to throw light on the glass (bangles) material revealed during the course of the burial excavation at Hirapur in Chandrapur district of Maharashtra which is the first excavation of any dolmen site in central India. Critical scientific analysis of the glass finds shows the significance of these glass bangles in the glass studies of India and has thrown light on its relation to the other sites in Maharashtra.

INTRODUCTION

Excavations and researches undertaken in the Vidarbha Megaliths from 1970 onwards are quite significant for the recovery of various cultural materials yielded from burial and habitation sites. Often it has been seen that biological, zoological and anthropological remains recovered from these sites have been studied extensively but not much emphasis has been given to the glass material yielded from the sites like Dhavalameti (Ismail 2013) and Dhamana Linga (IAR 2000-01: 97- 107). The site Hirapur has been excavated by the author for three successive years (2010-11 to 2012-13) revealed the evidence of large amount of glass bangles from the non-sepulchral burials which has been studied further by using Laser Ablation-Inductively Coupled Plasma-Mass Spectrometry technique.

RESEARCH PROBLEM

Historiography on the Megalithic culture of Vidarbha which was part of Iron Age culture in the region of

Central India, started much earlier in the pre-independence era. These efforts resulted into the discovery of more than 100 sites, which have been reported with variety in the burial typology and few of them have been excavated (Mohanti and Selvakumar 2002). Attempts of the excavation have been limited only to the sepulchral category of burials like stone circles. Not a single effort has been made to understand the archaeology of Non-sepulchral category of burials like Dolmen which were discovered at Pipalgoan (ASI 1928-29:37) and Tilota Kheri (ASI 1930-34:141) in the Bhandara district and Hirapur (Pawar 2011a) in Chandrapur district of Maharashtra. The site Hirapur

has been excavated to understand the architectural and material differences between the sepulchral and non-sepulchral categories within the burials which gave a new dimension to the Megalithic investigation in the region.

SITE AND ENVIRONMENT

The site of Hirapur (20° 35'N & 79° 33' E) is located on an elevated landscape, partly covered by the

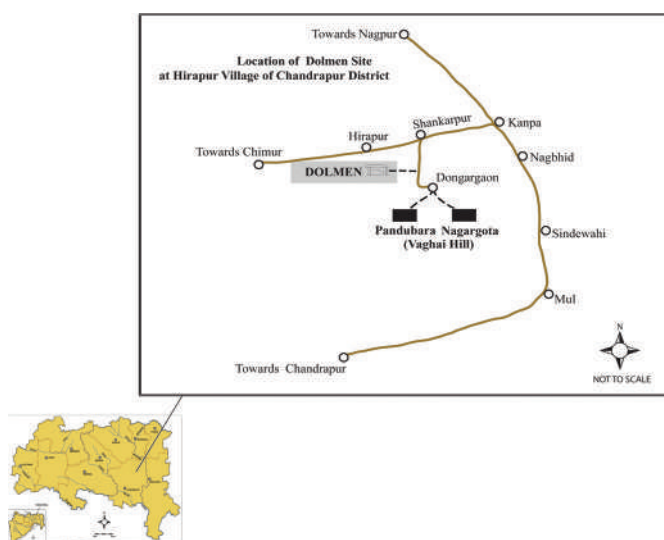


Fig. No. 1- Location Map of Dolmen Site

Mukta-Bai Pahar hill range (Fig. 1). A tar road divided the site Hirapur in two localities, numbered as Burial Locality number 01 and Burial Locality number 02. Twenty four burials of different types like Stone circle, Cairns, Dolmen, Dolmenied Cist and Menhirs have been encountered within these burial localities. Current Excavation has undertaken only in locality 01 where four non-sepulchral burials have been excavated (Pawar 2011b). Out of these four, one double chambered dolmen is in intact position where as others are disturbed (Fig. 2).



Final View of 2010-11



Final View of 2011-12

Fig. No. 2- General View of Excavated Trench

Excavated Burial

The Dolmen has two chambers separated by a thin Laterite slab, each has rectangular porthole. Four huge Laterite slabs are placed vertically, making an angle of almost 90 degree between each other (Fig. 3).

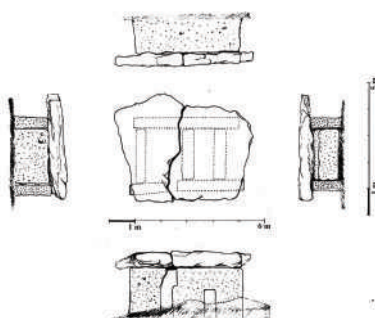


Fig. No. 3- View of Megalithic Burial 01 (MBI)

Left Chamber

The left chamber has been exposed upto natural soil upto 1.75 mt. divided into 6 layers (Fig. 4). Thickness of the layers varies (Layer 01-6 cm, Layer 02-38 cm, Layer 03-70 cm, Layer 04-11 cm, Layer 05-32 cm and Layer 06-18 cm) and except 01 & 06 all the layers have yielded ceramics and other materials (Pawar 2012).

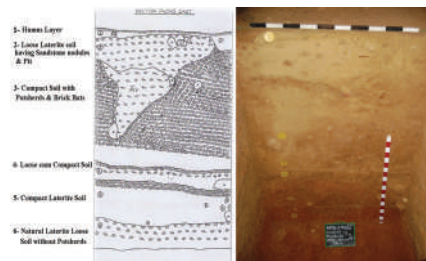


Fig. No. 4- Exposed East Facing Section of Left Chamber in MBI

Occurrence of Glass Bangles

Glass bangles have been reported from Layers 2 to 5 in the left chamber of a megalithic dolmen, with corresponding depths ranging from 32-50 cm for Layer 2, 3 and 125 cm onwards for Layer 5 (Fig. 5). Glass samples collected from above mentioned layers has been taken for the analysis by application of the technique known as laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS) at the Institut de Recherche sur les Archéomatériaux (IRAMAT) in Orleans, France. Following questions that might hope to answers based on the chemical compositional results could include:



Fig. No. 5- Reported Glass Bangles from Left Chamber

- 1) What types of glass were found in this megalithic dolmen, and how do these compare to other glasses found in South Asia?
- 2) Is it possible to see changes by depth of excavation, possibly related to chronological differences?
- 3) Does the glass help to date the megalithic dolmen?

WHY LA-ICP-MS

LA-ICP-MS is very useful non-destructive technique to examine different chemical composition within the glass samples taken for scientific study unlike other methods Viz; X-Ray Fluorescence analysis. In other methods like XRF, firstly samples have been prepared in liquidized form for further examination and secondly it gives idea about the composition of elements. With result of LA-ICP-MS technique one can examine various chemical components for their similarity and differences from different sites of the country and outside for which database is available for more than 1000 archaeological sites. Whereas in other methods rate of contamination is very high in percentage as compared to LA-ICP-MS, also we do not have sufficient database and those methods have few limitations.

MATERIALS STUDIED

A total of twenty samples (Bangle fragments) from Hirapur were

analyzed for chemical composition (Table. 1). All of the samples were bangle fragments, most with a D-shaped crosssection, with diameters ranging from 1.5 to 3 mm. The range of colours was limited: all samples were monochrome, with

most either opaque black or dark, transparent, green; one sample was dark blue. Nine fragments were from Layer 2, 32-60 cm depth, ten from Layers 2 and 3, 50-96 cm depth, and one from Layer 5, 104-125 cm depth.

Application of Techniques

All analyses were conducted at the Centre Ernest-Babelon of the IRAMAT (Orléans) using Laser Ablation High Resolution Inductively Coupled Plasma Mass Spectrometry (LA-HR-ICP-MS), allowing virtually non-

Table 1. Glass Bangle Samples from the Left Chamber of the Dolmen

Site	Context	Number	Sample	Colour	Form	Diameter	Technique	Date of Analysis	Type
Hirapur	Layer 2, 32-50 cm depth	HPR S1 11	bangle fragment	black	D section	3mm	LA-ICP-MS	2012.01	mNA 4
Hirapur	Layer 2, 32-50 cm depth	HPR S1 02	bangle fragment	black	D section	4mm	LA-ICP-MS	2012.01	mNA 4
Hirapur	Layer 2, 32-50 cm depth	HPR S1 10	bangle fragment	black	D section	1.5mm	LA-ICP-MS	2012.01	mNA 4
Hirapur	Layer 2, 32-50 cm depth	HPR S1 08	bangle fragment	black	rounded	2m	LA-ICP-MS	2012.01	mNA 4
Hirapur	Layer 2, 32-50 cm depth	HPR S1 06	bangle fragment	green transparent	D section	3mm	LA-ICP-MS	2012.01	vNC HPR
Hirapur	Layer 2, 32-50 cm depth	HPR S1 03	bangle fragment	green transparent	D section	3mm	LA-ICP-MS	2012.01	vNC HPR
Hirapur	Layer 2, 32-50 cm depth	HPR S1 04	bangle fragment	green transparent	D section	2mm	LA-ICP-MS	2012.01	vNC HPR
Hirapur	Layer 2, 32-50 cm depth	HPR S1 07	bangle fragment	brownish pale transparent	rounded	3mm	LA-ICP-MS	2012.01	vNC HPR
Hirapur	Layer 2, 32-50 cm depth	HPR S1 09	bangle fragment	green transparent	rectangular	2mm	LA-ICP-MS	2012.01	vNC HPR
Hirapur	Layers 2 and 3, 50-96 cm depth	HPR S2 04	bangle fragment	black	D section	3mm	LA-ICP-MS	2012.01	mNA 2
Hirapur	Layers 2 and 3, 50-96 cm depth	HPR S2 01	bangle fragment	black	D section	2mm	LA-ICP-MS	2012.01	mNA 2
Hirapur	Layers 2 and 3, 50-96 cm depth	HPR S2 03	bangle fragment	black	D section	2mm	LA-ICP-MS	2012.01	mNA 2
Hirapur	Layers 2 and 3, 50-96 cm depth	HPR S2 07	bangle fragment	green transparent	D section	3mm	LA-ICP-MS	2012.01	vNC HPR
Hirapur	Layers 2 and 3, 50-96 cm depth	HPR S2 05	bangle fragment	green transparent	D section	3mm	LA-ICP-MS	2012.01	vNC HPR
Hirapur	Layers 2 and 3, 50-96 cm depth	HPR S2 10	bangle fragment	green transparent	D section	3mm	LA-ICP-MS	2012.01	vNC HPR
Hirapur	Layers 2 and 3, 50-96 cm depth	HPR S2 02	bangle fragment	green transparent	D section	2mm	LA-ICP-MS	2012.01	vNC HPR
Hirapur	Layers 2 and 3, 50-96 cm depth	HPR S2 09	bangle fragment	blue cobalt	D section	3mm	LA-ICP-MS	2012.01	vNC HPR
Hirapur	Layers 2 and 3, 50-96 cm depth	HPR S2 08	bangle fragment	black	D section	3mm	LA-ICP-MS	2012.01	vNC HPR
Hirapur	Layers 2 and 3, 50-96 cm depth	HPR S2 06	bangle fragment	black	D section	2mm	LA-ICP-MS	2012.01	vNCA
Hirapur	Layer 5, 104-125 cm depth	HPR S3 03	bangle fragment	black	D section	1.5mm	LA-ICP-MS	2012.01	mNA 2

destructive analysis, and invisible to the naked eye. The concentrations of fifty-two elements were determined for each sample.

For LA-ICP-MS analysis, the object is placed in the ablation cell and sampled by the laser beam, which is generated by a Nd YAG pulsed laser, with frequency quadrupled to allow operation in the ultraviolet region at 266 nm. The diameter of the ablation crater ranges from 60 μm to 100 μm , with a depth around 250 μm . An argon gas flow carries the ablated aerosol to the injector inlet of the plasma torch, where the matter is dissociated, atomised and ionised. The ions are then injected into the vacuum chamber of a high resolution system (Element XR from Thermofisher Instruments), which filters the ions depending upon their mass-to-charge ratio. The ions are then collected by a channel electron multiplier or a faraday cup (Gratuze 2011).

The isotope ^{29}Si was used as an internal standard; external standards include Standard Reference Material 610 from the National Institute for Standards and Technology, reference glasses Corning B, C and D (depending on the type of matrixes being studied), as well as an archaeological glass previously analysed by other methods. An Excel Visual Basic calculation program is used to process all of the data. The calculation method used is based on the internal standard principle (Dussubieux *et al.* 2008, 2010).

The detection limits vary from 0.1 to 0.01% for major elements and from 20 to 500 ppb for other elements. Accuracy is roughly 5 to 15 relative % depending on the elements and content levels measured.

RESULTS

As stated, Table 1 lists all of the samples from Hirapur, along with brief descriptions and the identified

chemical compositional types, based on the typology reported by Dussubieux (2010). Table 2 gives the detailed chemical results for major, minor and trace elements, with major and some minor elements expressed as weight percent and trace elements as parts per million (ppm). Eight of the Hirapur samples are soda-alumina glass with a mineral source for the alkali (m-NaAl); these are all similar to Dussubieux's m-Na-Al groups 2 and 4 (**Table 2**). Twelve samples have the higher magnesia (MgO) associated with glass made from the ashes of halophytic plants. Seven of these are higher in lime (CaO) than alumina (Al₂O₃) and are listed as v-Na-Ca, with v referring to a plant-ash or vegetal source of the soda. The remaining plant-ash sample has alumina equal to lime, and is coded as v-Na-Ca-Al. In order to assign particular samples to the possible chemical compositional groups, we used the multivariate statistical procedures of principal components analysis (PCA) and cluster analyses, comparing the Hirapur samples to a database of 129 glasses with similar compositions found in Afghanistan, India and Bangladesh.

OBSERVATIONS

The analysis of the glass bangles from Hirapur will follow the archaeological questions posed.

Question 1: What types of glass were found in this megalithic dolmen, and how do these compare to other glasses found in South Asia?

From the results reported above we can see that about half of the samples were mineral sodaalumina glass, evenly divided between groups m-Na-Al 2 and m-Na-Al 4 (Dussubieux *et al.* 2010). Both of these compositional groups can be easily distinguished from the much more common m-Na-Al type 1 glass that was characteristic of South Indian and Sri Lankan production from the

late 1st millennium BCE through the 1st millennium CE, based on their higher values for uranium and cesium. In addition, they are different from the generally early (mid-to-late 1st millennium BCE to mid-1st millennium CE m-Na-Al type 3 glass associated with such early sites in North India as Kopia (Kanungo and Brill 2009) and Kausambi (Brill 1999; Lankton and Gratuze unpublished).

Neither the production sites nor the complete chronology is known for the two groups m-Na-Al 2 and m-Na-Al 4, although the samples tend to have a strong identification with western India and Maharashtra, and have been found both at the port site of Chaul and on the African continent (Dussubieux *et al.* 2008). The known dates for the samples of both of these glass types as reported by Dussubieux are relatively late, probably not before the 9th c CE. Our own comparison samples for m-Na-Al types 2 and 4, when dated, were from the Bahmani period in the Deccan (ca 1435-1518 CE).

The plant-ash glass samples from Hirapur are more difficult to relate to known types of glass found in South Asia. The Hirapur plant-ash glass samples with lime higher than alumina (v-Na-Ca) are superficially similar to Islamic-period glass from the Middle East, although the higher values of uranium for the Hirapur samples suggests production from a granitic sand more characteristic of the Indian sub-continent. On the other hand, the relatively low alumina values for these Hirapur glasses distinguishes them from a group of 12th CE and later glasses of possibly Indian origin used to made ornaments and vessels found in Indonesia (Kota Cina, Brill 1999) and West Africa. The single plant-ash glass sample from Hirapur with a higher alumina value is moderately similar to a bracelet fragment from Kolhapur of the Bahamani period. For the moment, we have listed the Hirapur plant-ash

glasses as v-Na-Ca HPR to indicate their so-far distinctive composition.

Question 2: Is it possible to see changes by depth of excavation, possibly related to chronological differences?

All of the m-Na-Al 4 samples were from Layer 2, 32-50 cm depth, while the m-Na-Al 2 and v-Na-Ca HPR samples were from Layers 2 and 3, 50-96 cm depth, with a single m-Na-Al 2 samples found in Layer 5, 104-125 cm depth. Whether this pattern is the result of the small sample size or of real chronological differences is not possible to say, although m-Na-Al 2 and m-Na-Al 4 both date from similar periods at Kolhapur and Nevasa. On the other hand, the Hirapur plant-ash soda glass, v-Na-Ca HPR, was found in both Layer 2 and Layers 2 and 3 in the Hirapur megalithic dolmen. Two possible explanations for this would be that the various layers were deposited over a relatively short period of time, or, alternatively, that the v-Na-Ca HPR glass was produced over a relatively long period of time, a situation that is known for other types of glass found in India. One piece of evidence in favor of the first hypothesis is that the Hirapur plant-ash glasses were very similar one to another based on PCA and cluster analysis, perhaps too similar to have been produced over an extended period. Independent dating of the various layers at left chamber of the Dolmen at Hirapur would be very helpful here. In summary, our current answer to Question 2 would be that the available evidence does not support clear differences in chemical compositional type by layer in the excavation; this impression could easily change with further excavation and a greater sample size.

Question 3: Does the glass help to date the megalithic dolmen?

While glass itself cannot be scientifically dated, the strong association between

certain types of glass and particular time periods may help to date archaeological levels when other methods are not available. Such may be the case with the mineral soda-alumina glass from the site, since both m-Na-Al 2 and m-Na-Al 4 have so far been found only in post-9th century contexts, extending up to at least the Bahamani period in the Deccan. On the other hand, the monochrome and somewhat roughly-made bangles found in the Hirapur dolmen are quite different from the well made polychrome examples from Kolhapur and Nevasa. In fact, we have very little data on early glass in the Deccan, so whether similar glass compositional types were made there over a long period of time is simply not known. Thus, it's possible that the Hirapur mineral soda-alumina glass bangles were from an earlier period of production of glass with a similar composition to that used much later. What is clear is that the workshop producing the Hirapur bangles was different from those producing bangles found at Kolhapur and Nevasa. Regarding the Hirapur plant-ash glass, authors are not aware of any similar samples from a dated context. The workmanship of the plant-ash glass bangles is very similar to that of the mineral soda-alumina glass bangles, raising the question of whether they were made in the same workshops. It is interesting to note that all of these objects were possibly made during a similar period of time.

However, it is not always correct, underlining the importance of finding samples from well dated, early, sites in order to have a better chronology for the Hirapur plant-ash glass. One additional interesting point is that the cobalt ore used to prepare the cobalt colourant for the single cobalt-blue v-Na-Ca HPR bangle was only slightly high in arsenic and low in nickel- quite different from the high-arsenic/high-

nickel cobalt used to decorate m-Na-Al 2 and m-Na-Al 4 bangles found at Kolhapur and Nevasa. Although it is possible that more than one cobalt source might have been used at the same time, this difference in cobalts could also be explained by either a geographical or a chronological difference in the production of v-Na-Ca HPR bangles and those made with types 2 and 4 of the soda-alumina glass.

CONCLUDING REMARKS

The evidence from recent analyses of glass from Hirapur opens the new dimensions in the study of early glass in Maharashtra. It is possible to make several conclusions even from this limited study.

1. Full compositional analysis, including trace elements to the parts per million levels, is essential to distinguish the various types of glass found at early sites in India. At present, only LA-ICP-MS offers this capability without sample destruction.
2. The three main types of glass used to make the bangles found in the Hirapur megalithic dolmen suggest regional or even localized production and exchange for these objects. There is no glass that can be identified as coming from outside the subcontinent, and at least the mineral soda-alumina glass matches types found mainly at sites in the Deccan. The plant-ash glass is less straightforward, since we found no samples from other sites that were a good match, but I believe we can say that this plant-ash glass is not Middle Eastern, and probably not Central Asian, based on the compositions.
3. In terms of dating, we do not see a certain progression of chronological types ranging from Level 2 to Level 5 in the

excavation. Based on current information, both of the mineral sodaalumina glass types found at Hirapur tends to be later, perhaps extending into the 16th century. However, as discussed above, earlier dates are possible, since many of the glass compositional types found in India stretched over an extended time period.

- Studies, including this one, of pre-modern glass in Maharashtra have opened a window into both glass production and the long-distance exchange of glass products to areas as far away as southern Africa. The historical and technological precursors of this later production are little understood.

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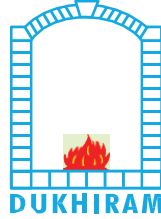


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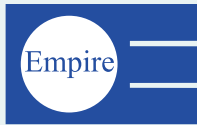
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Thermal imaging hot's up

The ability to extract and analyse data from critical locations is essential for efficient control and optimisation of the glass melting process. Originally published in *Glass Worldwide* (preferred international journal of AIGMF), Philippe Kerbois and Neil Simpson demonstrated how the latest infrared temperature measuring equipment is being used in oxy-gas borosilicate furnaces to optimise production and quality.

Ensuring consistent temperatures and thermal profiles in glass melting tanks is an essential part of maintaining high quality glass production and extending the campaign life of a furnace.

Within the furnace, there are a variety of temperature measurements that can be taken in different locations and it is important to be able to trend temperature measurements at points such as the crown, ports and burner blocks. Also, temperature visualisation of cold spots should be carried out in the refractories as a precaution against air leaks typically caused by structural issues or the condensation of volatiles.

The latest technology, including the Near Infrared Borescope (NIR-B) in-furnace thermal imaging system developed by Ametek Land, has taken the glass industry to another level of understanding of glass furnace operations. This is true for many end-fired or cross-fired regenerative furnaces where glass producers have demonstrated the potential of using data obtained from the NIR-B to further develop controls to meet the needs of Industry 4.0 and the optimisation of furnace processes.

NIR-B provides a true-temperature radiometric image, enabling live continuous temperature values to be obtained 24/7 from >324,000 pixels (and three million pixels with the latest high definition NIR-B-2K).

Utilising ImagePro software, it is possible to measure the temperature of the melt line, the batch coverage and batch transit time for recording and comparison.

The NIR-B delivers many benefits that ensure a short return on investment including:

- Thermocouple verification.
- Thermal profiling with hot spot locations.
- Air ingress and batch control.
- Combustion optimisation for energy efficiency.
- Emission optimisation.

Oxy-gas furnace project

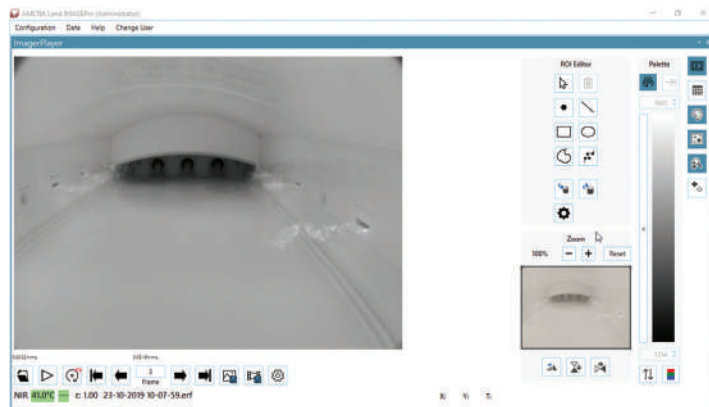
Following a rebuild in 2019, glass packaging manufacturer SGD Pharma installed an Ametek NIR-B in-furnace thermal imaging system on its furnace in St Quentin Lamotte, France, to replace its existing CCTV system. The company's 50 tonnes/day oxy-gas furnace is dedicated to the production of borosilicate glass for pharmaceutical packaging.

The original purpose of the system was to obtain clear higher resolution images to monitor batch line/flow and improve the setup of the batch line. There is an inherent risk of damage to oxy-fuel burner blocks in oxy-fuel furnaces when borate condensate/run-down can start to deflect the flame and potentially damage the burner blocks.

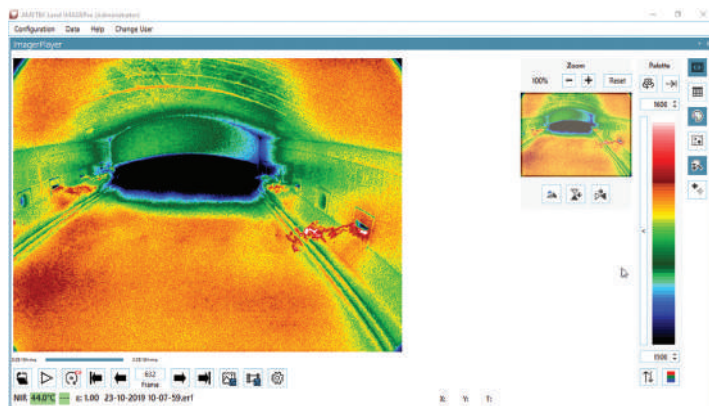
Utilising an over-temp alarm function, it is possible to include the monitoring of hot spots and burners. Receiving temperature data from the NIR-B with additional thermal

profile data to improve the overall efficiency of the process was essential for SGD Pharma.

Benefits of using the NIR-B for daily operation in an oxy-gas furnace include the combustion side for flames'



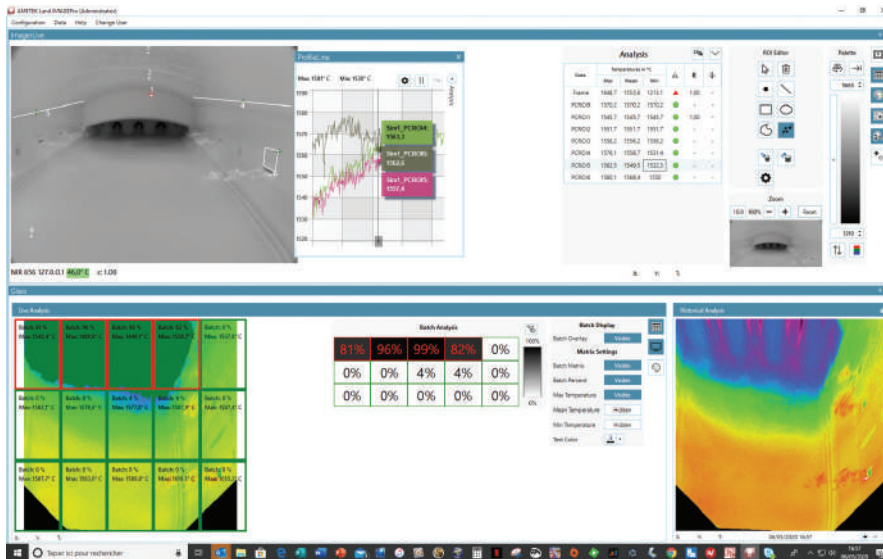
Black and white NIR-B thermal image. NIR-B offers the operator the same views as a typical CCTV system.



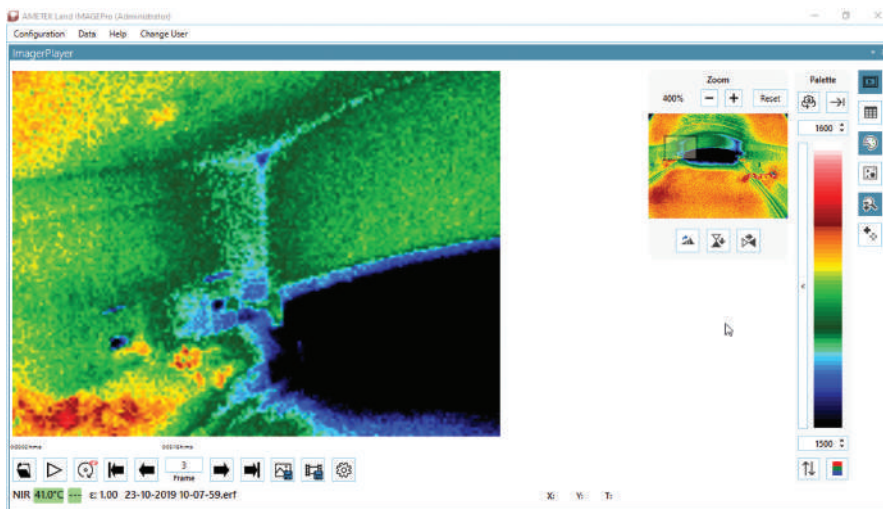
An NIR-B thermal image.



Lower temperature band 200°C greater resolution shows run-down on the L4 batch line is skewed and longer on LHS.



Batch line location and thermal profiling with Ametek's ImagePro software.



Crown 400% above R2 is hotter.

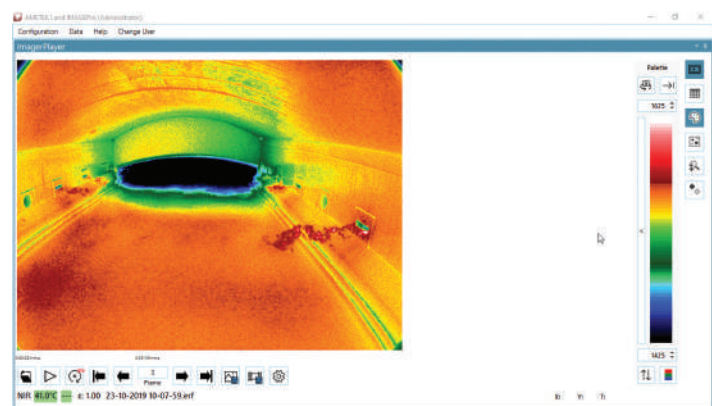
heat deflection to prevent overheating. Since there are no regenerators with a reversal, the solution allows long-term data trending for flames optimisation, plus it enables thermal optical profiles to be measured continuously, which is ideal for oxy-gas borosilicate furnaces with continuous operation.

SGD Pharma has used its latest infrared temperature measurement equipment to highlight best practices within a glass melt tank, enabling the company to make necessary repairs and then optimise flames to achieve desired pull rates.

Isotherms provided by the NIR-B tool are highlighted to show cold and hot locations. Alarms and temperature isotherms also provide the manufacturer with long-term asset protection against over-heating and condensation zones. On the firing side, burners block cleaning and inspection will be shown as the flame risk of impact on refractories.

At this stage at SGD Pharma, there is no direct data exchange for thermal zones of interest to the DCS (Digital Control System) of the furnace or to a system for optimisation. This is a potential future option for SGD, as

the NIR-B is already able to collect temperature data based on 100 zones of interest and send all the data to any DCS or expert systems.



Rainbow palette RHS glass flow is hotter than LHS cold spot in the crown skew corner – cold spots on tuck stone joints.

Implementation on borosilicate glass furnaces

In the past, the implementation of CCTV for an oxy borosilicate glass furnace was always a challenge due to the highly aggressive furnace atmosphere. Clearly, this is a harsh environment, often resulting in blurry images and inconsistent measurements or videos.

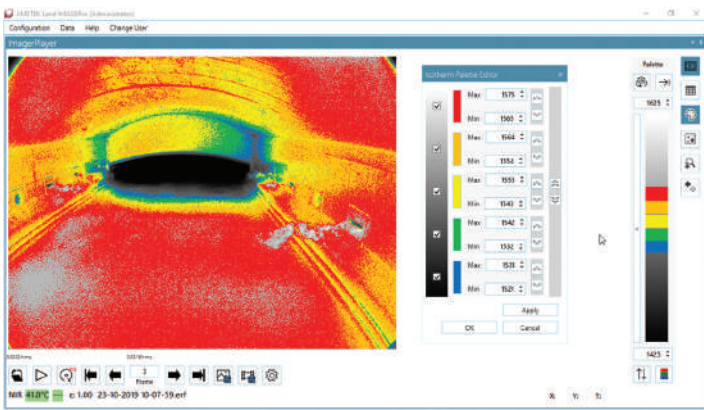
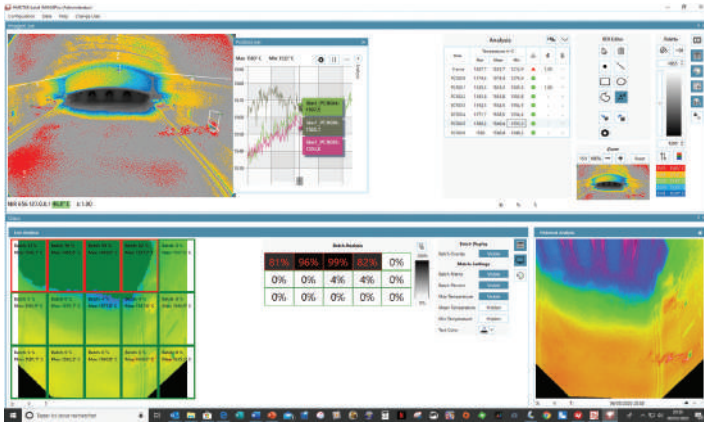
However when using the NIR-B a clear image is visible due to the high quality of the lens. Proper installation is essential for robustness and dedicated infrared shields have been created for the protection of the NIR-B's retraction mechanism against the infrared radiation coming from the whole camera block and the glass working zones around the instruments.

The most suitable location for installation on a small furnace is above the throat in the centreline of the furnace to provide a good field of view of the refractories including crown, sidewalls, burner blocks and batch line.

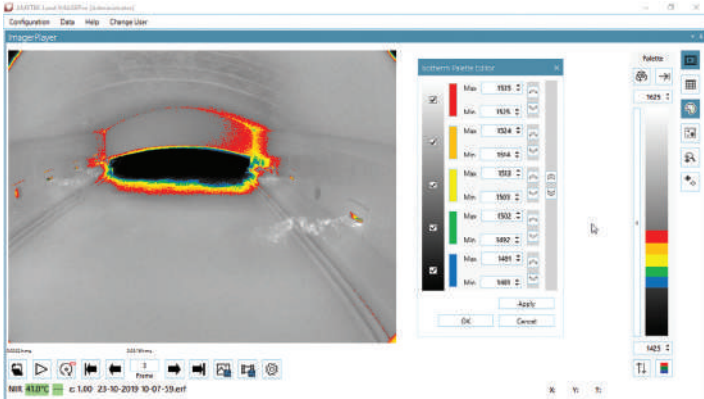
Optical measurement and batch flow focus

Accurate and repeatable temperature measurement is essential for efficient control and optimisation of glass manufacture and processing. This is even more critical within oxy-gas furnaces where the temperature of the flame is significantly hotter – measurements are typically performed only at critical locations. Point measurements can be obtained using thermocouples, either embedded in the walls or intermittently by using a hand-held portable infrared (IR) pyrometer.

Focusing on visual images, operators can forget that there are 320,000 thermocouples with temperature data that can be used



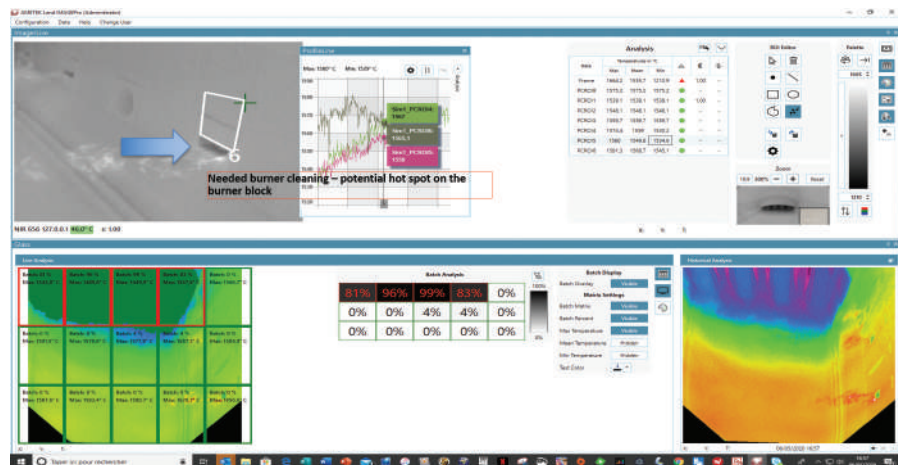
Above: B&W plus isotherms shows RHS hotter; possible crown overheating above R2.



Refractory cold spots.

to optimise the furnace and validate CFD models. Ametek Land's software enables points of temperature measurement to be exported to a furnace control system.

By setting minimum or maximum temperature, it is possible to have an alarm function. When an alarm is triggered, a snapshot is taken of the whole image and stored for future analysis. An 'area' function of the software also enables multiple areas to be configured. Examples could include the crown, port/target wall, tuck stones, breast walls and skew line. In some applications the corresponding crown thermocouple location temperature is measured within the



L4 block 300% zoom. The last frame shows the hottest part on an L4 block.

image to verify the accuracy of thermocouples, which decay and ultimately fail through time.

The most important initial benefit of the NIR-B is the ability to obtain a furnace thermal profile continuously in oxy furnaces and confirm that hot spot locations are well aligned with the furnace design and batch line. This is probably the most powerful tool from an operation's perspective.

By drawing profile lines at desired points such as crown and/or skew, it is also possible to obtain a thermal profile continuously.

Batch patterns

Batch flows are initially impacted by charging control and potentially the flames. However, flow patterns are driven by the thermal flows/convection currents. In the same way that heat flows from hot to cold, thermal currents follow the same thermal vectors.

The primary purpose is always looking at the batch pattern. Time-lapse recording can be used for reviewing batch flows as a conventional CCTV. Ametek's ImagePro software provides batch coverage based on a grid with rows and columns for better batch tracking.

Since the image is based on thermal data, it is possible to add areas and apply alarms if the cold batch reaches a certain point. Whenever an alarm is triggered, the image is recorded for QA and troubleshooting purposes.

By utilising a specific thermal palette and adjusting temperature bands, it is possible to identify which flames and which blocks are the most intense or hottest, therefore generating the optimal flames pattern and heat transfers.

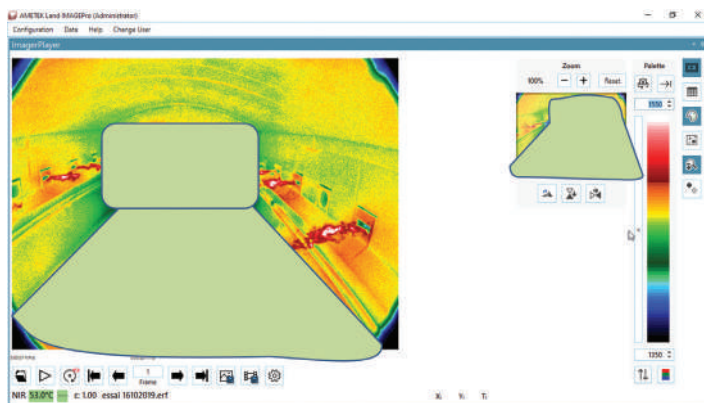
From an asset protection perspective, one of the most important analytical tools is the negative image, which can be instantly displayed. This function shows the areas with the greatest cooling. Utilising an up to 400x zoom function, the NIR-B can accurately determine the relative location of the small hole and assist in determining its absolute location. It could also be employed to identify over-cooling of the metal line, which leads to increased wear due to the Marangoni effect [mass transfer along an interface between two fluids due to a gradient of the surface tension] and cold batch piles scraping along the furnace length.

Data analysis

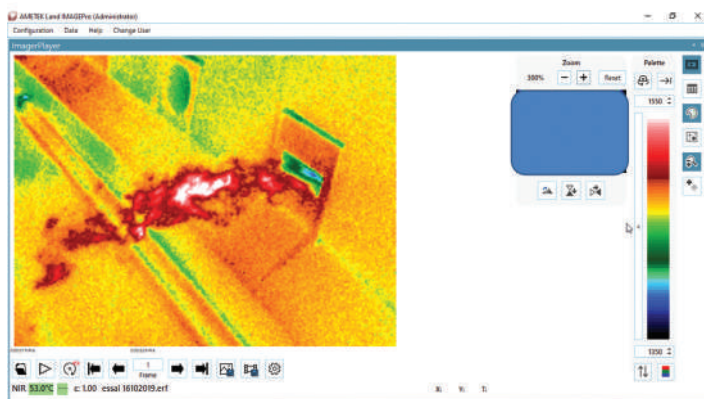
One of the challenges of the NIR-B system is the massive amount of data captured and how it should best be interpreted. While it is suggested that operators use some of the functions in real-time, other functions are better suited



Continued operation will most likely see damage to the L4 block on the bottom downstream corner.



Furnace heat-up at the start of a fill.



Heat-up fill showing early damage on L4.



Survey mode with transportable NIR-B via an existing peephole.

to off-line analysis by batch and furnace managers. It is suggested that every day at given times, snapshot images are taken of the furnace. It is then possible to compare data from 24 hours, one week, one month, three months, six months and 12 months previously to identify short-term problems and long-term changes in the asset. With this data, it is possible to prepare a long-term preventative maintenance schedule and more importantly, a short-term reaction.

Isotherms for hot and cold spot locations

By utilising a specific thermal palette and adjusting the temperature bands, it is possible to identify refractory temperatures to see which flames and blocks are the most intense or hottest, therefore generating the best suitable flames pattern and heat transfers.

Burner block inspection

The NIR-B zoom enables the identification of potential refractory damage, especially on burner blocks requesting actions for cleaning or repair.

Furnace heat-up

The NIR-B is a powerful tool during heat up in which to review the expansion and gain reference images of the melt tank before and during filling. See some snapshots from the existing location above the throat are presented as part of this article.

Survey mode from existing peep holes

A portable NIR-B model is available, providing the possibility to use the tool temporarily for thermal surveys. In addition, a thermal survey has been undertaken to explore other locations in the furnace. Available peepholes are used and snapshots of the refractories taken, revealing many other details on flames, batch pattern, electrical boosters and glass temperatures.

Conclusion

Data from the NIR-B was used at SGD Pharma to reduce labour input, improve response times, identify and then troubleshoot furnace operations to improve yield or achieve higher pull and lower specific energy. Utilising 32in LCD monitors could be the best way to achieve a clear furnace image that could become the focus of attention of the operators' team and during customer visits.

While this should result in increased asset life, it has helped support the team with the potential for future energy optimisation and cost reductions. What can clearly be seen is that temperature measurement at critical locations in the production process is essential for efficient control and optimisation of the glass melting process and today, the technology to enable glass producers to do this is better than ever. ●

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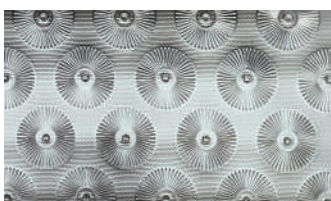
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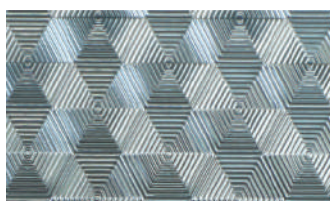
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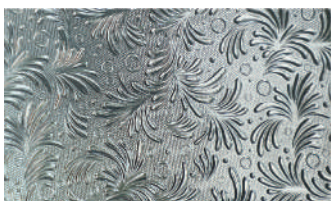
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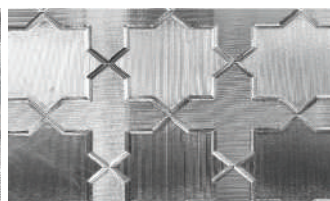
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