

# Kañch

INTERNATIONAL YEAR OF  
**GLASS**  
**2022**

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Quarterly Journal of The **All India Glass Manufacturers' Federation**  
**Bi-lingual**



**AIGMF 1<sup>st</sup> Photography Contest- 'Glass in our Lives' (2021)**  
2<sup>nd</sup> Prize: Medhansh Singha (8 years)  
3<sup>rd</sup> Class student of Delhi Public School (Vasant Vihar) New Delhi

## Special Feature

- Glass News
- Key Highlights of Union Budget of India 2022-23
- भारत सरकार का केंद्रीय बजट: 2022-23
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- Solar Glass for an Ecological and Economic Upswing
- Manufacturing and other Operations in Warehouse Regulations, 2019 (MOOWR, 2019)
- A Turning Point for the Flat Glass Sector
- Heye Process Control: An Incomparable Success Story
- A Practical Approach to Establish a Bronze Colour Glass Composition
- Prolific Multi-tasker Engaged in Major Projects
- Further Exploration of some Special Glasses



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<p><b>Liquor Bottles</b></p>  <p>Bottles Range:- 60 ml to 2000 ml</p>	<p><b>Anti-Bacterial Jars</b></p>  <p>Jars Range:- 250 ml to 1000 ml</p>	<p><b>Pharma Bottles</b></p>  <p>Bottles Range:- 5 ml to 4000 ml</p>
<p><b>Bottles &amp; Food Jars</b></p>  <p><b>Greendrop</b> Bottles, Jars Range:- 250 ml to 1000 ml</p>	<p><b>Soft Drink Bottles</b></p>  <p>Bottles Range:- 150 ml to 1000 ml</p>	<p><b>Wine Bottles</b></p>  <p>Bottles Range:- 180 ml, 375 ml &amp; 750 ml</p>

\* The product images shown are for illustration purposes only and may not be an exact representation of the product.

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## From President's Desk

Chairman Emeritus of Borosil Group, Mr. B. L. Kheruka departed for the heavenly abode on Dec 12, 2021. Mr. B L Kheruka's contribution to the glass industry in India and beyond over many decades cannot be overstated. He was the winner of the prestigious 'CK Somany Award for Innovation and Technology (2019)'. Mr. Kheruka was remembered at the Container Glass Promotion meeting at ALOFT New Delhi on Dec 23 and at the virtual Executive Committee Meeting held on January 15.



Myself, Office Bearers and Former Presidents released AIGMF 2022 print calendar on the theme 'Glass in our Lives' at the Glass promotion meeting held at ALOFT New Delhi on December 23.

*To commemorate International Youth Day, The All India Glass Manufacturers' Federation (AIGMF) invited online entries from the age group between 7-24 years to participate in the 1<sup>st</sup> Photography Contest on the theme "Glass in our Lives" wherein 7,000 entries were received from educational institutes and Youth across India. On September 10, 2021 Chief Guest Dr. Reinhard Conradt, Vice President and President Elect of the International Commission on Glass unveiled a touring exhibition on 'Glass in our Lives' at the virtual Annual General Meeting of The All India Glass Manufacturers' Federation (AIGMF). Later, the entire project was converted into the 2022 Calendar by covering few best shots.*

As part of an educative process, Wall and Desk versions of the calendars were distributed to AIGMF Members/Regional Associations, Stakeholders: All Members of Parliament/Government of India Secretaries/office of Chief Secretaries/LGs/Administrators/CMs/select Gol contacts/Trade Chambers/Education Secretaries/All FOSG Members/Firozabad/CGCRI contacts/Trade and Foreign Missions/General etc.

Parallel to the Glass promotion meeting, IYOG Calendar Glass Bottle 2022 was presented to Mr. Pranav Bharadwaj, Director Sales at ALOFT New Delhi on December 23 to promote green packaging ■

A handwritten signature in black ink, appearing to read 'Bharat Somany'.

(Bharat Somany)  
President AIGMF  
and Vice - President, HNG & Inds. Ltd.



# GLASS News

## REINHARD CONRADT ELECTED AS NEW ICG PRESIDENT



The Council of the International Commission on Glass (ICG) has elected Dr. Reinhard Conradt - former Professor and Chair of Glass and Ceramic Composites of RWTH Aachen University - as new president of the ICG for the period 2021-2024 during its hybrid meeting on 2<sup>nd</sup> December in Frankfurt, Germany.

The International Commission on Glass (ICG) is a non-profit international association of national scientific and technical organizations with members bringing together the world's most respected institutions, universities, companies and allied organizations operating in the field of glass, whose main objective is to promote understanding and stimulate cooperation in the field of glass science and technology, as well as glass history and art. Founded in 1933, the ICG has reached 88 years in 2021; currently has representation

from 32 countries on all continents. Its activity focuses on various topics, including education, the promotion of young people, and a structure of 24

Technical Committees, which bring together more than 600 experts in all branches of glass science and technology, [www.icglass.org](http://www.icglass.org)

## INTERNATIONAL YEAR OF GLASS (IYOG 2022) ADVERTISED AT IRAN NATIONAL DRAGON BOAT CHAMPIONSHIP

Both Women and Men's teams advertised IYOG 2022 by wearing smart jerseys at the Iran National Dragon Boat Championship organized by Iran Canoe Federation at Bushehr Port in South of Iran in Nov 2021.

This competition also helped to select Iran's national team.

Tehran Dragon Boat teams (both women and men) won Gold Medals out of 24 participating teams.

Similar announcements would be made during Iran Dragon Boat Premier League to be organised by Iran Canoe Federation at Tehran Stadium Lake in March 2022.



Germany has been participating in the ICG since its founding, right from the start represented by the then young German Society of Glass Technology (DGG, founded 1922). DGG was among the core founding bodies of ICG, together with the national societies from Belgium, France, Italy, Spain, the United Kingdom, and the United States. In fact, the idea to form an association like ICG already emerged at an international conference 1928 in Aachen, Germany, jointly organized by the Society of Glass Technology (SGT, U.K.) and DGG, bringing together the protagonists of the above societies.

Dr. Conradt holds a PhD in Physical Chemistry (1981) and a Habilitation (1996) with *venia legend* in Glass Science and Technology. After his PhD at Aachen University, he became involved with the topic of glass for the first time, performing industry related research at Fraunhofer Institute of Silicate Science (ISC) Würzburg, Germany, for 6 years. Then, he served for 10 years as lecturer and industry consultant in an emerging market of Asia (Thailand). From 1997 to 2016, he was full professor and Chair of Glass & Ceramic Composites at RWTH Aachen University, Germany. His work has been committed to building bridges between science, especially chemistry, thermodynamics and kinetics, and industrial engineering. From 2015 to 2020, he served as President of DGG.

His relationship to ICG goes back to the XIII. ICG Congress 1983 in Hamburg. He has been a

member of the Technical Committee 23 (TC23) of Education for more than 20 years, chairing TC23 from 2007 to 2016 and serving within the core team of ICG Montpellier Summer School, ICG Wuhan Winter School, and ICG Kolkata Glass Tutorial. Beyond this, he was part of the core team of TC18 (Properties of glass forming melts) for several years.

The new President of ICG said *"Taking over the presidency from Prof. Alicia Duran with her outstanding achievements, especially with respect to establishing the UN International Year of Glass 2022, means maneuvering within the wake of a big ship. One important task will consist in facilitating and consolidating the organizational transition of ICG, especially the expansion from an association of national participating organizations to a society with individual membership. The promotion of educational activities as well as a constant support for the initiative of Young Scientists and Technologists will remain a major focus. Special attention will be paid to the reinforcement and promotion of the activities of the Technical Committees, understood as the backbone of the ICG. Here, a joint effort of TCs directed towards the challenges of the climate issue shall*

*be implemented. ICG offers an ideal structure and a very wide basis to deal with these challenges, in specific, with the many precompetitive topics related to this issue".*

## PASSING AWAY OF B L KHERUKA

Chairman Emeritus of Borosil Group, Mr. B. L. Kheruka departed for the heavenly abode on Dec 12, 2021.



Mr. B L Kheruka's contribution to the glass industry in India and beyond over many decades cannot be overstated.

Mr. B L Kheruka was the winner of



Prayer meeting held in remembrance of Mr. B L Kheruka at ALOFT New Delhi on December 23.

the prestigious 'CK Somany Award for Innovation and Technology (2019)'.

Mr. Kheruka was remembered at the Container Glass Promotion meeting at ALOFT New Delhi on Dec 23 and at the virtual Ex Com Meeting held on Jan 15.



**IYOG CALENDAR GLASS BOTTLE 2022 PRESENTED TO ALOFT HOTEL NEW DELHI**

Parallel to the Glass promotion meeting, IYOG Calendar Glass Bottle 2022 was presented to Mr. Pranav Bharadwaj, Director Sales at ALOFT New Delhi on Dec 23 to promote green packaging.

Sept 10, 2021 Chief Guest Dr. Reinhard Conradt, Vice President and President Elect of the International Commission on Glass unveiled a touring exhibition on 'Glass in our Lives' at the virtual Annual

packaging material. As part of an educative process, Wall and Desk versions of the calendars were distributed to AIGMF Members/ Regional Associations, Stakeholders:



**RELEASE OF AIGMF 2022 PRINT CALENDAR ON THE THEME 'GLASS IN OUR LIVES'**

President Mr. Bharat Somany, Office Bearers and Former Presidents released AIGMF 2022 print calendar on the theme 'Glass in our Lives' at the Glass promotion meeting held at ALOFT New Delhi on Dec 23.

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General Meeting of The All India Glass Manufacturers' Federation (AIGMF).

Top 3 three winners were given cash prizes. Later, the entire project was converted into the 2022 Calendar by covering few best shots.

As the National Apex Body of the Glass Industry, the AIGMF undertakes socially responsible steps as a voluntary service to society, thereby bringing increased awareness of Glass being a safe and 100% recyclable

**Glass in our Lives**

General Meeting of The All India Glass Manufacturers' Federation (AIGMF).

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Chief Guest Dr. Reinhard Conradt, Vice President and President Elect of the International Commission on Glass unveiled a touring exhibition on 'Glass in our Lives' at the virtual Annual General Meeting of The All India Glass Manufacturers' Federation (AIGMF) held on Sept 10, 2021.

Online entries were invited from the age group between 7-24 years to participate in the 1<sup>st</sup> Photography Contest. A kickstart event to mark the International Year of Glass 2022 activities in India wherein over 7000 entries were received from Educational Institutes and Youth across India.

The roadshow will travel to other cities showcasing the vital role of Glass, being the only 100% recyclable packaging and building material. A digitized version of the exhibits may be viewed at: [www.aigmf.com](http://www.aigmf.com)

About the AIGMF:  
The All India Glass Manufacturers' Federation (AIGMF) is a not-for-profit National Apex Body of the Indian Glass Industry, representing all segments and sectors. AIGMF undertakes socially responsible steps as a voluntary service to society, thereby bringing increased awareness of Glass.

**The All India Glass Manufacturers' Federation**  
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Soft copy of the calendar is available at [www.aimf.com](http://www.aimf.com)

### **TURKEY'S SISECAM TO BUY 60% OF U.S. BASED SODA ASH FACILITY FOR \$450 MILLION**

In a statement, Siseecam said it would buy a 60% stake in Ciner Resources Corporation. The entity holds a 74% interest in Ciner Resources LP, which in turn holds 51% in Ciner Wyoming USA, a fully operational natural soda ash production facility with 2.5 million tons per year capacity.

Siseecam and Ciner Group, which are joint venture production partners in the natural soda ash business, will invest about \$4 billion in total in the United States, the statement said.

With the move, Siseecam-controlled soda ash production capacity will

quadruple to 10 million metric tonnes, compared to existing capacity of 2.5 million.

Siseecam said the investment would include the establishment of the largest soda ash production facility in a single location and make the company the largest natural soda ash producer in the United States.

### **SCHOTT GLASS RESPONSIBLE FOR ALMOST 90% OF COVID-19 VACCINE PACKAGING IN INDIA**

Leading German specialty glass maker SCHOTT Glass India has announced an additional investment of 70 million euros to expand its Gujarat tubing plant that already makes FIOLEX glass used in Covid-19 vaccine packaging in India.

According to the company, almost 90 per cent of Covid-19 vaccines in India are packed in glass tubing made by SCHOTT at its plant in Jambusar, Gujarat. In the wake of German Ambassador to India HE Walter J Lindner's visit to the plant, SCHOTT Glass India's Managing

Director Mr. Pawan Shukla reiterated the announcement of an additional investment of 70 million euros in the plant, following several million in investments over the last few years.

*"It (the German Ambassador's visit) gave us an opportunity to showcase a successful example of know-how and transfer of technology (TOT) from Germany to India. We have recently announced an investment of 70 million euros in the site to set up additional glass melting tanks and ensure adequate supply to the Indian pharma industry as well as neighbouring countries,"* said Mr. Shukla

The tubing plant in Gujarat is the Asian manufacturing hub of high-quality pharma glass tubing. It has also been a frontrunner in the fight against Covid-19 and provided pharmaceutical glass for primary packaging to fill billions of Covid-19 vaccines worldwide. In India, almost all approved vaccines are packed in FIOLEX glass made by SCHOTT, which has been the gold standard for pharmaceutical packaging for more than a century.

### **PROUD USERS OF IYOG 2022 CALENDAR GLASS BOTTLE – A GLIMPSE**



Mr. Nirmal Mundra, Affiliate Member of AIGMF presenting bottle to Mr. J P Agarwal Operations Director (COO) M/s Frigo Glass Industries Ltd., NIGERIA



Mr. Shashi Kant Former Deputy Adviser, Planning Commission and Confederation of Construction Products and Services (CCPS)



Mr. Nirmal Mundra, Affiliate Member of AIGMF presenting bottle to Mr. Antar Singh Nehra, District Collector of Jaipur

According to SCHOTT, the material is best suited for vaccines and life-saving medications, as it avoids the interactions between containers and the drug formulation that can limit its effectiveness.

Post his visit, German Ambassador to India Mr. Walter J. Lindner said that any vaccination program across the globe would've been very difficult without SCHOTT glass.

*"In fact, not many people know that SCHOTT glass is responsible for almost 90 per cent of Covid-19 vaccine packaging in India. I want to congratulate the SCHOTT team here as they promote a product that is German high quality and produced in India,"* he added.

Earlier this year in August, Serum Institute of India (SII), the world's largest vaccine producer and manufacturer of highly effective biologics, has bought the 50% stake in the Indian joint venture SCHOTT Kaisha from former co-owners Mr. Kairus Dadachanji and Mr. Shapoor Mistry. The joint venture is the leading Indian manufacturer of pharma packaging products such as vials, syringes, ampoules, and cartridges used to package life-saving medications.

### **SORG, EME AND GRENZEBACH WORK TOGETHER TO PROVIDE SOLUTIONS TO THE INDIAN MARKET**

German businesses SORG, EME and Grenzebach have teamed up to supply the Indian glass manufacturer Triveni Renewables Pvt. Ltd., with some of the industry's best technologies and solutions. In India, Triveni is building a manufacturing plant with a melting capacity of 240 TPD. The construction will help the company take advantage of the growing Indian solar glass market through its subsid-

ary, Triveni Renewables Pvt. Ltd.

The glass maker's choice is meant to fulfil Triveni's desire to have a highly efficient, environmentally friendly factory that can offer high-quality solar glasses.

EME will provide Triveni with a batch plant and cullet return system, while SORG is responsible for the melting furnace. Grenzebach will deliver the annealing lehr and the cutting line.

Triveni's decision to commission a SORG melting furnace is based on SORG's extensive experience in the solar and figured glass industry. It also highlights the benefits of the long-term partnership between SORG and Grenzebach to provide glassmakers worldwide with the best equipment for flat glass production.

In a statement, SORG said that *"they have been closely working with Grenzebach in the flat glass sector for a long time. Together, we can jointly provide a complete technological line for flat glass production. The partnership allows customers to benefit from the technological leadership of both companies."*

Mascot Engineering Company represents SORG and EME in India.



Triveni's new solar plant is expected to go into production from the third quarter of 2022-23.

### **TOWARDS A CLIMATE-NEUTRAL FUTURE WITH GLASS**

The innovative capacity of the glass industry was highlighted once again by experts from the most diverse areas

during the 2-day glasstec UPDATE International Conference. They explored in depth the ways the sector can contribute to a climate-neutral future along the entire value chain without losing its competitiveness.



*"It was exciting to witness how in-depth and robustly industry and planners debated the potential of glass and the contribution it can make to a climate-neutral future at this Conference. There is huge potential for the ideas, visions and solutions that are being pursued, which can also be experienced live at glasstec 2022,"* says Professor Ulrich Knaack of the Institute for Structural Design and Engineering at the Technical University of Darmstadt.

Even today the glass industry no longer solely focuses on optimizing energy efficiency. The sector is also working intensely on switching to alternative energy sources so as to reduce CO<sub>2</sub> emissions. At present, three technologies are in focus here: full electrification with green power, the construction of hybrid glass melting furnaces that are fired with electricity and natural gas and/or hydrogen later on, as well as the use of renewable gases such as hydrogen or biogenic gases. However, there is still a tremendous need for research and development work to be done in order to scale up existing technologies to the required level.

*"The journey to a CO<sub>2</sub>-neutral glass industry has already begun and is irreversible. Now we have to come up with short-term solutions to cut current CO<sub>2</sub> emissions with such innovative*

products as lighter double and triple glazing units but also concrete savings in manufacturing by optimizing existing lines. In the medium term, completely new technologies will have to be developed to ensure CO<sub>2</sub>-neutral glass production. We are already working hard on all three dimensions," says Mr. Martin Stadler, Sales & Marketing Director, Saint-Gobain Glass Deutschland GmbH.

Experts agree: a holistic approach is needed to achieve long-term decarbonization targets. For this purpose, they say, the glass industry needs political support to shape the transformation process in such a way that its competitiveness is maintained. "The glass industry faces up to the challenges of the future and does intensive research into the conversion of its processes," says Dr. Johann Overath, Director General of the Federal Association of the German Glass Industry (Bundesverband Glasindustrie e.V.), "but it also depends on policy-makers to create the necessary infrastructure and framework for change. This includes, above all, low energy prices and subsidies, the so-called Carbon Contracts for Difference, with the aim of also staying competitive after the switch to renewable energy sources." Add to this other relevant factor such as the recyclability and up cyclability of products as well as logistics issues that can also contribute to CO<sub>2</sub> reduction.

Architects and planners also shared their visions on climate-neutral buildings, energy-efficient buildings and urban life of the future without losing focus on a healthy and liveable environment.

Mr. Stefan Kieckhöfel, Director General of the Federal Association of Glazier Trades and member of the programme advisory body, also sees a duty for the skilled trades: "Some

14% of all CO<sub>2</sub> emissions in Germany are accounted for by the building sector. However, the emissions produced by power generation and distance heating or by building materials are not factored in here but allocated to the energy sector and the industry. Nevertheless, we consider it one of our most urgent tasks to intensely cooperate in the energy-efficient refurbishment of buildings by proactively approaching end users and building sponsors in a consulting capacity. There is still an enormous pent-up demand for energy-efficient refurbishment of existing window stock."

The mega trends decarbonization and CO<sub>2</sub>-neutrality will also be in focus at glasstec 2022, from 20 to 23 September.

At the concurrently held "decarbXpo" ([www.decarbXpo.de](http://www.decarbXpo.de)) technology and service providers will showcase solutions and services for decarbonizing industry and commerce.

### **KAISHA PACKAGING ACHIEVES RECORD OF SUPPLYING SEALS FOR 2 BILLION DOSES OF COVID VACCINES GLOBALLY**

Leading pharma-packaging firm, KAISHA Packaging, has accomplished new heights in the fight against COVID-19. The company has successfully provided over 2 billion doses worth of flip-top aluminium seals used for packaging COVID vaccines. The seal is used as closures for injection vials during the vaccination drive and is as such an essential part of the vaccine package ensuring tamper-proof delivery. This is especially relevant for fulfilling India and the world's current vaccination drive, especially given the need for successive booster doses considering

the ever-changing nature of COVID.

KAISHA Packaging has been a constant and biggest supplier for these seals to all the vaccines available in the Indian market and abroad. To ensure a consistent supply of vaccines and plug any shortages or gaps, the company managed to arrange and stock an extremely large volume of raw material. Not only did KAISHA Packaging successfully manage this challenge, it also expanded its capacity by over 450 million pieces to reach the overall capacity of 1.2 billion pieces per annum over the past year, which was unprecedented.

Mr. Rishad Dadachanji, Director, KAISHA Group of Companies, shared, "This is a testimonial of our commitment to support India's vaccine drive and developers with the best packaging solutions. As a pharma allied sector company, we have worked hard to ensure no gaps remain in our supply chain to ensure a consistent supply of vaccine seals. We are proud to have provided seals for over 2 billion vaccine doses so far. Under the current circumstances of ambiguity around the COVID pandemic, Kaisha is well-prepared to rise up to any supply challenges."

KAISHA packaging was established as a premium manufacturer of pharmaceutical closure systems for vials in 2003. The company has since revolutionized the way that aluminium seals are manufactured in India.

The company is part of the larger (Dadachanji Group), headquartered in Mumbai, India. It is a diversified group with business interests that include Pharmaceuticals and Biotechnology, Primary and Secondary Packaging, Medical Devices, Machine Building, Automation and Robotics. The group previously also owned a part of the Indo-German Venture SCHOTT-Kaisha, which is the largest supplier of vaccine vials in the country.

## KEY HIGHLIGHTS OF UNION BUDGET OF INDIA 2022-23

The Union Minister for Finance & Corporate Affairs, Ms. Nirmala Sitharaman presented the Union Budget 2022-23 in Parliament on Feb 1. Following are the key highlights:

- National Master Plan aimed at world class modern infrastructure and logistics synergy
- Formulation of Master Plan for expressways. Completing 25000 km national highways in 2022-23
- 4 Multimodal Logistics parks through PPP to be awarded in 2022-23
- Integration of Postal and Railways Network facilitating parcel movement
- 400 new generation Vande Bharat Trains
- Launching fund with blended capital to finance agriculture start ups
- Virtual labs and skilling e-labs to promote critical thinking skills and stimulated learning environment
- A Digital University will be established with world class quality universal education
- Digital Ecosystem for Skilling and Livelihood (DESH-Stack e-portal) will be launched to promote online training
- 3.8 crore households to be covered in 2022-23. 80 lakh houses to be completed in 2022-23
- 100% of post offices to come on the core banking system
- Scheduled Commercial Banks to set up 75 Digital Banking units in 75 districts
- Raising and Accelerating MSME Performance (RAMP) programme will be rolled out
- E-Passport with embedded chips to be rolled out in 2022-23
- Modernization of building byelaws, implementing Town Planning Schemes and Transit Oriented Development
- Introduction of Digital Rupee by RBI starting 2022-23
- Measures to aid investment by Venture Capital and Private Equity Investment
- Allowing taxpayers to file Updated Return within 2 years for correcting errors
- Reducing Alternate Minimum Tax Rate and Surcharge for Cooperatives
- Income from transfer of virtual assets to be taxed at 30%
- Better litigation management to avoid repetitive appeals
- Any Surcharge or Cess on Income and Profits not allowable as business expenditure
- Phasing out concessional rates in capital goods and project imports gradually and apply a moderate tariff of 7.5%
- Review of customs exemptions and tariff simplification
- Customs duty rates are being calibrated to provide a graded rate structure to facilitate domestic electronics manufacturing
- Unblended fuel shall attract additional differential excise duty

## भारत सरकार का केंद्रीय बजट: 2022-23

केन्द्रीय वित्त मंत्री श्रीमती निर्मला सीतारमण ने संसद में वित्त वर्ष 2022-23 का केंद्रीय बजट पेश किया। प्रमुख योजनाएँ इस प्रकार हैं:

- एक्सप्रेस वे के लिए मास्टर प्लान तैयार करना, 2022-23 में 25000 किलोमीटर राष्ट्रीय राजमार्गों का काम पूरा करना।

- ऑनलाईन ट्रेनिंग को बढ़ावा देने के कौशल एवं आजीविका हेतु डिजीटल इको सिस्टम (Desh Stack e-portal)।
- पीएम आवास योजना - 2022-23 में 80 लाख घरों का निर्माण कार्य पूरा किया जाना है।
- डिजीटल पेमेंट्स-अनुसूचित वाणिज्यिक बैंको के द्वारा 75 जिलों में 75 डिजीटल बैंकिंग यूनिट्स की स्थापना।
- एमएसएमई के कामकाज को बढ़ाना और इसमें तेजी लाना (आरएमपी) कार्यक्रम को अभी लागू किया जाना है।
- आईटी सेतुओं के माध्यम से केन्द्र एवं राज्य स्तरीय प्रणालियों का समेकन।
- 2022-23 में निजी निवेश और मांग को बनाये रखने के लिए सार्वजनिक निवेश।
- 2022-23 से आरबीआई के द्वारा डिजीटल रुपये के संचलन।
- हरित अवसंरचना के लिए संसाधनों को जुटाने हेतु ग्रीन बॉण्ड्स।
- डाटा सेंटर और इनर्जी स्टोरेज सिस्टम्स के लिए अवसंरचनात्मक स्थिति।
- उद्यम पूंजी और निजी इक्विटी निवेश के द्वारा निवेश में सहायतापूरक उपाय।
- गलतियों को ठीक करने के लिए करदाताओं को 2 वर्ष के भीतर अद्यतन रिटर्न दायर कर सकने की अनुमति देना।
- कर संबंधित प्रोत्साहन देने के लिए पात्र स्टार्टसअप को शामिल करने की अवधि का बढ़ाना।
- बार-बार की अपीलों से निजात पाने के लिए मुकदमेबाजी का बेहतर प्रबंधन।
- अनब्लैडिड ईंधन पर अतिरिक्त विचलन उत्पाद शुल्क लगाया जाएगा।

(News Source: AIGMF Research Team /  
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# Making adjustments for a decarbonised world

The technology exists for major advances in reduced-CO<sub>2</sub> glass production; hybrid and superboosted furnaces are making progress, but high electricity rates could compromise plans for all-electric vertical melters. Originally published in *Glass Worldwide* (preferred international AIGMF journal), Stuart Hakes looked at some of the issues surrounding the future of the glass industry.



Stuart Hakes.

Adverse weather conditions in New Zealand, China, USA, Canada, Belgium, Germany and Switzerland amongst many others this summer surely underline to us all that the necessity to reduce the amount of carbon dioxide going into the atmosphere is the utmost priority. The problem is, of course, that this comes with many hard decisions which have to be made.

If the glass industry is to play its part – with all of the major developments over the past few years, which have resulted in nearly 25% reduction in CO<sub>2</sub> emissions, we are still producing 1.5 million tons/year of CO<sub>2</sub> from our process.

To meet the commitments that various governments are setting, whether they be EU targets, British targets or United Nations climate change targets, requires the glass industry to make a major impact in our future CO<sub>2</sub> emissions, equivalent to approximately another 50% from where we are now. There are obviously financial impacts as well as technical impacts and as long as the glass industry remains ultra conservative, it is difficult to see how the correct decisions will be made.

It is not without some bright spots. The setting up of the Glass Futures furnace in the UK with an international assembly of companies in both the hollowware and flat glass fields and the Furnace For the Future container furnace (F4F) by FEVE show fantastic faith by some very able thinkers. This is to be applauded. However, the Boards of Directors who have to sign off on the results of these demonstration projects are probably a long way from being on-board, governed as they are by the necessity of delivering shareholder's returns and being ultra cautious.

## How will the industry look in the future?

There is no doubt that there now is very much a consensus that hybrid furnaces are the way forward and

these are described in more detail below.

We all know that for furnaces up to about 250tpd that cold top, all-electric vertical melters are by far and away the most efficient way of producing glass. The reason that cold top all-electric furnaces are so super efficient is quite obvious. There are no regenerators to heat and no superstructure as a batch blanket is established on top of the melt that effectively seals all the heat into the melt itself – the very top layer being a thick layer of batch, typically about 100mm thick followed by a reaction layer followed by a refining layer. This is clearly vertical melting and gives stunning energy efficiencies of approximately 2.6GJ/t for very small furnaces, anything between 25–80tpd.

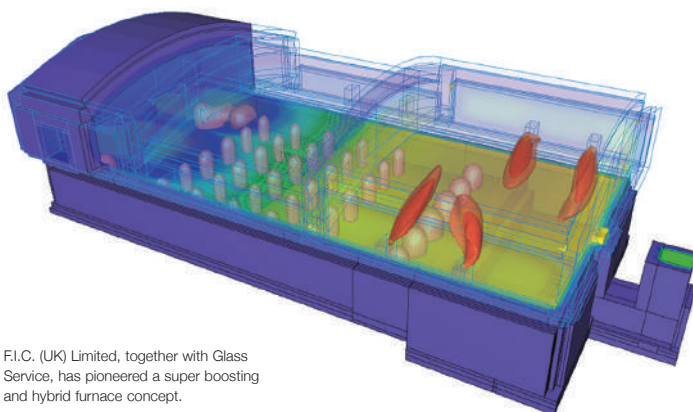
However, there are a number of negative factors, including lack of turn-down ratio (in other words the ability to go from zero pull to maximum), shorter furnace campaign lives, some perceived issues with reduced glasses such as amber, dead leaf green, etc. and the current high cost of electricity. I have argued for a long time that shorter lives should not be an issue as the rate of technology change is so great that locking ourselves into a 20-year furnace life span makes no sense. The other issue with a 20-year life span is that the furnace is very expensive in order to make it last that long.

Because we do not have to concern ourselves with regenerators, which are arguably one of the first areas to clog up, locking ourselves into a 10-year life for an electric furnace, without the expense of regenerators means that the payback in terms of building and operating an all-electric furnace for 10 years becomes much better than the older model. It is now quite common for cold top all-electric furnaces to last eight years and with the advance in technologies I am confident this can be pushed to 10 years and beyond. The issues of dealing with reduced glasses are not nearly as difficult as is believed.

## The price of power

For a long time in the 1970s with the first oil shock, many all-electric furnaces were built specifically to melt amber glass and to avoid the issues they were normally operated as semi hot-top; in other words, the establishment of a thick blanket to hold the heat in was not proceeded with and by using normal screw-chargers and redesigning a superstructure, heat could escape above the surface and allow pre-heating of the batch. These hot-top and semi hot-top all-electric vertical melters made amber glass perfectly.

It remains therefore that the greatest drawback to all-electric furnaces is the cost of electricity and currently the UK has one of the highest rates of electricity pricing in Europe. This is the greatest drawback and I know much representation has been made by the high energy industries to address this anomaly and in particular its cost ▶



F.I.C. (UK) Limited, together with Glass Service, has pioneered a super boosting and hybrid furnace concept.

Originally published in *Glass Worldwide*, preferred international journal of



in relation to natural gas. How effective this will be long term really determines how the industry can respond to decarbonisation. Unless steps are taken to reduce the price of electricity the industry cannot decarbonise. It is as simple as that.

### Size matters

We also know that in terms of energy efficiency, big is beautiful and that bigger furnaces are inherently more efficient. Most of the container furnaces nowadays are bigger than 250tpd and are more energy efficient than smaller furnaces but these sizes exceed the practical limit for cold top all-electric vertical melters. So, it becomes obvious that these cold top all-electric vertical melters are only a small part of the answer for the industry to decarbonise going forward.

The majority of major container manufacturers and in particular all of the flat glass industry have much bigger furnaces; typical size for a float glass furnace is between 600–800tpd and many are being built at 1000–1200tpd. Trying to set up a cold top all-electric vertical melter with the melt area suitable for a furnace of that size would require an enormous glass depth and is probably a technical advance too far. Whilst it is technically feasible, the furnace life with all the horizontal joints and the construction costs make it extremely unlikely. So the question is how do we move the industry going forward? The answer, is of course, as I intimated earlier, a horizontal hybrid electric melter.

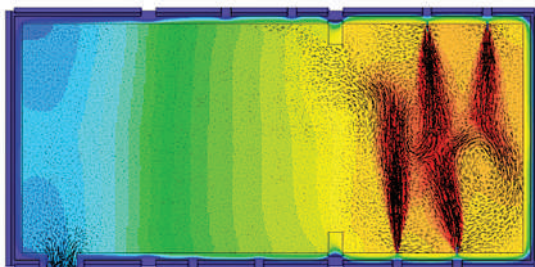
### Hybrid melters

It is very encouraging to see that virtually all furnace builders and boost suppliers have now come around to a hybrid melter. This has come about because Computational Fluid Dynamic Modelling (CFD) has shown this to be the most efficient way forward. It is very interesting to see that even though there are differing CFD modelling systems being employed, they are all now converging on something very similar to each other.

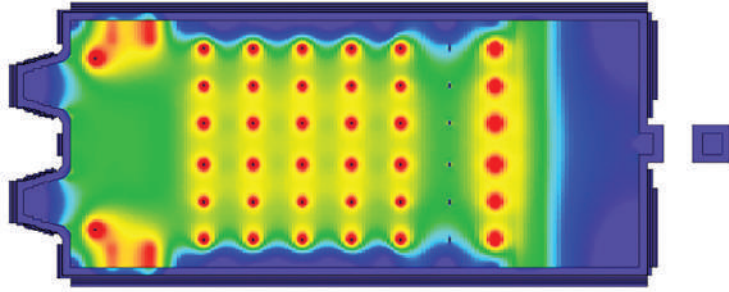
So, what is a hybrid all-electric melter? Well basically this is an all-electric melter but instead of being vertical melting it is horizontal melting, meaning that the furnace size is very similar, if not identical to the footprint of the existing fossil fuel fired melter.

The in-glass electrical melting component is maximised at around 80% of the total energy. The remaining 20% of the energy has to be supplied by some top heat – either more electricity from elements or by burners. This top heat is required for controlling the glass quality.

Obviously, the furnace has to be decarbonised, which eliminates entirely any form of fossil fuel and I would also suggest eliminates bio-fuels. I think we are deluding ourselves when we believe that using bio-mass, which is a renewable resource, is saving the planet because the



F.I.C. (UK) Limited is a leader in the design and manufacture of electric glass melting systems.



Stuart Hakes: "There is no doubt that there now is very much a consensus that hybrid furnaces are the way forward..."

amount of bio-mass that we consume in a single day, and the length of time it takes to grow a tree or whatever to replace that is entirely disproportionate. Besides which we are still producing CO<sub>2</sub>, and in global warming CO<sub>2</sub> is the problem. Therefore, we have to entirely eliminate any kind of bio-mass, which means that the heating is going to be either electric or hydrogen.

If we are going to use hydrogen it means that we are using oxy-hydrogen fuels as anything else (such as air/hydrogen) would be many times more dangerous than possibly oxy-hydrogen would be. It also means that if we are going to eventually end up as oxy-hydrogen, we can transition initially into another oxy-fuel to give us the background and the confidence before making the change to oxy-hydrogen.

So, from the above it can be seen that the majority of the existing furnaces can go through a transition stage whereby more boost is added to the furnace, which is termed superboosting, and then at some stage change the regenerative furnace to an oxy-fired furnace and then the final step to a hybrid furnace.

Hybrid furnaces are typically envisaged to be running at a maximum of 80% in-glass heating by Joulean heat through molybdenum electrodes and around 20% by heating above

the surface. All of the modelling shows that this heat is required in the refining area, which is the downstream portion of the melter. Most modellers recognise that different crown heights makes sense but we need to look at the other issues.

These are principally the refractories required if we are to burn hydrogen in the furnace but that is for another paper. There's much more to say!

In short, the technology exists for major advances in decarbonisation; the modelling proves it is safe. A small number of furnaces are already hybrid and there are also a few superboosted. Small steps on the path forward. Glass Futures and the FEVE project are tangible demonstrations but who will commit their money first and how do we tackle the future energy costs? Time will tell. ●

#### About the author:

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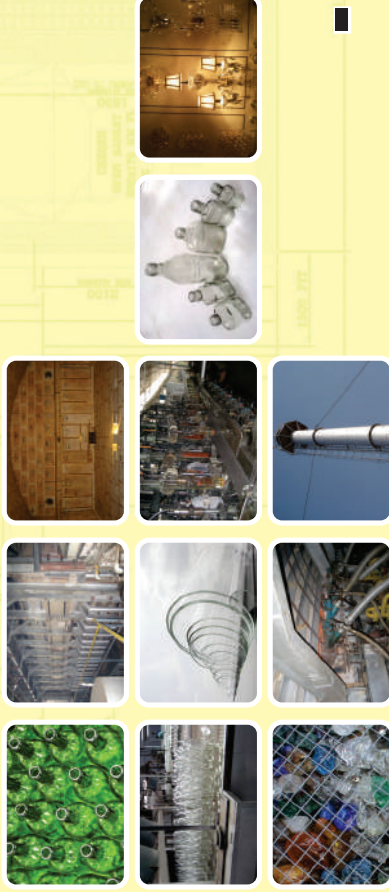
- Selection of site
- Plant layout
- Furnace design, selection of refractory & steel structure
- Furnace building, commissioning & maintenance
- Selection & commissioning of combustion system, instrumentation & allied equipment
- Selection of raw material
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# Innovation meets quality

Shamvik Glasstech Pvt Ltd was quick to embrace Industry 4.0 for its IS machines. As reported in *Glass Worldwide* (preferred international AIGMF journal), the pioneering company has partnered with Russian tech firm Sibir Telematics to provide advanced turnkey solutions for glass factories.

Shamvik Glasstech Pvt Ltd (SGPL) was founded in 1973 as Maul Eastern Limited, a JV with Maul Brothers USA with the goal of providing the most innovative IS machines built at world-class standards with an affordable price for its customers. Over the years the company has been involved in various technical partnerships with the top European IS machine manufacturers that reflect the latest technology contemporarily available.

## Industry 4.0

While the early 2000s and 10s called for a gradual shift towards servo machines for less human interference and error, the last few years have ushered in Industry 4.0 to create an environment of inter-operability and connectivity between machines, which SGPL was quick to incorporate into its manufacturing abilities.

As a result, not only has SGPL integrated Industry 4.0 into its premises to ensure quicker delivery times but the company has also increased its serviceable range for more varied centre distance machines. This has enabled SGPL to offer brand-new IS

machines at a price comparable to that of reconditioned machines.

## A new era of efficiency

At the same time, SGPL has revived its reconditioned machinery vertical to ensure it is able to match not only the customer's machine configuration requirements but also offer a plethora of machinery that is suitable to customer budget/capital requirements. The company's relations with manufacturers around the world combined with its engineering prowess ensures that customers receive a reconditioned machine that rivals brand-new configurations.

The creation of a separate unit geared towards delivery equipment ensures that customers are able to receive complete sets promptly.

This decade will be characterised by the efficiency glass factories can achieve not only through their IS machine lines but from melt-to-pack as a whole, as the focus shifts to a forgotten aspect of lost revenue that has been further highlighted by the adverse effects of the Covid-19 pandemic.

## Partnership with Sibir Telematics

Shamvik Glasstech Pvt Ltd has partnered with Sibir Telematics, an innovative company from the scientific and research-oriented region of Novosibirsk, Russia – to provide the most advanced turnkey efficiency solution to glass factories and overcome the challenges of integrating IS machines and the efficiency in achieving glass production in real-time.

This is one of many partnerships yet to be announced by SGPL with the aim of pairing industry-leading technology with cost-efficiency.

The 'Conveyer' solution is a tool, for shareholders and top management, that forms an objective picture of the current efficiency of production processes at the enterprise. Objective data is the basis for staging and monitoring the implementation of key performance indicators (KPIs) aimed at increasing production efficiency. For production workers, it is a tool that will help them achieve new KPIs through the use of the following functions:

- Analytics of downtime (type/reason) that provide module data in real time.
- A system of online notification for target events geared towards improving melt:pack ratio.
- For the management of the plant, the functions in demand are:
  - Formation of the balance of raw materials of the enterprise in real time, in a closed cycle format throughout the entire plant cycle.
  - Calculation of the percentage of waste from a clean charge.
  - Control of losses in all areas.

The solution has already proven its cost-effectiveness at the LLC Siberian Glass and Interglass factory, which is reflected in company's official press release for 2020.

The amount of additional profit generated at pilot plants has ensured an astounding payback period of only six months to one year, given that the plant is able to generate economic benefits immediately after the start of operation of the system. ●



SGPL has completed over 180 installations and turnkey projects worldwide over almost five decades.

### Further information:

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# HOT TOPICS

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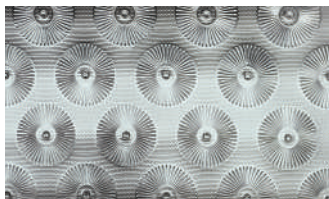
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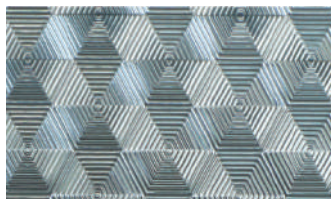
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# Solar glass for an ecological and economic upswing

India is currently pushing the development of renewable energies and looking to strengthen its economy further with the production of photovoltaic modules. A partner of the glass industry in India for decades, Grenzebach is supporting the solar power boom with innovative production technology for patterned glass. *Glass Worldwide* (preferred international AIGMF journal) reported.

India's economy has provided strong growth impulses in the last years. In the long term, experts expect a growth corridor of 4–8% for the economy. Almost 1.4 billion people live in India (the second-largest population after China) and the country, which stretches from the Indian Ocean to the Himalayas, is increasingly striving for economic independence from neighbouring states and has also set ambitious climate targets. Images of New Delhi smothered by smog are set to be a thing of the past; solar power instead of coal-fired power is the driver.

With its 'Incredible India' campaign, the subcontinent has been showcasing its diversity for several years now. The economic and ecological upswing is being intensively promoted by the Indian government. While around 75% of solar panels installed in India have so far been supplied by China, the amount of domestically-produced solar panels is expected to rise rapidly. The Indian government has added photovoltaic (PV) modules and battery storage for solar power to the list of the Production-Linked Incentive (PLI) schemes.

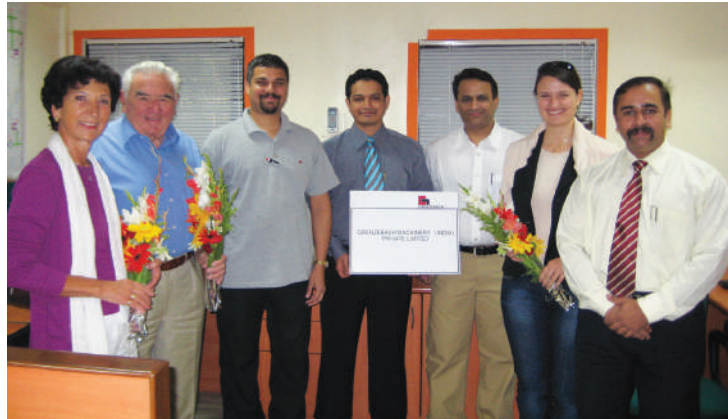
## High demand for drawing and float glass

Photovoltaic applications (such as solar panels) require ultra-clear glass with high light transmission, a light-focusing structure and low light reflection. Drawing glass, also called patterned glass, meets these requirements.

"At the moment, we are seeing an increased demand for drawing glass lines because the patterned glass is used in PV modules. The production of float glass will also increase further in order to supply the automotive and construction industries with glass products, for example," explains Jan Lukassek, Senior Sales Manager in the Business Unit Glass at Grenzebach. Since 2005, he has been in regular contact with Indian partners and customers, advising on the design of glass manufacturing plants and supporting customers with his expertise through all communication channels until the start of production and beyond. "So far, compared to the country's population and growing economic strength, there are relatively few glass manufacturing plants in India. I reckon that around 70% of the current capacity and the now growing capacity will be used for products for the Indian market. The rest will be exported," he believes.

## Supporting manufacturers in India

Grenzebach took its first step into India in 1996 with the installation of a stacking system at the cold end of an existing float glass line. In 2006 Grenzebach opened its own subsidiary in Poona in western India, around 50 miles from Mumbai. From there, Grenzebach employees maintain plants throughout India and also neighbouring countries. "The glass industry in India and in our neighbouring countries has gained great momentum since the Grenzebach team started



Maria and Rudolf Grenzebach (left), the company founder couple, and Sonja Grenzebach-Proeller (second from the right), today the main shareholder of the Grenzebach Group, visit experts at the Indian site in Poona. This archive photo is from 2007. Source: Grenzebach.

a quarter of a century ago. Solving day-to-day issues together with our customers and also strategically supporting the companies is a great pleasure," says Prasanna Hedge, Managing Director at Grenzebach Machinery (India) Pvt. Ltd in Poona. As an example of this momentum, in 2009, the drawing glass line premiere in India took place together with

Borosil Glass Works Ltd., in 2019 a second line was commissioned and in 2022, another two drawing glass lines for patterned glass will be installed for the newly founded company Borosil Renewables Ltd. Today, a total of six float glass lines from Grenzebach are in operation in India, with a daily capacity of almost 3,800 tons. With the two new plants at Borosil, four ▶



Producing for the energy transition: the second drawing glass line at Borosil was set into operation in 2019. Source: Grenzebach.

drawing glass lines will then produce up to 1,000 tons of patterned glass per day.

### Fine-tuning technology

In order to reduce CO<sub>2</sub> emissions and drive the energy transition forwards – improving the quality of air and thereby the quality of life for the people living in India's 28 federal states, protecting the environment and making a significant contribution to the international efforts for climate protection – the government is relying in particular on the power of the sun.

Grenzebach is prepared for the additional installation of drawing glass lines, which are specifically designed for the production of glass for photovoltaic modules. To meet the increasing demand for solar glass – currently also occurring in China – Grenzebach experts comprehensively revised the company's portfolio for drawing glass and added new technologies; a state-of-the-art product line.

### Early adopter

Indian glass manufacturer Borosil anticipated the great demand for solar modules as early as 2009 and put its first drawing glass line into operation with a daily output of 180 tons per day. Another drawing glass line, commissioned in 2019, generates additional 240 tons per day. Borosil continues to expand to meet the increasing demand for drawing glass for PV modules as a result of the international energy transition. In 2022, a further two patterned glass lines will be installed, each with a daily output of 275 tons. They will be located in Bharuch in the federal state Gujarat.



Grenzebach took its first step into India in 1996 with the installation of a stacking system at the cold end of an existing float glass line. Source: Grenzebach.

Borosil Renewables Ltd., part of the international Borosil Group, has doubled its capacity in India for patterned glass to five gigawatts of photovoltaic modules by expanding in Bharuch. The company now meets about 40% of the demand for drawing glass on the domestic market. The remainder is imported from China and Malaysia.

"Investing in green power technology early on has proven to be the absolutely right strategy," states Ramaswami Velayudhanpillai from the Management of Borosil Renewable Ltd. "We knew that drawing glass for solar modules would be of great importance on the Indian market. We will resolutely continue going on this path. The investment in the two additional drawing glass lines is an important step so that we can meet the increasing demand and in addition expand this strategically important business."

The company is also exporting heavily. Borosil Renewables exports about 20% of its patterned glass to the USA and Europe – in particular to Germany, Spain, Portugal, Turkey and Russia.

### New Borosil site in Bharuch

Flexibility in production is important to Borosil. Drawing glass for solar modules has a thickness of 1.6mm to 4mm. The formats of the glass sheets depend on the order but range within the parameters of 1–2m<sup>2</sup>. "In the area of photovoltaic, bigger glass formats are on the rise. Borosil anticipated that already and the line is designed to allow maximum gross widths. This promotes flexibility," explains Jan Lukassek from Grenzebach. The maximum glass width is defined by the length of the structure roller. The two new lines each have three robots to stack the glass sheets at the line. Flexibility is also an important aspect of this: two single sheets can be picked simultaneously (double pick) or individually (single pick).

The cold end at Borosil's plant is supplied by Grenzebach; the annealing lehr by CNUD EFCCO GFT. Following the motto 'from hot to cold', Borosil uses integrated solutions from a single source. With 300 systems installed worldwide, both Grenzebach and CNUD EFCCO GFT have immense application knowledge. Together, they cover a large part of the subsections of a glass line and customers benefit from their joint expertise in the hot and cold areas.

### Booming potential

Borosil, with its additional expansion, is one of the drivers of India's growing importance in the global energy transition. India has the potential to become an important hub for the enormous international demand for photovoltaic technology.

Although the Indian economy was hit by a slump as a result of the Covid-19 pandemic and the country will have to struggle with the effects of the pandemic for a long time, by 2030 India could become one of the top three economies in the world. The boom in renewable energies and the boom in glass production are significantly contributing to this. ●



(L-R) Pradeep Kheruka, Chairman of the Borosil Group and Jan Lukassek, Senior Sales Manager in the Business Unit Glass at Grenzebach with Sorab Singhal from DGM Glass Service at Borosil meeting at a solar exhibition in 2014. Source: Grenzebach.

### Further information:

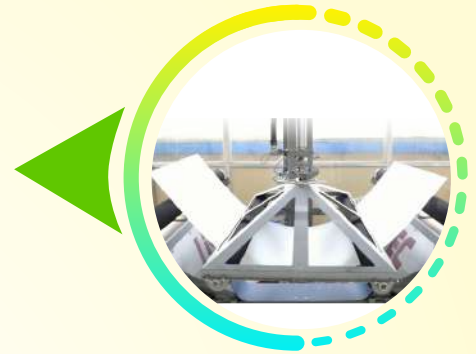
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# BOROSIL renewables

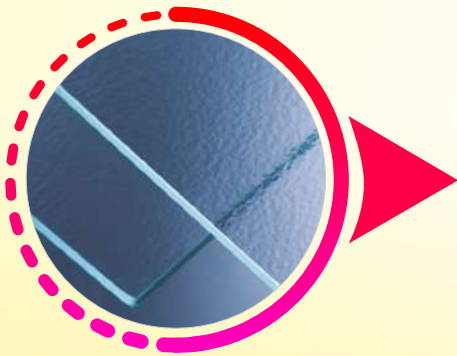
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# Manufacturing and other Operations in Warehouse Regulations, 2019 (MOOWR, 2019)

*CA Sanjay Jain is a Fellow Member of the Institute of Chartered Accountants of India (ICAI). A Certified Management Consultant from Consultancy Development Council, Government of India. A Certified Director from the Institute of Directors of India, Director International Trade at Indo-Latin American Chamber of Commerce, New Delhi and has been a part of active Corporate think tanks of various Government and Corporate organizations.*

*Mr. Jain has a vast experience of more than 3 decades in Consultancy and Business Advisory in the field of International Trade, FDI, MOOWR-2019, Drawback, FEMA, and Project Funding through Private Equity and ECB along with SME listing with various Stock Exchanges.*

*He has been actively participating in various commercial and Taxation issues on TV and social media including representation before the Government for Taxation Policy matters from different forums.*



CA Sanjay Jain

## WHAT IS MOOWR 2019

- The scheme is for manufacturers who want to carry out manufacturing operations in a bonded warehouse subject to specified conditions.
- This scheme was revamped with the intention of giving the **'Make in India'** campaign a boost. Thus, the features of the scheme are focused on ease of doing business for manufacturers.

## ELIGIBILITY CRITERIA

- An entity incorporated or registered in India or a persons citizen of India is eligible for MOOWR 2019.
- An entity or a person has to obtain a license for a warehouse under Section 58 of the Customs Act, in accordance with Private Warehouse Licensing Regulations, 2016.
- The existing factory premises can also be applied for as a warehouse.

- Permission can be obtained for any premises. Such premises must be added as an additional place of business under GST.
- Persons already having a licenced private bonded warehouse under Sec. 58.
- A person who is not at all exporting can also apply.

## APPLICATION PROCESS

The following simple steps are to be followed to opt for the MOOWR 2019 scheme:

- Online application with all details

to be filed with the Jurisdictional Commissioner of Customs.

- A bond is required to be executed and furnished to Jurisdictional Commissioner of Customs, who is a single point of contact.
- The Jurisdictional Commissioner of Customs verifies the application and premises and thereafter grants license. This license is valid indefinitely until cancelled or surrendered.

## BENEFITS

- Duty deferment (without Interest) in case of import of



- capital goods and raw materials.
- Capital goods can be imported and brought to the warehouse without payment of Customs Duties (BCD and IGST, which shall be payable only when the capital goods are removed from the warehouse.
- Imported inputs, can be brought into the warehouse without payment of Customs Duties (BCD and IGST) and stored in the warehouse.
- No customs duty if the Capital goods are exported from the warehouse.
- If the imported inputs are exported (either as such, after subjecting to manufacturing or other processes), no need to pay Customs duties on the imported inputs.
- Capital Goods / Inputs can be sourced from SEZ/FTWZ.
- The eligibility of a factory for manufacture and other operations in a bonded warehouse does not depend upon whether the final goods will be sold in the domestic

market or exported.

- There is no quantitative restriction on sale of finished goods in the domestic market.
- No export obligation or Positive NFE requirements.
- SION norms to be adopted on a self-certification basis.
- Most liberal as compared to EPCG/Advance License Schemes.
- Interest-free storage period till the time the goods could be utilized in manufacturing.
- No need to renew license unless it is cancelled or surrendered.
- No need to pay any interest till the permitted warehousing period.
- Paves way for greater cash flow. (Substantial amount payable upfront on account of BCD and IGST deferred).
- Paves way for earlier break-even period for Green Field Projects due to deferment of BCD and IGST.
- Self appointed warehouse keeper and no physical control by “Bond

officer” or Customs Department.

- Single point of approval.
- No geographical restriction.
- Unlimited period of warehousing.
- Easy compliance.

### CONCLUSION

- The scheme looks lucrative and beneficial for the manufacturer-exporter segment.
- The scheme was launched at the right time and right before the pandemic struck.
- There is no doubt that the Indian Government has revamped the 1966 MOOWR scheme in the best possible way and at an appropriate time.
- The trade is quickly adopting the scheme and it will soon become the next popular initiative for the ‘Invest India’ crusade ■

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# A turning point for the flat glass sector



High-tech glazing is set to play a crucial role in the journey toward climate-neutrality. As originally published in *Glass Worldwide* (preferred international AIGMF journal), with some 'fine-tuning' the European Commission's Fit for 55 proposals will provide important support for the glass industry as it focuses on reducing manufacturing emissions.



Philippe Bastien, President of Glass for Europe and Regional President of AGC Glass Europe.



On 14 July 2021, the European Commission revealed its strategy to reduce its emissions by 55% in the next decade and

make Europe the first climate neutral continent by 2050. "With the release of the so-called 'Fit for 55' package, the European Commission does not fall short of its ambition" says Bertrand Cazes, Secretary General of Glass for Europe. "This is a turning point and a remarkable moment for a sector like the flat glass industry."

The Fit for 55 package contains more than a dozen inter-twined legislative proposals. The European Commission aims to update several pieces of its Energy and Climate legislative framework to align the requirements to the increased climate ambition of the Union. New initiatives have been put on the table to secure contributions to the CO<sub>2</sub> emissions reduction goal from sectors such as buildings and transport. Glass for Europe is particularly supportive of measures which have the potential to support the market uptake of CO<sub>2</sub> avoiding products, such as initiatives to boost energy efficiency and renewables in both buildings and transport.

## Renovating with glass

Philippe Bastien, President of Glass for Europe and Regional President of AGC Glass Europe, explains: "In the journey toward climate-neutrality, high-tech glazing will play a crucial role to renovate ageing buildings, to support the clean mobility transition and to increase the share of solar energy. In Europe's flat glass sector, we stand ready to make this essential material available while developing novel ways to lower our own industrial emissions".

The release of the Fit for 55 package is the first step of a long legislative process which could take up to two years. In the coming months, both the European Council and the Parliament will have their say and intense negotiations will take place before the final agreement. "While a clear political direction is provided with this package," continues Bertrand Cazes, "some fine-tuning will be needed to make sure this framework supports our industry's efforts to reduce its manufacturing emissions." Glass for Europe will be active to make sure that the Fit for 55 legislative package does trigger a virtuous decarbonisation cycle for the European flat glass industry.

"Glass for Europe will work in the coming months to make sure today's legislative package does trigger a virtuous decarbonisation cycle," concluded Glass for Europe's President, Mr Philippe Bastien.

## Review of the Emissions Trading System

The EU's Emissions Trading System (ETS) is the world biggest carbon market and covers both the power sector and manufacturing industry. Under the EU ETS, flat glass companies are required to buy carbon emissions permits for their installations. In order to further increase the price of carbon, the European Commission has proposed to lower the emission cap and increase its annual rate of reduction.

Glass for Europe believes that new proposals may need improvement to

ensure that frontrunners like the flat glass industry are not penalised and that sectors at the risk of carbon leakage are thoroughly protected.

## Residential and transport decarbonisation

This is probably going to be one of the most controversial proposal included in the Fit for 55 package. The Commission intends to create a new, separate ETS to decarbonise the residential and transport sector. In practice, fuel suppliers of domestic heating and combustion cars will have to pay a price for the carbon emissions of their products.

Glass for Europe calls on extreme vigilance with regards to the extension of the EU ETS to buildings. While it may generate funds for building renovation, citizens' buy-in for the measure should remain a pre-requisite.

## Energy efficiency in buildings

In addition to the new ETS for building, other pieces of the legislative puzzle under review are targeting the building sector, which is by far the market of reference for the flat glass products. In its proposal, the European Commission set a more ambitious energy efficiency target that could drive the energy renovation of the European building stock and demanded national governments to lead the way. Member States are in fact asked to renovate annually 3% of the floor area of all public buildings, including healthcare, education and public housing and to consider energy efficiency solutions in policy and investment decisions in energy systems and non-energy sectors (i.e. buildings).

Glass for Europe welcome the proposal to increase the energy efficiency target and to make it binding at EU level. It also supports the creation of a fund potentially available for building renovation through instruments, such as the EU Emission Trading Scheme and the New Social Climate Fund. ●



Bertrand Cazes, Secretary General of Glass for Europe.

### Further information:

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# Heye Process Control: An incomparable success story

*As it reaches over 1000 process controls delivered to customers, Heye is the leading partner for process optimisation, regulation and digitalisation of the NNPB process. According to Mr. Hans Renders, Head of Product Management at Heye International, the Heye Process Control 4.0 (HPC) was the crucial milestone to initiate Industry 4.0 within the glass industry.*

The Heye Process Control 4.0 is a closed-loop-solution for the press process of all plunger mechanisms within an IS-machine. Simultaneously, it keeps the gob weight stable. Its computer interface displays a number

of forming events on selectable charts and allows users to improve parameter setting by comparing data.

Early detection of malfunctions increases production efficiency. The integrated plunger cylinders guarantee precise and consistent parison parameters for press-blow and NNPB production.

By delivering the 1000<sup>th</sup> HPC, Heye comprehensively demonstrated that it has recognised and fulfilled the approach required by the market for stable and sustainable process data management in the past decades. The Heye Process Control is the essential closed-loop-system for every glass manufacturer in order to

meet the high quality requirements of NNPB production.

Changes in customers' process requirements have driven Heye International engineers to modify the Heye Process Control (HPC) from solely a plunger sensor to a holistic solution. The data acquisition from different sensors and the regulation of process parameters are now realised in the Heye ProcessMaster in which the Heye Process Control becomes a subsystem.

The Heye ProcessMaster (HPM) is a modular central software solution which is used as a basis for most sensor solutions

in Hot End production. HPM makes it now possible to implement single sensors as well as complex sensor systems.

These sensors are for example:

- the Heye GobMaster for weight control of BB-process and additional information like gob-shape, temperature and dimensions
- the Heye BlankMaster, which monitors different mould part temperatures and gob loading at the blank side
- stand-alone gob temperature sensor

All collected sensor and machine data can be used inside the production process to regulate process parameters like gob weight, press duration or mould part temperatures.

All collected process data is stored in the HPM for seven days.

The collected data can also be extracted via Heye SmartLink to be used by a third-party Manufacturing Execution System (MES) to get a long-term history of all relevant machine and process data. This helps to generate a better understanding of the process and the machine behaviour and consequently to implement optimisations on process and machine.

In addition to all these hardware optimisations, Heye is always in contact with its customers to set up user interfaces for a friendlier and more intuitive operation. Hence, the HPM gets a reworked user interface on each operating system update to let the operator feel more comfortable and familiar when handling the system.



Fig. 1: Heye ProcessMaster: Overview of available functions (depending on the package)

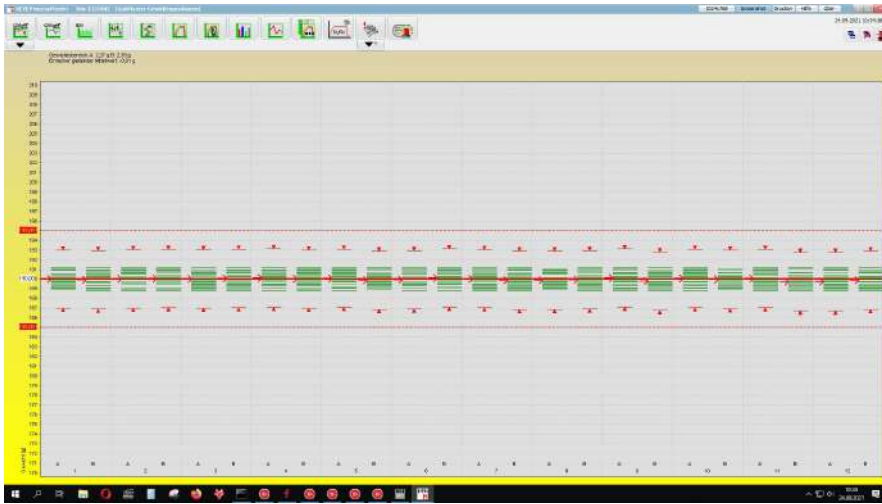


Fig. 2: GobMaster weight positions: Screen displays value per cavity – same terms and visualisation in all systems (set points and erratic values)

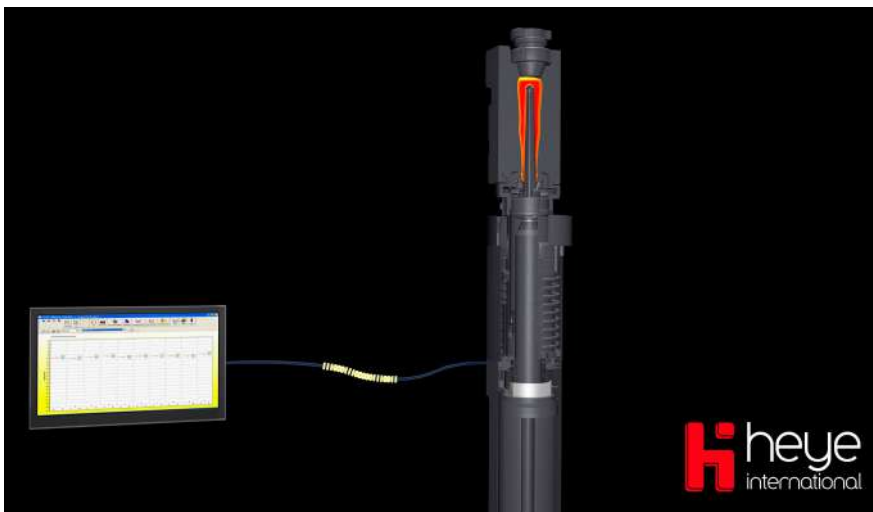


Fig. 3: Data transfer

**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.

**ABOUT THE AUTHOR**

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# A practical approach to establish a bronze colour glass composition

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## INTRODUCTION

It is well known fact that selenium in the metallic form imparts a pink colour in soda lime Glass. Several Flat Glass manufacturers have melted the glass successfully. But everybody has reported the problem with fleeting nature of selenium. To produce a consistent commercial bronze colour is a very difficult job. It necessitates a careful control of melting process, flame condition, rate of glass pull etc. otherwise it requires the alteration of selenium amount in batch depending on the colour intensity in the actual glass produced. Although the particular Bronze colour has become a commercial success but every manufacturer treats its technology as a most secret one. The object of undertaking these experiments was to establish a suitable bronze colour glass composition and also to study how the fleeting nature of selenium can be suitably controlled by establishing a suitable Redox equilibrium.

## THEORETICAL

It has been earlier established that Se in the metallic form imparts pink colour, in the selenite form it is colourless and in the polyselenides form it is Amber like iron polysulphides' in C-S Amber Glass. So if Se can be retained in Glass in Se form between the two extremes polyselenides and selenite, then true Pink colour can be achieved and so it appears that a true neutral atmosphere is required in the tank furnace which is not at all possible. Apart from this Flame and

higher temperature in the furnace plays a certain reducing role and a common refining agent  $\text{Na}_2\text{SO}_4$  in flat glass batch is itself an oxidising agent to selenium. At higher temperature Se volatilises also. So taking these facts into consideration approach has been made to evolve a suitable refining agent and to establish a near Red-Ox equilibrium so that the Batch can be melted in the normal tank furnace and a steady Bronze colour can be maintained through out the run without much disturbing the Se proportion in the Batch.

## EXPERIMENTAL

Several Batches have been melted each weighing about 1200 in Sillimanite pots in an oil fired experimental Furnace. Batches were charged at 1200°C. The temperature was raised upto 1400°C in 90 minutes and maintained for 2 hours 30 minutes. The temperature was then reduced to 1240°C and glass kept at this temperature to release the gas bubbles. Glasses then poured and casted in 10/12 mm thick slabs. Glass slabs were immediately put in the Laboratory Muffle Furnace holding temperature about 650°C, the muffle door was sealed with clay and the furnace was switched off to cool down to 80/100°C. The glass slabs were grinded and polished for visual colour examinations of these glasses numbering G-42, G-49 and G-51 were tested for Light Transmission in the visible range (350-750 nm) and compared the curves with a Foreign made Bronze glass.

## DISCUSSION

In all 14 glasses have been melted under similar furnace condition, numbering G-28, G-29, G-37, G-39, G-40, G-41, G-42, G-43, G-45, G-47, G-49, G-51, G-53 and G-54. The raw materials composition of these glasses have been tabulated in Table 1 and their oxide constituents,  $\text{Fe}^2/\text{Fe}^3$  ratio and visual colour have been tabulated in Table 2.

The glass No. G-28 was melted with 0.060% Se, 0.015% NiO, 0.0025% CoO, and 0.12%  $\text{Fe}_2\text{O}_3$ , refining agent used was Blast Furnace Slag-20 gm. The colour of the glass turned Dark Amber.  $\text{Fe}^2/\text{Fe}^3$  ratio by analysis was 1.88. So it shows that B.F. Slag has acted as a strong reducing agent which has probably converted Se to alkali polyselenides.

In glass No. G-29, Se concentration keeping same, NiO/CoO omitted,  $\text{Fe}_2\text{O}_3$  reduced to 0.069%, glass was melted with conventional  $\text{Na}_2\text{SO}_4$ /Carbon refining agent and 0.025%  $\text{As}_2\text{O}_3$  was incorporated to act as Red-Ox buffer. The colour of the glass turned very light straw colour within a pinkish hue. Probably in this case the Selenium has been oxidized to selenite by the action of  $\text{Na}_2\text{SO}_4$  and  $\text{As}_2\text{O}_3$ .

In G-37 Glass, again slag was introduced in combination with 0.045%  $\text{As}_2\text{O}_3$ , the colour of the glass was Amberish but lighter than G-28.  $\text{Fe}^2/\text{Fe}^3$  ratio was also reduced to 1.36, so  $\text{As}_2\text{O}_3$  has destroyed some polyselenide colour by its mild oxidising action.

In G-39, Se - 0.040%, CoO - 0.001%, and As<sub>2</sub>O<sub>3</sub> increased to 0.10%, Slag reduced, and 22 gm. NaNO<sub>3</sub> incorporated to make batch more oxidising to destroy the Amber colour. The visual colour was Pinkish yellow, Fe<sup>2</sup>/Fe<sup>3</sup> ratio reduced to 0.077 only.

In G-40, Se - 0.020%, CoO - 0.0018%, NiO - 0.015% and the quantity of slag, As<sub>2</sub>O<sub>3</sub> and NaNO<sub>3</sub> kept same as G-39. The colour was as G-39 but lighter. This may be due to

the lesser amount of Se.

In G-41, As<sub>2</sub>O<sub>3</sub> and NaNO<sub>3</sub> were reduced considerably, other things keeping the same as G-40. The colour of the glass was again turned little yellowish and Fe<sup>2</sup>/Fe<sup>3</sup> ratio increased.

In G-42, Se further reduced to 0.012% but CoO increased to 0.0024%, NaNO<sub>3</sub> and As<sub>2</sub>O<sub>3</sub> were also increased. The colour of the glass turned dark Pinkish with a little yellowish hue and Fe<sup>2</sup>/Fe<sup>3</sup> was 0.52.

In this case the residual yellowish

tint has probably been masked with increased cobalt.

In glasses G-43, G-45, G-47 and G-49 Se further reduced, CoO increased, % of NiO altered in minor amount, Slag and As<sub>2</sub>O<sub>3</sub> concentration maintained the same, amount of NaNO<sub>3</sub> also was almost same. The visual colour of these glasses were almost of Bronze colour with varying intensity between pinkish to greyish, Fe<sup>2</sup>/Fe<sup>3</sup> ratio pattern was also nearer to each other. The Light transmission

**Table 1**

**Bronze Glass Oxide Composition**

Glass No.	SiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	Fe <sub>2</sub> O <sub>3</sub>	CaO	MgO	K <sub>2</sub> O	Na <sub>2</sub> O	NiO	CoO	Se	As <sub>2</sub> O <sub>3</sub>	BF Slag	Sulphate/C	NaNO <sub>3</sub>	As <sub>2</sub> O <sub>3</sub>	Total Fe <sub>2</sub> O <sub>3</sub>	FeO	Fe <sup>2</sup> /Fe <sup>3</sup>	Visual colour
G-28	72.14	1.45	0.12	7.86	3.63	1.72	12.93	0.015	0.0025	0.060	X	20	X	X	X	0.155	0.092	1.880	Dark amber
G-29	72.16	1.32	0.069	7.93	3.46	1.91	12.88	X	X	0.060	0.025	X	12.2	8	0.25	X	X	X	Light straw pink
G-37	72.07	1.45	0.18	7.9	3.57	0.83	13.80	0.015	X	0.040	0.045	20	X	X	0.45	0.248	0.130	1.360	Amber lighter than G-28
(K <sub>2</sub> O+Na <sub>2</sub> O)																			
G-39	72.25	1.34	0.18	7.84	3.57	14.67	X	0.001	0.040	0.10	15	X	X	22	1.00	0.2	0.013	0.077	Pinkish yellow
G-40	72.26	1.34	0.18	7.84	3.57	14.68	0.015	0.0018	0.020	0.10	15	X	X	22	1.00	X	X	X	Pinkish yellow lighter than G-39
G-41	72.26	1.34	0.18	7.84	3.57	14.66	0.015	0.0018	0.020	0.07	15	X	X	20	1.0	0.233	0.073	0.250	Little yellowish than G-40
G-42	72.26	1.34	0.18	7.84	3.58	14.66	0.015	0.0024	0.012	0.10	15	X	X	20	1.0	0.233	0.073	0.520	Dark pinkish with a little yellowish hue
G-43	72.24	1.34	0.2	7.84	3.58	14.65	0.02	0.005	0.010	0.10	15	X	X	20	1.00	0.248	0.050	0.280	Bronze colour greyish
G-45	72.29	1.34	0.15	7.84	3.57	14.65	0.012	0.006	0.0075	0.10	15	X	X	15	1.00	0.196	0.046	0.350	Bronze light pinkish
G-47	72.19	1.49	0.15	7.83	3.57	14.63	0.008	0.005	0.0075	0.10	15	X	X	15	1.00	X	X	X	Bronze light bluish pink
G-49	72.34	1.34	0.15	7.83	3.57	14.63	0.012	0.005	0.0076	0.10	15	X	X	15	1.00	0.178	0.045	0.380	Nearer to sample glass but litter darker
G-51	72.29	1.41	0.15	7.83	3.58	14.64	0.01	0.0039	0.009	0.075	12	X	X	20	0.74	0.17	0.039		Same as G-49 but a little lighter than G-49
G-53	72.05	1.47	0.18	7.81	3.56	14.61	0.0079	0.0038	0.013	0.066	15	7/0.3	X	15	0.65	0.2	0.033	0.220	Bronze colour but very light
G-54	7.02	1.54	0.17	7.81	3.57	14.60	0.008	0.0034	0.013	0.071	18	7/0.3	X	9	0.7	0.192	0.028	0.190	Same as G-53

**Table 2**

**Bronze Glass Batch Composition**

Glass No.	Silica Sand	Felspar	Slag	Dolomite	Lime stone	Soda Ash	Potash	Sodium Sulphate	Carbon	NaNO <sub>3</sub>	As <sub>2</sub> O <sub>3</sub>	Rouge	NiO*	Cobalte Oxide	Selenium
G-28	720	X	20	162	32	220	25	X	X	X	X	0.48	0.21	0.25	0.6
G-29	720	20	X	162	46	211	25	12	X	X	0.25	X	X	X	0.6
G-37	720	X	20	162	32	235	10	X	X	X	0.45	1.12	0.21	X	0.4
G-39	720	X	15	162	33.5	235	X	X	X	22	1	1.12	X	0.01	0.4
G-40	720	X	15	162	33.5	236	X	X	X	20	1	1.12	0.21	0.018	0.196
G-41	720	X	15	162	33.5	241.5	X	X	X	11	0.75	1.12	0.21	0.018	0.196
G-42	720	X	15	160.5	33.5	236	X	X	X	20	1	1.12	0.21	0.025	0.118
G-43	720	X	15	160.5	33.5	236	X	X	X	20	1	1.3	0.28	0.05	0.098
G-45	720	X	15	160.5	33.5	239	X	X	X	15	1	0.8	0.17	0.06	0.074
G-47	723.5	X	15	160.5	33.5	239	X	X	X	15	1	0.8	0.11	0.05	0.069
G-49	723	X	15	160.5	33.5	239	X	X	X	15	1	0.8	0.168	0.045	0.075
G-51	722	X	12	160.5	39	235	X	X	X	20	0.74	0.8	0.365**	0.04	0.089
G-53	723	X	15	160.5	37.5	234	X	7	0.3	15	0.65	1.12	0.29**	0.038	0.128
G-54	723	X	18	160.5	35.5	238	X	7	0.3	9	0.7	1	0.30**	0.35	0.125

\*NiO-70%  
\*\*NiSO<sub>4</sub>.7H<sub>2</sub>O

curve of the Glass No. G-49 follows the pattern of the Foreign Bronze glass but the overall transmission is lesser. Visually the colour of this appears to be darker also.

In glass G-51 to make the glass lighter in colour and more pinkish, CoO reduced, Se increased, slag reduced. The visual colour was mostly the same as Foreign Glass though the overall transmission is still lesser than foreign glass.

Glasses G-53 and G-54,  $\text{Na}_2\text{SO}_4/\text{C}$  along with varying amount of Slag were melted but in these glasses pinkish colour intensity considerably reduced and the glasses shifted to greyish colour, probably due to loss of Se form and the colour of NiO and CoO predominates.

## CONCLUSION

1. So to get a consistent good Bronze colour the composition of the Glass No. G-51 is the most suitable one.
2. To get a consistent Bronze colour the Red- Ox equilibrium is to be maintained throughout the run by altering if necessary the amount of B.F. Slag and  $\text{As}_2\text{O}_3$ .
3. B.F. Slag is a must for this glass as it retains the Se in the stable polyselenide form in the early stage of melting and in the later stage it is oxidised to Se form by the oxidizing action of  $\text{As}_2\text{O}_3$  and  $\text{NaNO}_3$ ,  $\text{As}_2\text{O}_3$  also acts as Red-Ox buffer, B.F. Slag also helps in the melting which is an established fact also.  $\text{NaNO}_3$  and  $\text{As}_2\text{O}_3$  in combination also acts as a refining agent. So considering the benefits of B.F. Slag,  $\text{NaNO}_3$  and  $\text{As}_2\text{O}_3$ , the conventional  $\text{Na}_2\text{SO}_4/\text{Carbon}$  refining agent can be eliminated from the Bronze colour glass composition.

**Table 1**

### Batch Composition (kg)

	G-51	G-51(A)
Silica Sand	0.722	377.00
B.F. Slag	12.0	12.00
Dolomite	160.5	84.5
Limestone	39.0	16.00
Soda Ash	235.0	117.5
$\text{NaNO}_3$	20.0	20.0
Rouge	0.80	0.78
CoO	0.04	0.041
$\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$	0.365	0.375
Selenium Metal Powder	0.089	0.092
$\text{As}_2\text{O}_3$	0.74	0.75
Cullet-Clear/Flint	Nil	0.500
Total	1190.535	1129.38
GLASS YIELD	980.447	1016.164

**Table 2**

### Oxide composition (%)

	G-51	G-51(A)
$\text{SiO}_2$	72.29	72.17
$\text{Al}_2\text{O}_3$	1.41	1.42
$\text{Fe}_2\text{O}_3$	0.15	0.15
$\text{MnO}_2$	0.004	0.0039
CaO	7.83	7.45
MgO	3.58	3.92
Alkalies	14.64	14.48
CoO	0.0039	0.0039
NiO	0.010	0.010
Se	0.0090	0.0090
$\text{As}_2\text{O}_3$	0.075	0.074

### MIXING OF COLOR ANTS -COLORANTS USED

Se (Selenium Metal Powder)  
 $\text{Fe}_2\text{O}_3$  (Synthetic Iron Oxide)  
 CoO (Cobalt oxide)  
 $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$  (Nickel Sulphate)  
 $\text{As}_2\text{O}_3$  (Arsenic Trioxide)

All the above colorants and Arsenic Trioxide are used in very small amounts in the Batch, it is preferred to use a premixed diluted coloured mix to the main raw materials Batch during mixing. Se Powder,  $\text{Fe}_2\text{O}_3$ , Cobalt oxide and Arsenic Trioxide proportionately added to about 500 kg., weighed Silica Sand and  $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$  dissolved in water should be added to the coloured mix and mixed in a Batch mixer. The coloured mix of 500 kg, is to be stored in a wooden box covered with a polythene sheet

to protect from the possible moisture loss. In each main Raw material Batch, the required amount of color mix to give the actual colour concentration in Batch is to be added during mixing.

G-51(A) The glass composition of G-51(A) is basically the same that of established Bronze colour of G-51. The experimental melt was undertaken to see the effect of white cullet addition to the original G-51 Batch, colorants were proportionately compensated for the white cullet. Amount of slag,  $\text{NaNO}_3$  and  $\text{As}_2\text{O}_3$  was kept according to the weight of Se in original G-51 Batch.

Batch Weight : 627(excluding Rouge, CoO,  $\text{NiSO}_4 \cdot 7\text{H}_2\text{O}$ , Se and  $\text{As}_2\text{O}_3$ )

$627 \times 0.8 = 501.6 + 500$  (Clear /Flint Cullet)=1001.6 kg Glass weight ■

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# Prolific multi-tasker engaged in major projects

Indian furnace contractor Furnotherm has successfully undertaken the challenge of accomplishing several running projects, amidst the second wave of Covid-19, writes Jogendra Singh.

On 15 March 2021 Frigoglass in Nigeria started the expansion project of its 180tpd container glass furnace to make it a 300tpd Furnace, designed by HORN Glass, Germany. The job involved 645 tonnes steel erection and 3,000 tonnes refractories erection. In addition to that, Furnotherm had executed complete utility piping, total furnace cooling air ducts and nozzles, secondary air ducts and also the installation of the complete electrical and instrumentation job. Initially it was decided to execute this project in 120 days. Furnotherm made it possible to accomplish this project in a record time of 79 days (glass to glass). The first glass came out of Frigoglass' IS machine on 1 June 2021.

## Flat glass factory

Furnotherm has also taken the prestigious project of constructing the first float glass plant at Uzbekistan, the green field project of Zarafshon Oyna LLC, designed and supplied by HORN, Germany. The job involves the total steel erection and the furnace refractories and tin bath. More than 80% of the jobs have been completed and the project will be completed soon.

## Projects in India

Furnotherm teams are currently engaged in two major projects in India. The company has been



Furnotherm prides itself on quality workmanship.

contracted for PGP Glass's 250tpd container glass furnace greenfield project in Jambusar, Gujarat, India. The job involves the fabrication and erection of the complete batch house structure and raw materials silos along with the installation of all batch house equipment. Furnotherm is also responsible for the fabrication and erection of furnace steels and the erection of the furnace refractory, along with the installation of all the furnace equipment. The job entails 430 tonnes of steel and 3,500 tonnes of refractories. Furnotherm will supervise heat-up and expansion control. It will also fabricate and erect the cooling ducts and nozzles of the furnace and erect the secondary air ducts.

The second greenfield project is building a 180tpd container glass furnace for Sunrise Glass in Surat, Gujarat. Furnotherm will fabricate and erect furnace steels and erect the refractory for the furnace, plus install all furnace equipment. It will also fabricate and erect the cooling ducts and nozzles of the furnace.

Furnotherm has also taken on the task of rebuilding the 500tpd container glass plant of AGI Glaspac at Hyderabad. The job involves dismantling and reinstalling 4,100 tonnes of refractories.

Furnotherm is successfully managing all of these projects simultaneously in different parts of the world with its most competent teams of efficient manpower. The company is confident that it can undertake any major glass furnace construction project at any time. ●

### About the author:

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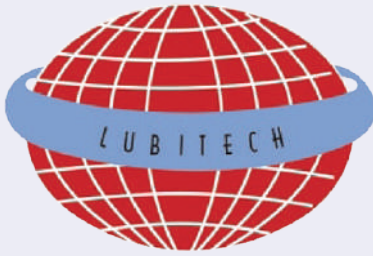
Furnotherm specialises in the construction of various types of glass melting furnaces.



The competent Furnotherm team are well equipped to undertake major glass furnace projects in different parts of the world.

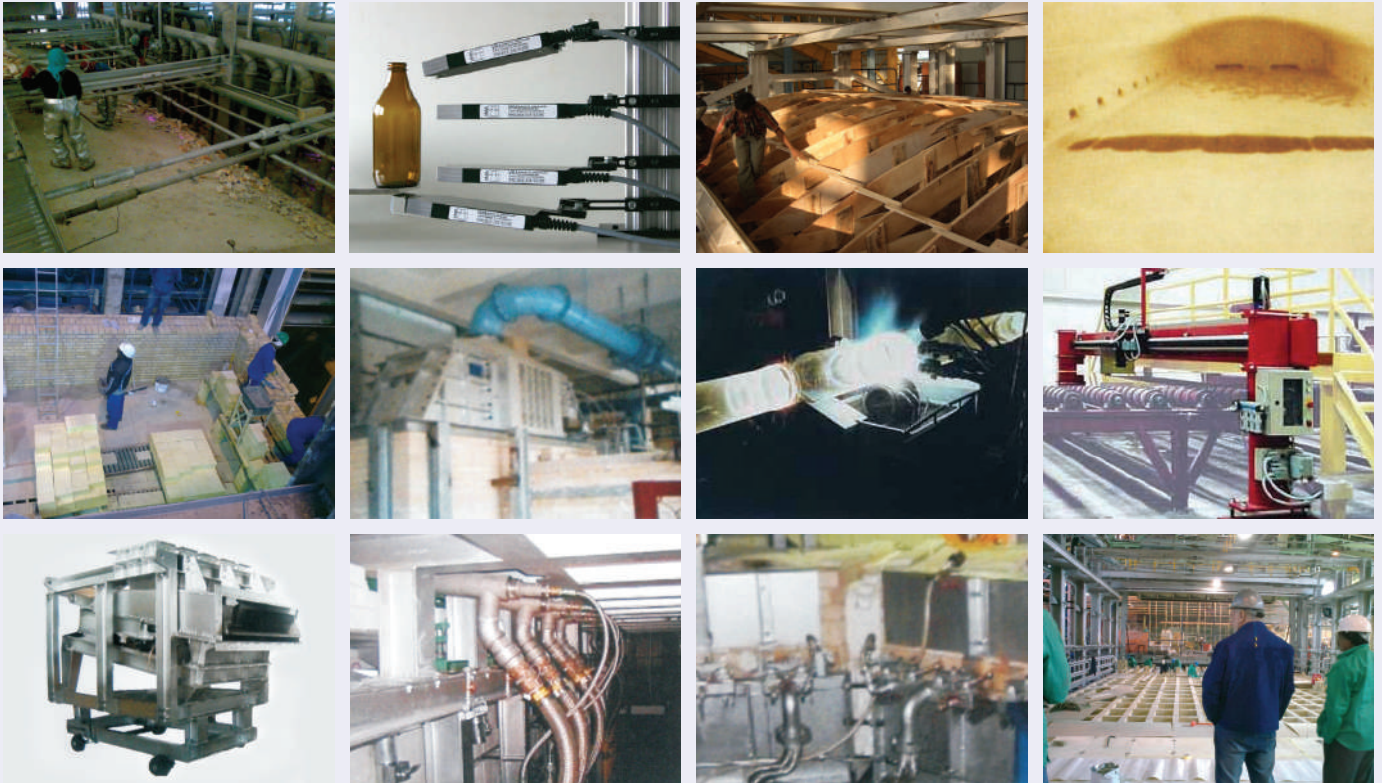


Several projects were successfully completed during the second wave of Covid-19.



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# Further Exploration of some Special Glasses

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## Abstract

It is very well known that by mixing various ingredients with silica sand as the main component that works as the network former and a range of other components, oxide glasses are mainly produced for a variety of applications as container glasses of a variety of shapes and sizes. Another set of applications are sheet glass in various forms as a very useful building material. There is no denying the fact that glass engineers as well as architects have more or less equal contribution in this field of construction activity for both domestic and commercial buildings. In this context, some special glasses such as laminated glass, wired glass, toughened glass etc. need a proper mention. The latter also has applications in the field of automotive industry as safety glasses. Most of these issues have been discussed in several articles in Kanch in the past [1-3]. Some of these glasses with either thermal treatment or in sandwich form through special organic compounds are briefly discussed here. Later, some of these issues will be discussed in more detail in future articles of Kanch.

## INTRODUCTION

Sheet or plate glasses that are used casually for building construction are no longer possible. In the old days, the 'architect' would design tall buildings that are mainly rectangular or square, whereas the present designs consist of various shapes and sizes. Certain parts of the concerned building need high mechanical strength requiring the use of safety glass like 'toughened glass' made with suitable heat treatment of 'float glass' sheets. Although the glass technologists have a great role to make such float glasses with suitable control of various parameters, apart from windows, the architects have a very tough time in doing necessary calculations to make a decision on the application in the right place, e.g. on the side track of the staircase, the partition of larger rooms into two pieces ensuring that

the light is equally spread across the rooms. There are many more considerations.

In malls, shopping complexes, large glass-panelled showrooms, etc. with complicated design and required facilities or public utility, the layout is more complex. The architects also have to think about the cost factor and hence would prefer to resort to the lesser use of such expensive glasses. Here, of course, matured and well-trained marketing people could push for the use of more such glasses. Now, it is better to write briefly about the safety glasses.

## SAFETY GLASS

There is a distinction between container glass that is tailor-made and float glass [1-3], wherein there are techniques to manufacture various types of special glasses,

such as sandwiched laminated glass, thermally treated toughened glass, wired glass, chemical-resistant glass, E-glass for saving energy, etc. This type of glasses have high mechanical intensity and good impact resistance. When smashed, the broken pieces will not splash or injure people and they are also fireproof. The host of such advantages make them a very attractive proposition to many architects, even though they bother about environmental considerations.

## A) Laminated Glass:

Laminated glass is made by inserting plastic plates into two or more pieces of glass which are heated, pressed and bound together to form a flat or curved product of glass-plastic composite.

It has been stated earlier that glass can be given different properties by



being combined with other materials [1-3]. For example, laminated glass is a glass-plastic film (polyvinyl butyral (PVB) or ethylene vinyl acetate (EVA))-glass sandwich. Some special glasses such as laminated and toughened glass cannot be recycled. Low-e glass has a molecular layer of metal on the inside surface of the double (or triple) glazing unit, which accounts for its insulating properties. This can be recycled but like the majority of glass not as window glass but as glass fiber insulation or powdered for use as filler in paints as made by Ecospecifier Pty Ltd. Glass can be recycled though currently most end of building life glass finishes up in landfill [4]. But, security is of main concern. Here is a picture showing a tall building could be secured.



Fig. 1: Meeting building codes and providing strength, sound damping, solar control, visual beauty, and impact resistance for safety, security, storm protection, and post-breakage performance are all attainable with laminated glass when using proper design.

#### Lifetime Expectations:

In a laminated glass unit, a ten-year warranty is the required minimum for the seal in a sealed glass unit and no delamination. Generally “industry lifetime” standard warranties are in the range of 10 to 25 years, and some offer lifetime warranties for glazing units.

The permeability of both foil and butyl sealant is very low and leads to a theoretical lifetime of the glazing of more than 100 years for a completely perfect rim seal. However, large temperature differences across the glazing and temperature fluctuations lead to thermal stresses. This occurs particularly in the butyl sealant, which combined with aging will become the real parameters with respect to the glazing lifetime. Based on experiences from sealed glazing units, the typical lifetime of glazing is 20–25 years [5].

#### B) Toughened Glass:

Generally speaking, the native identity of glass has been one of being fragile

and delicate, and even over decades of technological advancements, the misconceptions still prevail. People continue to remain misinformed and ignorant of the fact that modern-day glass is anything but fragile. Despite retaining the delicacy of regular glass in looks, the character of modern-day glass is that of strength and extreme durability capable of withstanding heavy external impacts. That brings us to the world of special glasses, and in this case a Toughened Glass or Tempered Glass or Safety Glass is one such member of the glass family that is known to be robust and sturdy.

When common flat glass is heated to the temperature near heat distortion point (around 650 °C), the change of shape will eliminate inside stress and then move the glass out of heating furnace and cool it fast and uniformly by blowing its two sides with cold wind from multiple jet nozzles. When room temperature is reached, the process of making toughened glass is finished. The time of thermal treatment is an important parameter, and it is almost proportional to the thickness of float glass sheet -- as the thickness is larger, the time to remove

the internal stresses is longer.

#### PROPERTIES OF TOUGHENED GLASS

The following are the characteristics of toughened glass:

##### 1. Resistance to Thermal Breakage

The heat from sunlight can make glass expand and contract at inconsistent rates. This creates stress in the glass and can lead to breakage. But the risk of thermal damage can be prevented by using toughened glass with an excellent thermal-withstanding capability.

##### 2. Mechanical Strength

Toughened Glass is physically as well as thermally solid, and research shows that it can withstand surface compression of at least 10,000 psi making it to be considered as safety glass. It is also known to be 4 to 5 times stronger than as-annealed glass, and 3 times stronger than heat-strengthened glass. As these glasses are robust, they reduce the risk of damage if they come in contact with a calamity or disaster.

### 3. Resilience

Toughened glass is used when regular glass is exposed to extreme heat and then cooled rapidly. Due to this excessive heating and cooling process, the chemical composition of the glass goes through an alteration making it more resilient.

### 4. Enhanced Safety

If toughened glass comes in contact with some harsh impact, instead of breaking into sharp, jagged shards, it breaks into harmless circular chunks. Thus, these glasses reduce the risk of injury. If toughened glass breaks, it is also easier to clean them than the jagged shards of glass.

### 5. Versatility

Toughened glass is a material that is extremely flexible and versatile, which means that it can be used as per the requirement. It is now available in the market in various types of styles that makes it the ideal choice for various modern interior settings.

## APPLICATIONS OF TOUGHENED GLASS

As a versatile material, toughened glass becomes the ideal option if one is looking for a material that can give strength, provide thermal-resistance along with enhanced safety. It is explicitly designed to be of use in places that are prone to impact and breakage.

Toughened glass is often used in buildings and houses as doorways, stairways, sliding doors, standard windows as well as floor-level windows. It is used because they won't be a cause of worry in a situation of accidental impact.

Toughened glass is an excellent material used in residential homes. It can be used for shower doors, glass cabinets, glass table-tops, dividers, glass shelves, and also glass for a fireplace. There is no worry about the

children being injured, as it is known for strength and safety. Moreover, it makes the homes lighter and much more spacious while making the house or office look modern. As toughened glass is resistant to heat, it becomes the perfect and safe choice for kitchen shelves or as a kitchen backsplash.

Toughened glass can also be used as skylights or big windows or floor-length windows, as they will not only add an element of lightness to the interior decoration, but they will also become the source of natural light during daytime.

Toughened glass finds an entry into homes for wardrobes. These wardrobes add a high-end modern look because of the toughened glass sections in the wardrobe panels. All these wardrobes are easy to install and maintain. They are also highly durable and are incredibly resistant to any moisture or scratch.

If one looks for installing toughened glass wardrobes or planning to upgrade the present one, one should contact Asahi India Glass Ltd. Asahi Glass is India's leading integrated glass solutions company. They are a leading player both in the automotive as well as the architectural glass segments. During the last ten years, I have been writing in Kanch about a strategy to offer a package of services with products to make end-to-end solutions that is now done by AIG. From a "marketing person", we need to transform the system by calling them "Customer Engineer" that would always make a better importance in the minds of customers.

### C) Wired Glass:

In the glass tank furnace, there is a pool of glass from which plate glass is made with two rollers in the front just before annealing furnace. A roll

of wire-mesh is hung from the top that goes inside the plate glass drawn almost in the middle. Thus, the Wired glass is made by pressing "wire mesh" into the molten glass (semi-viscous), it works here as reinforcement.

Wired glass sometimes referred to as Georgian Wired Glass (GW Glass) was patented by Frank Shuman in 1892 [6]. During the manufacturing process of plate glass, the wire mesh is embedded within the melt and the glass is generally obscured. It has a visually distorting rolled surface pattern. The wire mesh does not improve its impact resistance, but it ensures that if the glass breaks, the broken pieces are retained by the wire mesh and do not fall out, which could create a hazard. It can also ensure glazing retains its overall shape, continuing to form a barrier even though it has broken.

Wired glass typically has a grid size of around 12.5mm and is used as a low-cost fire-resistant glass in which the wire holds the glass in place, if broken. It can also be used for security reasons, or in areas where impact is likely, and it is commonly used in the skylight window of a workshop or factory, lighting roof and fire-proof door and windows.

Wired glass is less visually attractive and not as strong as laminated glass or toughened glass. There have also been safety concerns in relation to wired glass, as the shards of glass remain in place after breakage, which can cause injury to people. Alternatives include glass reinforced by a polycarbonate mesh which is lighter, easier to cut and more difficult to break.

## CONCLUSIONS

In the past, in many issues of Kanch,

there have been articles on toughened glass, wired glass, laminated glass, etc., but still there are some relevant points that need to be explored or explained that is what has been attempted briefly in this article [7,8].

A lot of new aspects on laminated glass have been mentioned, and more will be done in the future in Kanch. The same is true for other special glasses with a variety of usage. Application has always been considered important for such glasses, and hence some have been discussed with the mention of services offered by Asahi Glass Ltd. that is in line with our concepts expressed many times

in Kanch by the present author due to his experience on the subject.

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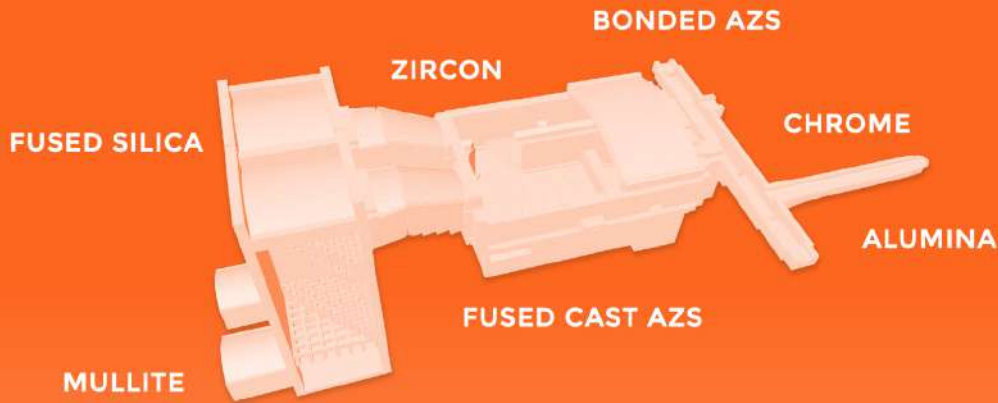
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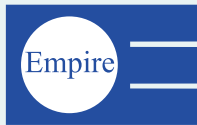


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