Vol. 5 | No. 2 | July - September 2017

Kañch

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

Bi-lingual

Inside

Interview

Gopal Ganatra
Executive Director, Asahi India Glass

Talks about Role of Asahi India Glass in Automotive and Architectural Glass

Upcoming Events

- *CII's Indian Green Building Congress 2017*
  (Oct 4 – 7, 2017: Hotel Clarks Amer, Jaipur)
- *Indiapack Pacprocess 2017*
  (Oct 26-27, 2017: Pragati Maidan, New Delhi)
- *USGBC's Greenbuild India*
  (Nov 2 – 5, 2017: Bombay Exhibition Centre, Mumbai)
- *AIGMF Executive Committee Meeting / Special Session with USGBC*
  (Nov 4, 2017: Bombay Exhibition Centre, Mumbai)
- *World of Fenestration 2017*
  (Dec 14-17, 2017: Pragati Maidan, New Delhi)

Special Feature

- *Announcement of C K Somany Glass Award*
- *India Imposes Anti-Dumping Duty on Tempered Glass from China*
- *Two-Days Training Programme on "NBC 2016 and Glass & Glazing System in Buildings"*
- *Characterisation of Emissions and Energy Balances in Furnaces*
- *Glassy Ceramic Glazes for the Glass Industry – Part I*
- *The Benefits of Two-Leg versus Three-Leg Power Control*
- *Simple Way of Understanding GST*
- *Electrode Holder Innovation*
- *Role of Glass Packaging in Promoting Safety & Security for Consumers*
- *Lithium in Glass Melting and Forming Process*
- *Glassy Ceramic Glazes by Composition Engineering – Part II*

(Page # 19)

Main Story

Solar Rooftop with Special Focus on BOO/BOOT Model & Industrial Gas for Glass Manufacturers

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AIGMF will participate as one of the Supporting Associations

Confederation of Indian Industry

IGBC
Indian green building council

15th Edition

Green Building Congress 2017

4 - 7 October 2017, Jaipur, Rajasthan, India
Hotel Clarks Amer

Theme: 'Sustainable Built Environment for All'

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Objectives

- Facilitate enhancing Green Building footprint in India
- Enable greening of all forms of built environment
- Showcase leadership initiatives
- Create a conducive atmosphere for market transformation
- Showcase innovative and futuristic green building technologies
- Provide a platform for networking

Highlights

- Exclusive sessions on healthcare, schools, homes, affordable housing and data centers
- Panel discussion with key industry leaders and financial institutions
- WorldGBC special session
- Exhibition on green building products, material and technologies
- The Emerson Cup 2017 award night
- Awards for IGBC certified projects
- Green your school contest
- Design contest for architectural students

Event Schedule: Green Building Congress 2017

	Event	4 Oct	5 Oct	6 Oct	7 Oct
1.	Curtain Raiser - cum - Inaugural	←			
2.	International Conference		←	→	
3.	Exhibition on Green Building Products & Technologies		←	→	
4.	Advanced Training Programme on Green Buildings			←	→
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4 - 7 October 2017, Hotel Clarks Amer
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c/o Pragati Glass Works (P) Ltd.
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Kurla (W), Mumbai - 400 070
President - H R Bhandari
Honorary Secretary - G K Sarda

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Contents

From President's Desk	5
Glass News	7
About The AIGMF	15
समाचार	16
New Members	17
Membership of The AIGMF	17
Solar Rooftop with Special Focus on BOO/BOOT Model and Industrial Gas for Glass Manufacturers	19
Government of India, Ministry of Finance (Department of Revenue) Notification No. 38/2017-Customs (ADD)	21
Two-Days Training Programme on "NBC 2016 and Glass & Glazing System in Buildings"	25
Characterisation of Emissions and Energy Balances in Furnaces	28
Glassy Ceramic Glazes for the Glass Industry – Part I	32
Gopal Ganatra talks about Role of Asahi India Glass in Automotive and Architectural Glass	37
Advertise on AIGMF Website	38
The Benefits of Two-Leg versus Three-Leg Power Control	41
Simple Way of Understanding GST	43
Electrode Holder Innovation	48
Advertise in Kanch	49
Role of Glass Packaging in Promoting Safety & Security for Consumers	51
Lithium in Glass Melting and Forming Process	55
Glassy Ceramic Glazes by Composition Engineering – Part II	57
List of Advertisers	59

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INDIAN GLASS DIRECTORY 2017

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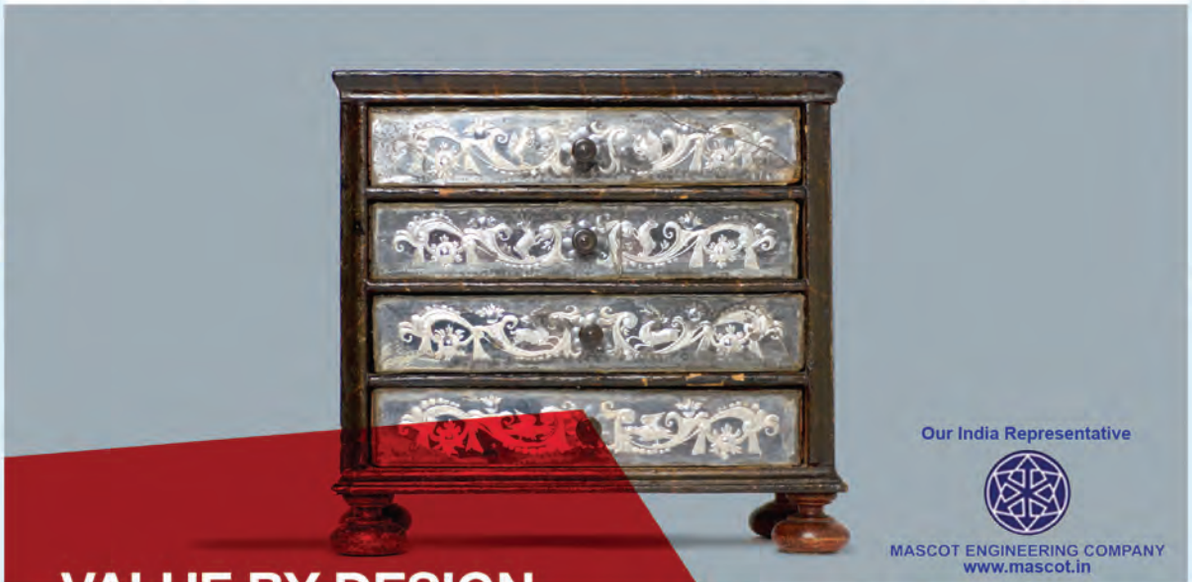

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From President's Desk

The Annual General and Executive Committee Meetings of the AIGMF were held on August 18, 2017 at New Delhi wherein Executive Committee Members for the Year 2017-18 were announced. In addition, presentations on Solar Rooftop with Special Focus on BOO/BOOT Model and Industrial Gas for Glass Manufacturers were kept for the benefit of members.

Mr. Akshai Raja of CleanMax Solar gave an overview and its successful installation of more than 200 projects including Karnataka's first open access solar farm, of 30MW capacity in Tumkur district. It was told that the company develops projects on a turnkey basis, providing power on a per-kWh basis, under long-term Power Purchase Agreements, at rates cheaper than grid tariffs.

Mrs. Lavina Gadodia of Shanghai Chinllenge Gases Co., Ltd. told that SCGC is a professional gas company mainly engaged in on-site gas production and provides total solutions for gas plants. It was informed that SCGC has successfully raised the efficiency of the gas plants and lowered running costs for its customers.

Select photos and presentations can be downloaded from http://www.aigmf.com/past-events.php. As part of its ongoing commitment for *Swachh Bharat Abhiyaan* (Clean India Campaign), AIGMF gifted 100 water glass bottles to Hotel Pride Plaza.

In recognition of tremendous contribution to Indian Glass Industry, AIGMF announced CK Somany Glass Award. This annual award will be given to one recipient (individual) for valuable contribution in the field of technology / manufacturing / innovation / services / education etc. at AGM or during AIGMF's high profile events i.e. Glasspex / Glasspro exhibitions, etc., for which dates will be announced in advance.

To promote flat, solar and container glass, AIGMF would be participating in following events as a Supporting Association:

- CII's Indian Green Building Congress 2017 (Oct 4 – 7, 2017: Hotel Clarks Amer, Jaipur)
- Indiapack Pacprocess 2017 (Oct 26-27, 2017: Pragati Maidan, New Delhi)
- USGBC's Greenbuild India: (Nov 2 – 5, 2017: Bombay Exhibition Centre, Mumbai)
- World of Fenestration 2017 (Dec 14-17, 2017: Pragati Maidan, New Delhi)

The next Executive Committee of the AIGMF has been kept parallel to U.S. Green Building Council's Greenbuild India 2017 at Bombay Exhibition Centre, Mumbai on November 4, 2017.

USGBC's Greenbuild India is likely to bring together Indian and global industry leaders, experts and frontline professionals dedicated to sustainable building, making Greenbuild India the ideal space to learn about ground-breaking green building products, services and technologies in the region.

In addition to interactive session with USGBC team, a guided tour of the exhibition by U.S Green Building Council team has been kept exclusively for AIGMF members to debate on Use of Glass in Buildings / Smart Cities, RERA / NBC and AIGMF's role in next edition of USGBC.

I extend invitation to all members to participate in these events ■

Harsha Kadam G.
AIGMF President and CEO AGI glaspac

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GLASS News

MEETING WITH MINISTER OF COMMERCE AND INDUSTRY

Members of the AIGMF met Mr. Suresh Prabhu, Minister of Commerce and Industry on Sept 27, 2017. The Hon'ble Minister was briefed on the concerns of Industry mainly on imposition of Anti- Dumping Duty on imports of Soda Ash.

The delegation also gave a copy of Pre-Budget Memorandum for FY 2018-19 to the Hon'ble Minister seeking support of Commerce and Industry Ministry for the labour intensive Glass Industry.

The delegation also presented glass water bottle* *(specially manufactured by Hindustan National Glass and Industries Ltd.)*, which carries a logo of *Swachh Bharat Abhiyaan* (Clean India Campaign) enabling people demand responsible and safe packaging.

**Glass is 100% recyclable and can be recycled endlessly without loss of quality and quantity.*

ANNUAL GENERAL MEETING OF THE ALL INDIA GLASS MANUFACTURERS' FEDERATION

Following were elected as Office Bearers of the AIGMF for the Year 2017 – 2018 in the Annual General Body Meeting held on August 18, 2017 at New Delhi:

President

Mr. Harsha Kumar G
AGI glaspac (An SBU of HSIL Ltd), Hyderabad

Sr. Vice President

Mr. Raj Kumar Mittal
Mittal Ceramics, Firozabad

Vice President

Mr. Bharat Somany
HNG & Inds. Ltd., Bahadurgarh

Hony. General Secretary

Mr. Sanjay Agarwal
Kwality Glass Works, Firozabad

Hony. Treasurer

Mr. Kailash Chandra Jain
HNG Float Glass Ltd., Mumbai

On the recommendations of the Zonal Associations following were nominated as members of the Executive Committee for the Year 2017-18:

WESTERN INDIA GLASS MANUFACTURERS' ASSOCIATION, MUMBAI

1. Mr. GK Sarda - Empire Ind. Ltd., Vitrum Glass, Mumbai.
2. Mr. Sanjay Tiwari - Piramal Glass Ltd., Mumbai
3. Mr. Naresh Gupta - HNG & Inds. Ltd., Mumbai
4. Mr. Asit Chawla - Haldyn Glass Ltd., Mumbai

EASTERN INDIA GLASS MANUFACTURERS' ASSOCIATION, KOLKATA

1. Mr. Vinay Saran - HNG & Inds Ltd., Kolkata

U.P. GLASS MANUFACTURERS' SYNDICATE, FIROZABAD

1. Mr. Deepak Bansal - Kwality Glass Works, Firozabad
2. Mr. Sanjay Mittal - Farukhi Glass Industries, Firozabad
3. Mr. Krishan Mohan Gupta- Firozabad Glass Shell Industries, Firozabad
4. Mr. Anurag Gupta - Om Glass Works (P) Ltd., Firozabad
5. Mr. Mukesh Kumar Bansal- Sri Sitaram Glass Works, Firozabad
6. Mr. Uma Shankar Agarwal- Pooja Glass Works (P) Ltd., Firozabad

SOUTH INDIA GLASS MANUFACTURERS' ASSOCIATION, HYDERABAD

1. Mr. Sandip Somany - AGI glaspac (An SBU of HSIL Ltd.), Hyderabad

NORTHERN INDIA GLASS MANUFACTURERS' ASSOCIATION, NEW DELHI

1. Mr. Ram Bahadur Dadu - Gujarat Guardian Ltd., New Delhi
2. Mr. Shailendra Kumar Misra - HNG & Inds. Ltd., Bahadurgarh

Following were co-opted as members of the Executive Committee for the year 2017-18:

1. Mr. Balkrishan Gupta - Advance Glass Works, Firozabad
2. Mr. Sanjay Somany - HNG & Ind. Ltd., Bahadurgarh
3. Mr. Pradeep Kumar Gupta - Om Glass Works Pvt. Ltd. Firozabad
4. Mr. PK Kheruka- Borosil Glass Works Ltd. Mumbai
5. Mr. Mukul Somany - HNG & Ind. Ltd., Bahadurgarh
6. Mr. SC Bansal - Adarsh Kanch Udyog, Firozabad
7. Mr. Subhash Tyagi - Gold Plus Glass Industry Ltd., New Delhi

C K SOMANY GLASS AWARD

In recognition of tremendous contribution to Indian Glass Industry, AIGMF is pleased to announce CK Somany Glass Award.

This award will be given to one recipient (individual) for valuable contribution in the field of technology / manufacturing / innovation / services / education etc.

Applications are invited at info@aigmf.com from within India from all those connected with glass industry, who are required to submit a write-up on why they should be considered for this award?

Referral applications can also be submitted by Regional Associations UPGMS, SIGMA, WIGMA, NIGMA and EIGMA who may give recommendation for giving award to a likely individual.

AIGMF may also take help of BHU (Ceramic Glass Division), CGCRI (Central Glass and Ceramic Research Institute), CCPS (Confederation of Construction Products and Services) and FOSG (Federation of Safety Glass) for identifying suitable candidates for the award.

The award will be given at AGM or during AIGMF's high profile events i.e. Glasspex / Glasspro exhibitions, etc., for which dates will be announced in advance.

For more information log on to http://www.aigmf.com/C-K-Somany-Glass-Award.php

CENTRE NOTIFIES NEW STANDARDS FOR SOLAR EQUIPMENT

MNRE has enlisted six standards for different types of equipment used in solar power projects.

With the domestic solar industry facing the heat from cheap imports

and steeply falling tariffs, the Ministry of New and Renewable Energy (MNRE) has drafted a new set of norms and standards for all solar equipment – domestic as well as imported.

The move will help the government keep a check on the quality of upcoming solar projects, given that the power purchase agreements (PPAs) are signed and tariffs set for 25 years.

Domestic solar manufacturers have been up in arms against the imports, especially from China. Their contention is that the steeply low tariffs are a result of cheap imported solar equipment, whose quality is questionable.

The MNRE has listed six standards for different equipment, including solar panels and batteries, used in solar power projects. The standards are designed under the Bureau of Indian Standards Act and would be governed under the same. The standards would be enforced after 12 months.

"No person shall by himself or through any person on his behalf manufacture or store for sale, import, sell or distribute goods which do not conform to the specified standard and do not bear the standard mark as notified by the Bureau for such goods from time to time after obtaining registration from the Bureau," said the notice reviewed by our research team.

Reacting to the development, Mr. Ratul Puri, Chairman, Hindustan Power, said, "As the government has provided 12 months' time before the Act is applicable, players can work to achieve the standards in a sustainable way. This is a good move that will counter low-quality imports and will be extremely useful in the distributed and rooftop segment where the end-user is technically not sophisticated."

The Ministry would also set up labs for testing the equipment. Industry executives, however, pointed out that this would lead to an increase in prices and more hassles as all suppliers would need to get certified in India, which had limited testing facilities.

Industry get together at a curtain raiser event of glasspro 2018

LAUNCH OF GLASSPRO 2018

glasspro India 2018 was officially launched at a curtain raiser event on Sept 4, 2017 at Hotel Hot Mess in New Delhi.

From Sept 7-9, 2018, Glass Bulletin and Messe Duesseldorf India will come together to present glasspro India at the Bombay Exhibition Centre, Goregaon East, Mumbai.

AIGMF will be a supporting association for the event.

To acknowledge outstanding contributions and achievements of all players and stakeholders of the industry, Glass Bulletin Awards would also be organized alongside the glasspro exhibition.

glasspro would be of huge benefit to the industry. With over 200 exhibitors expected to participate, it would be a glorious platform bringing together the who's who of the industry and encourage interaction and fair business practices. It would give exhibitors the opportunity to showcase their best products at a platform of international significance and that would in turn facilitate the growth of the industry.

INTELLIGENT NETWORKING: BIG DATA ENABLING A NEW STANDARD IN SCHOTT'S PHARMACEUTICAL GLASS MANUFACTURING

SCHOTT has recently integrated a specially developed big data solution into its pharmaceutical tubing production in India, replacing statistical sample-based quality assurance with 100 percent on-line measurement.

With the new IT-based process called perfeXion™, process- and product-

quality data of each individual glass tube is collected online and in real-time – an innovation that sets new standards in the pharmaceutical glass industry.

During the multi-layered process of pharmaceutical tubing production, statistical quality control is not 100% thorough. However, thanks to a unique big data approach, SCHOTT Glass India is now able to measure 100% of every single glass tube in production. Instead of selecting a few glass tubes from each batch for statistical quality control, the new perfeXion™ system measures the entire glass tube many times over as it is drawn from the melt. Lasers recognize deviations in diameter and wall thickness, for example, and camera and IR inspection systems can even detect the smallest inclusions in the glass. Around 100,000 data tags are generated every minute. An integrated IT system, evaluating the continuous glass tube with real-time data measurements, calculates incidents of imperfection with such precision that it can later differentiate corresponding individual tubes which can then be sorted out. Each tube is checked again at its completion.

"This data enables for post-processing steps to be efficiently aligned with the tubing quality. With big data, the international technology group is creating a new industry standard and raising the quality of pharmaceutical glass production to a new level," said Mr. Sundeep Prabhu, Vice President Sales and Marketing, SCHOTT Glass India Pvt. Ltd.

The system's development took several years. Analyzing a curved tube surface zooming down a production line was a particularly difficult challenge. The effort, however, has paid off – not least because the data analysis is a source of insight into how production can be further optimized.

Every year, SCHOTT produces about 150,000 tons of glass tubing worldwide, most of which is destined for pharmaceutical packaging. Thanks to the new perfeXion™ approach, quality data can be traced back more detailed along the value chain. "There comes a particular responsibility being a pharmaceutical industry supplier, and traceability is a major issue in the industry," says Dr. Patrick Markschläger, Executive Vice President at SCHOTT Tubing. "By gathering information on each individual glass tube, we've already made an important contribution to quality assurance for downstream post-processing steps at the very beginning of the value chain."

Data usage opens new potential

"Companies that want to systematically control their production to make it more efficient in the long run can't afford to miss a strategic use of production data," adds Dr. Frank Heinricht, Chairman of the Board of Management at SCHOTT AG. "Making intelligently linked data available to others not only optimizes processes – it creates new creative potentials for product and process development." The system is tailored for production of glass tubing, but other areas of the company can certainly benefit from the findings in the medium-term. SCHOTT's perfeXion™ has been installed at all its tubing lines globally, including its India plant in Jambusar, Gujarat, where the system has been implemented from July 1st onwards.

India's Pharma Outlook

The Government of India has unveiled its aim to make the country a global leader in the pharma manufacturing sector with 'Pharma Vision 2020'. Constant innovation is key to achieving this vision, with state-of-the-art-technology and corresponding know-how guaranteeing the same. This implies efficient pharma packaging, and advanced allied technologies by pharmaceutical companies, research labs, and other stakeholders. For pharmaceutical packaging, utmost precision and accuracy needs to be maintained at every step of the process in making the required glass tubes such as vials and syringes.

INDIA'S BOROSIL ACHIEVES 'WORLD-FIRST' FULLY-TEMPERED 2MM SOLAR GLASS

Indian manufacturer Borosil Glass Works has completed acceptance tests for a major line of 2 mm fully-tempered glass, which a company executive claims to be the first such glass produced at this thickness in the world.

The current world standard for solar tempered glass is 3.2 mm, but Borosil has created a line that can produce significantly thinner glass, which would come out at 1.6 GW capacity.

Mr. Pradeep Kheruka, Vice Chairman of Borosil, told "we are the first people to have actually taken the risk of investing in a line that claimed they could do it and our gamble paid off."

The firm performed an acceptance test, attended by Borosil and the line supplier, running the line for an eight-hour period nonstop without any hiccups. The next step is to send the glass out to be certified with reputed international bodies. Mr. Kheruka said he had no doubt that the product would be certified.

The thinner glass should create higher efficiencies when used in a solar module, because there is less

glass to absorb solar irradiance before reaching the cell, added Mr. Kheruka. Until now, any 2 mm glass used in modules has been 'heat-strengthened' rather than fully-tempered, which means it is significantly weaker, he claimed.

Borosil's 2 mm glass is the same price as the 3.2 mm glass "with a small premium", since drawing the glass out at 2 mm thickness results in lower production.

Noting several windows of opportunity opened up with 2 mm+2 mm glass modules, Mr. Kheruka cited the new trend in PV module development towards glass-glass modules. These are thought to improve a modules lifetime and decrease the rate of failure due to the added insolation of having glass on both the back and front sides, instead of using a backsheet. The ability to use bifacial cell architecture also creates added efficiencies, with up to 30% increases in sandy desert environments for example.

Mr. Kheruka added: "Secondly, a module made with 2 mm+2 mm glass would weigh about 10 kgs / M2 as against 8 kgs/M2 for 3.2 mm glass. Since this would be a laminate of two pieces of fully tempered glass, there would be greater safety than with a single piece of 3.2 mm glass. Undoubtedly a better bet for roof glazing.

"This is going to make a safer more long lasting module and we are the first guys in the world to have done it."

Despite there being a number of other tempered glass suppliers in India, Gujarat Borosil was the only petitioner in a recently successful anti-dumping case brought against imports of tempered glass from China (as long as one side is longer than 1,500 mm, among other requirements).

GLASS PACKAGING DEMAND GROWTH: THE MARKET TRUSTS GLASS

Glass packaging production in Europe grew by 2.9% in volume (Tonnes) and by 2.1% in unit terms in 2016, according to data published by the European Container Glass Federation (FEVE). The growth was driven by exports as well as continued demand for glass packaging in food and beverage segments in Europe. A total volume of 20.9 million tonnes or 75.9 billion units were produced in Europe for the EU and international food and beverage markets.

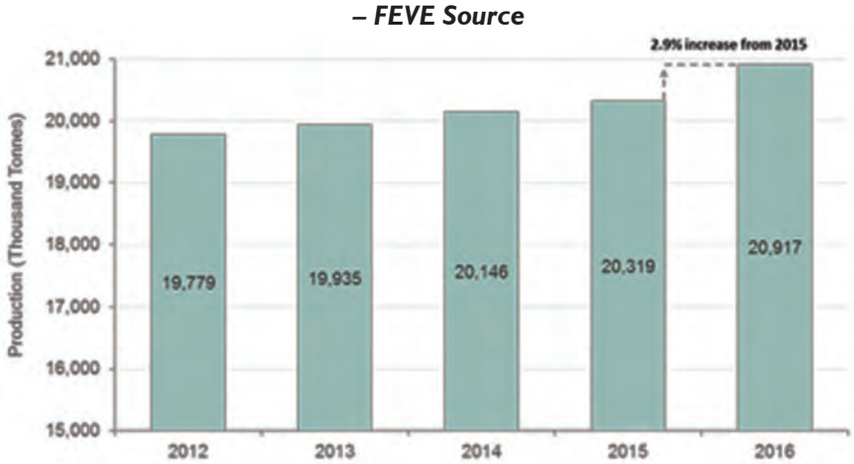
"The buoyant demand for glass is a strong signal of trust from customers in our industry and in glass packaging to help brands stand out on the shelves both in the European market and internationally," says FEVE President Mr. Johan Gorter.

The strong performance in 2016 confirms the steady trend of the last 5 years. Since 2012, the industry has increased its production by 5.8% in volume and 6.1 per cent in units.

Glass continues to be the reference packaging material for leading markets such as spirits, wines and beer, while it is increasingly gaining share in the food, water and dairy sectors. This is not only due to new consumption trends for local, organic and natural food, but also because of the positive image of glass packaging and the strong consumer trust in glass as their preferred packaging for environmental, health and taste

InSites Consumer Research 2016

Glass Container Production for Food and Beverages in Europe – FEVE Source



preservation reasons. According to a recent survey, glass is consumers' favourite packaging, with 1 in 2 Europeans saying they use more glass than three years ago and 75% of Europeans view glass as the most environmentally friendly packaging.

"It is encouraging that consumers trust glass because of its sustainability credentials and because it best preserves the quality of their preferred products. As an industry, we are committed to making the inherent properties of glass more visible to our customers and to the final consumer" continues Mr. Johan Gorter.

IIT-BOMBAY DEVELOPS TECHNOLOGY FOR COLOUR COATING SOLAR GLASS BUILDING

Indian Institute of Technology (IIT) Bombay has developed a technology that allows colour coating of solar glass buildings without affecting their energy-harvesting property.

The institute has patented its 'nanophotonic coating' technology and will soon launch a startup that would take this technology to the commercialisation stage.

At present, more than 90% of the solar market consists of silicon solar cells, which are used as rooftop or stand-alone systems. Lending colour to solar cells results in very high reflection losses, causing the solar cells beneath to fail.

"But our solution overcame this problem by using nanophotonic coating. Not only will users be able to customise the colour of the solar modules but they will also be able to use the vertical space of buildings," said Mr. Aldrin Antony, a national solar science fellow working at IIT-B's energy science department.

The technology uses conventional solar cell to integrate into buildings as architectural glass for building fenestrations like windows, facades, roof shingles, etc. The invention consists of a nanophotonic coating named SMART (selectively modulated aesthetic reflector technology). "It is the technological secret to fabricate coloured solar modules," said Mr. Antony.

IIT-B's invention has piqued the interest of several glass manufacturers who have approached it for partnership. "Talks are on with international and Indian glass manufacturers," said Mr. Antony.

In India, the dominant players in the glass segment are Asahi, Saint Gobain and Gujarat Borosil. "We would prefer to partner with Indian stakeholders," Mr. Antony said.

As part of the technology, nanophotonic coatings are mixed to generate different coloured appearances for solar modules. The Institute is also in talks with the Ministry of New and Renewable Energy (MNRE) for financial support. Research for the technology was carried out at the institute's National Centre for Photovoltaics Research and Education.

IIT Bombay researchers presented this technology at the European Photovoltaic Conference in Munich, 2016, and in the IUMRS conference in Singapore.

"I feel our work has been in line with the government's policy of 'Make in India'. With more support from the government to promote development of such technology within the country, we can achieve wonders," said Mr. Antony.

Mr. Antony left his job in solar energy research and permanent residency in Europe to join the National Solar Energy Mission research in India as a national solar science fellow. The fellowship, awarded by the President under the MNRE, is for five years —2012 to 2017.

INDIA IMPOSES ANTI-DUMPING DUTY ON TEMPERED GLASS FROM CHINA

India has imposed anti-dumping duty on tempered glass, used mostly to protect touchscreen mobile devices, from China for five years to protect the domestic industry from below cost imports.

The duty, ranging between $2.85 and $136.21 per tonne, has been levied on textured toughened (tempered) coated and uncoated glass.

Investigations by the Directorate General of Anti-Dumping and Allied Duties had found that the tempered glass has been exported to India from China below its associated normal value and that the domestic industry has suffered material injury which was caused by the dumped imports of the goods from China.

Commerce and Industry Minister said that anti-dumping duty was in force on 93 products, which were imported from China.

These products fall in the broad groups of chemicals and petrochemicals, products of steel and other metals, fibres and yarn, machinery items, rubber or plastic products, electric and electronic items and consumer goods, among others.

Apart from protecting domestic industry, the anti-dumping levy will also help curb India's alarming trade deficit with China. India's imports from China grew 2.13% to $61.70

billion in 2015-16, but dropped almost 0.7% to $61.28 billion in the subsequent year.

HEYE INNOVATIONS BENEFIT TAIWAN GLASS

Increasingly, Asia's glass container producers are turning to Heye International for innovative and reliable solutions for their production lines. Among the company's high profile customers is the Hsinchu factory of Taiwan Glass.

A leading supplier of production technology to glass container manufacturers throughout the world, Heye International GmbH has assisted Taiwan Glass with its conversion of four more production lines to Heye technology and the installation of a new Heye IS machine, featuring the company's latest developments in Narrow Neck Press and Blow (NNPB) production.

Established in 1994, family-owned Taiwan Glass is Taiwan's leading glass producer, with diversified business interests associated with the manufacture of glass packaging, flat glass, solar glass and glassfibre. A technical assistance agreement was signed with Heye International in 1983 and subsequently, the company has pioneered the NNPB process in Taiwan and the region. In total, 11 Heye production lines are now operated at the Hsinchu glassworks, a positive relationship having developed between the experts of both companies over the past two decades.

With a high proportion of output destined for export, Taiwan Glass manufactures an extensive series of products, including very small items and with frequent job changes. The factory operates a wide range of Heye production machines, including all of the German company's latest innovations. This includes Heye's Press Duration Control to minimize hot end defects, to provide reproducible wall thicknesses and to ensure high quality production.

PERMASTEELISA GROUP AWARDED MAJOR FAÇADE CONTRACT FOR OCEANWIDE CENTER IN SAN FFRANCISCO

Permasteelisa Group has been awarded a major contract for the façades of the Oceanwide Center in downtown San Francisco. The overall duration of the project will be around 4 years, from the design phase all the way to the production and final installation; it will be carried out by Permasteelisa North America and by Josef Gartner in Germany and USA, with the support of the Italian Headquarters as well as other companies of the Group.

The new addition to San Francisco's downtown is a mixed-used development located in the Transbay neighborhood, at the corner of First and Mission Streets. Designed by Foster + Partners, the new development by Oceanwide Holdings will comprise two high-rise towers and provide the city with 1 million square feet (around 93,000 sqm) of office space, 265 luxury residential units and a 171-key luxury hotel.

The taller tower, on First Street, will rise 910 ft (277 m) and is going to become the second tallest in the city of San Francisco. The 61-storey building mixed-use residential and office tower will have a 730,000 sq.ft. (67,800 sqm) curtain wall which incorporates recessed, stainless steel diagrid cladding, floor-to-ceiling high performance glass, and a custom aluminum profile, for a total of 11,500 units.

The façade will contribute to achieve the LEED Platinum rating for which the building has been designed.

The second tower, on Mission Street, will rise 645 ft (197 m). This elegant 54-storey mixed-use residential and hotel building will have 300,000 sq.ft. (approx. 28,000 sqm) of cladding by Josef Gartner, in a modern interpretation of the traditional bay window buildings. The tower is characterized by its natural stone

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cladding that features unique "glass vitrine" windows, and is designed to achieve the LEED Gold Rating.

"We are proud to be part of this amazing and ambitious project", said Mr. Riccardo Mollo, Chief Executive Officer of Permasteelisa Group. "Its magnitude and advanced technical features make it almost impossible for anyone but for Permasteelisa", adds Mr. Mollo, "and it's another wonderful opportunity to work alongside with Foster + Partners on a very challenging and unique project just after the successful completion of the Apple Park in Cupertino."

ZIPPE BATCH PLANT FOR FLOAT GLASS WAS SUCCESSFULLY PUT INTO OPERATION AT KBI THAILAND

The renowned container glass manufacturer Bangkok Glass has extended its product scope and has successfully commissioned a float glass plant at Kabinburi. In the past, ZIPPE already had the privilege to supply different container and cullet glass plants for Bangkok Glass.

The plant was commissioned according to schedule without complications. The plant is designed for a daily capacity of 600 tons per day. Weighing of raw materials is effected by seven container scales. Two high performance pan mixers with 3000 liters are implemented as mixers which guarantee ideal batch homogeneity.

Cullet addition is effected continuously after the mixing process by three belt scales to enable an ideal batch/ cullet sandwich. On the transport way to the furnace pre-silo, there are different permanent magnets as well as metal detectors installed to avoid metal impurities in the melting furnace.

Cullet which is transported to the cold end will be conveyed directly back into the batch house. On this transport way, two hammer crushers are installed in order to convert cullet into an ideal grain size for the direct re-melting ■

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

About

The All India Glass Manufacturers' Federation

The All India Glass Manufacturers' Federation was founded in 1944. The Federation is made up of five Regional Associations viz.

Eastern India Glass Manufacturers' Association **(EIGMA)**-Kolkata

Northern India Glass Manufacturers' Association **(NIGMA)**-Haryana

South India Glass Manufacturers' Association **(SIGMA)**-Hyderabad

Uttar Pradesh Glass Manufacturers' Syndicate **(UPGMS)**-Firozabad and

Western India Glass Manufacturers' Association **(WIGMA)**-Mumbai

The Federation was incorporated under the Companies Act, 1956 (No. 1 of 1956) as a Limited Company on 15-6-1970.

The main aims & objectives of the Federation are:-

- To encourage, promote and develop the manufacture of glass articles of all kinds and to safeguard and protect the interests of glass industry and glassware business in India.
- To form a common link amongst Glass Manufacturers' in India and thus develop a spirit of mutual help and cooperation with one another.
- To promote the study and research in Glass Technology.
- To consider all matters relating to the manufacture and marketing of glass articles in India and the question of export and import thereof.
- To devise ways and means for securing necessary supply of raw materials required for the manufacture of glass articles at comparatively lower prices and thus to decrease the cost of production and increase the national wealth.
- To collect necessary information and data and propagate it for the benefit of Glass Industry and trade in India.
- To make representations whenever necessary to the Union Government or any unit of the Union of India for the removal of difficulties that might hamper the trade of glass articles or for grant of special facilities for the Glass Industry.
- To draw Government or public attention to the difficulties in the way of Glass Industry and to solve other problems confronting it and to solicit their help and support through concerted action.
- To organise a united front on behalf of all glass manufacturers and thus strive to gain all those advantages which may not be possible through individual effort.

All those engaged in the manufacture of glass and glass articles are enrolled as **Ordinary Members** of the AIGMF and those associated with the Glass Industry are enrolled as **Affiliate Members** of the Federation.

Almost all glass manufacturers including many in the small scale sector are 'Ordinary' Members of the Federation.

Articles of Association of the AIGMF were amended in September 1992 to enroll foreign companies as Affiliate Members of the Federation ■

समाचार

उत्तर प्रदेश वित्त मंत्री ने चूड़ी व कांच उद्योग की समस्याओं पर किया मंथन

प्रदेश सरकार के वित्त मंत्री माननीय राजेश अग्रवाल जी ने कांच नगरी के उद्यमियों के साथ चूड़ी व कांच उद्योग की समस्याओं पर मंथन किया। उद्यमियों ने मंत्री को जीएसटी से चूड़ी व ग्लास एक्सपोर्ट पर पड़ रहे प्रतिकूल असर के बारे में जानकारी दी। वहीं प्लास्टिक उत्पादों से शहर के कांच की बोतल बना रहीं इकाइयों के हितों को पहुंच रहे नुकसान बताए। उद्यमियों ने मंत्री के समक्ष प्लास्टिक की बोतल में पेय पदार्थों की पैकिंग पर रोक लगाने की मांग उठाई।

24 सितंबर को उद्यमी संगठन यूपीजीएमस द्वारा एफएम वाटिका राजा का ताल पर आयोजित संगोष्ठी में यूपीजीएमएस चेयरमैन राजकुमार मित्तल ने कहा कि अनेक खाद्य पदार्थों, दवाइयों, दूध, जूस, कोल्ड ड्रिंक, देशी विदेशी शराब आदि की पैकिंग में प्लास्टिक (पैट) की बोतलों का धड़ल्ले से प्रयोग किया जा रहा है। जबकि प्लास्टिक बोतल में पैक होने वाले खाद्य व पेय पदार्थ जन स्वास्थ्य पर प्रतिकूल प्रभाव डाल रहे हैं। साथ ही इससे फिरोजबाद में कांच की बोतल बनाने वाली इकाइयों को भारी आर्थिक नुकसान उठाना पड़ रहा है। एक्सपोर्टर मुकेश बंसल (टोनी) ने कहा कि निर्यात होने वाले ग्लास आयटमों में उपयोग होने वाले कच्चे माल पर जीएसटी लग रही है जिससे एक्सपोर्ट आयटमों को उत्पादन लागत बढ़ रही है। जिसका सीधा असर निर्यात कारोबार पर पड़ रहा है।

उप्र व्यापार मंडल के जिलाध्यक्ष वीएस गुप्ता ने कहा एक जुलाई से लागू हुई जीएसटी में चूड़ी को कर मुक्त रखा गया है। कार्यक्रम में वित्तमंत्री अग्रवाल ने उद्यमियों व कारोबारियों की समस्याएं सुनीं। उन्होंने कहा कि जीएसटी काउंसिल की बैठक में चूड़ी व कांच उद्योग, कारोबार से जुड़ी समस्याओं को रखवाया जाएगा। साथ ही यथा संभव इनका निराकरण

कराया जाएगा। कार्यक्रम में मंत्री के साथ भाजपा जिलाध्यक्ष वीएल वर्मा, महानगर अध्यक्ष कन्हैयालाल गुप्ता, नगर विधायक मनीष असीजा मंचासीन रहे। संचालन व्यापारी नेता सत्यवीर गुप्ता ने किया।

वित्तमंत्री का हुआ स्वागत: कार्यक्रम में वित्तमंत्री राजेश अग्रवाल का जोशीला स्वागत हुआ। स्वागत करने वालों में एक्सपोर्ट एसोसिएशन के मुकेश बंसल, प्रदीप पचौरी, पुष्पेन्द्र गोयल, सुलभ बंसल, अर्जित अग्रवाल, विपिन अग्रवाल, सिंहराज यादव, यूपीजीएमएस के धर्मेन्द्र मोहन गुप्ता, प्रदीप गुप्ता, संजय मित्तल, शैलेश बंसल, नमन बंसल, द बैंगिल ग्लास सिंडीकेट निदेशक हनुमान प्रसाद गर्ग, टैक्सेशन बार एसोसिएशन के अध्यक्ष कुलदीप मित्तल, इनकम टैक्स के अनिल गर्ग, सैलटैक्स के कैलाश गुप्ता, राजीव कुमार, सीए एसोसिएशन के पवन अग्रवाल, नरेश अग्रवाल, भाजपा के कोषाध्यक्ष आनंद, व्यापार मंडल के रवीन्द्र तिवारी, प्रकाश भारद्वाज, उप्र व्यापार प्रतिनिधि मंडल के अध्यक्ष अनिल मैनेजर, मनोज गुप्ता, सोमदत्त गुप्ता, भारतीय व्यापार मंडल जिलाध्यक्ष मनीष, हरिओम शर्मा, ग्लास डेकोरेशन एसोसिशसन के शंकर गुप्ता, भाजपा नेता श्याम सिंह यादव, सुनील शर्मा, अरविंद बघेल शामिल रहे।

उद्यमियों ने बताई अपनी समस्या:

उद्यमियों एवं एक्सपोर्टर ने वित्त मंत्री को अपनी समस्याएं बताई। जीएसटी के बाद भी गैस पर यूपी में अतिरिक्त लग रहे पांच फीसद वैट से आ रही परेशानियों के संबंध में बताया। यूपी ग्लास मैन्युफैक्चर्स सिंडिकेट ने प्लास्टिक बोतल से सरकार को पहुंच रही राजस्व की क्षति के संबंध में बताते हुए कहा कि जहाँ यह प्रतिबंधित है वहाँ यूपी से ज्यादा राजस्व मिलता है।

जीएसटी से खत्म हुआ इंस्पेक्टर राज: राजेश अग्रवाल

यूपी के वित्तमंत्री राजेश अग्रवाल का कहना है कि देश भर में व्यापारियों को 18-20 तरह के अलग-अलग तरह के टैक्स देने पड़ते थे। इंस्पेक्टर राज कायम था, लेकिन जीएसटी लागू से देश में इंस्पेक्टर राज पूरी तरह खत्म हुआ है।

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

Welcomes New Member

Company Name and Address	Products/Services
M/s Nishal Enterprises Pvt. Ltd. Contact: Mr. Namit Munshi B-802, Lotus Corporate Park Off Western Express Highway, Goregaon East Mumbai – 400 063 Tel: +91-22-6682 0000 E-mail: contact@nishalgroup.com	Oxyfuel Technology, Hydrogen Gas and catalyst to glass Industry.

Membership of the Federation

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

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

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

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

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

ADMISSION FEE / ANNUAL SUBSCRIPTION

Ordinary Members:

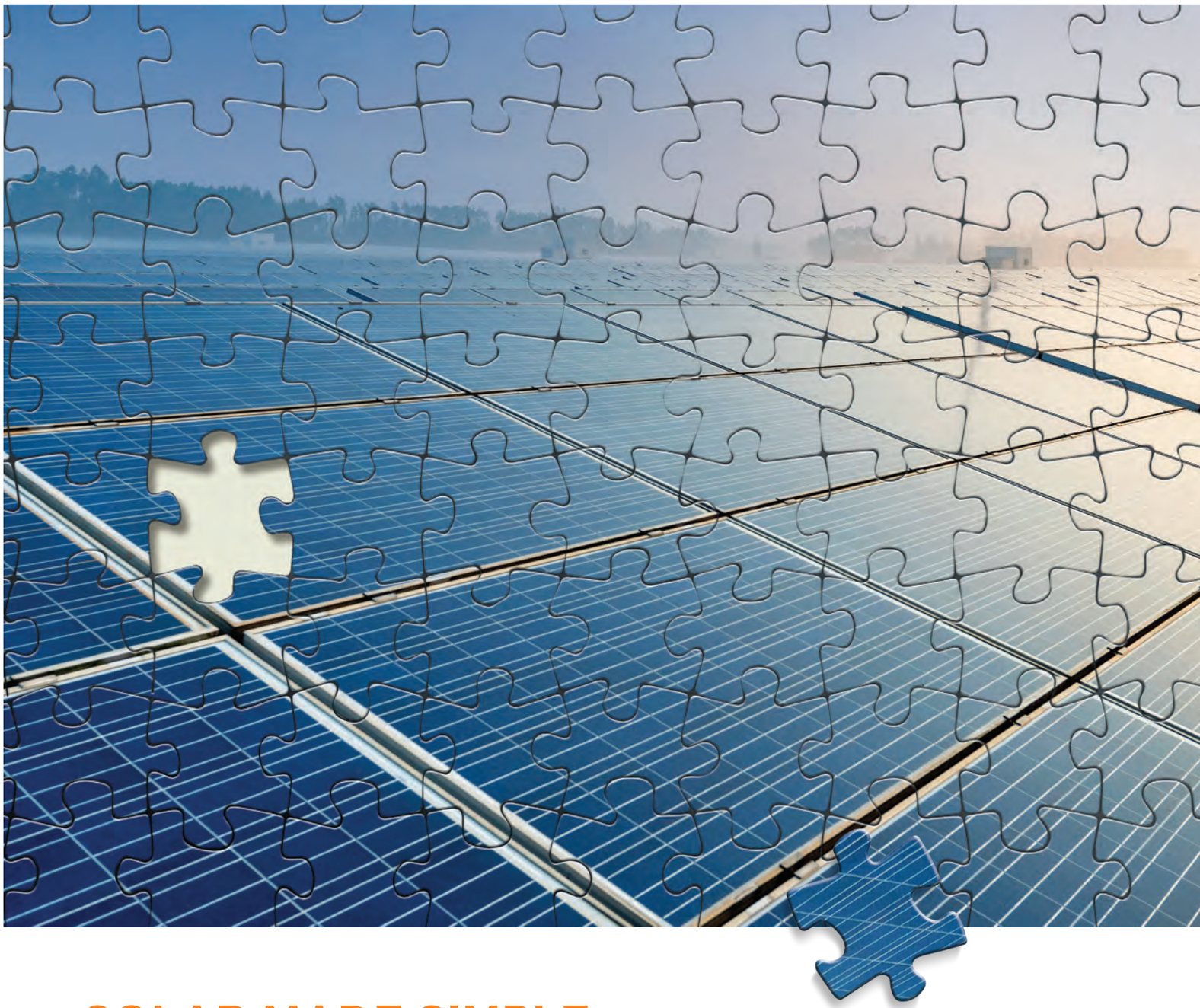
- Admission fee ₹ 5000/-
- Annual subscription: Single Unit: ₹ 25,000 + GST as applicable
- More than one Unit: ₹ 1,00,000 + GST as applicable

Affiliate Members:

- Admission fee ₹ 5000/-
- Annual subscription: ₹ 10,000 + GST as applicable
- Applicants for enrollment for a period of five years may pay a consolidated amount of ₹ 45,000 (including admission fee) + GST as applicable

Affiliate Members from countries other than India:

- Admission fee US $ 200
- Annual subscription: US $ 400 + GST as applicable
- Applicants for enrollment for a period of five years may pay a consolidated amount of US $ 1500 (including admission fee) + GST as applicable ■



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FOR CORPORATE INDIA

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Solar Rooftop with Special Focus on BOO/BOOT Model and Industrial Gas for Glass Manufacturers

(New Delhi, August 18, 2017)

Presentations on Solar Rooftop with Special Focus on BOO/ BOOT Model and Industrial Gas for Glass Manufacturers were organized parallel with Executive Committee and Annual General Meetings of the AIGMF on August 18, 2017 at Hotel Pride Plaza, Aerocity, Delhi

Mr. Akshai Raja from CleanMax Solar, made a presentation on Solar Rooftop with Special Focus on BOO/BOOT Model.

It was told that CleanMax Solar, founded in 2011, has successfully installed more than 200 projects across 50 plus corporate clients, with a combined on-site capacity of more than 85 MW, making one of India's largest rooftop solar developer and provider of sustainability solutions for Corporate India. CleanMax Solar has a market share of 24% (as per Bridge to India 2017 report). CleanMax Solar also built Karnataka's first open access solar farm, of 30 MW capacity in Tumkur district and now operates multiple solar farms to supply to corporate consumers on an open access basis across Karnataka and Tamil Nadu.

The company develops projects on a turnkey basis, providing power on a per-kWh basis, under long-term Power Purchase Agreements, at rates cheaper than grid tariffs. CleanMax Solar has been recognized by the Ministry of New & Renewable Energy (Govt. of India) with National Excellence Awards for Rooftop

Solar Developer and Rooftop Solar EPC Player in the 2016. www.cleanmaxsolar.com

Mrs. Lavina Gadodia, Shanghai Chinllenge Gases Co., Ltd. made a presentation on Industrial Gas for Glass Manufacturers.

Shanghai Chinllenge Gases Co. Ltd (SCGC), founded in 2001, is a professional gas company mainly engaged in on-site gas production. Currently one of the gas companies that enjoy the largest share in the on-site gas market segment, SCGC provides total solutions for gas plants.

With professional personnel and technological innovation such as unmanned automatic control of the plant and remote video monitoring control, SCGC has successfully raised the efficiency of the gas plants and lowered running costs for its customers. It is committed to be a professional gas company capable of providing customers with high quality on-site services relying on its abundant experience in equipment integration and application technology in the fields of electronics, glass, shipbuilding, metal processing etc. SCGC operates across many countries and continents and is rapidly expanding. www.scgc.com.cn

AIGMF gifted 100 glass water bottles to Hotel Pride Plaza as part of its ongoing commitment for *Swachch Bharat Abhiyaan* (Clean India Campaign)■

Select photos and presentations can be downloaded from http://www.aigmf.com/past-events.php

[TO BE PUBLISHED IN THE GAZETTE OF INDIA, EXTRAORDINARY, PART II,SECTION 3, SUB-SECTION (i)]

GOVERNMENT OF INDIA
MINISTRY OF FINANCE
(DEPARTMENT OF REVENUE)

Notification No. 38/2017-Customs (ADD)

New Delhi, the 18th August, 2017

G.S.R. (E).- Whereas in the matter of Textured Toughened (Tempered) Glass with a minimum of 90.5% transmission having thickness not exceeding 4.2 mm (including tolerance of 0.2 mm) and where at least one dimension exceeds 1500 mm, whether coated or uncoated (hereinafter referred to as the subject goods) falling under tariff item 7007 1900 of the First Schedule to the Customs Tariff Act, 1975 (51 of 1975) (hereinafter referred to as the Customs Tariff Act), originating in, or exported from China PR (hereinafter referred to as the subject country), and imported into India, the designated authority in its final findings vide notification number 14/03/2016-DGAD, dated the 20th June, 2017-DGAD, published in the Gazette of India, Extraordinary, Part I, Section 1, dated the 20th June, 2017, has come to the conclusion that–

i. the subject goods have been exported to India from the subject countries below its associated normal value;

ii. the domestic industry has suffered material injury;

iii. the material injury has been caused by the dumped imports of the subject goods from subject countries.

and, whereas, the designated authority has recommended imposition of definitive anti-dumping duty on the imports of subject goods, originating in or exported from the subject country and imported into India, in order to remove injury to the domestic industry;

Now, therefore, in exercise of the powers conferred by sub-sections (1) and (5) of section 9A of the Customs Tariff Act, read with rules 18 and 20 of the Customs Tariff (Identification, Assessment and Collection of Anti-Dumping Duty on Dumped Articles and for Determination of Injury) Rules, 1995, the Central Government, after considering the aforesaid final findings of the designated authority, hereby imposes definitive anti-dumping duty on the subject goods, the description of which is specified in column (3) of the Table below, falling under tariff item of the First Schedule to the Customs Tariff Act as specified in the corresponding entry in column (2), originating in the country as specified in the corresponding entry in column (5), exported from the country as specified in the corresponding entry in column (6), produced by the producers as specified in the corresponding entry in column (7), exported by the exporters as specified in the corresponding entry in column (8), and imported into India, an Anti-Dumping Duty at the rate equal to the amount as specified in the corresponding entry in column (9) and as per unit of measurement as specified in the corresponding entry in column (10), of the said Table, namely :-

Sl. No	Tariff item	Description of Goods	Specification	Country of Origin	Country of Export	Producer	Exporter	Amount (in United States Dollar)	Unit of Measurement
1	2	3	4	5	6	7	8	9	10
1	7007 1900	Textured Toughened (Tempered) Coated and Uncoated Glass	*	China PR	China PR	Henan Ancai Hi Tech Co Ltd	Henan Ancai Hi Tech Co Ltd	64.04	MT
2	7007 1900	Textured Toughened (Tempered) Coated and Uncoated Glass	*	China PR	China PR	Xinyi PV Products (Anhui) Holding Ltd.	Xinyi Solar (Hongkong) Limited	52.85	MT
3	7007 1900	Textured Toughened (Tempered) Coated and Uncoated Glass	*	China PR	China PR	Dongguan CSG Solar Glass Co Ltd	Dongguan CSG Solar Glass Co Ltd	97.63	MT

4	7007 1900	Textured Toughened (Tempered) Coated and Uncoated Glass	*	China PR	China PR	Wujiang CSG Glass Co Ltd	Wujiang CSG Glass Co Ltd	83.38	MT
5	7007 1900	Textured Toughened (Tempered) Coated and Uncoated Glass	*	China PR	China PR	Anyone other than above S. No. 1 to 4	Anyone other than above S. No. 1 to 4	136.21	MT
6	7007 1900	Textured Toughened (Tempered) Coated and Uncoated Glass	*	China PR	Any country China PR	Any	Any	136.21	MT
7	7007 1900	Textured Toughened (Tempered) Coated and Uncoated Glass	*	Any country other than China PR	China PR	Any	Any	136.21	MT

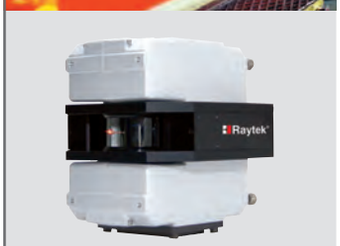
* Textured Toughened (Tempered) Glass with a minimum of 90.5% transmission having thickness not exceeding 4.2 mm (including tolerance of 0.2 mm) and where at least one dimension exceeds 1500 mm, whether coated or uncoated."

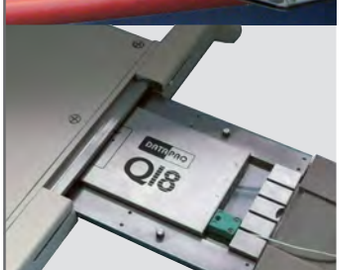
2. The Anti-Dumping Duty imposed shall be effective for a period of five years (unless revoked, superseded or amended earlier) from the date of publication of this notification in the Official Gazette and shall be payable in Indian currency.

Explanation.- For the purposes of this notification, rate of exchange applicable for the purposes of calculation of such Anti-Dumping Duty shall be the rate which is specified in the notification of the Government of India, in the Ministry of Finance (Department of Revenue), issued from time to time, in exercise of the powers conferred by section 14 of the Customs Act, 1962 (52 of 1962), and the relevant date for the determination of the rate of exchange shall be the date of presentation of the bill of entry under section 46 of the said Act ■

[F.No.354/140/2017 -TRU]

Ruchi Bisht
Under Secretary to the Government of India





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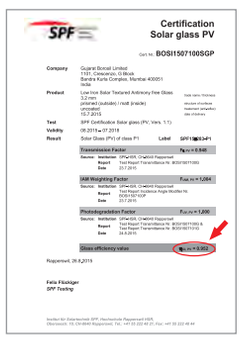
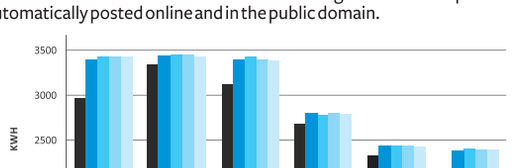


Field trials support laboratory results :

R & D Installation at our warehouse rooftop in Gujarat, India

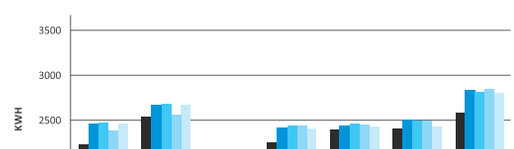
Field results conclusively prove that modules made with BOROSIL® **SolarBurst** Glass have consistently outperformed modules made with glass from the leading European producer. Over a period of 12 months, clusters of 96 modules placed side by side in our rooftop R&D installation has yielded the results shown below. All modules were made by EMMVEE Photovoltaic Power Pvt. Ltd. at the same time using identical components. These results are automatically posted online and in the public domain.



All figures in KWH

		Mar-15	Apr-15	May-15	Jun-15	July-15	Aug-15
EU Glass	SG-AP-04	2977	3347	3310	2684	2334	1557
BOROSIL® SolarBurst Glass	B-P-09	3399	3435	3389	2811	2438	2397
	B-P-10	3433	3447	3433	2797	2443	2426
	B-P-11	3417	3447	3381	2811	2442	2399
	B-P-12	3420	3418	3378	2789	2440	2403
	Average	3417	3436	3395	2802	2441	
	Additional	440	90	285	118	107	
	% extra	14.8 %	2.7 %	9.0 %	4.4 %	4.6 %	

NOT SHOWN



All figures in KWH

		Sept-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16	Mar-16
EU Glass	SG-AP-04	2401	2779	2015	2423	2603	2621	2834
BOROSIL® SolarBurst Glass	B-P-09	2687	2943	2256	2625	2658	2739	3148
	B-P-10	2692	2955	2283	2658	2658	2731	3113
	B-P-11	2595	2805	2235	2653	2677	2730	3146
	B-P-12	2685	2934	2274	2624	2648	2094	3102
	Average	2665	2909	2262	2640	2668	2733	3127
	Additional	264	130	247	217	65	112	293
	% extra	11 %	4.7 %	12 %	9 %	2.5 %	4.3 %	10.3 %

Best performance assured by :

- **High resistance to PID**
  A high degree of resistance to Potential Induced Degradation (PID) is built into the glass. Tests conducted by the Photovoltaic Institute in Berlin have demonstrated that glass from Borosil is the most resistant to PID as compared to the product from other leading manufacturers.
- **High Chemical Durability**
  Chemical durability of our antimony-free glass is 6.7 ml vs. an average of 8.6ml for other solar glasses, as measured in tests laid down by USP.
- **Lowest Iron Content**
  With an iron content of less than 80 ppm, antimony-free glass is the lowest iron content solar glass in the world.
- **Anti reflective coating**
- Light transmission and performance durability certified by TUV Rheinland, Netherlands
- Light transmission > 93.5 ~ 94% for single side AR coated glass
- Cost effective model that achieves a balance between optimal light transmission gain and coating durability
- Smooth and uniform surface morphology ensures a seamless contact surface and hydrophobic characteristics

	European Glass	BOROSIL® SolarBurst Glass	Extra Power	
			KWH	%
Total Power per inverter	32078	34496	2418	**7.5%**

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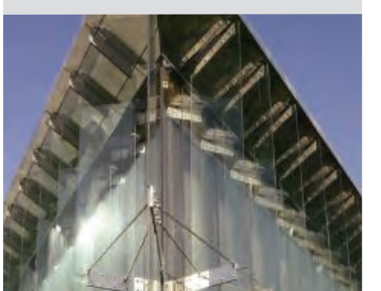

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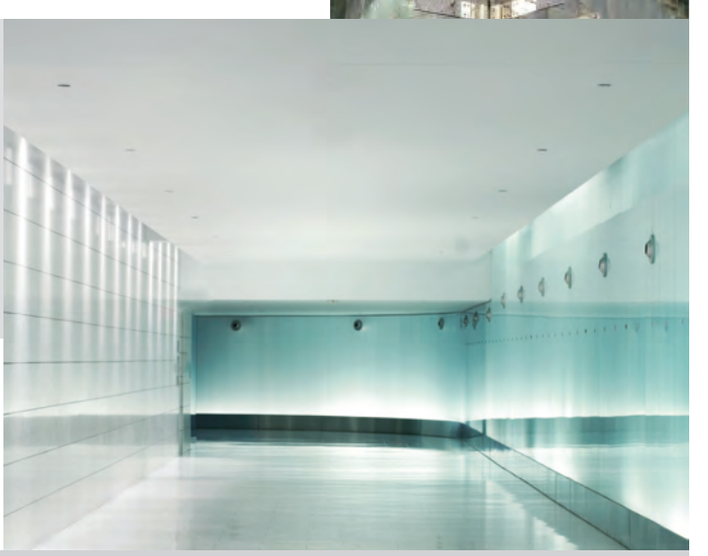
lacquered glass



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Two-Days Training Programme on "NBC 2016 and Glass & Glazing System in Buildings"

(July 17-18, 2017)

Reported by:
Er. Shashi Kant, Adviser, CCPS, New Delhi
Former Dy. Adviser, Planning Commission, Govt. of India

Architectural Glass Panel (Asahi Glass, Gujarat Guardian, HNG Glass & Gold Plus) / AIGMF alongwith other glass manufacturers like Saint-Gobain are committed and making all efforts to propagate appropriate glass use, enhance energy conservation performance, lighting, hygiene and functionability and ensure human and fire safety. In this endeavour the contribution and efforts of Confederation of Construction Products and Services (CCPS) are appreciable. Regulatory bodies and major Govt. construction departments like CPWD, Govt. of Andhra Pradesh, Govt. of Rajasthan, NBCC, Airport Authority of India, MES, PWD's of Delhi, Haryana etc. have mandated and implemented the recommendation of CCPS "Guidelines on Use of Glass in Buildings: Human Safety".

Recently revised National Building Code 2016 was released in March 2017 and for the first time a new section on Glass and Glazing was included in the document. To acquaint and update engineers, architects and professionals particularly from Government sector about the requirements for ensuring safe and appropriate glass use in buildings as per NBC 2016, IS 16231 and CCPS Guidelines continuous efforts are being made, therefore, Two-Days Training Programme on "NBC 2016 and Glass & Glazing System in Buildings", was organized by CCPS, in collaboration with Indian Buildings Congress (IBC) on July 17 -18, 2017 at IBC (HQ), R. K. Puram, New Delhi.

The program was inaugurated by Mr. Sanjay Pant, HoD, CED, BIS on July 17th and certificates were distributed by Brig. Girish Joshi, DDGW (Design), MES at Valedictory Session on July 18th.

The programme was participated and attended by 44 senior officers and dignitaries from, Military Engineering Services, Central PWD, Bureau of Indian Standards, PWD Delhi Govt., PWD Gwalior MP, North Municipal Corporation of Delhi, PWD Rajasthan, MMRDA Mumbai, Schueco India, Dhruv Consultancy, Samrat Ashok Technology Institute Vidisha, M. P., Lingaya University, Faridabad and Amity University.

Following twelve topics were covered, including the recommendations of Section 8 GLASS AND GLAZING of Part 6 STRUCTURAL DESIGN and Clause 3.4.10 Glazing of Part 4 FIRE AND LIFE SAFETY of National Building Code 2016, during the two days program:

1. Overview of Provisions on Glass and Glazing in IS 16231 (Parts 1-4) and NBC 2016 by Mr. Arun Kumar, BIS
2. Overview - Types of Glass & its Application by Mr. D. S. Sachdev, Former DG, CPWD
3. Why Glass and what we can do to make our Buildings Safer, Healthier & Energy Efficient by Mr. Deepak Gahlowt, Convener, CCPS
4. Selection of Glass with reference to NBC 2016 / ECBC / GRIHA / IGBC parameters and for Energy Efficiency and Thermal Comfort in Buildings by Ms. Suchi Verma, Saint Gobain India Pvt. Ltd.
5. Selection of Glass subjected to Wind and Seismic loading and Codal provisions by Mr. Sourabh Kankar, Gujarat Guardian Ltd.
6. NBC 2016 - Fire Protection and Safety in Glazing by Mr. Hatinder Vohra, Saint Gobain India Pvt. Ltd.
7. NBC 2016 - Human Safety Aspect in use of Glass and Responsibility of Professionals by Mr. Shashi Kant, Adviser, CCPS
8. Façade Testing a need for Safe and Sustainable Modern Buildings by Mr. Sudhanshu Dighe, Façade India Testing Inc
9. Importance of Selection of right Sealants in Structural Glazing and Fire Seals by Mr. Niten Patial, McCoy Soudal
10. Role of Silicone Sealants in Structural Glazing and Fire Seals by Mr. Himanshu Jain, Dow Corning India Pvt. Ltd.
11. Architectural Hardware Solutions for Glass by Mr. Manav Gulati, Dorma India Pvt. Ltd.
12. Motorized Hardware Solutions for Glass Façade by Mr. Ashim Chugh, LGF Sysmac India Pvt. Ltd.

The program was appreciated by the participants and majority of them viewed that human safety conditions related to glass and glazing should be included in Building Byelaws by the local bodies and items in Schedule of Rates / Specifications of Govt. contraction departments. CCPS appreciated the cooperation, contribution and support of Indian Buildings Congress, Gujarat Guardian Ltd., Saint Gobain India Pvt. Ltd., Dorma India Pvt. Ltd., LGF Sysmac (I) Pvt. Ltd., Dow Corning India Pvt. Ltd., Façade India Testing Inc and McCoy Soudal for making the programme successful.

Concerned Departments of Central & State Governments., Development Authorities, Local Bodies, PSUs, prominent architects, consultants were approached by CCPS to take necessary action in propagation, implementation and inclusion in Building Byelaws the relevant recommendations of NBC 2016 to ensure human and fire safety while using glass in buildings and the gist of recommendations was widely circulated. Article on "Revised National Building Code of India 2016 equipped with a new Section on Glass and Glazing" was published in Kanch April-June 2017 issue highlighting the advisory clauses for safety against glass impact, manifestation, ease of carrying out fire fighting and rescue operations etc. Many Departments, Local Bodies, Development Authorities have started considering recommendations of NBC 2016 for implementation. Recently Notification - Chandigarh Building Rules (Urban) – 2017 have been uploaded on July 27, 2017 by Chandigarh Administration and order dated August 25, 2017 was also issued by MES ■

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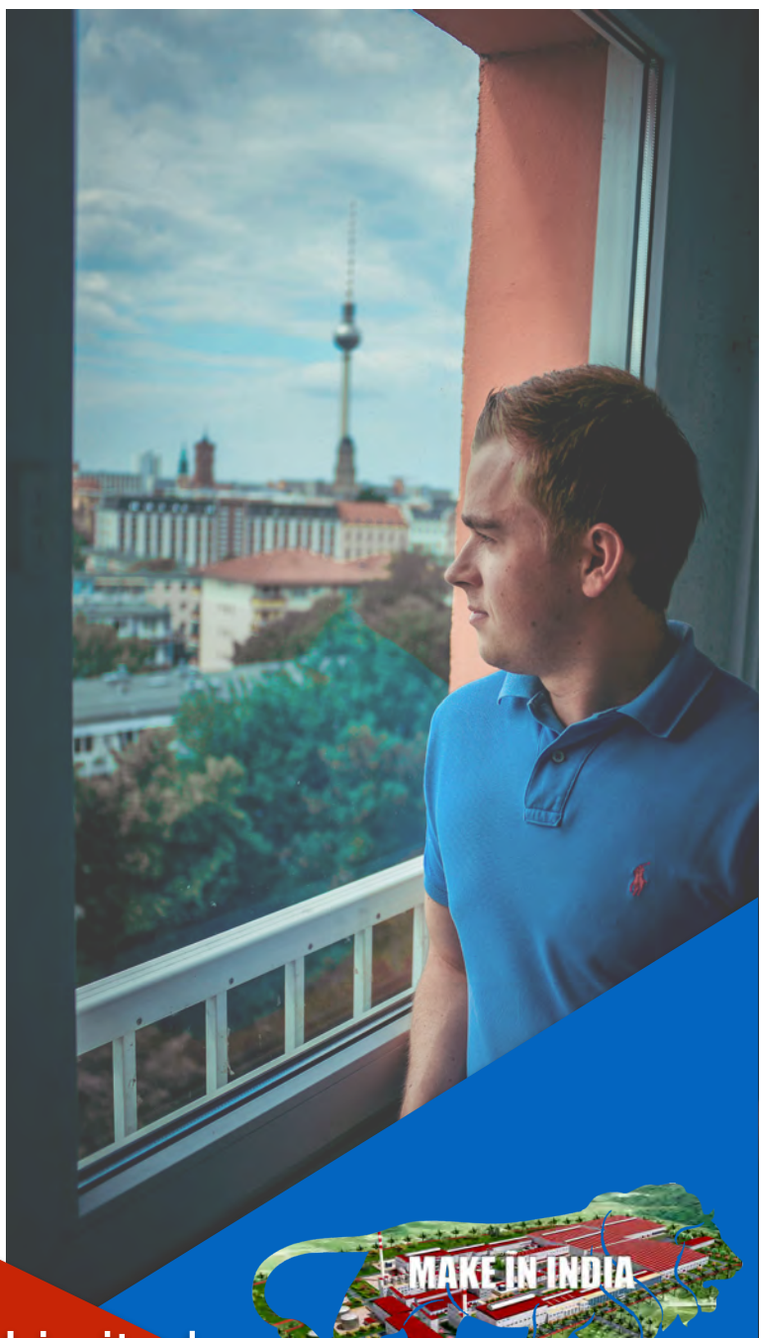

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Characterisation of emissions and energy balances in furnaces

Simone Tiozzo, Walter Battaglia and Alessandro Migatta discussed with *Glass Worldwide* the PRIME Glass project's contribution to the improvement of methodologies for the characterisation of emissions and energy balances in glass melting furnaces.

Co-financed by the European Union's LIFE programme (LIFE12 ENV/IT/001020), the PRIME Glass Project started in 2014 and aimed at the industrial-scale development and implementation of two primary techniques, capable of reducing the NO_x emissions released into the atmosphere by fuel-fired regenerative glass melting furnaces. These are waste gases strategic recirculation at the bottom of the regenerator chambers and hybrid hot/cold air staging.

With the PRIME Glass waste gases recirculation system, a fraction of flue gases is drawn from the bottom of the regenerator chamber and injected into cold combustion air at the bottom of the other chamber by means of a high T resistant fan and of a purposely designed ducting system. Bearing less O_2 and more radiating species (H_2O, CO_2), the injected flue gases reduce NO_x generation and enhance heat exchange in the regenerator, increasing energy efficiency (figure 1.1).

With PRIME Glass hybrid air staging technology (figure 1.2), the thermal NO_x emissions are reduced by simultaneously lowering excess combustion air inside the furnace and completing CO combustion at lower temperature in the waste gases port neck. This latter effect is achieved with minimal energy losses by means of the high speed injection of preheated air, which is spilled from the opposite port via a specifically designed refractory connection duct and propelled by jets of compressed cold air (whence the 'hybrid' name).

The two primary techniques and related technologies were thoroughly designed, modeled and computationally simulated by Stara Glass and Università degli Studi di Genova with the help of Stazione Sperimentale del Vetro, were implemented by Stara Glass in three Italian plants and were thoroughly tested during several experimental campaigns by SSV and Stara Glass.

After three years of project activity and three successful industrial-scale installations, the goal can be considered achieved, since primary reductions of the order of -30% in the production of thermal NO_x in the three project furnaces has been achieved with both technologies.

Moreover, another positive result of the project has been the definition by SSV of a tailored experimental procedure for the complete, integrated and simultaneous study of gaseous streams within end port glass melting furnaces, that was developed to validate the results of numerical simulations performed during the project and to accurately assess the impact of the implemented PRIME Glass technologies on the glass production process and on its emissions.

INTEGRATED EXPERIMENTAL APPROACH

This dedicated characterisation method co-ordinates several sampling techniques, custom-built probes and analytical instruments into a single integrated approach. It is capable of providing a detailed mapping of flue gases (or combustion air) local compositions, temperatures and pressures in several parts of the furnace system, like the port neck or the top or bottom of the regenerator, at the same time. From this crucial information, it is then possible to elaborate an even more complete picture of the system, for example drawing estimates on cold air infiltrations, gaining insight on combustion and post-combustion reaction kinetics, assessing energy recovery efficiency, mapping the regenerator workload etc. This allows SSV to perform a thorough evaluation of furnace behaviour and performance.

The tools required for the task are deployed to the production site in the SSV mobile laboratories, ie custom-built vans or caravans, each equipped with several gas conditioning systems and analysers (FTIR, chemi-luminescence, FID, electrochemical cells etc), data acquisition units, calibration tanks, etc. Water-cooled probes for gas sampling, micro manometers and suction pyrometers for measurements on high temperature streams are then installed in several critical spots of the system, first on one side of the furnace and then on the other.

The best configuration for collecting the most complete information on the system is the deployment of sampling probes in the port neck, the front (closer to the

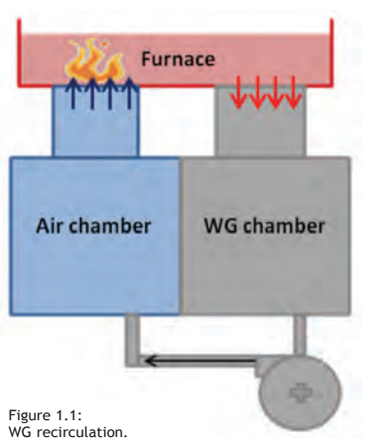


Figure 1.1:
WG recirculation.

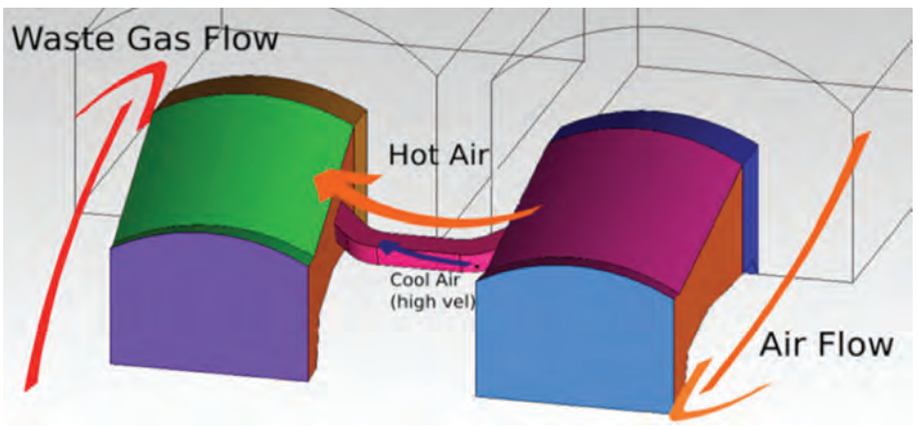


Figure 1.2: Hybrid air staging.

Originally published in Glass Worldwide, preferred international journal of AIGMF

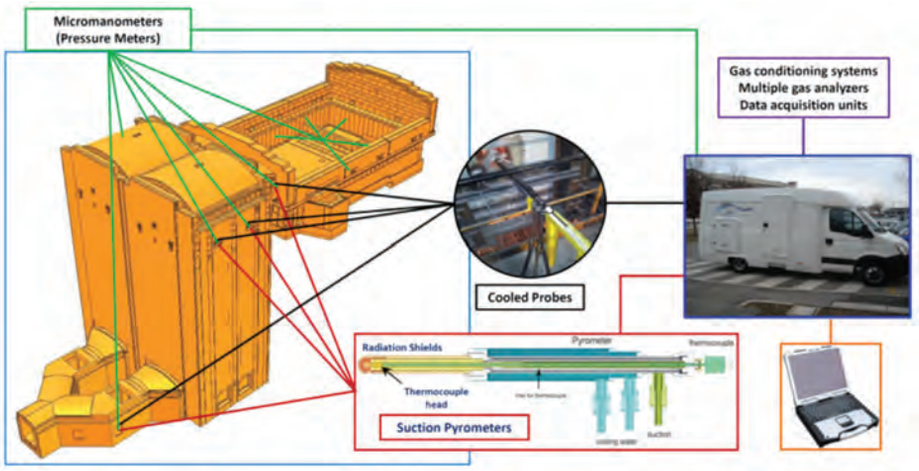


Figure 2: Schematic representation of the deployment of analytical equipment for the complete characterisation of end port furnaces with the SSV integrated approach method.

furnace) and the rear of the top of the regenerator chamber and the bottom of the regenerator (or the waste gases duct close to the reversing damper). Measurements of pressure from several peepholes all around the furnace are usually performed spot-wise; see figure 2 for a detailed diagram.

The experimental approach can be further tailored to specific needs on a case-by-case basis. For example, when there is strong interest in evaluating the emissions of the plant as a whole, additional sampling probes are installed in the stack and measurements of combustion species (NO_x, SO_x, CO_2, H_2O, CO, O_2), dust, acid gases (HCl, HF), volatile metals (eg Pb, Se, Ni, As) etc are also performed according to international standards. When an assessment of energy performance or combustion optimisation are required, carryover measurements, endoscopic inspections for flame shaping and thermographic scanning (both external and endoscopic) can also be applied.

If the plant layout allows the handling of 4.5m long probes, a detailed mapping of flue gases and air compositions above the whole area of top checkers of the regenerator can be achieved by sampling at various depths of probe insertion, that is at increasing distances of the suction tip from the outer sidewall of the chamber.

CASE STUDIES

In the PRIME Glass project, the accurate mapping of combustion air composition at the top of the chamber and in the port neck was instrumental in validating the CFD simulations of the strategic waste gases recirculation system and in studying the actual spatial distribution of waste gases injected into the air stream at the bottom of the regenerator.

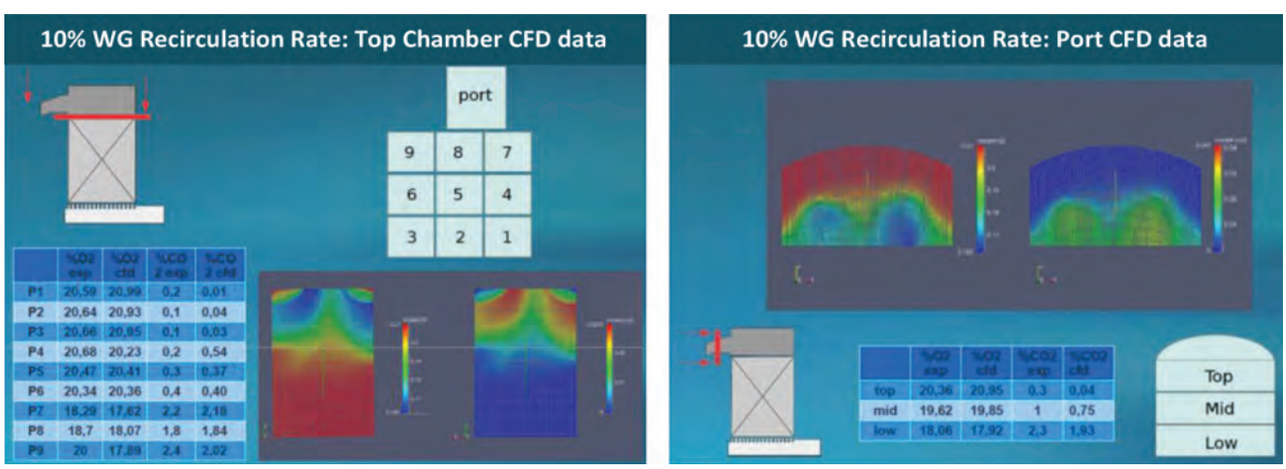
During the campaigns of operative trials performed on two plants where this technology was installed, the SSV team operated simultaneously with two 4.5m long, custom-designed, water-cooled probes for gas sampling at the top of the regenerator, mapping chemical compositions of air at three increasing depths from two or three peepholes in the sidewall; one 2m long water-cooled suction pyrometer with an S thermocouple (for high temperature streams); one 2.5m long suction pyrometer with a K thermocouple (for temperature measurements at the bottom of the regenerator); several curved alumina 99.7% probes in the port neck at different heights for chemical analyses; and additional probes in the plant's stack for 'final' emissions characterisation.

An example of the resulting experimental chemical mapping, obtained from measurements lasting several inversions, is reported in figure 3.2, together with the corresponding thermo-fluid-dynamics simulation data of chemical compositions and temperature profiles (figure 3.1).

From the comparison of data of figures 3.1 and 3.2, it is easy to notice the good match between CFD model and real measurements, demonstrating the successful segregation of flue gases injected by the PRIME Glass recirculation system towards the bottom layers of the air stream, thus creating an O_2-depleted zone at the root of the flame (high temperature region closer to the burner), which in turn is effective in keeping the NO_x formation rate low.

Application of the recently refined SSV integrated approach to flue gases characterisation was also instrumental in studying the effects of the PRIME Glass hybrid hot/cold air staging system. In this case, the simultaneous compositional mapping of combustion gases both in the port and in several points of the top chamber allowed SSV to investigate both the kinetics of out-of-furnace post-combustion of CO and the fluid dynamics of the mixing between flue gases and staging air.

Experimental analyses performed with the integrated approach method, using an analytical setup >



	%O2 exp	%O2 cfd	%CO 2 exp	%CO 2 cfd
P1	20,59	20,99	0,2	0,01
P2	20,64	20,93	0,1	0,04
P3	20,66	20,95	0,1	0,03
P4	20,68	20,23	0,2	0,54
P5	20,47	20,41	0,3	0,37
P6	20,34	20,36	0,4	0,40
P7	18,29	17,62	2,2	2,18
P8	18,7	18,07	1,8	1,84
P9	20	17,89	2,4	2,02

	%O2 exp	%O2 cfd	%CO2 exp	%CO2 cfd
top	20,36	20,95	0,3	0,04
mid	19,62	19,85	1	0,75
low	18,06	17,92	2,3	1,93

Figure 3.1: CFD simulation of waste gases injection into combustion air at a 10% recirculation rate.

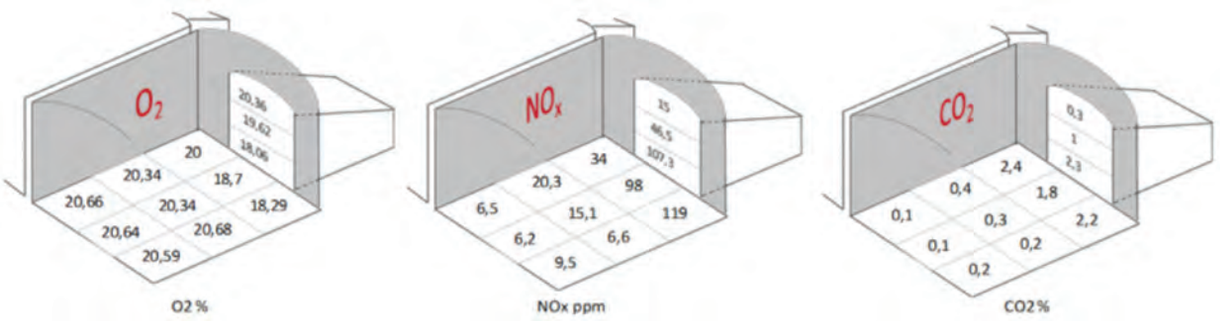


Figure 3.2: Experimental mapping of combustion air composition at 10% recirculation rate.

(probes, sampling points etc) similar to that applied during waste gases recirculation trials, demonstrated that in low ratio/high staging air injection conditions, a low NO_x combustion can be successfully achieved; reductions of NO_x emissions as high as 30%-40% were registered.

Moreover, the high CO levels that are reached in the port neck due to the low excess air combustion conditions realised inside the furnace were demonstrated to be successfully post-combusted before entering into the regenerator. Five out of six top chamber CO values in figure 4.1 reporting the deltas between air staging 'off' and 'on' conditions are in fact negative differences, ie represent lower CO concentrations. Very good agreement between experimental data and CFD modeling was also encountered, with a good match between simulated and real 'good mixing' (low CO) and 'poor mixing' (high CO) zones, as can be seen by comparing figures 4.2 and 4.1.

The information that can be acquired exploiting the SSV integrated approach, however, is not limited to the compositional mapping of high temperature gaseous streams. Interesting furnace health indicators can be obtained indirectly. For example, the distribution of regenerator workload (ie localisation of preferential flow zones) can be evaluated from the thermal mapping of the top of the checkerworks during the inversion time, especially right after flame reversal. The amount of cold air infiltration in several parts of the system can be inferred from the differences between O_2 concentrations in flue gases, eg between port and top chamber, or between top and bottom of the regenerator. An estimation of the energy losses caused by cold air infiltration can be inferred from temperature measurements performed with suction pyrometers etc.

CONCLUSIONS

The PRIME Glass project played a key role in fostering the development and implementation of the SSV integrated experimental approach to gaseous streams characterisation. Thanks to this recently perfected method and to the related custom-designed equipment, the validation of the results of numerical simulations performed during the project and the precise evaluation of the impact of the innovative PRIME Glass technologies on glass production emissions became possible.

With the integrated approach, it is now possible to gather in a co-ordinated and simultaneous way a wealth of information on glass melting furnaces, such as compositional and thermal mapping of air and flue gases in several parts of the furnace, quantification of cold air infiltrations and associated energy losses, assessment of the regenerator's efficiency and workload distribution, characteristic combustion behaviour (ie 'smoke point' curves) and much more. This in-depth analytical tool is now applicable to all end port glass melting furnaces. The upgrade of this custom-built equipment for its extension to cross-fired regenerative systems is also being engineered. ■

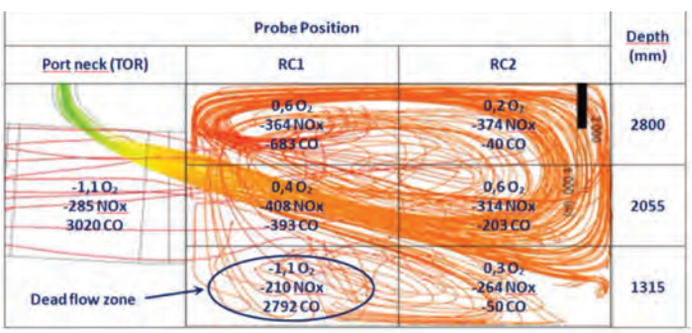


Figure 4.1: Flue gases experimental mapping in 20/80 Nm^3/h air injection setup (high staging air flow rate), superimposed to CFD simulation data on flue gases/staging air mixing. Reported values highlight the difference between air staging 'off' (baseline) and 'on' conditions.

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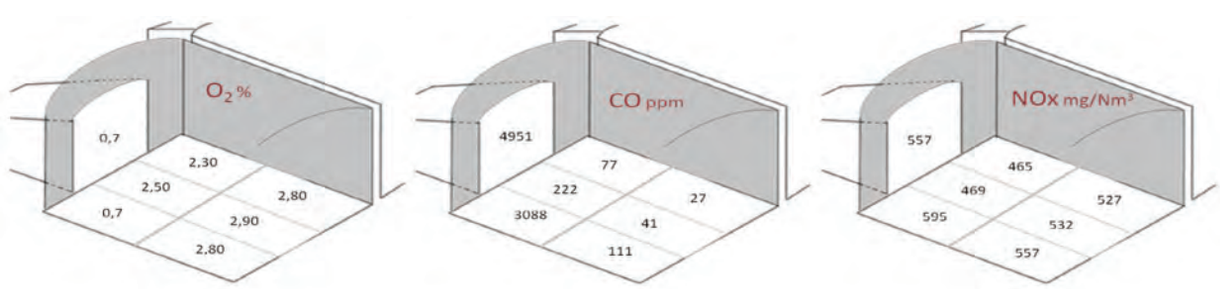

Figure 4.2: Flue gases real mapping in 20/80 Nm^3/h air injection setup (high staging air flow rate).

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Glassy Ceramic Glazes for the Glass Industry – Part I

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Abstract

Glass is a distinct field of study. Ceramics on the other hand is also a vast field of investigations. Both have a variety of applications for human consumption. Glass is an important component in glazes for making ceramic products that not only cover the biscuit-fired ceramic-wares, but also adds to them the required colour and design from beautification point of view. In this article, the importance of ceramic glazes is described briefly. Different raw materials are used for various purposes that are both chemical and physical. Before elaborating on different compositions, some details are given here in the Part-I of the article on ceramic chemistry and glaze preparation techniques.

INTRODUCTION

First of all, it should be emphasized that there is a significant difference between ceramics and glass products manufacturing. The oxide and non-oxide ceramics in powder form (mixed with little or no water to make dry/moist solid or liquid) are fabricated by various manufacturing techniques for a variety of shapes and sizes, and then dried to remove the water (if any) and fired to impart strength so that they can be handled for other supplementary manufacturing processes. Eventually, apart from customer appeal, they must be mechanically stronger for handling during their usage. However, for glass manufacturing, mainly oxides, carbonates, nitrates, etc. are homogeneously mixed and then directly melted in a typical glass tank furnace at very high temperature (over 1550^{0}C) depending on the glass composition, viscosity, etc. In any manufacturing process, two types of system are possible. Either it is a batch type, e.g. optical glasses melted in a pot (about 1 to 1.5 ton capacity) to maintain high level of homogeneity, and also special types of glasses – or, it is a continuous process of manufacture, e.g. float glass, container glass, glass fibre, etc. **[1-5].**

Glazes are actually nothing but glasses by physical definition, i.e. the glazes are amorphous non-crystalline materials that have a transformation temperature. However, we talk about these glasses of various colours, we call them "ceramic glazes". So, let us make it very clear that as glazes are glasses -- they become a part of our study. Why a glass company never ventured into the field of making 'glassy' ceramic glazes is altogether a different matter. A major part of ceramic products, such as crockery, dinner-ware, sanitary-ware, floor and wall tiles, etc. are glazed with glassy materials having the impervious character that is also chemically resistant.

Let us mention about a verse: "A thing of beauty is a joy for ever". In this verse, the famous English poet Keats immortalized the beauty of a superbly glazed and decorated Grecian Urn. The resplendent luster and beauty of ceramics have fascinated the people all over the world in all ages, so much so that glazes and decorative ceramicwares have become period pieces and have adorned the shelves of museums and almost all connoisseurs of art. This trend still persists in very modern ages, when there are many alternative pieces of materials and specific pieces that are available in the market. In a previous article in Kanch **[6]**, the glass-wares with high aesthetic or artistic values were described in details based on the visits to some old US companies

and museums where they are vividly displayed for public to appreciate. In the same manner, the beautiful ceramic-wares (mainly crockery, dinnerware, flower vase, etc.) are also on display to show their beauty in many other museums.

It should be pointed out that the glazes of ceramicwares are not only of cosmetic value, but it is also of a necessity for different physical and chemical characteristics, such as:

a) Glazes make the fired ceramicware bodies impervious,
b) Mechanically strong,
c) Abrasion resistant,
d) Corrosion resistant, and more importantly
e) Chemically inert.

These extra, but necessary, benefits are in addition to making the ceramicwares decorative and aesthetically appealing to customers. From business point of view, some of the ceramic articles compete well with glass products, such as container glasses for food items, where chemical inertness is of utmost importance. In that sense, both glasses and ceramic glazes can be made to resist chemical attack – so the competition is quite tough. A comparison is not made here, as the purpose of this article is little outside its scope. In the following, a brief outline will be given on ceramic glazes and some other relevant details are given in order to be able to throw more light on the chemical side of the story. Here, it is important to write a few lines on the importance of ceramic chemistry in the study of ceramic glazes.

CERAMIC CHEMISTRY

Ceramic chemistry studies the relationship between the physical properties of fired ceramics and ceramic glazes, and their chemistry. It is true that ceramic engineers have long understood many of these relationships, but the advent of computer software to automate the conversion from batch to formula. Consequent analysis has brought this science within the reach of many more people. Physical properties of glazes in fired products, such as thermal expansion, hardness, index of refraction, colour and melting temperature or range, are directly (but not solely) related to the chemistry. The properties of glass melts, such as viscosity and surface tension, also involve chemistry, e.g. an increase of soda content in glass composition would decrease the viscosity thereby making the molten glass little bit "soft" that makes the processing more difficult and vice versa.

Ceramic technologists in the ceramic tile, tableware, artware, pottery, sanitary-ware, glass, fibreglass, bottle glass, optical glass and related industries all use this science, and the relationships of physical properties with chemistry of the composition. In ceramic chemistry, fired glazes are viewed as composed of oxides, e.g. SiO_2, Al_2O_3, B_2O_3, Na_2O, K_2O, CaO, Li_2O, MgO, ZnO, MnO, Fe_2O_3, CoO, etc. Each oxide is known to contribute specific properties to the melted glass. Many material suppliers publish chemical analyses of their products that cite percentages of these oxides as well as volatile components, i.e. the components that burn away during firing process -- giving off gases and fumes such as H_2O, CO_2, SO_3. Some details are given in the next section on how chemistry is effective in ceramic glazes.

In traditional ceramics, some examples are given here on "what the application of ceramic chemistry can accomplish?". It also enables the following:

1) Fixing glaze defects, such as crazing, blistering, pin-holing, settling, clouding, leaching, crawling, marking, scratching, powdering.
2) Substituting frits, incorporate better, cheaper materials, or replace no-longer-available ones.
3) Adjusting glaze melting temperature, gloss, surface character and colour (in ceramics colours, it is a matter of chemistry).
4) Identifying weaknesses, e.g. proximity to volatile firing zones, use of unreliable materials, in glazes to avoid problems.
5) Creating and optimizing base glazes to work with difficult colours or stains and for special effects dependent on opacification, crystallization, etc.
6) Creating glazes from scratch and use native materials in the highest possible percentage.

In ceramic bodies, the physical properties of the final fired product are often more related to the firing curve, the physical properties, e.g. particle size and shape, decomposition history, of the ingredient materials and the mineralogy and interaction between the different particle types.

CERAMIC GLAZES

During the past several hundreds of years, the design and colours of different ceramic wares, either for daily use or for home decoration purposes, have always fascinated us. In the Figure 1, a Persian flower vase is shown that is a masterpiece kept in the museum, and the Figure 2 shows crockery wares that are used in daily lives, but they are also elegant.

Let us now properly define: What are ceramic glazes? Glazes are thin layers of coatings, which are made of 'low temperature melting' glasses that are fused on ceramic (biscuit-fired) bodies to impart special functional properties and decorative appeal. The glazes have specific chemical compositions, which are obviously different than those of different ceramic bodies. They are

designed in a way to make the glass formation possible. Ceramic body, such as dinnerwares, sanitarywares, even tiles, is mainly composed of clay (alumino-silicates), feldspar (source of alumina and soda) and quartz (pure silica). After such a composition is mixed and formed into different shapes and sizes, they are fired to give initial strength for handling etc. – called biscuit-firing, which has a lot of porosity, i.e. not impervious. So, glazes are required for not only covering this type of porous bodies, but also imparting mechanical and chemical strengths.

Figure 1: Persian Flower Vase with Cobalt Blue Decoration and Art-work (in Chinese and European museums, such examples can also be found)

Figure 2: Ceramic Crockery Wares with Cobalt Blue Glaze Design

For making glazes, certain specific raw materials and chemicals in proper proportions are ground to a desired fineness and then thoroughly mixed in a mixer. Then, this mixture is smelted in small rotary kilns/furnaces (mostly with gas firing) to form low temperature glassy melts. The molten glasses are suddenly quenched in water to make "Frits", which are amorphous in nature like glasses. These "Frits" are then used for applying a coating on ceramic bodies, after making certain preparations for forming thin slurry with specific viscosity. The thickness of such glaze coatings can be controlled as desired. Normally, it is applied on ceramic bodies either by dipping (for delicate items) or simply by spraying when the viscosity of the "slurry" should be correct to the need of the process.

The main purpose of fritting is to render the soluble constituents in the mixture insoluble and also to attain a uniform specific gravity to avoid different sedimentation of the melt during the smelting process. Moreover, it converts the hazardous constituents into harmless compounds. There are different types of ceramic glazes: these can be raw, fritted or partially fritted. Fritted and raw glazes can be both transparent and opaque. Raw glazes are used in sanitary-wares, 'single fired' wall and floor tiles, bone-china crockery (i.e. translucent body), earthenware crockery (i.e. opaque body).

Ceramic Glazes can be considered as a glass coating, either clear transparent or, with the addition of a transition metal in any of several forms, in a rainbow of colours. They may also be glossy or matt, translucent or opaque, smooth or even textured. The effects are limitless depending on formulation, application and combinations. One should not generally hesitate to try new combinations, but it has to be always tested first.

Glazes are formulated as a mixture of ground, powdered ingredients which, by their nature, do not dissolve but are merely suspended in water. Glazes do not get spoiled with age but, it is critical that the batch or bottle be mixed thoroughly before each application, due to the fact that different ingredients tend to come out of suspension at different rates. This may be done with a spatula, an electric mixer or simply by shaking a bottled glaze, but one must be certain there is no glaze remaining as 'cake' or 'sediments' at the bottom, then one might loose some of the important components in the glaze formulation.

Good glazing begins with properly fired and clean biscuit-fired, i.e. after first firing of earthenware products. Single firing (glaze applied to green-ware) is not recommended with today's glazes. Proper biscuit-firing is done at a temperature high enough so that the organics and water have been driven off, and certain other (ceramic) reactions have occurred but not so high that the porosity necessary to 'hold' the glaze on has been eliminated. Technically, this would be different for different china-clays. Generally, low fire, say at 1020°C glazes on low fire china-clays should be bisque fired at 50°C hotter than the recommended glaze firing temperature. Wetting overly porous bisque will reduce the porosity and help in getting an even glaze application. If bisque is not porous enough due to over firing or if additional glaze needs to be added to an already glazed and fired piece, heating the piece in the oven or on top of the kiln before applying the glaze may help by opening the pores.

Glazes are not "sticky" but adhere to

biscuit-fired bodies before firing by penetrating the porous clay and after firing this bonding is increased by a degree of interaction of the glaze melt with the surface of the clay. Thus, any dirt, dust or bonding is increased by a degree of interaction of the glaze melt with the surface of the clay. Thus, any dirt, dust or oil on the bisque that even slightly prevents the glaze from soaking into the clay can cause the glaze to "lift" or "crawl" in firing, leaving unglazed spots or pin holes due to excessive gas release. Prepare bisque by wiping it with a wetted and well squeezed sponge, chamois or other non-shedding material to remove dust. Make certain that the hands are clean when handling bisque. Even body oils can cause problems.

In order to give desired property to a particular glaze, it is very important that a proper calculation is made to ascertain the correct amount of different components in glaze compositions, which is the subject matter of the second part of the article. The concept can also be utilized in the glass industry – particularly when certain glass companies are trying to make decorative pieces of "wall tiles" that can be used in certain areas of living or dining room in the apartment buildings without involving too much cost.

CONCLUSIONS

Ceramic glazes are basically glasses with an amorphous or non-crystalline structure, based on silicate networks with some modifying atoms to change certain properties and with required 'flowability' to make an impervious cover over the ceramic-wares. This is also made in different colours with the trace additions of transition metal ions that can be sometimes done with various layers of colours. Some more details on ceramic chemistry that is also relevant for glass industry is given here. In the second part of the article, the chemical calculations encompassing the glaze formulations are given in details.

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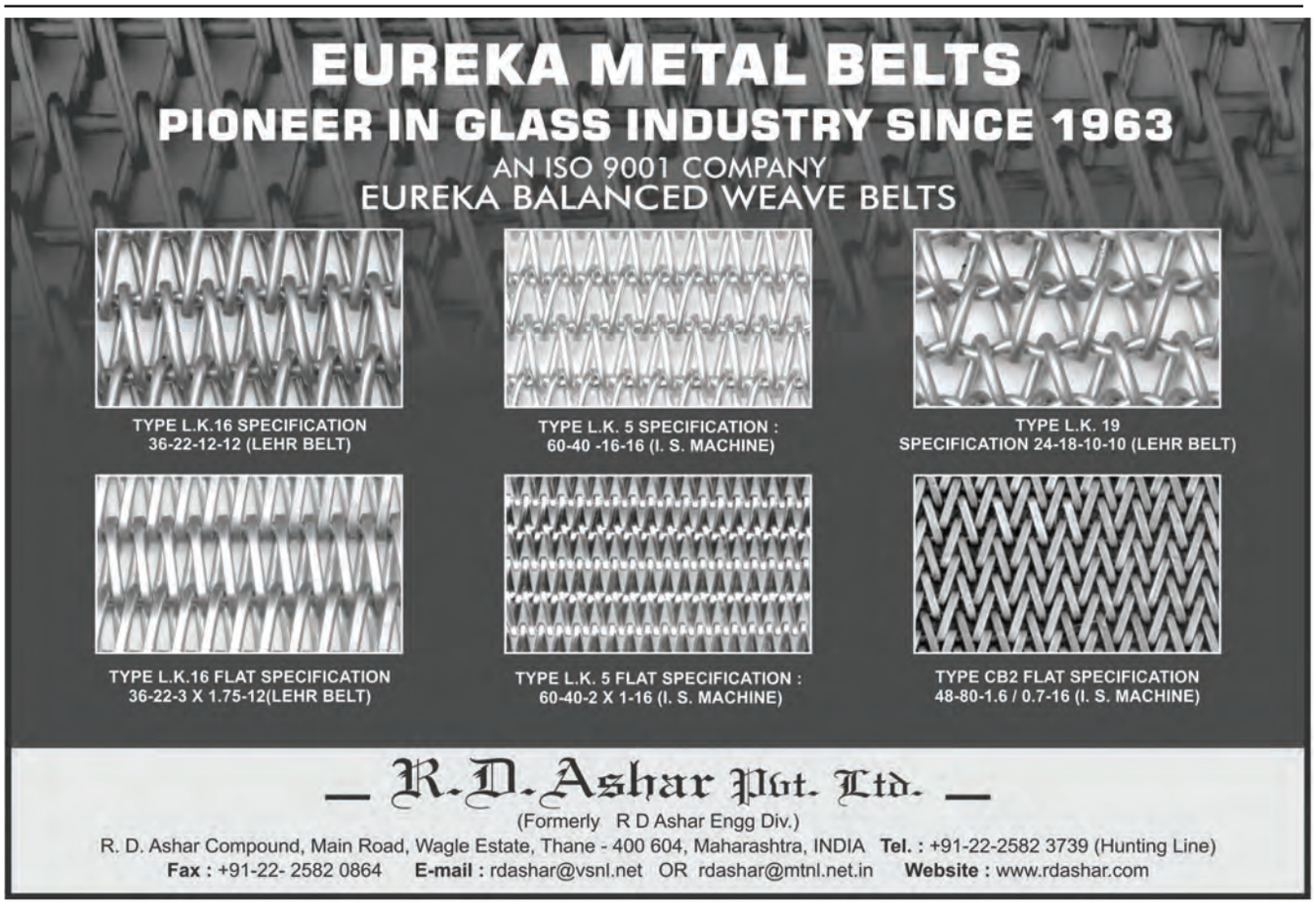

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Gopal Ganatra talks about Role of Asahi India Glass in Automotive and Architectural Glass

With 18 years of work experience, Mr. Gopal Ganatra has been with AIS for the last one decade and has spent last six years in various senior management positions. Mr. Ganatra is a qualified CS, LLB and MBA (major in Finance and Marketing and minor in Strategy) from MDI, Gurgaon. Besides spearheading the Legal, Governance (including Internal Audit) and Investor Relations roles from corporate headquarters of AIS, Mr. Ganatra heads many strategic and operational CFTs within AIS.

Asahi India Glass (AIS) is India's leading integrated glass solutions company and is a dominant player both in automobile and building material. It commands about 78% share in the Indian passenger car glass market and has an established track record of about three decades. Established in 1986, AIS footprint today spans the entire spectrum of the automotive and architectural glass value chains. It is a sand-to-solutions organisation with products and services for both institutional and retail customers.

The Company's origin can be traced to the JV agreement between the Labroo family, Asahi Glass Company (AGC), Japan and Maruti Suzuki India Limited in 1984. As a promoter group, the three entities jointly hold about 55% of paid-up equity capital of AIS with the balance 45% being held by the public.

According to Mr. Ganatra, "High-performance glass is an integral part of any building in a Smart City. These glass products are capable of huge energy savings, plus glass is a 'green' material and is 100% recyclable. AIS is fully-positioned to cater to this opportunity."

Gopal Ganatra
Executive Director, Asahi India Glass

WHAT IS THE IMPACT OF GST ON THE OVERALL GLASS INDUSTRY AND THE COMPANY IN PARTICULAR?

GST is a very welcome step for the glass industry and specifically, at AIS, we are broadly happy with the new tax regime. We firmly believe that GST will significantly widen tax base and compliance. This would, in turn, allow AIS to address more business opportunities in some unorganised/ smaller market segments, where we were forced to be uncompetitive solely due to the innovative ways of tax evasion under the earlier tax regime. We now have a level playing field to pitch our highly competitive value proposition into these segments also. We have also made a representation to the government for bringing petroleum products, mainly natural gas, under the GST ambit for obvious benefits to everyone.

DO YOU OVERSEE ANY IMPACT ON THE COMPANY DUE TO THE SLUGGISH GROWTH IN THE REAL ESTATE INDUSTRY?

Last year remained yet another subdued year for the real estate industry. Affected by demonetisation, RERA and run up to the GST, the construction sector remained muted with 1.7% growth. Our sales were flat in the institutional segment as very few large projects came up for bidding and closure. However, our sales in the distributed market remained strong with the introduction of a range of new value-added products which were well-received by the market.

Our outlook for the real estate industry remains very positive and we are very bullish with our range of high-performance value-added products and integrated solutions. Further new regulations like Energy Conservation Building Code (ECBC) and National Building Code (NBC) which were recently released by the government are very positive for AIS. Both these regulations are forward-looking and very positive for the industry and consumers. Energy, safety, acoustics, daylighting and fire protection in

a building, some of which are key ingredients of 'Green Building' are all possible through the correct use of value-added glass and are very well addressed in these Regulations. We are very confident of strong demand for glass solutions in the near future.

PLEASE SHARE YOUR ORGANIC AS WELL AS INORGANIC GROWTH PLANS?

We are already in the midst of refurbishing and restarting of our second float glass line at Taloja (Maharashtra) with the latest technology and with the ability to produce high value-added glass at a capex of approx Rs 300 crores. The project is as per schedule and we shall start production in Q3, FY 2017-18. This expansion shall give us additional capacity to produce 550 tons of float glass per day and will increase our top line by approximately 60% from FY 2018-19. This expansion will also further strengthen our ability to service our customers through better product mix and also give AIS the highest grade of glass for internal value-added purposes like mirroring, hard coating, soft coating and high-level processing. Most importantly, this will have the capability to make the highest standards of automotive raw glass giving us 100% capability to make our own automotive glass.

We are also to begin work at our fifth automotive glass plant - a new green field project in Gujarat - mainly to service the requirements of Maruti Suzuki in Gujarat. Our Gujarat project shall be a state-of-the-art automotive glass plant with the latest global technologies with the ability to manufacture all value-added glass products for automotive requirements. AIS shall make an investment of up to Rs 500 crores in this project in two phases. In the first phase, the plant will have capacities to produce about 1 million laminated and 1.2 million tempered glass sets per annum. Our Gujarat plant will further strengthen our scale, flexibility and ability to seamlessly service our customers across India.

DO YOU SEE SMART CITIES REVAMP THE ENTIRE GLASS INDUSTRY GOING FORWARD AND WILL IT EMERGE AS AN OPPORTUNITY?

Yes, Smart Cities initiative of the government is a huge opportunity for the glass industry, especially for those who have the range of high-performance value-added glass products and integrated solutions. High-performance glass is an integral part of any building in a Smart City. These glass products are capable of huge energy savings, acoustic solutions, safe and serene building spaces as well as fire protections. Plus, glass is a 'green' material and is 100% recyclable. AIS is fully-positioned to cater to this opportunity and is already working closely with various government and other agencies towards this mission.

WILL YOU PLEASE GIVE US A BROADER PICTURE OF THE COMPANY'S PLANT WISE CAPACITY UTILISATION?

We are operating at 100% capacity in our float glass plant. All our automotive plants are operating at optimal capacity utilisation levels to enable us to cater to our customer requirements and maintain our market share of 78% in the automotive segment.

WILL GOVERNMENT-AIDED SCHEMES FOR AFFORDABLE HOUSING LEAD TO GROWTH IN AIS REVENUE?

All the government-aided schemes are a huge boost to the glass industry. Glass is a very friendly construction material with almost ZERO maintenance costs. AIS has a range of products for every segment of the market and we are very happy with the government's boost for affordable housing. This will only increase use and penetration of glass in India■

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$$\sigma_{Th} = \sqrt{\frac{\frac{E\gamma}{a}}{(\frac{\pi\delta}{\lambda} + \frac{2\pi^2\delta^2}{\lambda^2})}}$$

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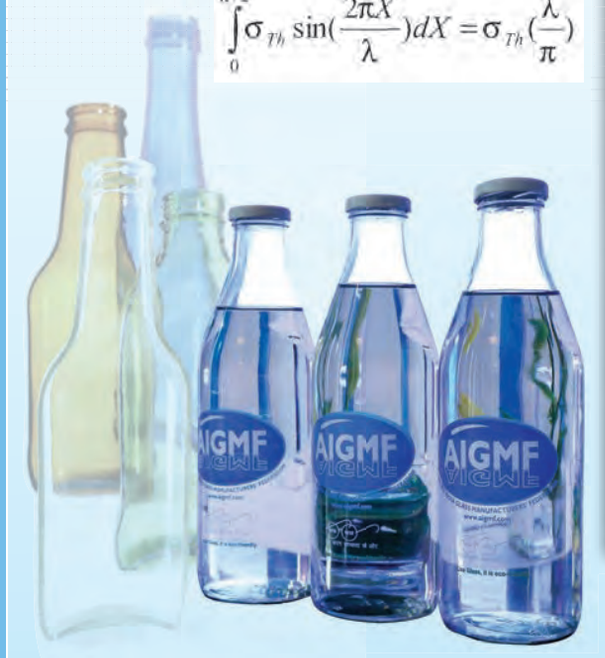

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The benefits of two-leg versus three-leg power control

René Meuleman described to *Glass Worldwide* how investing in up-to-date power control can reduce both CAPEX and OPEX.

Traditionally, three-leg power control is still used in three phase heating applications. In some cases, however, this type of control is not a necessity and two-leg control can be a better option. Technological developments in SCR (silicon controlled rectifier) power controllers combined with the latest system design methods have resulted in solutions that help reduce capital and operational expenditure. So what is two-leg control and what savings can be made compared to the three-leg method?

Traditional three-leg power control is needed for three phase applications running in grounded star configuration, or where SCRs are situated in a delta configuration. However, not all applications have these requirements, for example the control of SiC (silicon carbide) element-based tin bath roof heating. In these situations, more suitable control methods can be utilised to greatly improve the energy efficiency, overall load management and robustness of these systems, while remaining economically competitive.

Eurotherm carefully considered these types of application during the development of the EPower SCR controller, based on over 50 years' experience in the design and manufacture of power control products, systems and services for the glass industry. The result was an advanced, robust product line, specifically designed to help customers meet their growing efficiency, reliability and economic viability requirements in high quality, high throughput processes.

TWO-LEG CONTROL APPLICATION

Traditional three phase SCR power systems have an SCR in each leg. This is a requirement in applications running in grounded star configuration, as shown in figure 1, or where the SCRs are situated in delta configuration, as shown in figure 2.

However, these requirements are not needed to control certain types of application, such as SiC element-based tin bath roof heating systems in the glass industry. This was one of the most important types of application considered by Eurotherm during the design of the EPower range in terms of possible efficiency improvements. This resulted in the proposal of using two-leg burst firing control, either in star or delta configuration in this situation, as shown in figure 3 and figure 4.

POWER EFFICIENCY CONSIDERATIONS

Each SCR dissipates approximately 1.3 watts per amp through the SCR. Using two SCRs instead of three to control the power applied to the roof zone means the power losses in the SCR controller are reduced by 33%. Since these systems are most often installed in air-conditioned environments, these energy savings will also have a beneficial effect on the energy consumption of the cooling systems, as well as robustness of the overall power control system.

The EPower controller was designed to run at 690Vac, which helps reduce the overall current in the system,

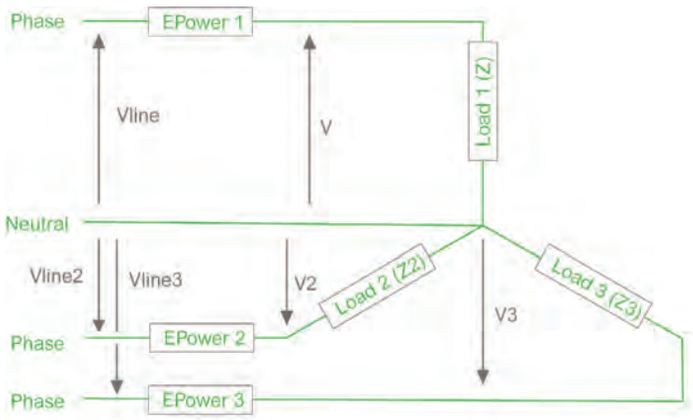

Figure 1: Grounded star three phase power supply control using three-leg control.

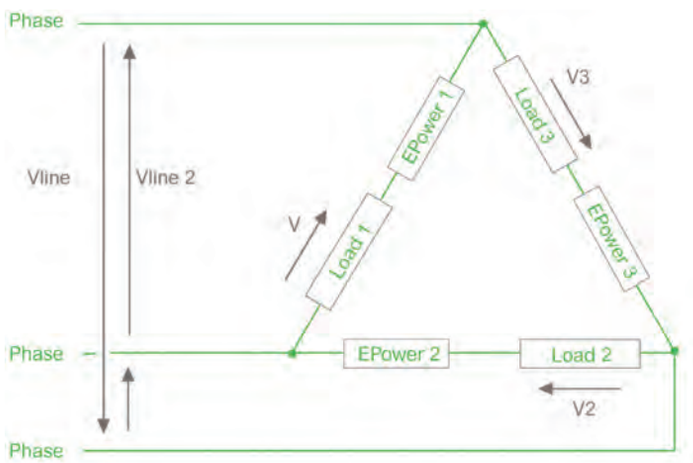

Figure 2: Delta configuration three phase power supply using three-leg control.

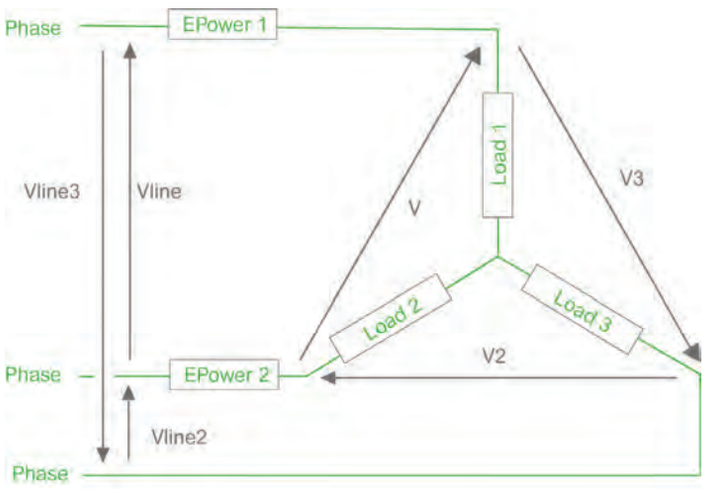

Figure 3: Star three phase control using two-leg EPower control.

Originally published in Glass Worldwide, preferred international journal of AIGMF

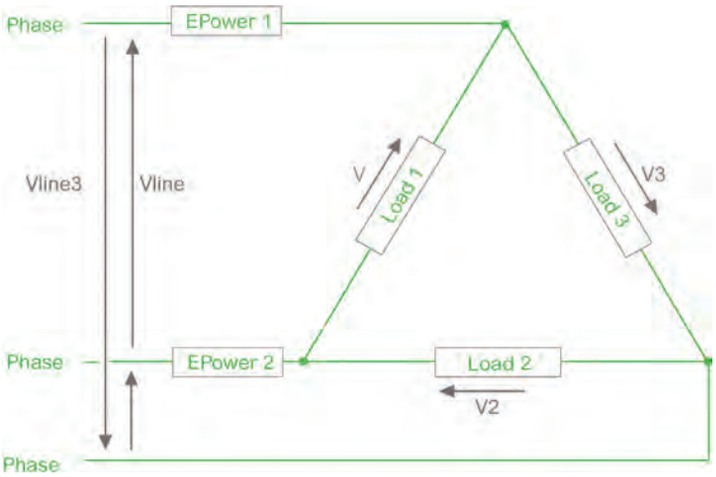

Figure 4: Delta three phase control using two-leg EPower control.

dissipate less power and reduce operating costs. It is also capable of controlling two zones in one four way power stack device (in two times two-leg control), which reduces the overall power equipment requirement.

REDUCING THD

In order to run these systems at the highest possible power factor and lowest THD and to make two-leg control possible, these systems are controlled in burst (zero crossing) mode. Although the load is turned on at zero crossing, it will never be possible to switch all three phases on at the same time and at zero crossing. In other words, it is physically impossible to avoid return paths, which result in clipping and harmonic distortion. In this respect, depending on the system design, it is often better to run the system in two-leg control instead of three-leg, as it lowers the possibility of harmonics.

In the case of roof heating systems, the load is dominantly resistive and balanced. Since the sum of currents in the system equals zero, in two-leg control EPower measures the current in two legs and the current in the third leg can be calculated.

DEALING WITH PEAK POWER DEMAND

To help prevent multiple burst fired zones from causing excessive peak power demands, EPower provides a sophisticated predictive and self-tuning power management strategy called Predictive Load Management (PLM). More information on this subject can be found in Eurotherm's white paper 'Using predictive strategies for better performance'.

CAPEX AND OPEX CONSIDERATIONS

With the capability to run four SCR power control modules in one base, EPower can accommodate two-zone-control in one device, which reduces the overall cost of equipment. At the system design stage, it is wise to consider this useful feature to reduce operating cost by combining important zones in frequent use, with unimportant normally unused zones. If properly designed, such a configuration will operate as and when required.

Eurotherm by Schneider exhibited at glasspex INDIA 2017.

IMPORTANCE OF TRANSFORMER DESIGN AND CONTROL

Care needs to be taken when connecting the supply to the transformer to prevent the inrush current from exceeding the SCR's maximum current rating and subsequently blowing the semiconductor fuse. The inrush current can be around 20 times the normal running current, depending on the flux density of the transformer. In the example of tin bath roof heating applications, transformers with a low, <1.25 flux density rating should be used. EPower allows higher, however, up to 1.35 tesla.

Considering the B-H (magnetic flux density - magnetic field strength) curve, it is a matter of chance, where on the curve the equipment is left on disconnection. The residual magnetism in the transformer core is therefore not known at re-start, so to help prevent inrush current, a phase angle ramp is applied. This technique is referred to as 'soft start' and is also applied when current limiting is required at start-up of the load.

Switching the thyristors at zero crossing on the primary of the transformer can lead to an over current approximately twice the nominal current. To avoid this inrush, which is due to magnetic flux in the transformer, the first firing of each phase must be delayed until the voltage on load corresponds with the minimum current through the load. To cope with this, Eurotherm has developed a technique of burst firing with delayed first cycle firing. The optimum delay angle can be adjusted to minimise transient over-current, dependent on the transformer, load and Q factors, typically around 60°. Thus inrush currents can be minimised while the benefits of burst firing control are realised.

CONCLUSION

Eurotherm's EPower product line is specifically designed to improve the efficiency of industrial heating applications such as tin bath roof heating in the glass industry. To run these types of system at optimum energy efficiency, highest power factor, lowest THD and with minimised CAPEX and OPEX, Eurotherm recommends the use of EPower to control two zones in one device, using two-leg burst firing control method with predictive load management (up to 64 zones).

If single zone integrity is desired, each zone can have a separate EPower with two power modules. However, the two by two-leg EPower control system has been found to be a low maintenance, cost-effective and energy efficient solution on many roof heating and similar heat treatment furnace applications. ■

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Simple Way of Understanding GST

SN Panigrahi
GST Consultant, Trainer & Practitioner
snpanigrahi1963@gmail.com

Mr. S N Panigrahi's expertise lies in Indirect Taxes - Advisory, Strategic Consulting, Tax Reviews & Designing Tax Efficient Business Models, Due Diligence, Trade Facilitation, Business Solutions, Audit, Compliance Consultancy, Customs & Foreign Trade, Import & Export, SCM, Project Management., GST Implementation & Compliance services.

Mr. Panigrahi has conducted more than 70 workshops on GST – both in-house & open-house.

He is associated with CII-GST Street, MSME, NSDC & FTAPCCI on Indirect taxes.

He is also associated with ASCI (Administrative Staff College of India), NMIMS (Narsee Monjee Institute of Management Studies), iiiEM

His last assignment was with HSIL Ltd., (AGI glaspac as VP – Commercial)

He is a member PMI (USA) & PMIPCC; Member Indirect Taxes, FTAPCCI; Life Member, IIMM.

Indirect taxes in India had been a contentious subject and in a constant state of evolution. Now, with the passage of the One Hundred and First Amendment Act of the Constitution of India enabling the introduction of a comprehensive Goods and Services Tax – GST, the Indian system of indirect taxation witnessed a very significant step in the field of indirect tax reforms in India. By amalgamating a large number of Central and State taxes (Earlier 17 Taxes & and 23 Cesses Subsumed now). In this short notes let us understand basic Concepts of GST in a simple way.

In short, GST replaces most of indirect taxes to create a Single Tax System, Uniform across the Country making entire Nation as a Single Market. That is One Nation – One Tax – One Market.

WHY GST?

By amalgamating a large number of Central and State taxes into a single tax uniformly applicable across the nation and allowing set-off of prior-stage taxes, it would mitigate the ill effects of Multiplicity of Taxes, Cascading Effect, Non-Availability of Cross-Credit and Double Taxation, pave the way for a common national market. For the consumers, the biggest gain would be in terms of a reduction in the overall tax burden on goods, which were previously estimated at 25-30%.

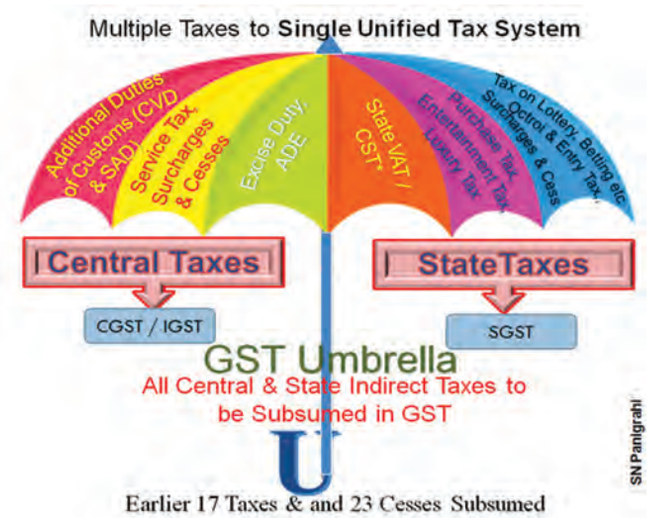
Introduction of GST would also make our products competitive in the domestic and international markets. Studies show that this would instantly spur economic growth. There may also be revenue gain for the Centre and

the States due to widening of the tax base, increase in trade volumes and improved to tax compliance. Last but not the least, this tax, because of its transparent character, would be easier to administer. With the adoption of advanced IT system enabling online filling of returns and other submissions, this will prove to be a biggest step towards digitalization, there by ensure complete transparency and no discriminatory interference of tax authorities. At a glance snap short of why GST is presented below:

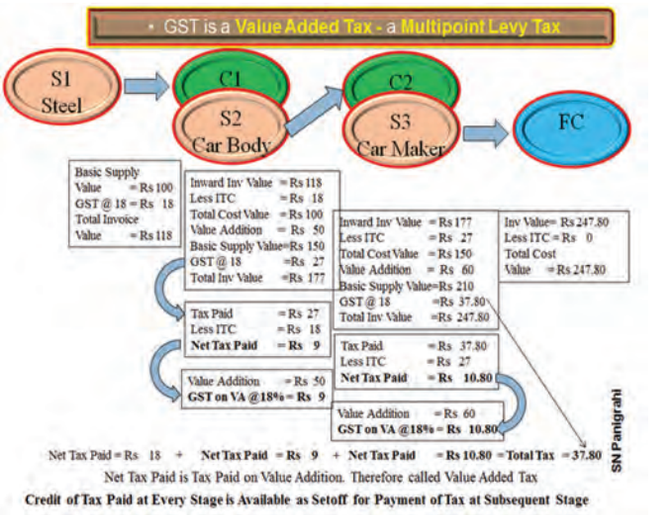
WHAT IS GST?

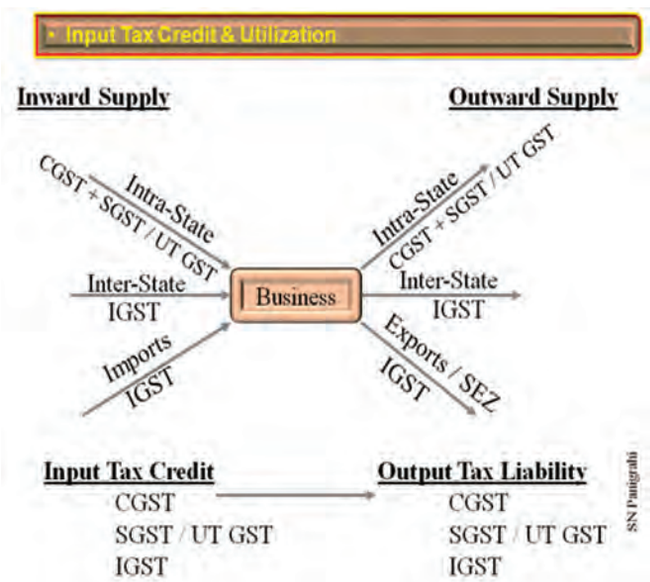
For simplicity of understanding pointwise description is made with some Pictorial Presentation as follows:

- GST unifying Multiple Taxes into Single Tax System by subsuming 17 Taxes & 23 Cesses of earlier tax regime.



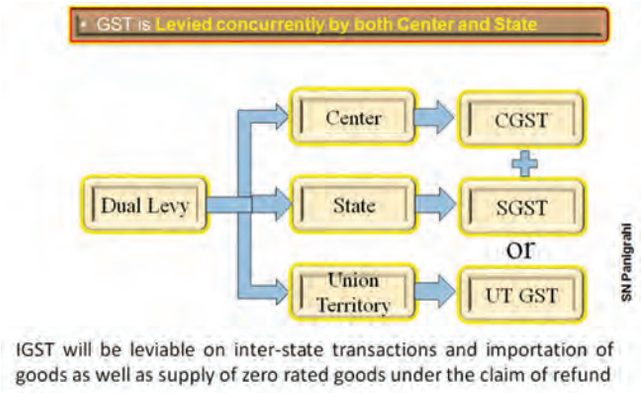
- GST is a Value Added Tax and a Multipoint Levy Tax allowing Seamless Credit. GST is a consumption based tax levied incrementally, based on the surplus value, added to the price on the goods or service at each stage of supply. To ensure that tax is levied only on the amount of value addition at each stage of the supply chain, credit for the taxes paid at the previous stage is granted. As an illustration of the concept see below example where Steel manufacturer supplying Steel Sheets to Car Body Manufacturer. Since the car body manufacturer after value addition supplying car body to car manufacturer for assembling, the car body manufacturer can avail credit of tax paid on his inputs. Such credit can be utilized for his tax liability on his supply of finished goods (car body), therefore his net tax payment is reduced to the extent of credit. Likewise it goes on at every stage by availing of credit of input tax at each stage and utilizing the same while paying tax on final supply.
- Since Tax is Levied at each stage of Supply, GST is also a Multi-levy Tax.
- Seamless Credit is allowed across the entire Value Chain. However credit chain breaks at the point of final consumption.
- Credit can be utilized when there is taxable outward supplies.



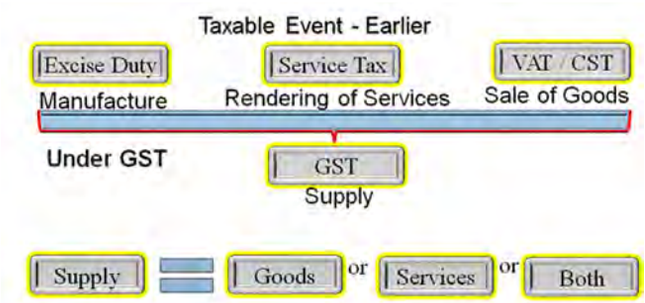


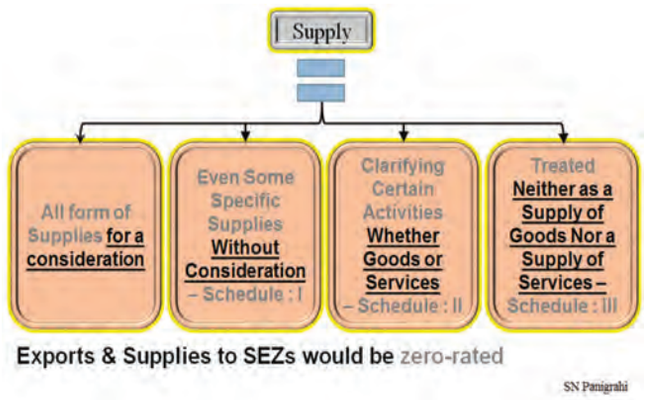
- GST is a Destination based Tax (as the name suggests is the taxation based on destination or consumption of the goods or services – meaning the tax shall accrue to the destination state). Hence, the place of consumption will decide the State that will collect tax. The parody behind destination-based taxation is, the producing/ selling state gets nothing while the consuming states receive complete share of revenue.

- GST is a Dual Tax - Levied concurrently by both Center and State



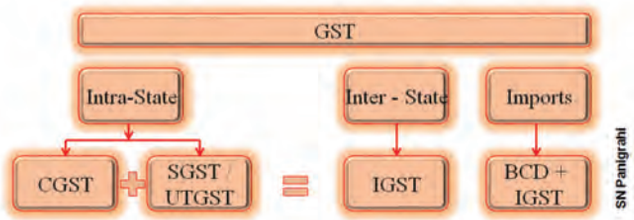
- Supply is the basis for Levy & Collection of GST – The Event for Taxation is Supply.



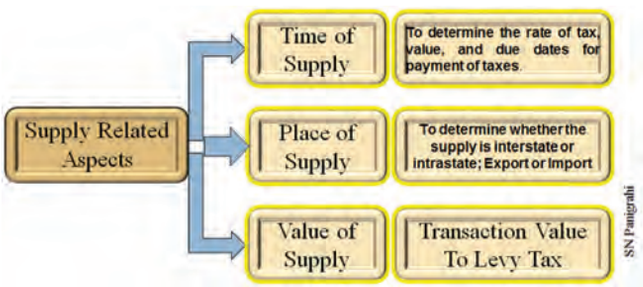


- To constitute a supply, the following elements must be satisfied:
  - The Activity Involves the Supply of Goods, Services, or Both.
  - Supply is for Consideration unless otherwise expressly provided for.
  - Supply Even without Consideration – Schedule -1.
  - Supply is Made in the Course of Business.
  - Supply is Made in a Taxable Territory.
  - Supply is a Taxable Supply.
  - A Taxable Person Makes the Supply.

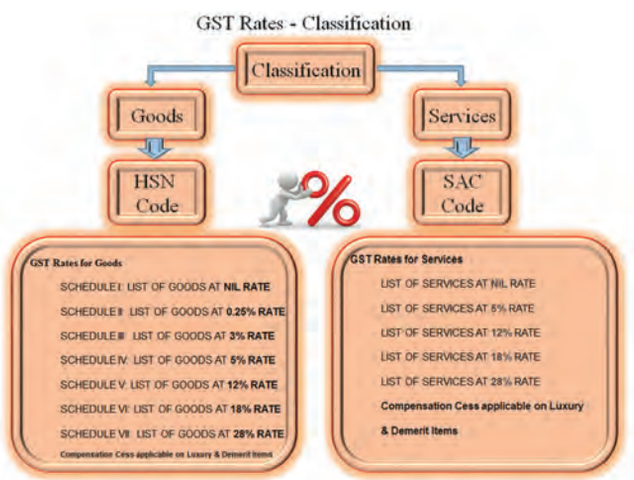
Supplies made within State are called Intra-State Supplies and attracts CGST + SGST. Supplies made out of state are called Inter-State Supplies and attracts IGST.



- Supply related other three aspects like Time of Supply, Place of Supply and Value of Supply are essential to determine and calculate Tax.
- Time of Supply is to determine the rate of tax, value, and due dates for payment of taxes.
- Place of Supply is to determine whether the supply is interstate or intrastate; Export or Import.
- Value of Supply – Transaction value or Price charged is taken as value for levying tax.

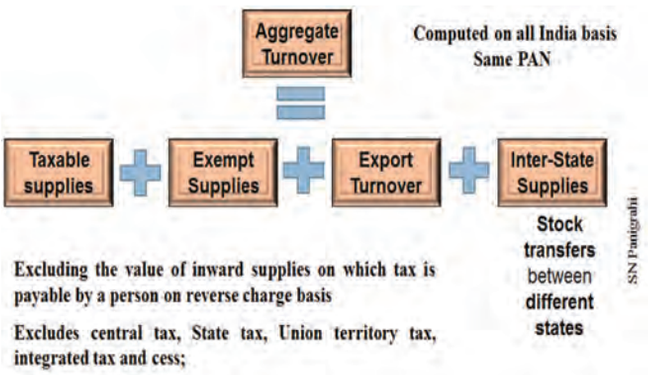


- Goods and Services are classified into various and groups and accordingly Tax Rates are fixed. Goods are Classified based on HSN Classification and Services are Classified based on SAC (Service Accounting Codes).
- Broadly the Rates fall into Four Categories – 5%, 12%, 18% and 28%. Apart from these there will be Nil Rate (exempted category) and Compensation Cess will be applicable to Luxury Items & Demerit Items.

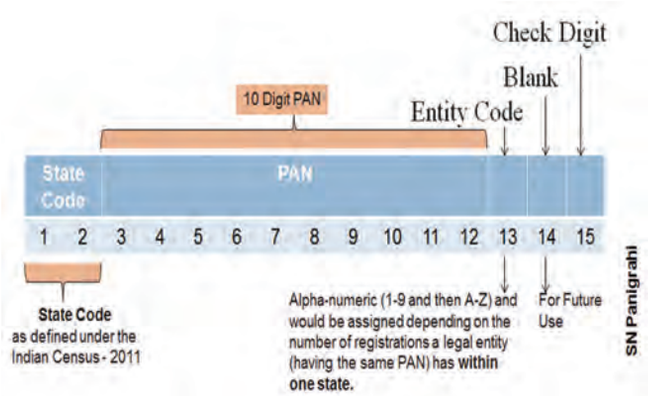


- Who is liable to pay GST? Taxable Person- Businesses and traders with annual turnover above Rs 20 lakhs are liable to pay GST. The threshold for paying GST is Rs 10 lakhs in the case of northeastern and special category states.

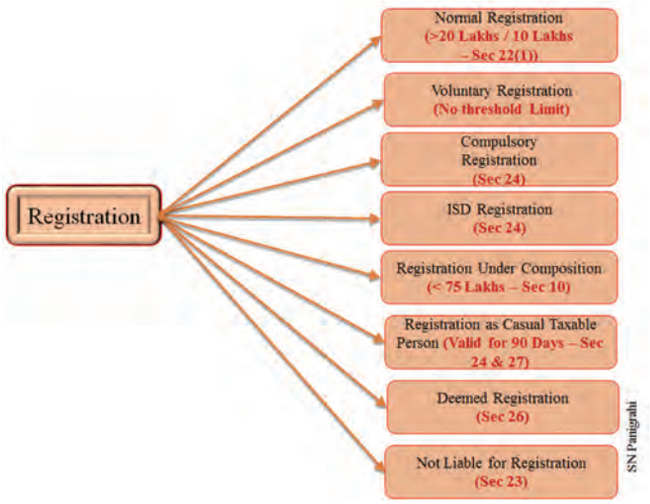
- GST is applicable on inter-state trade irrespective of this threshold.
- "Aggregate Turnover" means the aggregate value of all taxable supplies (excluding the value of inward supplies on which tax is payable by a person on reverse charge basis), exempt supplies, exports of goods or services or both and inter-State supplies of persons having the same Permanent Account Number.



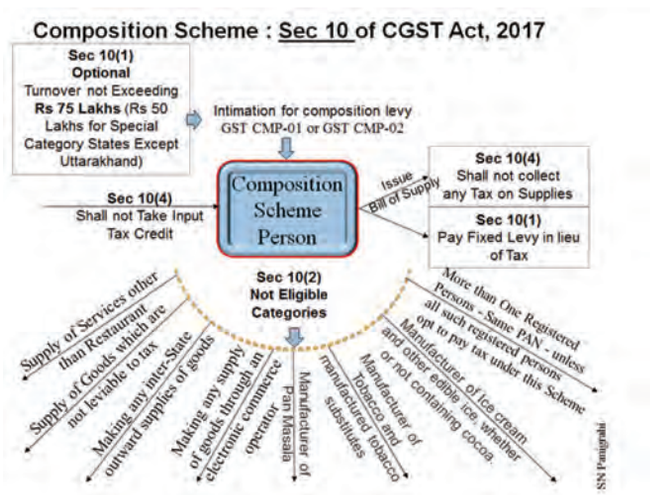
- Every Taxable Person need to be Registered under GST.
- Registration is State Specific : Registration in every such State or Union territory in which he is so liable.
- Registration is PAN Specific: Businesses with different PAN numbers need to take different GST registrations even though belongs to same group.
- Structure of Registration Number : Each taxpayer will be allotted a state wise PAN-based 15-digit Goods and Services Taxpayer Identification Number (GSTIN).



- Various digits in GSTIN will denote the following :
- Certain Category of Persons are Exempted from Registration – Like Agriculturalist, Persons Exclusively supplying Exempted items.
- Voluntary Registration Provisions are also made for Registration, irrespective of Turnover.
- GST does NOT apply to Agriculturists.
- Some Supplies fall into Mandatory Registration – Like Inter-State Supply, E-Commerce, Payments on Reverse Charge.



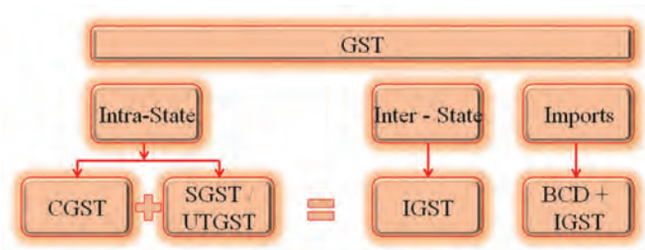
- To encourage small businesses a simplified scheme called "Composition Scheme" was introduced. Persons whose aggregate turnover in the preceding financial year did not exceed seventy five l akh rupees– may opt to pay, in lieu of the tax payable by him certain specified amount based on turnover.



- Some Category of supply required to pay tax under Reverse Charge.
- "Reverse Charge" means the liability to pay tax by the recipient of supply of goods or services or both instead of the supplier.
- Supplies from Un-registered person fall under Reverse Charge category and therefore tax liability should be discharged by the recipient of the supply.

- Supplies of some specified Goods (like cashew, silk etc.) and Services (GTA, Advocate etc.) also falls under Reverse Charge Mechanism.

- GST does not apply to any person engaged exclusively in the business of supplying goods and/or services that are not liable to tax or are wholly exempt from tax under this Act.



HOW GST WORKS?

- Businesses making taxable supplies have to be registered under GST if their annual sales turnover has exceeded the prescribed threshold - Rs 20 Lakhs (Rs 10 Lakhs in case of Special Category States).
- Only a registered person can charge and collect GST on the taxable supplies of goods and services made by him.
- GST is charged on the value or selling price of the products – Transaction Value.
- The amount of GST incurred on input (input tax) can be deducted from the amount of GST charged (output tax) by the registered person.
- GST requires businesses who have exceeded the prescribed threshold to register and to keep records of input and output tax. Businesses report their liability in a specific period called taxable period.
  - Registering your Business
  - Issuing Tax Invoices
  - Accounting for GST
  - Paying GST
  - Filing Tax Returns
  - Input Tax Credit Mechanism
  - Claiming GST Refunds if Eligible

HOW TO TRANSIT TO GST?

- All the Taxpayers already registered under Excise / VAT / Service tax need to Migrate to GST and register under GST.
- Transitional arrangements made for claiming Credit.
- Closing balance of the credit in the last returns.
- Un-availed credit on capital goods.
- Credit on duty paid stock.
- Credit on duty paid stock when Registered Person does not possess the document evidencing payment of excise duty/VAT.
- Credit relating to exempted goods under the existing law which are now taxable.
- Input/input services in transit.
- ITC in case of Centralised Registration under service tax.
- Reclaim the reversed Input Service credit.
- Where any goods or capital goods belonging to the principal are lying at the premises of the agent on the appointed day.
- Transition provisions also made relating to job work, goods returned/sent on approval etc.

WHO IS EFFECTED BY GST?

- Every Business and every citizen of India will directly or indirectly will be Effected.
- Businesses need to Assess the Impact.
- Some Businesses are Positively Impacted while the others Adversely.
- Overall Prices of most of the Goods may fall.
- Cost of some Services may go up.

HOW TO PREPARE FOR GST

- Understand GST & It's Impact.
- Mapping Business Processes – Impact Assessment - Taxes / Costs / Cash Flow.
- Analyze Organizations Requirement in line with GST - Find Gaps and make Preparedness to fully Align.
- Supply Chain Re-alignment to Reap Benefits - Effective Re-Design of SCM - Consolidation or Relocation of Manufacturing Plants & Warehouses - Re-framing Logistic Network.
- Draw Action Plans for Implementation.
- Update ERP Framework– Tax Re-Configuration, Vendor & Customer Data Updating.
- Patch up Accounting & Tax Framework - Preparing MIS & Tax Compliances.
- Awareness or Education to the Employees & Stakeholders.

With proper implementation of GST it definitely proofs to be Good and Simple Tax

GST = Good & Simple Tax ■

Electrode holder innovation

According to Fulvio Puccioni and Fulvia Corradini in a *Glass Worldwide* interview, the latest generation electrode holder from Italy's Glass Service is one step ahead in improving the quality of a glass manufacturer's job.

Since its establishment 23 years ago, Glass Service technicians have installed electric boosters in many furnaces, producing many different glass types. The company has also installed and tested several types of electrode holder, purchased from various suppliers. As a result of this experience and in compliance with requests from its assistance personnel, Glass Service has developed an electrode holder that provides enhanced performance and several advantages for the user.

Cooling of the electrode/refractory interface is the main problem of the electrode holder. Many existing designs have this functionality but today, their installation and furnace maintenance considerations require additional performance qualities, including:

- Safety operation in case of a lack of cooling water.
- Easy installation after start-up and throughout the furnace campaign.
- Very strong holder design.

To satisfy to these demands, Glass Service has developed a water/air cooling electrode holder that is made from one machined block of special steel, avoiding the need for welding in typical critical areas. The design also features a double cooling circuit, water for standard cooling and compressed air for emergency cooling or transition cooling. The special construction employed for the holder head also guarantees the unit's good resistance to high thermal stress.

Using this double cooling electrode holder, customers can realise many benefits and advantages. This includes:

- The use of air for cooling as an emergency in the case of a water shortage.
- Electrode insertion cooling transition compress air/water after start-up and for electrode adjustment during the campaign.

With standard water cooling electrodes, the insertion operation is quite dangerous for operators due to the water itself which, being overheated, creates a large quantity of steam when the water is switched on again.

The Glass Service design allows the control and reduced electrode holder temperature using compressed air for preliminary cooling before starting/returning to water flow.

These electrode holders are available in several sizes, from 1.5in to 4in. They can be installed either vertically or horizontally, in accordance with the electrode booster configuration. Each holder is equipped with a type K thermocouple for temperature detection. This thermo element is positioned close to the holder/refractory interface. The thermocouple can be easily changed if a fault is identified.

Electrically, the holder is totally electrical insulated and supplied with its own accessories, including a supporting plate, water/compressed air special high temperature pipe, fittings, insulated ceramic plate and electrode emergency supports. ■

Electrode holder model.

The recently announced Glass Service electrode holder.

Water and air flow.

ABOUT THE AUTHORS:
Fulvio Puccioni is Technical Director and Fulvia Corradini is Commercial Manager at Glass Service

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VITRUM
Energy For Excellence

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Role of Glass Packaging in Promoting Safety & Security for Consumers

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Mr. Arindom Chakraborty is working as the AGM Corporate Strategy in Hindusthan National Glass & Industries Limited (HNGIL). Mr. Chakraborty is BE (Mechanical) and MBA in Finance. His core areas of work are strategy development & deployment across the group, cost optimization, business excellence & sustainability initiatives. Mr. Chakraborty acted as the Project Manager of the 1st Container Glass Life Cycle Analysis (LCA) in India in 2012 undertaken by the AIGMF. The study covered all major container glass companies in India & generated tremendous interests among all stakeholders. The study also helped to identify many initiatives to reduce environmental footprints & establish glass as the safest packaging medium in all segments.

Prior to HNGIL, Mr. Chakraborty worked in mjunction (Tata Steel – SAIL JV) in the areas of management, operations, business excellence, aggregated purchase & strategy deployment.

In this era of rapidly growing pollution & diseases, role of packaging material to protect its contents has never been more important. At the same time, the packaging must not be reactive to the product, must not alter the taste or odor of the product and must be nontoxic. Not to mention, the material needs to be commercially viable so that it is suitable for high speed filling and meets applicable tamper resistance requirements. In a word, the packaging must provide complete protection from environmental, mechanical & biological perspective.

Glass not only meets the above criterion for the full protection, but actually it increases the value of its contents from aesthetic point of view as well. And, since its inception from first BC till date it is judged as the best because of the following:

- Best Barrier Protection – It doesn't allow any Oxygen & Water vapor transmission.
- Exceptional Preservation – It is totally inert, doesn't interact or migrate any substance to the contents & provide longer shelf life to product.
- Superlative Presentation- Excellent transparency & different molded shapes gives consumer real display value of product.
- Unsurpassed Security - Multiple choices of closures to guard & provides security against temper/pilferage. Glass also prevents counterfeiting of product as it needs huge investment to manufacture glass containers & secondary markets can be cracked easily.
- Best Convenience - Adequately designed for single & multiple serving with easy to open closures & there is no need to transfer the product for preservation after opening the seal.

LCA STUDY ON CONTAINER GLASS IN INDIA

The Life Cycle Assessment (LCA) is a tool to measure, assess and orient improvements in the environmental performance and impact of a product from raw materials through to production, use, and end-of-life phases. AIGMF commissioned the study in 2011 to establish a clear understanding of the environmental impact of container glass at all stages of the life cycle. The study was conducted on Cradle – to - Cradle approach which is the ultimate test in assessing the environmental impact of a product because it ensures that all aspects of a product's life, end-of-life and reincarnation are accounted for. The LCA model was created using the GaBi 5 Software system for life cycle engineering, developed by erstwhile PE International AG. Some of the key findings of the study are as below:

- In India, only glass is being reused (30%).
- Very high landfill rate (80%) for other packing materials.

Made from all natural and sustainable raw materials - silica sand, soda-ash, lime stone and other trace elements.

Glass is "Generally rated as safe (GRAS)" and is graded safe by the U.S. Food & Drug Administration

- Significant open burning for other packaging materials, leading to environment pollution & health hazard.
- Glass is by far the most eco-friendly material while packaging is concerned.
- Shelf-life of Food & Beverages with glass container is much more than other packaging mediums.
- With only 20% weight reduction & 75% recycling, environmental footprints of glass can further be reduced by ~ 45%.

Glass Container industry is undergoing tremendous innovative changes in order to be more sustainable and customer preferable. As such, light-weighting of glass bottles has become a focal point in the industry and as a result, glass bottles have become lighter by 50% compared to 3 years ago.

CONSUMER PREFERENCE ACROSS THE GLOBE

According to a survey conducted by Newton Marketing research of SAINT GOBAIN VERELLIA in 2011:

- Glass has been the preferred packaging choice for food and beverages since it was first introduced. It's no wonder the leading food, beverage, beer, wine and spirits brands continue to trust glass containers to preserve both their products and their brand image.

73%	Believe that glass keeps the highest quality of any container
78%	Feel glass is best at maintaining that purity
75%	Agree that glass keeps the truest taste and flavor of the product inside
77%	Feel that glass is the healthiest way to preserve foods

- Consumers are becoming more aware of packaging and how it can affect the foods and beverages they consume. Not only do glass containers protect the flavor and purity of organics, but choosing glass demonstrates an elevated commitment to sustainability and the preservation of our natural resources.
- In a recent survey conducted by EcoFocus Worldwide in 2017 on wellness and sustainability trends impacting the food and beverage industry, 86% of grocery shoppers and 87% of Millennial believe some types of packaging can leave undesirable chemicals in beverages. They say cartons and glass containers are the least likely to do so, and that cartons and glass best protect freshness without preservatives.
- In a survey conducted by Nielsen in India it was found that:
  - Rural consumers seem to prefer glass more than urban consumers considering all aspects.

"For consumers, the priorities of health and sustainability are clearly linked together, packaging has a growing role in their perception of both of these attributes. These are powerful synergies that speak to the 2017 consumer's holistic view of what is healthy." ***Linda Gilbert, Chief Executive Officer of EcoFocus***

  - Glass is considered the best in true preservation of taste and retention of freshness.
  - 75% of respondents across all categories (urban and rural) are willing to pay premium for modified glass packaging.

REDUCE, RECYCLE & REUSE - GLASS

The EcoFocus survey also revealed that 73% try to buy products in packaging that is recyclable & 59% look for beverages in packaging that is made with renewable materials. This not only saves raw material & energy consumption but also reduces packaging waste considerably. Glass

Every ton of glass recycled saves 322 KwH of energy, 246 kg of CO_2 and 1200 kg of virgin raw material

Only 7% believe that glass causes pollution or leaching against 70-80% for other major packaging mediums

is 100% Recyclable and can be re-used more than 40 times without compromising quality. While other packaging materials are mostly down cycled (not recycled) and goes for landfilling or incineration, used glass bottle comes back in the closed loop cycle. In Europe, it has created local businesses and jobs that are now helping to recover more than 70% of all post-consumer glass packaging in the EU and keeping valuable resources out of landfills. Only 40% glass is recycled in India due to lack of proper collection & segregation facilities and rest goes into landfill where it biodegrades with time unlike other non-biodegradable packaging materials.

INDIA - WITH GROWTH IN PACKAGING ..... INCREASES WASTE

According to study by ENVIS center on Municipal Solid Waste Management, sponsored by MoEF, total urban MSW (Municipal solid waste) generated in 2041 would be 230 million Tons per year (TPY) from 68 million TPY in 2011. Lack of public awareness, effective rules & institutional capacity in India call for use of recyclable, reusable and easily collectible packaging material in all spheres of life. And, only 15% of all Indian packaging initiatives include the use of recycled/renewable content, far behind their global counterparts which account for 31%. Apart from recyclability & reusability, glass bottle also have minimal water footprint compared to other packaging materials ■

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Lithium in Glass Melting and Forming Process

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Lithium is a very important material today not only in cellphone batteries, but also in electric automobiles in bulk. But its use in glass melting is almost not known. As it is a monovalent alkali metal like sodium and potassium that are very common in glass melting, its oxide Li_2O falls under the same class of materials like soda and potash in glass. Here, in this article, some details will be given on the use of lithium in glass melting along with the possible benefits.

Whenever 'glass producer' is faced with the limitations of increasing the glass pull from the furnace or make the glass melting more efficient in terms of fuel consumption, he has the following options:

1. Redesign the furnace to suit the increased pull
2. Introduce Oxy-fuel firing in the furnace
3. Introduce electric boosting in the furnace
4. Install Bubbling System

All the above four options available to the ' glass producers', require huge amount of investments in redesigning the furnace and new equipment for melting process. Even if the 'glass producer' is willing to invest certain amounts of money in incorporating the changes in the design and equipment, at times he is faced with the limitation of space and other constraints in an existing furnace that makes him unable to achieve the above objective.

However, there is another way to reduce energy consumption, or increase furnace pull, without investing large amount of capital in equipment and systems. There are proven cases of glass companies who have achieved the objective of lowering the furnace operating temperatures considerably - thereby saving fuel consumption by about 5-10%, with addition of small amount of Lithium in glass composition by adjusting the batch accordingly.

When addition of Lithium is combined with other modified design or new equipment, the savings can be still higher. The addition of lithium containing raw materials can also provide other benefits, such as increased production speeds, improved product quality, etc.

HOW DOES IT WORK?

Lithium is the lightest, smallest and most reactive of all alkali metals. Due to its unique ionic structure and highest ionic potential, it becomes an extremely powerful flux that can be used to benefit glass melting. Lithium appears near the top of the 'periodic table' with an atomic weight of 6.9 that is less than one third of sodium at 22.9. Lithium is the lightest of all solid elements with a specific gravity of only 0.5334; lithium metal floats on water or gasoline. Lithium has the smallest ionic radius and the highest ionic potential of any alkali.

RELATIVE IONIC POTENTIAL OF LITHIUM, SODIUM AND POTASSIUM

Lithium oxide (Li_2O), through lithium bearing mineral such as Spodumene, decrease the melting point, viscosity and thermal expansion characteristics of the glass. This in turn increases the melting efficiencies and/or makes 'effective furnace capacities' larger.

Detail studies have confirmed that Li_2O in glass can lower the required melting temperature by as much as 35° to 60°C.

As shown in Figure 24, the temperature showing log $\eta = 2.0$ was 1400°C when 0% Li_2O was used. When 0.2% Li_2O is used, that temperature is reduced by 30°C. When 1.9% of Li_2O is used, that temperature is reduced by 60°C to 1340°C. Thus small amount of

Element	Ionic Radius Angstroms	Ionic Potential
Lithium	0.60	1.67
Sodium	0.95	1.05
Potassium	1.33	0.75

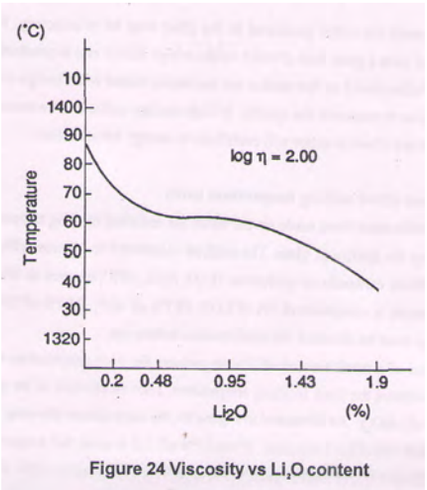

Figure 24 Viscosity vs Li_2O content

Lithium reduces the viscosity. This also reduces the bubble breaking time during the refining process.

It reduces the fuel consumption by 5-10% leading to the decrease in NO_x emissions. Additional benefits include better glass quality, better production efficiencies, as a result of fewer checks and better pack efficiencies due to its lower viscosity, better thermal stability during its forming process. Due to lower operating temperatures in different furnace firing zones it also contributes towards longer furnace life.

In the modern trends of light weight bottles for container glass, it is very essential that the glass bottles produced are with reduced wall thicknesses. Lithium can help glass producers to get the enhanced mechanical strength, hydrolytic, and chemical resistance. It also increases the working range of glass, providing better homogeneity in glass forming temperatures from top to bottom of the glass bottles. All these benefits can be achieved by a very small addition of Li_2O of about 0.1 to 0.17 wt % in glass.

It is significant that Lithium in glass can specially help production of table ware, and the cosmetic glass manufacturers can also enhance brightness and lower seed counts for their glass to become more attractive.

It is roughly estimated that 0.1 wt % can provide approximately the same effect as 10% of cullet addition in glass batch. Due to contaminations in recycled cullet, it restricts the high quality glass producers to used higher percentage of cullet in their batch. And addition of Li_2O is the best substitute available, to get additional benefits.

In general terms, lithium has been shown to raise surface tensions in molten glass. This helps in improving not only in better glass distribution, thinner wall thickness, but also in the enhanced mechanical strength of the glass containers.

Because of lithium's small 'ionic size', it provides a stronger exterior and is better able to resist incursions providing improved resistance to acids and alkalis.

WHY IS IT NOT BEING USED?

Spodumene is the only source through which Lithium can be introduced in glass with minimum cost increase. Despite its proven benefits, glass manufacturers are reluctant to use because there are not many sources of spodumene ore that are easily available. And if available, the prices are very high and it does not attract the glass manufacturers to use it on a regular basis in a cost effective manner.

Since Lithium in glass is required to be introduced is very small, i.e. only 0.1 – 0.17 wt %, it is not required to go for a very high purity spodumene ore. Only less than 1.0% Lithium containing ore is sufficient as glass grade quality. Other impurities contained in this low purity spodumene is Al_2O_3, Na_2O, K_2O, etc. They help in cutting down on their source from Soda-Ash, Feldspar, etc. This makes lithium bearing ores now more affordable with new sources of glass grade spodumens available, and the energy saving and other benefits that can be achieved with addition of Lithium can be made up more than the added material costs.

Major concern the Glass producer faces is the effect of fluxing agents such as Lithium, when added in the batch, on refractories inside the furnace and the impact on the furnace operating campaign life. It has been established by many glass producers who have used, have experienced that the small amount addition of Lithium, in fact reduces the furnace operating temperatures and rather help in getting better furnace campaign life.

WHY NOT USE IT

In India, the major concern of the glass producers is the cost of fuel, and any measure to save on the fuels costs should be a welcome sign for remaining competitive in a severe competitive market today.

OVERALL BENEFITS

1. Increased furnace pull
2. Lesser seed count due to improved refining at lower viscosity
3. Improved workability due to lower viscosity at forming temperatures
4. Improved Thermal Shock resistance due to lower thermal Expansion
5. Improved brilliance and luster
6. Improved Mechanical strength
7. Weight reduction due to better glass distribution
8. Reduced defects like cracks during forming
9. Improved Pack to Glass ratio
10. Improved production speeds
11. Contribution towards protection of environment by reduced NO_x emissions

Major advantage of using this option is that it does not require a big long term lock-in of major capital investment. It can be started without much of alteration in equipment or machinery, and can also be stopped anytime - it is felt that it is not giving the desired results ■

Glassy Ceramic Glazes by Composition Engineering – Part II

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Abstract

Ceramic glazes are actually glasses of various compositions and colours for decoration and artistic appeal. These glazes are prepared in a similar manner as glass, but applied to ceramic-wares in a different manner and then fired to give rise to the composite body or final product with all the technical, chemical, mechanical properties as well as artistic appeal. The compositions are engineered that involves different manners of formulating ceramic glazes, and calculations are shown to indicate the final oxide compositions in this second part of the article.

INTRODUCTION

By physical definition, the glasses are amorphous non-crystalline materials that have a transformation temperature, i.e. in the experiment of X-ray diffraction (XRD) on glasses, there is never crystalline peak, although glasses are made from all the crystalline materials, such as silica, alumina, lime, soda, etc. Ceramic glazes also fit into this definition behaving like glasses, i.e. amorphous non-crystalline materials **[1,2]**. Although the basic difference is that ceramic glazes are generally low-melting glasses with more percentage of soda, feldspar, borax, etc. Industrial glasses are mostly high-temperature glasses being melted above 1550°C. In the commercial arena of boro-silicate or borate glasses, low-melting glasses do exist.

However, the process of application of ceramic glazes on the earthen-ware bodies differs **[1,2]**. Generally speaking, the earthen-ware bodies are made of 50% china-clay (mostly alumino-silicates) -- sometimes plastic clay like ball clay is used for body consistency for the ease of fabrication method. This is considered as the "flesh" of the main body, and then there is 25% feldspar (soda-alumino-silicates) that acts as "blood", and 25% quartz (silica) that is taken as the main structural "bones". This may be one reason of calling earthen-ware as "body" – in comparison to human body for better understanding of the whole system **[1-4]**.

In order to impart desired property to a particular glaze, it is very important that a proper calculation is made to ascertain the correct amount of different components in glaze compositions as well as their ceramic chemistry **[5,6]**, which is the subject matter of the Part II of this paper on ceramic glazes. Before starting the process of calculations of ceramic glazes, let us emphasize that depending on the circumstances and the requirements, the calculation can be done in different ways, which is followed in most of the ceramic industry, and it is also followed in the glass industry.

PROCESS OF CALCULATION

Generally speaking, the formulations of various ceramic glazes can be made in two different ways **[1-4]**:

1. By Batch or Mineral Compositions, and
2. By Oxide Compositions.

For compositional engineering, it is necessary to understand the general characteristics of different chemical constituents needed for making the glaze formulation. As already indicated, it is basically a silicate network, as present in glasses. There are disordered array of networks silica tetrahedra – that fixes the main skeleton of the overall structure. Then, there are glass modifiers, such as the low melting borax (sodium borate) or soda ash, etc. to loosen the structure little bit so that the glaze can flow over the ceramic-ware and fill up

the pores and make it impervious, as well as lime and magnesia (or even dolomite containing both) to impart chemical inertness. Obviously, to bring some strength, alumina is added in the form of feldspar (as also in glasses) that adds soda to the batch as well.

2.1. BATCH/ MINERAL COMPOSITION TO OXIDE COMPOSITION

A typical glass batch composition is as follows: Feldspar (soda/ potash-alumino-silicates)=48.60%, Dolomite (both Cao and MgO)= 9.30%, Whiting (mainly lime)= 7.70%, China Clay= 11.30%, Quartz= 23.10%. In the calcined form, we talk about water or any gas-free component, i.e. oxides form. In the mineral or batch form, they are carbonates, nitrates, or contain hydroxyl ions or water that have to be removed. None of the above raw materials are actually in their purest forms. They contain some impurities that not only depends on the geographic locations but also within a given "mine" from layer to layer. It all depends on the geology of the particular rock formation. These other constituents are present either in medium percentage or in very small amounts. Therefore, in any ceramic factory in the laboratory (like in glass factory), there has to be regular chemical analysis of such raw materials to eventually asses the final composition of the glaze **[1-4]**. These data are shown in **Table 1**.

It is seen that the main sources of silica are from feldspar and china-clay. This is also true for alumina that comes in large amount from china-clay and then from feldspar. As potash feldspar is used in this formulation, there is more of potash than soda that maintains the required level of fluidity in the glaze composition. The proportion of CaO largely comes from 'whiting', and then from 'dolomite' that also contributes some amount of magnesia, which is necessary for controlling the viscosity of glaze that smoothly flows to cover the required surface of the ceramic-wares.

Both dolomite and whiting are carbonates, and hence the Loss on Ignition (LOI) is very high for these materials, due to the evolution of CO_2 and in china-clay, moderate LOI of about 13% is due to evaporation of H_2O. In order to know the oxide percentage of known minerals, one has to just multiply the 'recipe' weight by that of oxide of materials and then divide by 100. For example, for $\%K_2O$, the calculation is: 11.10 x (48.60/100) = 5.395, i.e. the K_2O content of the mineral Feldspar is 5.395%. The details of this calculation for all the chemical components in the above five minerals is shown in **Table 2**.

Each of the above components can be divided by the last column of the total for each individual mineral and then multiply by 100, which should ultimately give the exact mineral compositions in percentage term. Now, if we add different oxides of each mineral together, we obtain **Table 3**.

Table 3: Total Chemical Compositions of Different Minerals

Chemicals	Total in all Minerals	Molecular Weight	RATIO
K_2O	5.716	94.20	0.580
Na_2O	1.299	61.98	0.210
MgO	2.052	56.08	0.135
CaO	7.562	40.31	0.051
Al_2O_3	13.860	101.96	0.136
SiO_2	59.923	60.09	0.997

The sum of the first four components is 0.976. Now, if the above ratios of oxides are divided by the sum of RO units, we get the molecular formula of $RO:R_2O_3:RO_2$.

2.2. OXIDE COMPOSITION TO BATCH/MATERIAL COMPOSITION

Before we proceed further, we should be aware about smelted oxide composition. For example, Borax (H) has a molecular formula of $Na_2O.2B_2O_3.10H_2O$. One has to find out the molecular weight of the individual components, i.e. for Na_2O – 61.99, B_2O_3 – 2 x 69.64 = 139.28, H_2O = 10 x 18 = 180. Added together, the sum will be 381.27. Now, for Na_2O, divide 61.99 by 381.27, we get 0.163. Similarly, for B_2O_3 divide 139.28 by 381.27, we get 0.365. The water molecules evaporate during the smelting process, i.e. frit making

Table 1: Percentage Analysis of Individual Materials

Minerals	L O I	K_2O	Na_2O	MgO	CaO	Al_2O_3	SiO_2
Feldspar	0.65	11.10	2.50	0.10	0.20	19.45	66.00
Dolomite	47.35	-	-	21.20	31.20	0.15	0.24
Whiting	44.35	-	-	0.25	55.09	0.12	0.19
ChinaClay	12.99	0.86	0.74	0.11	0.78	38.06	46.46
Quartz	0.97	-	-	-	1.01	0.36	97.66

Table 2: Percentage Chemical Compositions of Different Minerals

Minerals	K_2O	Na_2O	MgO	CaO	Al_2O_3	SiO_2	Total
Feldspar	5.395	1.215	0.049	0.097	9.453	32.076	48.285
Dolomite	-	-	1.972	2.902	0.014	0.022	4.910
Whiting	-	-	0.019	4.242	0.009	0.015	4.285
ChinaClay	0.097	0.084	0.012	0.088	4.301	5.250	9.832
Quartz	0.224	-	-	0.233	0.083	22.560	23.100

process. Thus, the smelted oxide composition will be as follows: Na_2O = 0.163 and B_2O_3 = 0.365. Here, borax is mentioned, as it is a very important component in frit making process, since it helps in reducing the smelting temperature thereby reducing the cost of fuel consumption and eventually the total cost of production. Now, let us calculate the following oxide composition of glaze to batch/material composition.

2.3 OXIDE COMPOSITION

Here, mainly an alkali-alumino-borosilicate composition is considered, which is taken as: Na_2O- 4.56%, Al_2O_3– 7.69%, B_2O_3– 21.70%, CaO- 0.22%, MgO- 0.04%, SiO_2- 65.79%.

Total of the last column of the **Table 4** = **113.50**. In order to have a uniform unit of 100, one has to normalize, which is shown as follows:

Borax (H)- 24.73%, Boric Acid- 10.19%, Al. Oxide- 6.77%, Whiting- 0.35%, Quartz- 57.96%.

Thus the batch/mineral composition was established. The above exercise was carried out to make it clear that there are two distinct ways of calculating glaze compositions. The prime factor will be the 'selection' of the right type of raw materials before calculating the composition.

Table 4: Details of the Composition

Oxide	Na_2O	MgO	CaO	Al_2O_3	B_2O_3	SiO_2	Batch
Na_2O-4.56	4.56	-	-	-	10.25	-	Borax(H) **28.06**
B_2O_3 21.70	-	-	-	-	11.45	-	Boric Acid **11.56**
Al_2O_3 7.69	-	-	-	7.69	-	-	Al. Oxide **7.69**
CaO 0.22	-	0.04	0.22	-	-	-	Whiting **0.40**
MgO 0.04	-	-	-	-	-	-	-
SiO_2 65.79	-	-	-	-	-	65.79	Quartz **65.79**

CONCLUSIONS

In this second part of the article, it has been emphasized that there are two different methods of calculation of glaze compositions. The calculations of both (a) raw materials to oxide composition, as well as (b) oxide composition to raw materials have been shown in tabular form. The first method consists of calculation by "molecular weight" and the second method by "smelted composition". The idea is to clarify that both the methods can be used in the composition calculations. It has to be noted that various minor components, which are present in small traces in the materials, are also incorporated for the sake of knowledge of the readers. However, for practical purposes, it could better be avoided, i.e. done in oxide to batch/raw material composition.

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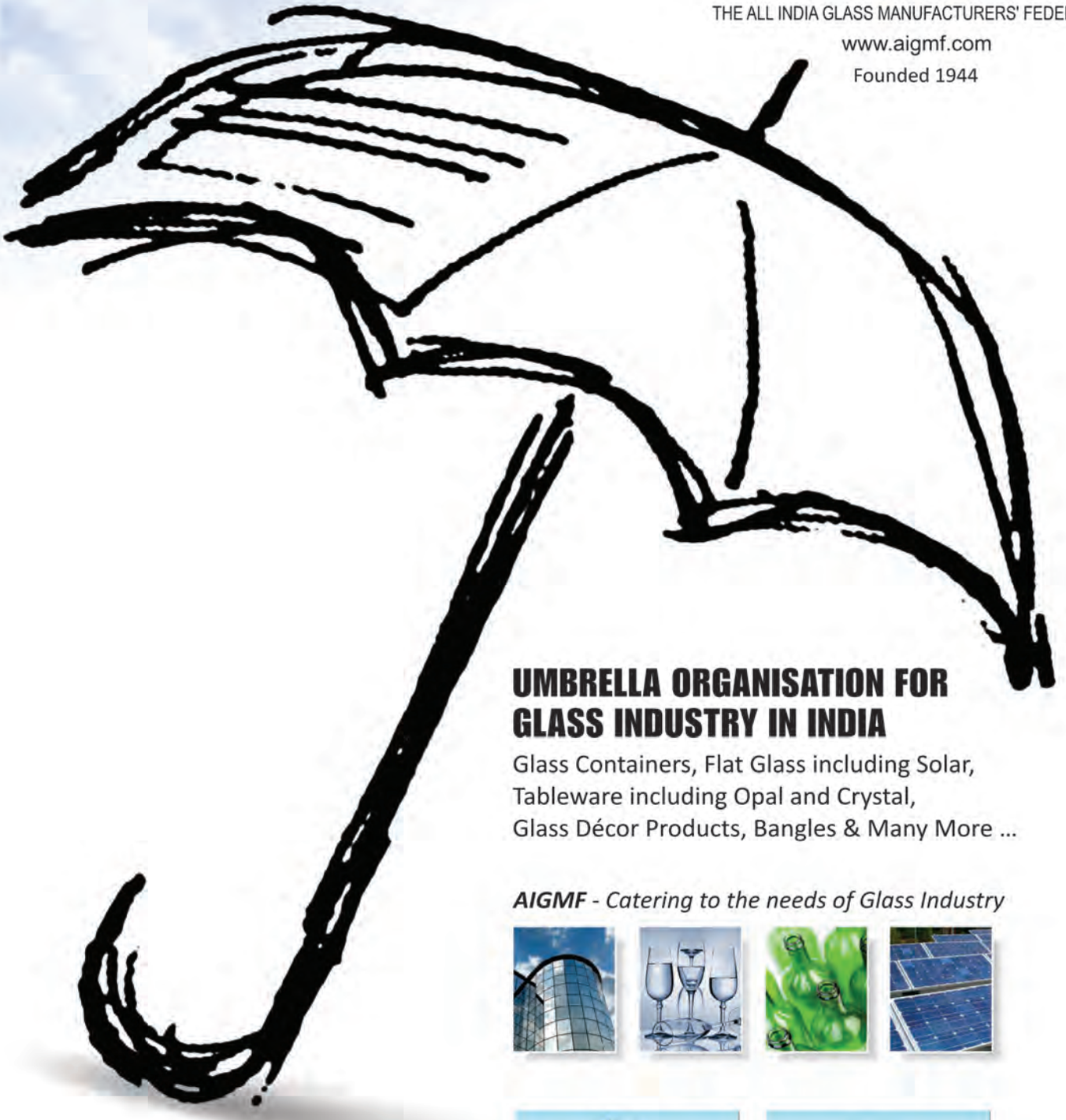

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