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THE QUARTERLY JOURNAL OF THE ALL INDIA GLASS MANUFACTURERS' FEDERATION


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Kanch

Quarterly Journal of
THE ALL INDIA GLASS MANUFACTURERS' FEDERATION

Vol. 4, No. 2, January-March 2011

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AIGMF
MEMBER ASSOCIATIONS

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Kotla Road
Firozabad - 283203, U.P.
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2nd Vice President - Raj Kumar Mittal
Hon. Secretary - Dharmendra Mohan Gupta
Treasurer- Deepak Gupta

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Vice President - S C Vishwakarma
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Vice President - Arvind Nandgopal
Hon. Secretary - Prashant Somany

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Kurla (W), Mumbai – 400 070
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Hon. Secretary – G.K. Sarda

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C/o Ashoke Enamel & Glass Works (P) Ltd.
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Kolkata - 700013
President - Dinesh Jhunjhunwala
Hon. Secretary - Pradeep Jhunjhunwala

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AIGMF

The All India Glass Manufacturers' Federation

From President's Desk

Dear Readers,

I extend warm welcome to all readers of first edition of **Kanch** for the year 2011, which also contains a few pages in Hindi, introduced for the first time.

I would like to thank glass manufacturers and others connected with glass industry for making 2^{nd} GLASSPEX INDIA 2011 held in Mumbai a success. I will like to put on record my appreciation for the hard work put in by Messe Düsseldorf GmbH, their subsidiary Messe Düsseldorf India Pvt. Ltd., and AIGMF staff for success of the event.

I am glad that exhibition and the international conference had a good response from the participants. Cultural evening was highly appreciated. The 3^{rd} GLASSPEX INDIA 2013 is slated to be held in Mumbai from 20 - 22 March 2013. I am sure all of you will participate in the same. This will be bigger and more diversified than GLASSPEX 2011. Your cost and effort in participation will be fully rewarded.

It is my pleasure to inform you that with the current issue we are increasing our readership to about 4,000 by bringing out an e-edition of Kanch, in addition to normal circulation of print version and its availability on our website www.aigmf.com. For subscribing to free e-edition of Kanch, interested readers may please send details to info@aigmf.com

You are welcome to send news/articles in Hindi or English for being published in Kanch.

I also invite you to visit redesigned and informative AIGMF website (www.aigmf.com)

We believe that there is always scope of improvement. Readers are requested to send their suggestions to Secretary AIGMF at info@aigmf.com

Mukul Somany
President, AIGMF
and Vice Chairman and Managing Director
Hindustan National Glass and Industries Ltd.

March 2011

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An Organisation Promoting Wellness
The All India Glass Manufacturers' Federation Aims to Ensure the Industry's Overall Growth and Development

The All India Glass Manufacturers' Federation (AIGMF) was formulated in 1944 and incorporated under the companies Act, 1956 (No.1 of 1956) as a Limited Company on June 25, 1970. AIGMF represents various segments of the glass industry consisting of large, medium and small-scale manufacturers in different parts of India. Federation is the sole representative body of all categories of glass manufacturers in India and promotes the cause of all segments of the Indian glass industry. Sustained efforts are being made by members of the federation to promote the industry's growth and development.

AIGMF has two categories of members. First category consists of manufacturers of glass and glassware who are ordinary members of the federation. Second category consists of affiliate members who are companies/ persons connected with glass industry. This includes suppliers of raw materials, machinery, consultants etc. Companies from abroad who are connected with glass industry are also enrolled as affiliate members. Ordinary members of the AIGMF manufacture complete range of glass items glass containers and pressed ware, flat glass including float, sheet, figured and wired, fibre glass, vacuum flask and refills, glass lamps and shells, glass table and kitchenware (including those of opal and crystal glass), scientific and laboratory glassware, glass wool, beeds, industrial glasses, extra clear low iron textured solar glass etc. Requirements of almost all types of glass and glassware are met from indigenous sources.

Zonal associations viz.,Western India Glass Manufacturers' Association, Eastern India Glass Manufacturers' Association, U.P. Glass Manufacturers' Syndicate, Northern India Glass Manufacturers' Association and South India Glass Manufacturers' Association are important constituents of The All India Glass Manufacturers' Federation. Enrollment of new members of the federation is done on the recommendation of zonal associations.

Role played by these zonal associations is of utmost importance for proper functioning of glass industry. Some of the major activities/functions of the federation are as under :

- Facilitates two way communication, government on one hand and the glass industry on the other
- Acting as the industry's focal point, playing the principal role in communicating the concerns and

aspirations of the members to the government, other external interest groups and trade bodies.

- Organise consultations between its members in order to arrive at fully representative common position on problems of general interest.
- Hosting seminars, fairs and international exhibitions to promote use of glass and technological advancements taking place in the industry.
- Meeting centre to exchange views on all issues related to the glass industry.
- Acting as centre for providing information solving and dealing with problems related to the glass industry and coordinating efforts in order to tackle problems in the production, processing and applications of glass.
- Encourage glass recycling and play active role in promotion of glass usage.

PAST PRESIDENT OF AIGMF		
Name	Company	Period
Shri Sushil Jhunjhunwala	La-Opala RG Ltd., Kolkata,	1999-01
Shri Pradeep Kumar Gupta	Om Glass Works Pvt. Ltd., Firozabad	2001-03
Shri Sanjay Somany	HNG & Industries Ltd., Bahadurgarh	2003-05
Shri P.K. Kheruka	Borosil Glass Works Ltd., Mumbai	2005-07
Shri Satish Kumar Jhunjhunwala	Shree Gobinddeo Glass Works Ltd., Kolkata	2007-08
Shri S.C. Vishwakarma	Universal Glass, Sahibabad	2008-10

OFFICE BEARERS OF THE AIGMF		
Office bearers	Name	Company
President	Shri Mukul Somany	HNG & Industries Ltd., Kolkata
Sr. Vice President	Shri S.C. Bansal	AdarshKanchUdyog, Firozabad
Vice President	Shri Sanjay Ganjoo	Asahi India Glass Ltd.,Taloja
Hony. Gen. Sec	Shri Arun Kumar D	AGI Glasspac (An SBU of HSIL Ltd.,)Hyderbad
Hony. Treasurer	Shri Ajit Kumar Gupta	Prashant Glass Works Pvt. Ltd., Varanasi

Secretary AIGMF

Membership of AIGMF

Membership

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**.

The membership forms can be downloaded from http://www.aigmf.com/membership.php Members of the Federation are enrolled on the recommendation of Zonal Associations viz.:

- Western India Glass Manufacturers' Association
- Eastern India Glass Manufacturers' Association
- U.P. Glass Manufacturers1 Syndicate
- Northern India Glass Manufacturers' Association and
- South India Glass Manufacturers' Association

Admission Fee / Annual Subscription

Affiliate Members:

The admission fee and annual subscription is Rs. 2,000/- and Rs. 5,400/- respectively

Applicants for enrollment for a period of five years may pay a consolidated amount of Rs. 27,000/- (including admission fee)

Affiliate members from Countries other than India

i. The admission fee and annual subscription is US $ 100/- and US $ 200/- respectively.

ii. Applicants for enrollment for a period of five years may pay a consolidated amount of US $ 1000/- (including admission fee)

Ordinary Members:

Admission fee Rs.550/-.

Annual subscription:

i. Single Unit: Rs. 13,600/-

ii. More than one Unit: Rs. 50,000/-

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Multi motors Inverter Drive
90° € - Pusher with PLC
Operator's Assistant II.
Retrofitting of € - Timing System with Valve Blocks into I. S. m/c.
Spares for above
I.S. Parts / Variables / Mechanisms
Quick Change Plunger Mechanisms
Neck Ring Mechanism (Std.)
CAMS (std. & heavy duty) for Funnel, Baffle & Blow Head mechanism.
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Oil immersed MOC linkages
Naviculoid Deflectors - 18000 Series
Delivery equipments : (Scoop, Trough & Deflector) for 4 1/4" & 5" cc SG & DG & 85mm & 4 1/4" cc TG I.S. m/c.
Variables : 4 1/4" & 5" cc for SG & DG, 85mm & 4 1/4" cc for TG I.S. m/c.
Blow Mould Cooling Mechanism & Vacuum on Blow side
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T. G. Variables
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Constant Cushion Invert & Take Out Cartridges
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€ - Valve Block
Mold Holder Arms
Cams, Driving Ring, Piston Rod, Arm Stud and Quick Change Funnel Arm
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2nd GLASSPEX INDIA 2011

(A Report)

2nd GLASSPEX INDIA Establishes Itself as a Key Market Place for the Glass Industry on the Indian Subcontinent

Highlights:

- The exhibition was organized by Messe Düsseldorf GmbH/Messe Düsseldorf India Pvt. Ltd., supported mainly by the AIGMF
- Total show area of the exhibition was 6588 sq. meters
- About 176 participants from 19 countries participated in three day exhibition
- Concurrent with the exhibition, following three conferences were organized:
    - o 2nd Glass Performance Days Focusing "Innovations in Architecture, Flat Glass - and Solar Technology (January 11-12, 2011);
    - o 9th International AIGMF Conference on "Managing Sustainable Growth" (January 12-13, 2011) and
    - o 1st Solar Industry Summit on "Application Meets Production- How to use and produce PV in India" (January 13, 2011)
- 4,072 visitors visited the exhibition

The fact that an exhibition and conferences were held concurrently not only meant a symbiosis for the visitors, but also a considerable time saving.

The 2nd Glass Performance Days India (GPD) began on 11th January and lasted for 2 days, focusing on topics such as glass architecture, flat glass and solar technology – especially tailored to the challenges facing the Indian market. Over 100 high ranking national and international visitors attended on each day of GPD.

Organizing GPD India in conjunction with GLASSPEX INDIA 2011 offered participants two high-quality events in parallel that provided high quality education and networking opportunities with experts from different fields of the glass industry worldwide (at GPD) combined with ample international business and

Mr. Bal Krishan Gupta, Ex-President-AIGMF and President, UP Glass Manufacturers' Syndicate inaugurates 2nd Glasspex on January 12, 2011 at Hall 6, Bombay Exhibition Centre, Mumbai in the august presence of Dr. Leopold-Theodor Heldman, Consul General, Germany Embassy in India; Mr. Mukul Somany, President- AIGMF and Vice Chairman & MD- Hindustan National Glass & Industries Ltd.; Mr. Werner M. Dornscheidt-President and CEO- MDI (Messe Düsseldorf GmbH/Messe Düsseldorf India Pvt. Ltd.), office bearers of AIGMF, MDI and other dignitaries'.

networking opportunities with professionals from the flat and hollow glass segments of glass industry.

13th January was dominated by the "1st Solar Industry Summit India" conference, which focused on the areas of development, financing and realization of production facilities, the latest production technologies and the international solar power market as well as the current quality assurance standards. This was the first time that this technical conference, organized in cooperation with Solarpraxis AG, took place and it was attended by about 100 representatives from Indian and International solar power companies, suppliers and investors.

On the concluding day Miriam Hegner, head of the Conference Department at Solarpraxis AG stated "GLASSPEX INDIA and the partnership with Messe Düsseldorf offered a very good framework to position our first conference on the promising Indian solar power market. We are very satisfied with the great interest and the good feedback from the participants and we are looking forward to more projects in India in future.

Industry representatives met at 9th International Conference of The All India Glass Manufacturers' Federation to discuss latest developments from 12 – 14 January, where about 150 participants found out more about the topic of "Managing Sustainable Growth".

The next GLASSPEX INDIA will take place in Mumbai from 20 - 22 March 2013.

Source: GLASSPEX INDIA-2011

2nd Glasspex India
(एक रिपोर्ट)

2nd Glasspex भारत में कांच उद्योग के लिए प्रमुख बाजार

विशेषताएँ:

- प्रदर्शनी **Messe** डसेलडार्फ **GmbH/Messe** डसेलडोर्फ इंडिया प्राइवेट लिमिटेड द्वारा **AIGMF** के सहयोग के साथ आयोजित की गयी।
- प्रदर्शनी का क्षेत्र 6588 वर्ग मीटर था।
- 19 देशों से लग-भग 176 कंपनियो ने तीन दिवसीय प्रदर्शनी में भाग लिया।
- प्रदर्शनी से समांतर, निम्नलिखित तीन सम्मेलन आयोजित किये गए:
    - o 2nd ग्लास प्रदर्शन दिवस 'आर्किटेक्चर में नवाचार, फ्लैट ग्लास और सौर प्रौद्योगिकी (11-12 जनवरी, 2011)
    - o 9वां अंतर्राष्ट्रीय **AIGMF** सम्मेलन (12-13 जनवरी, 2011) और
    - o पहला सौर उद्योग शिखर सम्मेलन ''अप्लिकेसन मीट्स प्रोडक्शन-भारत में पी.वी का उपयोग और उत्पादन कैसे करे'' (13 जनवरी, 2011)
- 4072 आगंतुकों ने प्रदर्शनी का दौरा किया।

दूसरा ग्लास प्रदर्शन (**GPD**) 11 जनवरी को आरम्भ हुआ और 2 दिनो तक चला, गिलास वास्तुकला, फ्लैट गिलास और प्रौद्योगिकी जैसे विषयों पर ध्यान केंद्रित किया गया। 2nd **GPD** विशेष रूप से भारतीय बाजार की चुनौतियों का सामना करने के लिए आयोजित किया गया। 100 से अधिक उच्च रैंकिंग राष्ट्रीय और अंतरर्राष्ट्रीय आगंतुकों ने इसमे प्रत्येक दिन भाग लिया।

GLASSPEXINDIA के साथ ग्लास प्रदर्शन दिवस के आयोजन ने प्रतिभागियों को दो उच्च गुणवत्ता के कार्यक्रम जैसे उच्च गुणवत्ता की शिक्षा और ग्लास इंडस्ट्री के अलग-अलग क्षेत्रों के विशेषज्ञों (फ्लैट और हालो ग्लास उद्योगों) के साथ नेटवर्किंग और अंतरराष्ट्रीय व्यापार करने के अवसर प्रदान किये।

13 जनवरी को आयोजित हुए सौर उद्योग शिखर का सम्मेलन ने मुख्य रूप से विकास, वित्तपोषण और उत्पादन सुविधाओं की प्राप्ति, आधुनिक उत्पादन तकनीकी, अंतरराष्ट्रीय सौर ऊर्जा बाजार और वर्तमान गुणवत्ता आश्वासन मानकों जैसे विषयों पर ध्यान केन्द्रित किया।

यह तकनीकी सम्मेलन पहली बार **Solarpraxis AG** के सहयोग से आयोजित किया गया, जिसमें भारतीय, अंतराराष्ट्रीय सौर बिजली कंपनियों, आपूर्तिकर्ताओं और निवशकों से लगभग 100 प्रतिनिधियों ने भाग लिया।

समापन दिवस पर मरियम हेग्नेर, प्रमुख, सम्मेलन विभाग **Solarpraxis** ने कहा कि '**GLASSPEXINDIA** और **Messe** डसेलडोर्फ के साथ साझेदारी से हमें एक बहुत अच्छे भारतीय सौर ऊर्जा बाजार की स्थिति का पता लगा। हम प्रतिभागियों की अच्छी प्रतिक्रिया से संतुष्ट हैं और भविष्य में भारत के साथ अधिक परियोजनाओं के बारे में विचार करेंगे।'

लगभग 150 ग्लास उद्योग प्रतिनिधियों ने 'ऑल इंडिया ग्लास' निर्माता संघ (**AIGMF**) के नौवें अंतरराष्ट्रीय सम्मेलन (12-14 जनवरी) में 'सतत विकास के प्रबंध विषय पर नवीनतम विकास के चर्चा सम्मेलन में मिले।

3rd GLASSPEXINDIA मुंबई में 20-22 मार्च 2013 में होगा।

Events

AIGMF Executive Committee Meeting

AIGMF Executive Committee Meeting was held on March 11, 2011 at India International Centre, New Delhi. The following subjects in interactive sessions / presentations were covered by conveners of sub committees –

a)	Taxation & Relief Sub –Committee – (Central Budget)	Shri Arun Kumar D, AGI Glasspac (An SBU HSIL Ltd.), Hyderabad
b)	Raw Materials & Fuels Sub-Committee - (Soda ash) Presentation by	Shri GK Sarda, Empire Inds. Ltd. Vitrum Glass, Mumbai Shri Alok Taparia, HNG & Inds. Ltd.
c)	Technical Sub-Committee – (Skilled Man Power)	Shri Sanjay Ganjoo Asahi India Ltd., Taloja
d)	Promotion of Use of Glass - Sub-Committee	Shri Vinay Saran, HNG & Inds. Ltd., Kolkata
e)	AIGMF Secretariat Way forward	Shri Manohar Lal / Shri Vinit Kapur

f) Presentation by Orbit Tours on proposed visit to 22nd China International Glass Industrial Technical Exhibition at Shanghai.

Next AIGMF Executive Committee meeting will be held in Hyderabad on 23rd June 2011. For more details please write to info@aigmf.com

22nd China International Glass Industrial Technical Exhibition

AIGMF team is travelling to 22nd China International Glass Industrial Technical Exhibition, Shanghai New International Expo Centre, (11 – 14 May 2011).

Companies to send names of their executives likely to join the AIGMF team latest by April 25, 2011. For more details please write to info@aigmf.com

"Green trees = clean air

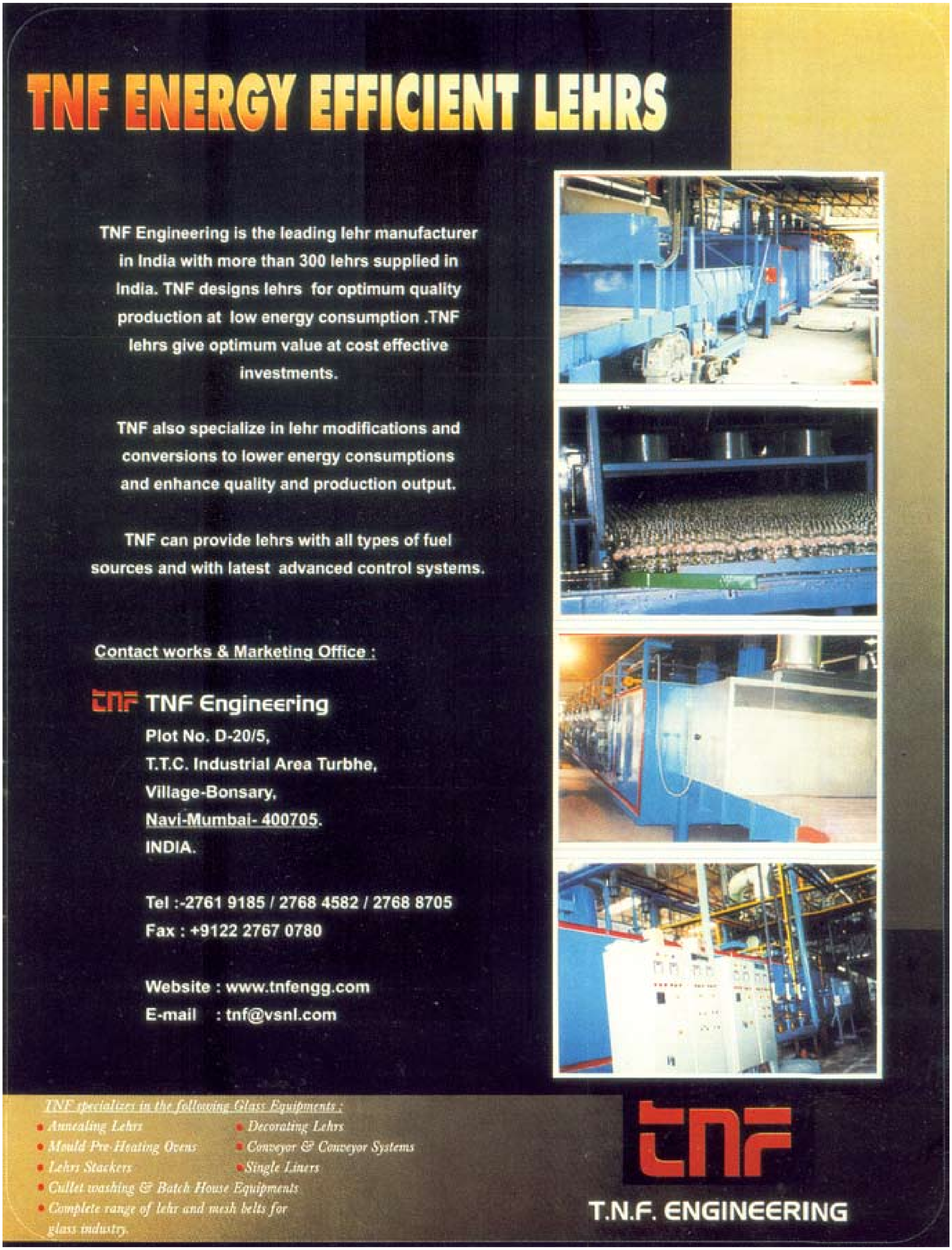
When trees can breath free, so can you!"

—Anon

"Forests are the lungs of our land,

purifying the air and giving fresh strength to our people."

—Frankin Delano Roosevelt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T.N.F. ENGINEERING

AIGMF Welcomes New Members

Company Name and address	Product	Recommended by
Affiliate Members – From India		
M/s BMT Machines Pvt. Ltd., 675/1/1, At. Post. Kuruli Near Kishor Pumps, Opp. Bharat Forge, Pune – Nashik Highway, Chakan Pune – 410 501 Contact Person : Mr. Sachin Kadave Tel : +91-2135-612400-62 Email : sales@bmt-india.com	Machinery required by Glass industry	Approved by Circulation
M/s Fosbel India Pvt. Ltd., 3/B, Sun Commercial Complex, Beside Citi Bank, Gotri Road, Vadodara – 390007, Gujarat, India Contact Person : Mr. Ajit Kumar Singh Tel : +91-265-2324340 Email : Ajit-Kumar.Singh@Fosbel.com	Ceramic Welding And hot repair Services + complete Furnace maintenance	Approved by Circulation
M/s Refratech (India) 4, B.B. D, Bag(East) 4th Floor, Room 60 A, Kolkata- 1 Contact Person : Mr. Bijay Kumar Email : refratech@dataone.in	Supplier of Machinery & Raw material	Subject to approval of EIGMA
Affiliate Members – From abroad		
M/s Hamad Aldress & Partners & Co. Kingdom of Saudi Arbia P.O. Box.: 325722 Riyadh – 113 71 Contact Person : Mr.Saad H. Aldrees Tel. : 0966 1 474444 Email : s@aldrees-im.com	Supplier of Raw Material	Approved by Circulation
Ordinary Members - Glass Manufacturers		
M/s Gold Plus Glass Industries Limited, G-192, Prashant Vihar, Delhi – 110 085 Contact Person : Mr. Vivek Dubey Tel. : 011 – 47000500 Fax : 011 – 47000555	Float Glass & Glassware	Subject to approval of NIGMA

Membership application of M/s Gold Plus approved for enrollment as ordinary member w.e.f. 01.04.2011.

Glass News-India

Commissioning of New Plant by Planet Ceramica

Planet Ceramica Private Limited has successfully commissioned 175 MT/day capacity Greenfield glass container project on 11^{th} March' 2011.

The plant has been set-up with complete state of the art technologies and machinery from leading suppliers in the world and will be one of the most modern glass container plants in India.

Name & Address of the new plant commissioned:
Samyu Glass Pvt. Ltd
Factory- Plot no 11, Ind. Development Park
APIIC , Pulivendula Kadapa Dist A.P.

USL to invest Rs. 600 crore in glass plants

Vijay Mallya led United Spirits (USL) plans to invest around Rs 600 crore to set up glass manufacturing plants, as the world's largest liquor firm by volume tries to rein in volatile input costs.

Glass is probably the second most key input after molasses in the production of packaged spirits brands. USL has experimented with tetra packs for some of its regular-priced brands in states like Andhra Pradesh and Karnataka. But this has been limited to smaller 180 ml packs and regular brands. Besides, the cost of investment in tetra packs is relatively higher.

Piramal Glass to invest Rs. 100 crore in greenfield project

Piramal Glass Ltd (PGL), a leading glass container manufacturer will invest Rs. 100 crore towards capacity expansion at its Jambusar unit in Gujarat to add 160 tonnes per day (TPD) through a greenfield project likely to be completed by F.Y. 12

Further, the company proposes to transfer 75 tonnes of its current capacity in the pharmaceutical segment to the cosmetic and pharmaceutical business.

Hindware receives the prestigious 'Power Brands of India' Award

HSIL Limited, India's leading Building Products and Container Glass Company, has set another benchmark in the industry with brand Hindware being honoured with the 'Power Brands of India' award for 2010. Company hopes to continuously grow through the coming years and conquer new heights of innovation and quality."

Making it one of the most trusted names amongst millions of households across India, some of the long list of Hindware's recognitions include: 'The Largest Tile, Ceramic and Sanitaryware Company' at Construction World Annual Awards 2010, 'India's 100 Most Valuable Brands' by 4Ps magazine and ICMR, CII- Godrej GBC award for 'The Most Innovative Water Saving Products' in 2010, Elle DECO International Design Award 2010, 'Business Superbrand 2010', 'Consumer Superbrand' by the Super Brand Council in 2009 and many more.

HNG & Inds. Ltd., setting up largest glass complex

Hindustan National Glass and Industries Ltd (HNG), the largest glass container manufacturer, is setting up the largest integrated glass complex with an outlay of Rs. 4,000 crore at Naidupet in Andhra Pradesh.

The project spread in about 210 acres will have five furnaces with three furnaces to manufacture glass containers and two to make float glass used in architecture and interior decoration.

First phase will commence production in March 2012.

Saint-Gobain Glass backs design talent with competition in India

A design competition aimed at students in India has been met by an unprecedented number of entries. 'Transparence 2010' was run by Saint-Gobain Glass India and received over 600 entries from architecture students from 100+ colleges, 14 of which are said to be using the work as their studio project.

The Awards Ceremony held recently at Hubli was attended by around 4,000 students, who saw Shoma Mathew & Surikrishna Siddharth from SPA College, New Delhi walk away with the first prize and Rs. 75,000. First runner-up and second runner-up were Shruti G H, MSRIT, Bangalore and Ankan Prasad, Somraj & Kritika Sha - Bengal Engineering College respectively and won Rs. 50,000 and Rs. 25,000 each

Live, Breath, Be Green

Don't kill the trees, rather plant a treee

and help the planet breathe.

ग्लास समाचार–भारत से

Planet Ceramica द्वारा नव संयंत्र चालू किया गया

Planet Ceramica प्राइवेट लिमिटेड ने सफलतापूर्वक 175 मीट्रिक टन– प्रति दिन क्षमता का ग्रीनफील्ड ग्लास कंटेनर परियोजना को 11 मार्च 2011 को चालू किया।

इस संयंत्र में अत्याधुनिक प्रौद्योगिकियों और संसार की अग्रणी आपूर्तिकर्ताओं से लाकर मशीनरी स्थापित की गई है। यह संयंत्र भारत में अति आधुनिक ग्लास कंटेनरों में से एक है।

नए संयंत्र का नाम पता: **Samyu** ग्लास प्रा. लिमिटेड
फैक्टरी–11 औद्योगिक क्षेत्र
विकास पार्क
(**APIIC, Pulivendula**)
कडापा जिला–आंध्र प्रदेश

USL द्वारा कांच संयंत्रों में 600 करोड़ रूपये का निवेश

विजय माल्या के नेतृत्व वाली युनाइटेड स्पिरिट्स (**USL**) कांच विनिर्माण सयंत्रों को स्थापित करने के लिए 600 करोड़ रूपए निवेश करेगा।

कांच संभवत: बोतल बंद मदिरा के उत्पादन में मलैसिज़ के बाद दूसरी सबसे महत्वपूर्ण सामग्री है। **USL** ने आंध्र प्रदेश और कर्नाटक जैसे राज्यों में अपने नियमित मदिरा पैक में से कुछ के लिए **tetra** पैक का प्रयोग किया, लेकिन इसे 180 मिलीग्राम मदिरा पैक तक सीमित किया गया है। इसके अलावा **tetra** पैक में निवेश की कीमत अपेक्षाकृत अधिक है।

पीरामल ग्लास द्वारा ग्रीनफील्ड परियोजना में 100 करोड़ रूपये का निवेश

पीरामल ग्लास लिमिटेड (**PGL**) अपने **Jambusar** गुजरात इकाई की क्षमता 160 टन प्रतिदिन बढ़ाने के लिए 100 करोड़ रूपये निवेश करेगा। यह परियोजना ग्रीनफील्ड के माध्यम से वित्तीत वर्ष 2012 तक पूरा होने की संभावना है।

Hindware को 'Power Brands of India' पुरस्कार की प्राप्ति

HSIL लिमिटेड, भारत की अग्रणी बिल्ड़िंग उत्पाद और कंटेनर ग्लास कंपनी, को **'Power Brands of India'** पुरस्कार से सम्मानित किया गया। कंपनी को आने वाले वर्षों में लगातार विकास, नवाचार और गुणवत्ता की नई ऊंचाईयों को प्राप्त करने की उम्मीद है।

HSIL भारत के लाखों परिवारों के लागों के बीच सबसे भरोसेमंद नाम है। **Hindware** के पुरस्कारों की लंबी सूची में से कुछ पुरस्कार इस तरह है: निर्माण विश्व वार्षिक पुरस्कार 2010 में 'सबसे बड़ा टाइल' सिरेमिक और **Sanitaryware** कंपनी, भारत के 100 सबसे मूल्यवान ब्रांड द्वारा **4Ps** पत्रिका और आईसीएमआर के लिए 2010 में 'सबसे नवीन जल उत्पाद सेविंग' सीआईआई के गोदरेज **GBC** पुरस्कार, एली डेको अंतरराष्ट्रीय डिजाइन 2010 पुरस्कार, 'बिजनेस **Superbrand 2010**', 'उपभोक्ता **Superbrand 2009** आदि।

हिंदुस्तान नेशनल ग्लास और इंडस्ट्रीज लिमिटेड करेगा सबसे बड़ा गिलास परिसर की स्थापना

हिंदुस्तान नेशनल ग्लास और इंडस्ट्रीज लिमिटेड (**HNG**), भारत का सबसे बड़ा कांच कंटेनर निर्माता, आंध्र प्रदेश के **Naidupet** जिले में सबसे बड़ा एकीकृत कांच परिसर की स्थापना करेगा।

यह परियोजना 210 एकड़ की फैलाव में पांच भट्टियाँ जिसमे की तीन ग्लास कंटेनर निर्माण और दो फ्लोट ग्लास और आंतरिक सजावट में इस्तेमाल कांच बनाने के लिए स्थापित की जाएंगी।

प्रथम चरण का उत्पादन मार्च 2012 में शुरू होगा।

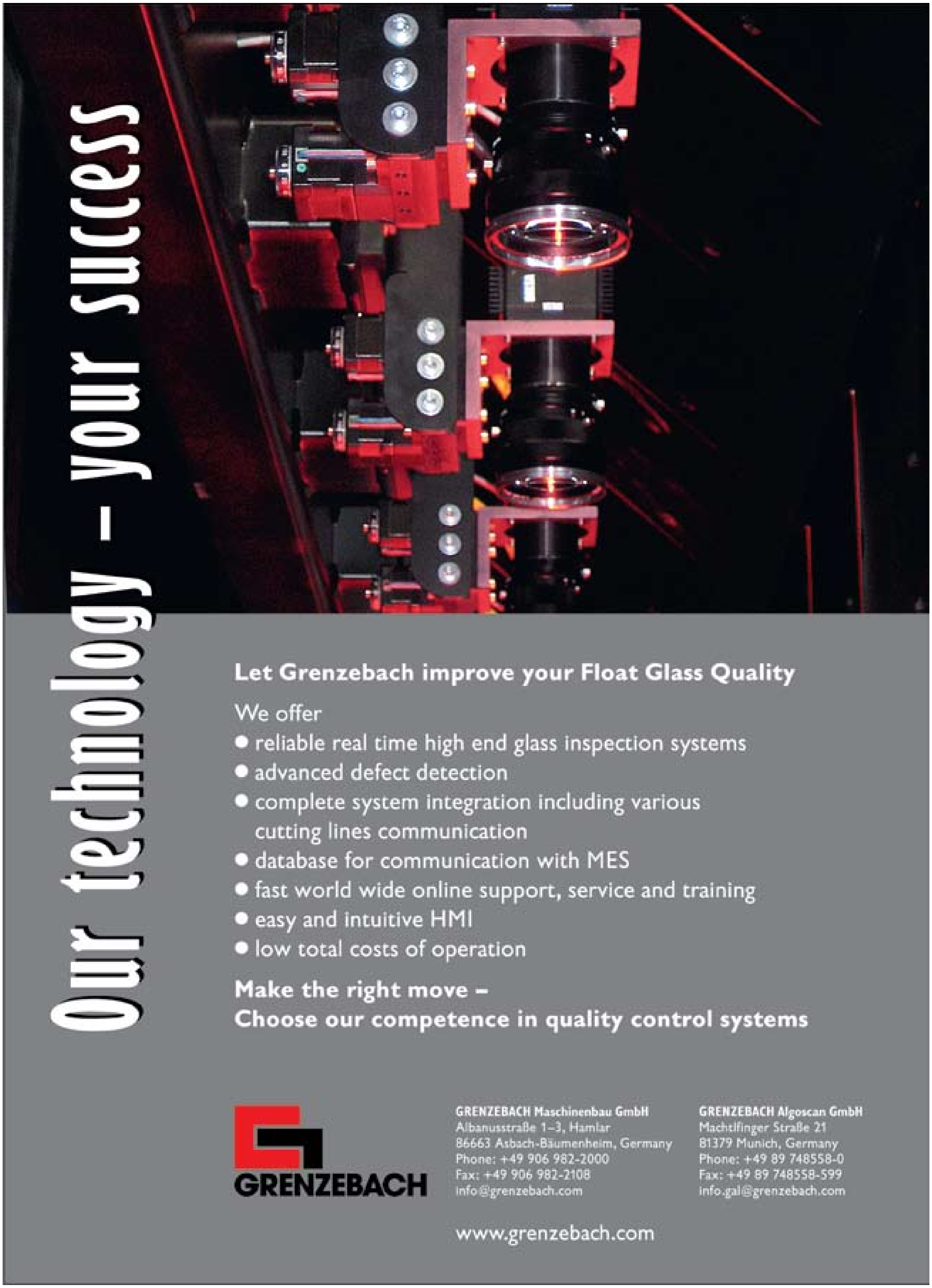
Saint-Gobain का डिजाइन प्रतिभा मे सहयोग

Saint-Gobain ने डिजाइन प्रतियोगिता **'transparence 2010'** का आयोजन किया जिसमे 600 से अधिक प्रविष्टियां 100 से अधिक कॉलेजों से प्राप्त हुई।

पुरस्कार समारोह हुबली में आयोजित हुआ जिसमे लगभग 4,000 छात्रों ने भाग लिया। शोमा मैथ्यू और सुरिकृष्ण सिद्धार्थ, **SPA** कॉलेज, नई दिल्ली को रू 75000 का प्रथम पुरस्कार: श्रुति **GH**, और अंकन प्रसाद, **MSRIT**, बंगलौर को रू 50000 का द्वितीय पुरस्कार एवं सोमराज और कृतिका शा, बंगाल इंजीनियरिंग कॉलेज को रु 25000 प्रत्येक से सम्मानित किया गया।

"When we heal the earth
we heal ourselves."

—*David Orr*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Fax: +49 89 748558-599
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www.grenzebach.com

Glass News – Worldwide

Industry representatives in Japan struggle to recover following earthquake

Those throughout Japan are struggling to recover after early March earthquake and tsunami, those within the glass industry doing the same.

Two glass manufacturers in the country have announced major donations to the recovery effort there. Asahi Glass Co. Ltd. (AGC) has announced that it is donating $3.7 million "to help recovery efforts in communities affected by the earthquake and tsunamis that hit Northern Japan."

"In addition, the AGC Group will assess the need in the affected areas and provide necessary in-kind donation," the company adds. "The Group will provide every possible assistance in relief and recovery operations in the region."

Pilkington parent NSG Group has announced it making a monetary donation of $1.2 million to the recovery efforts.

"We, NSG Group, would like to extend our deepest condolences for those who lost their lives in the Tohoku Pacific Offshore Earthquake in Japan and convey our sincere sympathies to those who were affected in the disaster areas," writes the company in its statement announcing the donation.

The core of a float line- New Grenzebach developments in glass cutting

Grenzebach has now achieved a new, patent-registered development. With this it has for the first time ever become possible to snap a cullet strip directly at the main snap roll with a length which can be reduced to a minimum of 200 mm over the glass ribbon width and which can be disposed of there at the same time. This will avoid glass loss compared to the procedure thus far, where a 600 mm strip was snapped and transported towards the next crusher. After successfully completed practical tests, the system is already being used for current orders.

A further new development will be available soon offering an offline version of Grenzebach's optimization software. As a result, glass cutting will be simulated and optimized offline using a standard PC. The resulting data will then be available for process optimization and planning.

For further and more detailed information please contact Grenzebach by e-mail at: egbert.wenninger@grenzebach.com

"If civilization has risen from the Stone Age,
it can rise again from the Wastepaper Age.

—Jacques Barzun

Plastic baby bottle ban prompts EU to recommend glass alternative

The European Container Glass Federation, FEVE, has welcomed the recommendation of the European Commission (EC) for parents to use glass baby bottles, following new rules to outlaw the use of poly carbonate baby bottles containing Bisphenol A (BPA).

On 1st March 2011, the EU Directive to ban the use of BPA in plastic infant feeding bottles took effect in EU Member States. Starting from 1st June, the ban will also cover imports of baby bottles containing the material.

The EC has taken due account of the European Food Safety Opinion of 2006, according to which, 'infants aged three and six months fed using poly carbonate infant feeding bottles have the highest exposure to BPA' and that this level of exposure 'decreases once feeding from poly carbonate bottles is phased out'.

In its Directive, the EC **therefore refers to glass as 'an alternative material to poly carbonate**' because it does not contain BPA and is safe for human health as it has to comply with very strict safety requirements set out for food contact materials.

ग्लास समाचार – दुनिया भर से

जापान में उद्योग प्रतिनिधि भूंकप क्षति से उभरने के लिए संघर्ष कर रहे है

जापान के लोग मार्च में आए भूंकप और सूनामी क्षति से उभरने के लिए संघर्ष कर रहे है। कांच उद्योग से जुड़े लोग भी इसी में लगे है।

देश के दो गिलास निर्माताओं ने जापान को इस संकट से उभरने के लिए भारी दान राशी देने की घोषणा की है। **Asahi Glass Company** (**AGC**) ने उत्तरी जापान में रहने वाले लोगों को सुनामी और भूंकम से हुई क्षति से उभरने के लिए 3.7 मिलियन डालर देने की घोषणा की है।

'इसके अलावा **AGC** प्रभावित क्षेत्रों में रहने वाले लोगों की आवश्यकताओं का आकलन करेगा और आवश्यक दान प्रदान करेगा' **AGC** इस क्षेत्र में हर राहत कार्यों में संभव सहायता प्रदान करेगा।

Pilkington, एनएसजी समूह, ने भी घोषणा की है कि वह राहत कार्यों के लिए 1.2 करोड़ डॉलर का दान देगा।

Grenzebach का ग्लास कटिंग में नव विकास

Grenzebach ने एक नव, पेटेंट पंजीकृत का विकास किया है। यह पहली बार संभव होगा के **cullet** को मुख्य पट्टी रोल से सीधा काटा जा सकेगा जिसकी लंबाई को कांच रिबन चौड़ाई 200 मिमी तक कम किया जा सकता है और साथ ही साथ निपटाया जा सकता है। इस नव प्रक्रिया से कांच की क्षति पहले से कम होगी, जहाँ 600 मिमी पट्टी को काटकर अगले क्रेशर की ओर ले जाया जाता था।

Grenzebach इस विकास प्रक्रिया में एक और नए ऑफ़लाइन अनुकूलन सॉफ्टवेयर को शीघ्र ही उपलब्ध करायेगा जो कांच को काटने में और अधिक सहायक होगा।

अधिक विस्तृत जानकारी के लिए कृपया (**Grenzebach**) के इस ई-मेल पर संपर्क करे egbert.wenninger@grenzbach.com

यूरोपीय संघ ने शिशुओं की प्लास्टिक बोतल पर प्रतिबंध लगाया और कांच का विकल्प दिया

यूरोपीय कंटेनर ग्लास फेडरेशन, **FEVE** ने यूरोपीय आयोग के इस निर्णय का स्वागत किया है। यूरोपीय संघ ने 1 मार्च 2011 को, शिशुओं की प्लास्टिक बोतलों में **BPA** के उपयोग पर प्रतिबंध लगाने का अपने संघ के सदस्य राज्यों को निर्देश जारी किया । यह निर्णय 1 जून से प्रतिबंध सामग्री युक्त बोतलों के आयात पर लागू होगा।

यूरोपीय संघ ने अपने इस निर्देशक में कांच का विकल्प इसलिए दिया है क्योंकि इसमें **BPA** नहीं होता और मानव स्वास्थ्य के लिए सुरक्षित है।

यूरोपीय संघ के इस निर्देशक की कॉपी आगे कांच में पढ़ें।

"Save trees; they are your food
Save trees; they are your clothing
Save trees; they give you shelter
Save trees; they give you rainfall"
Save trees; they are part of you."

—Anon

Environment Section

Zedtec's Development in Solar Glass
(installed by Gujarat Borosil Ltd)

The demand has soared for low iron glass used in the production of photovoltaic solar panels used for generating energy from natural sunlight. Gujarat Borosil a leading specialty glassware company in India has set up Extra Low Iron Textured Solar Glass at Bharuch, Gujarat. Thickness ranges from 3.2-4.0 mm. The glass is tempered as per EU Standards EN 12150 and is delivered custom packed.

For more information please visit at www.borosil.com

Further increase in Glass Recycling in Europe

The European Container Glass Federation (FEVE) has reported an increase in glass recycling in Europe. According to the figures released by FEVE, 11m tonnes of the 16.32m tonnes of glass collected in the 27 member states of the European Union were recycled. This corresponds to a healthy recycling rate of 67.42 per cent for the year 2009 and is a further improvement on the 2008 recycling rate of 65 per cent.

In 2009, Belgium lead the European Union with container glass collections reaching 95 per cent. It was followed by Switzerland and the Netherlands with 95 per cent and 93 per cent, respectively. Sweden and Austria reported collection rates of 90 per cent, while Germany lagged behind Denmark (88 per cent) at 81 per cent. FEVE figures put collection rate in France at 63 per cent. Bulgaria (27 per cent), Romania (22 per cent), Cyprus (18 per cent) and Greece (15 per cent) were at the bottom of the 27-country table.

According to the latest glass recycling estimates –

published one year ahead of the official Eurostat data - more than 67% of glass bottles and jars were collected for recycling in the European Union in 2009. The figures released by FEVE, the EU Container Glass Federation, translate into about 11 million tonnes or 25 billion glass bottles and jars being collected throughout the European Union, confirming the steady and positive trend of the last years (66% in 2008).

"Glass recycling increases each year thanks to the commitment of consumers everywhere. Our industry is able to turn this waste into a valuable resource to make new bottles and jars **because glass by nature is 100% recyclable -** says Niall Wall, President of FEVE – the European Container Glass Federation.

Recycling of glass avoids the use of virgin raw materials, reduces energy consumption and greenhouse gas emissions. Glass recycling contributes to creating and securing economic growth and local employment in Europe because glass is locally collected, locally recycled and locally produced.

EPA Recognizes Saint-Gobain with 2011 Energy Star(R) Sustained Excellence Award

The award recognizes the Company's outstanding leadership in energy management and reductions in greenhouse gas emissions. Through its U.S. subsidiaries, the Company becomes the first and only manufacturer of glass containers or fiber glass insulation ever to receive the award.

This is the third consecutive year that Saint-Gobain and its North American subsidiaries have been recognized by the EPA with an ENERGY STAR Award. Saint-Gobain was awarded the ENERGY STAR Partner of the Year Award in 2009 and 2010, but this is the first time the Company has attained the prestigious level of Sustained Excellence. Saint-Gobain's accomplishments will be recognized at an EPA awards ceremony in Washington, DC, on April 12.

Highlights of Union Budget (2011-12)

- GDP estimated to have grown at 8.6% in 2010-11
- Exports grew by 9.6%, imports by 17.6% in April-Jan 2010-11 over corresponding period last year
- Indian economy expected to grow at 9% in 2011-12
- Direct Tax Code (DTC) to be effective from April 01, 2012
- FDI policy to be liberalized further
- FII limit for investment in corporate bonds in infrastructure sector raised
- Additional banking license to private sector players proposed
- 15 more mega food parks during 2011-12
- National food security bill to be introduced this year
- 23.3% increase in allocation for infrastructure
- Surcharge on corporate lowered to 5%

Impact of the budget on glass industry-

- Manufacturing sector in GDP is targeted to be increased from 16 to 25%
- Surcharge has been reduced from 7.5 to 5%
- Government proposes to announce a Manufacturing Policy
- No change in the customs duty on imports of soda ash
- Fiscal incentives and budgetary support for green measures, customs duty on solar lanterns has been reduced from 10% to 5% to boost the use of green technologies
- An excise duty of 5% has been levied on Glass chimneys for lamps and lanterns, globes for lamps and lanterns and founts for kerosene wick lamps. However these goods would be subject to the concessional rate of one per cent excise without CENVAT credit facility, (under chapter heading of 70.1). 70.2
- The Concessional excise duty of 1% without CENVAT credit facility or tax has been imposed on Glassware produced by mouth -blown process and Glasses for corrective spectacles and flint buttons

AIGMF Team's visit to Asahi India Plant at Roorkee

February 2011 (Member Preview)

AIGMF Team visited the Asahi India plant at Roorkee. Discussions were held with Mr. Milind Gurjar, In-charge, Roorkee Float Glass Plant. The team visited all sections starting from batch collection to furnace and coming out of finished product - hot end till cold end.

AIS has two float glass manufacturing plants, one at Taloja and other in Roorkee. The Roorkee plant spread over an area of about 75 acres has a beautiful layout with greenery all around.

AIS manufactures various types of float glasses (varying in thickness of 2-15 mm in different shades and tints of clear, green, grey, bronze and blue in varying sizes).

The unit manufactures full range of automotive safety glasses, laminated windshields, tempered glass, solar control glass, etc. Heat reflective glasses and mirrors, which are used in construction and automotive sectors, are also manufactured.

The plant uses furnace oil as fuel. The company is anxious to have CNG to overcome the cost disadvantage because of the higher cost of energy per tonne of glass due to usage of furnace oil. The unit is using waste heat energy for heating furnace oil.

Silica sand used is brought from Allahabad and Rajasthan. Production capacity of the plant is 750 tonnes of glass per day. It is a fully automated plant employing about 550 persons.

They have a very hygienic canteen for staff and workers.

Problems/Expectations:

I. CNG availability for cost, quality and environmental factors

II. Closer interaction between technical experts of float glass manufacturing units in different companies. This could help all units in bringing improvements in the production process, etc.

III. To introduce legislation laying out a building code for use of appropriate types of glass in different buildings

IV. There is greater need to propagate not only eco-friendliness but also saving of energy by usage of reflective and other types of glass

Asahi India के रुड़की संयंत्र का दौरा (फरवरी, 2011)

AIGMF सचिवालय ने रूड़की में **Asahi India** संयंत्र का दौरा किया। चर्चाएँ श्री मिलिंद गुर्जर, प्रभारी, रूड़की फ्लोट प्लांट के साथ आयोजित की गई। **AIGMF** टीम ने **Batch Collection to Furnace** से लेकर - **hot end till cold end** तक सारे संयंत्र का दौरा किया।

AIS के दो फ्लोट ग्लास विनिर्माण संयंत्र है, जो की एक तलोजा और अन्य रूड़की में है। रूड़की का संयंत्र 75 एकड़ के क्षेत्रफल में फैला है, जो बहुत ही हरा भरा और सुन्दर है।

AIS अलग-अलग आकार के 2-15 मिमी के विभिन्न रूप, रंग (हरे, ग्रे, पीतल के **tints**, नीले) के फ्लोट ग्लास का उत्पादन करता है।

यूनिट मोटर वाहन, सुरक्षा, हवा ढाल, टेम्पर्ड, सौर नियंत्रण, हीट रेफ्लेक्टिव कांच और दर्पण की पूरी रेंज का निर्मात करता है। जिसका उपयोग निर्माण और ऑटोमोटिव क्षेत्र में अधिक रूप से किया जाता है।

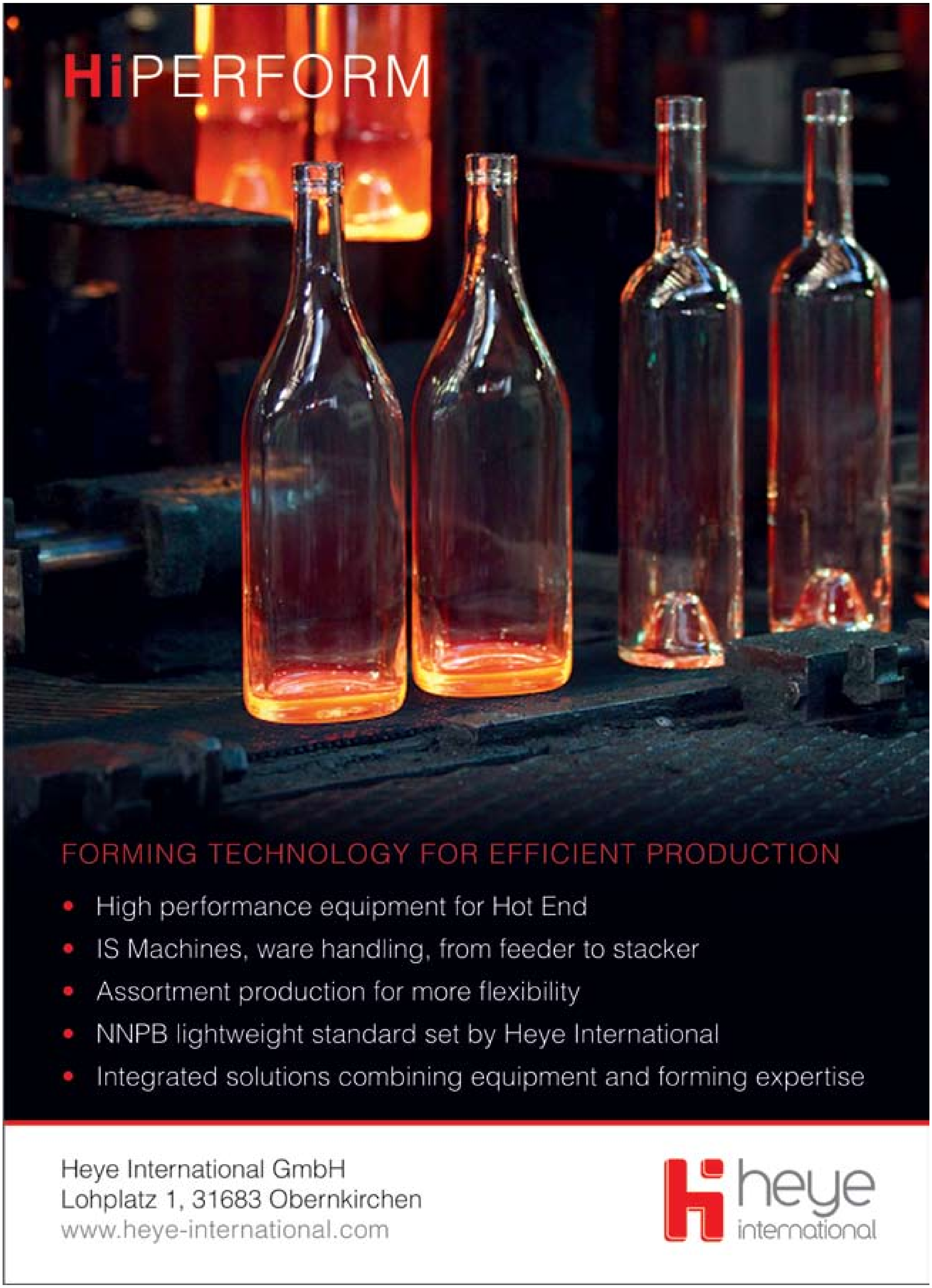
संयंत्र ईधन के रूप में भट्टी तेल का उपयोग करता है। कंपनी उच्च ऊर्जा लागत वाले भट्टी तेल के उपयोग के कारण की वजह से होने वाले नुकसान से उबरने के लिए सीएनजी का उत्सुक है। यूनिट बर्बाद गर्मी ऊर्जा का उपयोग भट्टी तेल गर्म करने के लिए कर रहा है।

सिलिका बालू इलाहाबाद और राजस्थान से लाया जाता है। संयंत्र की कांच उत्पादन क्षमता प्रति दिन 750 टन है। यह एक पूरी तरह से स्वचालित संयंत्र है जो 500 व्यक्तियों को रोजगार देता है।

रूड़की संयंत्र में कर्मचारियों और श्रामिकों के लिए एक बहुत स्वच्छ कैंटीन हैं

समस्याएँ/आशाएँ

1. सीएनजी की उपलब्धता, लागत, गुणवत्ता और पर्यावरणीय कारणों से
2. विभिन्न कंपनियों में फ्लोट ग्लास विनिर्माण इकाइयों के तकनीकी विशेषज्ञों के बीच बातचीत, जो कि सभी इकाइयों की उत्पादन प्रक्रिया, आदि में सुधार लाने में मदद कर सकता है
3. विभिन्न भवनों में कांच के उचित प्रकार के उपयोग के लिए कानूनी बिल्डिंग कोड लगाने का प्रस्ताव
4. अधिक से अधिक विभिन्न प्रकार के कांच का उपयोग न केवल पर्यावरण से मित्रता बल्कि ऊर्जा की बचत में भी सहायक है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Glass Melting Innovations
Glass Melting Technology: A Technical and Economic Assessment

Part II – Electric Melting and Batch Preheating*

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Abstract

This is the second part of a report prepared by the Glass Manufacturing Industry of USA under the US Department of Energy-Industrial Technology Programme. It gives the background and future course of development in glass melting technology. In the previous issue Fuel Fired Furnaces and Plasma Melting Technology were dealt with. In this part electric melting, batch preheating, non-conventional melting techniques and emission reduction innovations have been discussed.

Innovative electric melting technology

Electric furnaces have two shortcomings. The quality of the glass produced in all-electric furnaces is not sufficient for some requirements, such as color TV face plates. Furnace refractories are corroded more rapidly than in combustion-heated furnaces. These two drawbacks to electric melting have been addressed and a number of technologies have been patented. The following examples of innovations in non-conventional melting suggest the variety and extent of research and development in this area. (Barton, ICG, 1992)

Suspended electrodes (Saint-Gobain, 1986)

One of the main objectives of suspended electrode technology, patented by Saint-Gobain in 1986, was to reduce the temperature of and wear on the refractories at the sides and bottom of a cold-top electric furnace. This was done by choosing a suitable position at which to locate the vertical electrodes that were supported at their upper ends. As the energy is dissipated closer to the batch blanket, higher production is possible for a given throat temperature. By varying the depth of immersion of the electrodes, it is also possible, within limits, to independently vary the output of glass and temperatures. Another possible advantage is the ability to melt glasses whose resistivities are comparable to, or higher than, those of the furnace refractories. Suspending electrodes from the top of the furnace has several advantages. Temperature can be lower in the bottom and throat. Positions and lengths of electrodes can be changed after startup to adjust the furnace impedance. (Saint-Gobain, Levy, P.E., et al. FP2599734 (1986); Barton, 1993)

Refining zones for electric melters (Saint-Gobain, 1983; Pilkington, 1989; Trevelyan, 1989; Glaverbel, 1988)

The objective of four patents filed in the 1980s for electric melters was to use a special zone or compartment to refine electrically melted glass for the required quality of float glass. Patents by Saint-Gobain (1983), Pilkington (1989), Trevelyan (1989), and Glaverbel (1988) have in common the idea that refining requires an increase in temperature and convective currents to raise the molten glass to the surface and avoid return currents. The differences in each method are the ways in which the currents are organized.

Preheating batch and cullet

In the energy-intensive process of glass making, much heat is lost through exhaust gases that can otherwise be used to preheat batch and cullet. The basic function of preheating technology is to transfer heat from the glass furnace exhaust gases into the batch and cullet and increase production of the furnace. When batch and cullet and exhaust gas handling are integrated in a preheating

** Much work has been done on the subject since publication of this artical in 2004. We will keep members updated in the matter in subsequent issues.*
Those wanting to see part 1 of the article may refer to July-September, 2010 issue of Kanch.

system, energy costs can be saved and some emissions can be reduced.

During preheating, the batch can be agglomerated to simplify heat exchange techniques. Fluid beds are adapted and special silos are used. During air preheating, 57 percent of the non-electric glass melting systems surveyed in our study used metallic recuperators

During the early 1980s, heat recovery technology was of interest to conserve energy due to the high cost of fuel and lack of availability during the energy crisis of the 1970s. Also, boosting existing furnaces to increase production was preferable to the high capital investment of enlarging furnaces. Because research and development of preheating technology was hampered by limited funds and long periods of payback on investment, commercial success of preheating technology was limited. Yet the technology to conserve energy is worthy of study as costs of energy escalate in the United States.

Since the European glass industry has historically been challenged with higher energy costs than that in the United States, more innovative technology has been developed to conserve energy in the glass melting process. In at least seven preheating systems known to be operating on furnaces in Europe greater capital investment and operating costs are justified by the higher value placed on saving energy at the time of this writing.

A number of innovative approaches have been taken to develop preheating systems. In addition to preheating the batch, the temperature of the flame is lowered and NOx generation is reduced. In a LoNox furnace, batch is preheated as it floats on the surface of molten glass with the hot combustion gases, and the cullet is heated when these gases are cooler. In the PPG system, preheating and partial pre-reaction occur in a rotary kiln. (Barton, ICG, 1992).

During batch preheating, useful heat is recovered from furnace as exhaust gases to increase production and conserve energy. By recovering energy with a preheating system, glass producers could reduce furnace utility operating costs (fuel and oxygen) or boost furnace production, thus reducing the unit capital cost of producing additional glass. With batch/cullet preheating to approximately 1000°F (538°C), approximately 0.5 mmBtu/ton of glass produced can be recovered in the glass melting process. During preheating, the batch can be agglomerated to simplify heat exchange technique through adaptive fluid beds and use of special silos. Tecogen Inc. developed a fluidized bed batch preheater system for the Gas Research Institute in the 1980s. GRI then developed a raining bed batch/cullet preheater with a counter-flow heat exchange system. Corning and Tecogen, supported by DOE, developed a raining bed batch and cullet preheater in the late 1990s.

Since the mid 1980s, a number of batch, cullet or mixed batch plus cullet preheaters have been introduced into glass manufacturing. Batch/cullet preheat temperatures of 482-932°F (250– 500°C) and energy savings of 12 to 18 percent have been realized. Worldwide, 13 batch/cullet preheaters were installed, nine of these in Germany. European manufacturers have shown more interest in preheating systems because they have been faced with higher energy costs. Batch and cullet preheaters have been developed and installed by GEA/Interprojekt (direct preheating), Zippe (indirect preheating), and Sorg (direct preheating). A combined direct cullet preheater and electrostatic precipitator has been developed and installed by Edmeston. The Nienburger Process, in which exhaust gases and mixed agglomerated batch are in direct contact in a hopper, has had the most success of all the preheating technologies tried. A combination preheater and particulate capture variation to preheat loose batch-containing cullet is under development by BOC Gases.

When evaluating a preheating technology for application to a glass furnace, a number of issues must be considered.

- Does the unit preheat batch or cullet or mixed batch and cullet? Preheating of batch or cullet separately reduces the economic benefits and complicates the material handling systems.
- Does the unit constrain the batch/cullet ratio? Glass makers need to be flexible with batch/cullet ratios to meet constantly changing requirements of manufacturing.
- Does the unit increase pollution loading in exhaust gases, such as increased dust?

  Manufacturers in few countries will allow emissions to increase above current levels.
- Does the unit treat exhaust gases to best standards for particulate and SOx emissions? If not, an expensive post-process abatement device must be installed on the exhaust gas handling system.

E-batch (BOC Gases, 2001)

Electrostatic batch preheating technology, or "E-Batch," uses the waste heat from furnace exhaust gases for preheating batch and cullet to provide a simpler and lower-cost means of melting glass than conventional air-fuel furnaces when they are fitted with air pollution control systems. Developed by BOC Gases in 2001, the technology is unique in two ways. (1) It is designed to be integrated with oxy-fuel-fired furnaces. (2) It incorporates exhaust gas cleaning to the most stringent regulatory levels. The proprietary electrostatic mechanism (patent pending), which retains batch in the unit with occurrence of virtually no batch entrainment, is the key feature of E-Batch technology. (Alexander, Jeffrey C., "Electrostatic batch preheating technology: E-Batch," *Ceramic Engineering and Science Proceedings*, **22**[1], 37-53 (2001)).

In this system, particulate matter is precipitated from the furnace exhaust gases and deposited onto the batch surface. As a result, cooled outlet gases are recirculated to temper the hot furnace gases to about 1148°F (620°C). The E-Batch design has a low enough pressure drop to operate under natural draft from a stack that is appropriately designed. Cleaned, cooled gases are discharged into the atmosphere through the stack, in which the pressure is controlled by a damper. The most stringent regulations for particulate emissions are met with the E-Batch design.

So that less energy is needed by the furnace, raw material batch plus cullet can be preheated up to 932°F (500°C) prior to charging into a glass melt. Preheating humid batch or cullet provides additional savings in energy because water evaporates outside the furnace. Additional savings in cost of electricity per ton of molten glass can be obtained by using preheated batch and cullet because the pull of the furnace is increased and the amount of electric boosting needed to pull glass out of a furnace is decreased.

The greatest savings can be obtained by increasing the pull at the same thermal load of the furnace. Loss of wall heat per ton of molten glass will decrease because more glass will be melted in the same tank volume. Without increasing the pull or lowering the boosting capability, lower furnace temperatures can be realized while increasing the lifetime of the furnace. Reducing temperatures can often be prohibited when the quality of the glass product does not meet required specifications.

Batch is delivered by conventional material handling methods to the E-Batch module, which includes a reserve capacity above the active section. This allows for continued operation of the furnace during a failure or maintenance of the material handling mechanism. The module, a square or rectangular hopper located adjacent to the doghouse, features a discharge feeder to ensure mass flow of batch and cullet. Heated material is fed out of the bottom and delivered to the furnace in a continuous flow down through the silo, unlike conventional material handling equipment that maintains the batch level of the silo in a nearly full condition.

Furnace exhaust gases flow through the batch in horizontal channels, which are formed by rows of open-bottomed tubes in the silo. Gases from a given row are collected in a plenum at the side of the hopper and directed up to the next row of tubes. They pass through the silo in a serpentine path to create a cross/counter current flow with the batch as it moves downward. Because the tubes are open-bottomed, the batch forms a free surface by its angle of repose at the bottom of the channel. Since hot, flowing gases are constantly in direct contact with the

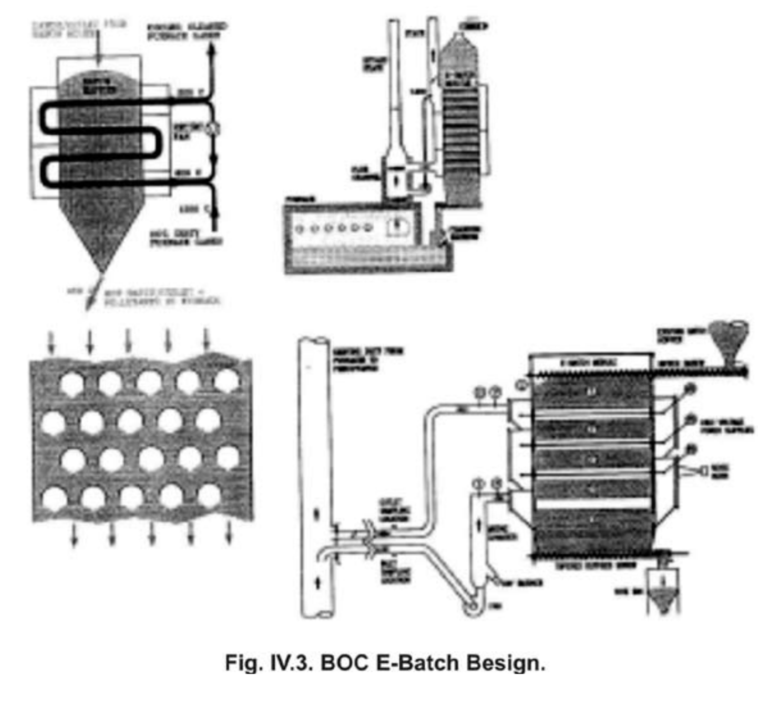

Fig. IV.3. BOC E-Batch Besign.

surface of the fresh batch material, heat transfer rates are many times greater than those achieved by indirect heat transfer. Chemically reactive batch constituents (soda ash) react with SOx in the gases. This forms sodium sulfite and sodium sulfate solid products that remain in the batch, partially removing SOx from the gas stream and scrubbing the gases. Reactions with HCl and HF are also possible.

However, direct contact causes entrainment of fine batch dust in the flowing gases and increased loading of particulate in the exiting gases. This requires additional cost for installation of downstream gas cleanup equipment. This electrostatic mechanism (patent pending), which is peculiar to the E-Batch technology, precipitates particulate matter from furnace exhaust gases and deposits it onto the batch surface, where it is delivered to the furnace with the heated batch. This meets the strictest regulations for particulate emissions.

BOC Gases installed a 14.4tpd E-Batch module in a slip stream of exhaust gases from the four operating oxy-gas fired furnaces at Gallo Glass (Modesto, CA). Actual glass batch was fed into the unit, although the preheated batch/cullet was not directly fed into a furnace, to evaluate issues involving oxy-fuel, particulates, operation with cullet, maintenance and cleaning methods, cold start-up procedures, and engineering parameters. With no device for air preheating, the inherent exhaust gas temperature of oxy-fuel furnaces is quite high. Thus the inlet temperature for the E-Batch, although limited by the sticking temperature of the batch, can be chosen by the designer. Hot exhaust gases from the furnace are tempered in the flue channel with cooled gases recirculated from the stack. The amount of re-circulated gases is controlled so that the inlet temperature to the E-Batch module is about 1148°F (620°C), or as high as possible while not exceeding the sintering temperature of the batch and cullet. Air could also be used for the tempering, but re-circulated gases, rather than air, are preferable.

Initial advantages of the E-Batch preheater over other types have been suggested, as follows

- Batch and cullet in any ratio and cullet of any normal size criteria can be handled in norms considered optimum for the glass melting process.
- The E-Batch module can be adapted to any conventional material handling and furnace charging equipment.
- All the desired functions can be achieved with one box rather than with a train of devices through which gas flows in a series.

A proof-of-concept bench-scale unit in the laboratory had initially suggested that:

- velocities for heat transfer are optimum;
- electrostatic collection is efficient;
- batch moisture is at a maximum.

BOC has been scaling up efforts to confirm the applicability of combining preheating of batch and cullet with furnace exhaust gases to collect particulate and acid gases. Development of the technology has been hampered by insufficient funding, scale-up, reliability and limited glass composition. E-Batch technology offers a simple and low-cost means of melting glass for conventional air-fuel furnaces that are fitted with air-pollution control systems.

Nienburger Glas Batch Preheater (1987)

Of all the preheating technologies explored, the Nienburger Glas Batch Preheater has been the most successful. In this system, furnace exhaust gases and a batch and cullet mixture are in direct contact inside a hopper. In the five installations in German glass facilities, furnace energy savings of up to 29 percent were reported.

The heat content of hot waste gases from the melting furnace directly heats the raw materials, batch and recycled cullet together in the preheater. Recycling waste heat back to the furnace is a very effective way to conserve energy in the glass melting process. The waste gases flow through the material in a rectangular mixed batch storage bin in which several levels of channels are open on the bottom. Inside a hopper, furnace exhaust gases and a batch and cullet mixture are in direct contact.

All raw materials are weighed and mixed prior to delivery to the preheater device. Located directly above the batch charger, this device acts as the mixed batch storage bin for the melting furnace. The hot flue gas from the furnace travels up through several layers of open-bottom ducts in a counter flow configuration relative to the batch being drawn downward as it is fed into the furnace. During the process, the alkaline components in the batch partially neutralize acidic gases in the waste gas stream.

Started up in December 1987, the first Nienburger batch preheater operated continuously for a 1.2 million tonne campaign ("tonne" refers to a metric ton [1000 kg], as opposed to a "ton" or "short ton," 2000 lbs.; therefore 1 tonne = 1.1 ton).

In March 1991, a second unit was installed on a new 330 tonne/day furnace and has remained on line over 99 percent of the time. In 1992, a third unit was commissioned as a greenfield furnace. It started up in

August 1995 with a 400 tonne/day batch preheater and a McGill electrostatic precipitator.

In February 1997, a "Gerresheim" oxy-fuel converted furnace was then built with a preheater, incorporating the design as developed during the previous installations. Using the Nienburger Glass process, batch preheating results in a certain amount of batch-dust carryover from the direct contact between the hot flue gases and the batch. A downstream electrostatic precipitator must be used to capture this fugitive dust as well as the fine particulate from the furnace. Although the Nienburger Glas batch preheater cannot be considered a particulate control device, it does reduce the emission of SOx, HCl, HF, as well as selenium from flint glass.

After operating for over 12 years, the Nienburger Glas batch preheating process has demonstrated:

- operations on end port, side port, and oxy-fuel container furnaces;
- no concerns for glass quality with green and flint container glass melting;
- energy used by the furnace was reduced by over 20 percent from conventional systems;
- proportional reductions of NOx and CO_2 by reduced fuel requirement;
- direct contact with batch results in collection of SOx, HCl and HF; recovery and recycling of sulfates and selenium.

Fluidized Bed Batch Preheater (Gas Research Institute and Tecogen Inc.; early 1980s)

In the Fluidized Bed Batch Preheater, hot furnace exhaust gases and supplemental energy from gas firing were used to preheat glass batch without cullet. Developed by Tecogen Inc. for the Gas Research Institute (GRI) with co-funding by Southern California Gas Co. in the early 1980s, a preheater demonstration unit was installed on a container furnace owned by Foster Forbes Glass (Milford, MA).

This preheater was designed to use hot furnace exhaust gases and supplemental energy (from gas firing) to preheat glass batch without cullet. Particulate condensation on the fluidized bed grid and material flow rate control created technical problems during operation. Too much space was required for the retrofit installation of the preheater to satisfy manufacturers. When batch carryover corroded the superstructure refractories, products of the corrosion (stones) contaminated the glass, and the project was abruptly terminated. In addition to the problem with refractory materials, funding was insufficient and scale-up, reliability, limitation of glass composition also made the technology less than feasible.

The preheater had a design capacity of 165 tons per day of batch and produced 250 tons of flint glass per day by using a cullet ratio of about 40 percent and 1200 KVA of electric boost. The technology showed promise as an energy conservation device, as well as an emission control device. (Hibscher, C.E., *et al.*, *Glass Industry*, **67**[2], Feb. 10, 1986, p. 8-10)

Raining Bed Batch/Cullet Preheater (GRI)

GRI subsequently developed a raining bed batch/cullet preheater with a counter-flow heat exchange system that could preheat the glass furnace charge with hot flue gases or supplemental combustion heating. The goal of this project was to demonstrate that raining bed preheater technology could improve the overall economics of commercial glass melting.

Hot combustion gases from natural gas-fired burners, which were separate from the furnace, were introduced at the bottom of the heat exchanger. Recycled glass, introduced at the top of the heat exchanger, was heated as it fell; discharged from the bottom of the preheater; and fed to a furnace charger. The cullet fines that were carried by the exhaust gas out of the top of the preheater were captured in a cyclone and returned to the preheater discharge. The upper preheat temperature was limited to 1150°F (621°C). by softening and sticking of the recycled glass.

Two demonstration units were installed to test the raining bed preheater technology. 1.) A 5 tpd pilot unit was tested for 48 hours at Thermo-Power in Waltham, MA, and showed:

- soda-lime batch/cullet could be preheated successfully to greater than 1000°F (538°C);
- a 1300°F (704°C) gas inlet and 280–380°F (138–193°C) gas outlet;
- the system could be integrated in association with an operating glass furnace;
- particulate loss from the preheater exhaust cyclone was <0.02% of the feed to preheater.

2.) The second demonstration, conducted on a soda-lime container furnace at Foster-Forbes in Milford, MA, showed:

- the furnace-firing rate was reduced by 10 percent;
- cullet preheat temperatures over 740°F (393°C);
- furnace temperature control was difficult;
- glass quality was not satisfactory.

Raining bed batch and cullet preheater technology was pursued by Corning Incorporated and Tecogen, with support by the DOE, in the late 1990s. Corning determined of the eight batch and cullet technologies available that the raining bed required the least capital and had the best opportunity to be accepted by the US glass market. When Corning chose not to continue business activities in this area, Praxair continued to develop the technology, believing that a successful demonstration would help lower operating costs of oxy-fuel furnaces. Praxair discontinued support of the project in late 2000 when installation of a unit at Leone Industries in Bridgeton, NJ, was forestalled due to permitting issues with the US Environmental Protection Agency (EPA). Changes in the configurations of the exhaust systems of existing furnaces are now interpreted as "modified sources," New source reviews are triggered by the EPA interpretations, and application of Best Available Control Technology (BACT) may not be feasible on some furnace configurations even though they may save energy. The most identifiable problems with raining bed preheating were materials of construction, insufficient funding, scale-up, reliability and limited glass composition.

Counterflow-crossflow Plate Cullet Heat Exchanger (Zippe, Germany, late 1980s)

A counterflow-crossflow plate cullet heat exchanger, developed by Zippe of Germany in the late 1980s, separates flue gases and the cullet with steel plates so that they have no direct contact. A separate cullet bin is required. Flue gases and batch mixture are separated by steel walls, minimizing pressure losses of the exhaust gases but not capturing particulate or acid gases in the batch. Hot waste gas flows through individual module ducts and is directed from the bottom to the top by corresponding air diversion funnels. The gases are cooled from approximately 1020°F (549°C) to 400F (204°C). The cullet is heated to 660°F (349°C) as it flows downward in adjacent modules.

The problem of fine particle entrainment with direct heating of loose batch was addressed by pelletizing, or briquetting, the batch. This solution is possible when low sulfur fuels are combusted, but not higher sulfur fuel that can be picked up by the batch and saturate the glass to form free sulfate on the melt surface. (Zippe, B-H, Glass, 1990, 67 [5] 1993; Barton Glass Tech., 34 [5], Oct. 1993) [Note: Owens Corning Fiberglass averted this problem by using ceramic balls as a heat exchange medium in an indirect batch preheat system. (Zippe B-H, Glass 1990, 67[5]) The modular design of the device makes for easy access to condensates for cleaning, but caused problems during operation. The Zippe indirect preheating device is in operation on furnaces in Europe, particularly in glass container furnaces in Germany, Switzerland and the Netherlands. (Barton, 1993) (Zippe B-H, *Glass*, **67**[5] (1990)

Electrified Cullet Bed (Edmeston, Sweden, 1990)

The Electrified Granulate Bed (EGB), a hybrid filter system, uses the cullet bed as a filter for waste gases. The system combines an electrostatic precipitator that removes dust with a direct cullet preheater. The hot waste gas enters the top of the system and passes through an ionizing stage, imparting an electrical charge to the dust particles. The gas then passes into a bed of granular cullet, which is polarized by a high-voltage electrode immersed in the cullet bed. The charged dust particles are attracted to the cullet, where they are deposited. The cullet is constantly being added at the top of a shaft from which it is removed at the bottom. The preheated cullet (up to 752°F [400°C]) and the attached particulates are charged into the furnace.

In 1994, the Irish Glass Bottle Co., along with the British Glass Manufacturers Confederation and Edmeston GmbH, received a Thermie grant from the European Commission to develop this innovative cullet preheating process. The system developed by this group incorporated an electrostatic principle to collect furnace particulate onto the cullet that was fed to the furnace. Like the Zippe system, this device requires a separate cullet bin. Since the exhaust gases must be passed through a bed of cullet about 12 to 18 in. thick, the cullet must be of a reasonable size to minimize the pressure drop through the bed. Cullet preheat temperatures above 1292°F (700°C) have been realized, and particulate is recaptured with the system. A second unit installed on a new oxy-fuel furnace at Leone Industries in the United States has met New Source Performance Standards (NSPS) standards for particulate control. (McGrath, J.M., "Preheating cullet while using the cullet ed as a filter for waste gases in the Edmeston heat transfer/emission control system," *Glass Technology*, **37**[5], 146-150 (1996))

Non-conventional melting systems

Methods of combining melting and refining in non-conventional melting systems have been explored extensively both in the United States and Europe. Attempts to design innovative glass melting processes for melting and refining have generally segmented the melting process into distinct steps that incorporate driven systems to increase dissolution of sand particles and initial gaseous evolution from raw materials.

Combined melting-refining systems explored over the past 25 years include the Rapid Melting and Refining (RAMAR) by Owens Illinois; Fusion et Affinage Rapide

(FAR) system by Saint-Gobain; Fusion et Affinage Rapide Electrique (FARE) system by Saint-Gobain; and the PPG P- 10 system. (See details of these technologies below.)

Since traditional glass melters rely on natural convection for internal melt movement, the melters are very "fragile." Critical convection patterns are strongly affected by minor changes in inputs, largely changing product quality. More robust melters are needed to allow a stirred chemical reactor in which convection is controlled directly. Controlled stirring forces can counteract the forces created by thermal and compositional gradients and by release of gases. Owens-Illinois pioneered the RAMAR system of mechanically stirred melter and centrifugal finer. Some of its essential features could be considered for future melters.

Rapid Melting and Refining (RAMAR) [Owens Illinois, 1972]

The RAMAR (Rapid Melting And Refining) project is a small, high-speed, electric glass melting and refining system developed by Owens-Illinois between 1967 and 1973. In this system, the melting and refining process is separated into three discrete steps that are carried out in three modules: a Macro Mix Melter, a Micro Mixer, and a Centrifugal Refiner. Equipment was designed especially for the project.

The RAMAR system demonstrates that high level shear can be exchanged for time and temperature in glass melting in the conventional melting process. The upper size limits of the Macro Melter were initially restricted by limitations on electrical power distribution, and the Centrifiner had limited scale ability and needed work on the rapid refining process. But Associated Technical Consultants Inc. has subsequently developed solutions to circumvent these problems.

Originally, the system functioned as designed except for the reboil in the Micro unit when the electric boost was on. Container glass was melted at optimum temperatures between 1950 and 2600°F (1066 and 1427°C). Temperatures were typically 2350 to 2450°F (1288 to 1343°C), and pulls were normally in the 12 to 16 ton/day range. This represents a 100 to 200°F lower molten glass temperature as compared to conventional container glass furnaces.

Glass homogeneity initially exceeded that of container glass melted in a conventional furnace, but the glass had a grayish color due to the presence of micro seeds of 0.0001 in. in diameter and numbering 10,000 per ounce. These seeds are unstable due to their high internal pressure caused by surface tension, and are not seen in conventional melts. The low-temperature, high-shear, short-time RAMAR process seemed to prevent the normal Ostwald ripening and consequent elimination of the micro seeds. These seeds may or may not have affected glass strength, but the process was changed. The settling tank was substituted for the Micro unit, increasing the holding time-temperature history of the glass and reducing the micro seed count to fewer than 200 per ounce. When this glass was hand blown into thin glass bubbles, clarity and smoothness were excellent; homogeneity was confirmed by Shelyubskii measurements.

RAMAR system steps

- The Macro Mix Melter introduces most of the energy needed for melting and accomplishes most of the large scale reactions by dispersing the batch through high-intensity mixing action in a high-powered electric melter. The melt space was a 2 ft. cube with a 6 in. by 6 in. outlet notch and trough in one side. Four 1 1/4 in. molybdenum electrodes were inserted through the bottom. A water-cooled steel shaft was mounted vertically on the centerline and an 18 in. diameter, fourbladed molybdenum propeller was attached to the end of the shaft, adjusted vertically and driven by a variable-speed, 10-horsepower motor. The batch chargers and auxiliary gas burners were inserted into a split cover about 6 in. above the melt chamber.

  A single-phase 600-KW saturable reactor supplied the power. One leg was connected to the rotating propeller shaft through graphite blocks and the other was connected to all four corner electrodes. The unit was a continuously stirred tank reactor.

  A typical low-level pull of 12 tons/day might use 240 volts, 1450 amperes, and 200 RPM and operate at 2350°F (1288°C). The batch stream was attenuated by the high surface velocity of the melt. The melt was very foamy with densities as low as 40 percent of normal glass. As a result, the batch sank into the melt to be further dispersed by the propeller.

  The rapid-response power supply was controlled by a thermocouple in the melt, so with any step increase in batch feed rate, the power increased nearly instantaneously with no temperature loss in the system. Maximum tested throughput was 18 tons/day, limited only by downstream processing equipment. With the low density, average residence (holding) time in the melter was short, typically 20 to 40 minutes for the normal operating range. As expected with a highly mixed system, batch materials were found in the output stream. At 2450° F (1343°C) temperature and 20 minutes residence time, about 3 percent partially reacted sand grains were observed. Higher temperatures or increased residence times decreased the amount of residual sand grains found.

Owens-Illinois (pellet et al. 1973; Barton, 1993).

- The Micro Mixer unit was designed on the micro scale process of homogenization. A 2ft.- diameter, 5ft.-deep cylindrical chamber contained an 8in.-diameter, 50in.-long molybdenum cylinder, located on the center line. The cylinder could be rotated up to 100 RPM by a three horsepower variable speed motor. Horizontal electrodes compensated for heat losses and temperature adjustment.

  This unit functioned mechanically, but chemical results were unacceptable. The unit was operating as a back mix reactor with a circulation loop. Reboil from the electrodes caused a stream of glass to circulate from the bottom to the top of the unit. The problem was avoided with limited power inputs and the unit then produced very homogeneous-foamy glass. Later the Micro Mixer was replaced with a more satisfactory holding tank, 24 in. wide by 24 in. deep by 66 in., with sidewall electrodes for temperature adjustment and heat losses. The output was a homogeneous seedy glass.

- The Centrifugal Refiner was designed to remove seeds and bubbles rapidly from the glass without using chemical refining agents. The normal bubble rise that results from density differences between the glass and the gas bubble is directly proportional to the gravitational force, normally 1G. The G force enhancement by means of a centrifuge offered the most potential for rapid seed removal.

  The Centrifiner's vertical axis inlet and outlet was operated with a 14 in. diameter, which had been designed for a 24 in. diameter hot zone. The inner chamber was about 4-feet long with inlet and outlets about 1.5 feet long. Heat losses caused temperature drops of 100 to 150°F in the glass and were dependent on pull rate. The unit was tested at a maximum temperature of 2600°F (1427°C). A platinum slinger placed in the top inlet caused the inlet stream to move to the top wall of the unit. A platinum diverter plate was located near the bottom, with holes located at the wall to allow glass with high G-force, time histories to move to the bottom exit tube. A stationary spindle decelerated the spinning glass column and moved vertically to control the flow rate.

Seed removal was controlled by rotational speed, viscosity (temperature), time (pull rate), and seed size. Seeds above a certain size are removed and smaller seeds pass through. The operating design parameters were selected to remove seeds above the normal minimum of about 0.004 in. at flow rates up to 19 tons/day. When operated at normal speed of 1100RPM, 240 G forces developed at the 14 in. diameter. (Richards, Ray S., "Rapid Glass Melting and Refining System," *Advances in the Fusion of Glass*, American Ceramic Society: Westerville, OH, 50.1-50.11 (1988))

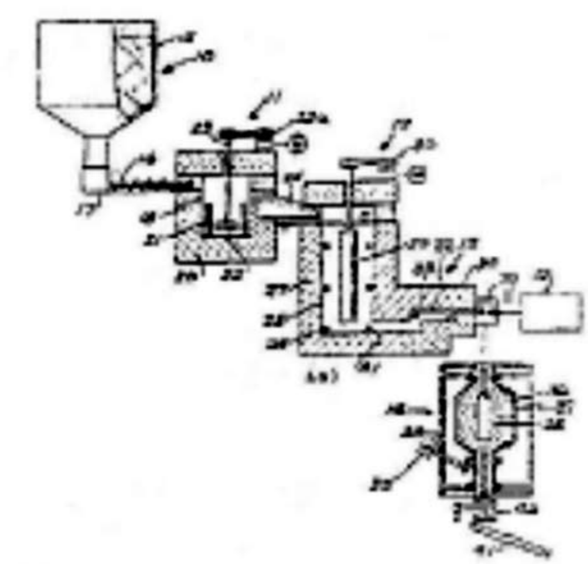

Fig. IV.4. Rapid Melting and Refining (RAMAR) Owens-Illincis (Pellet et al. 1973; Barton, 1993)

Table IV.I. RAMAR compared to conventional melting systems.

Standard Furnace	RAMAR
30 hr. Mean Resident Time	20 Times Faster
Mixing–8 ft. per hr.	2000 Times Faster
Heat Transfer by Radiation/ Convection	Direct Electric–100 Times Faster
2900°F (1593°C) Peak Temperature	2500° F (1371°C) Little Refining Agent
NOx Pollution	No NOx Pollution
SO_2 Pollution	No SO_2 Pollution
Bubble-See Rise-1/2 ft. per hr.	240 Times Taster
Large Furnace Size	20 Times Smaller

Owens-Illinois did not move into production scaleup because of technical limitations associated with the centrifigual refining device. The 12-ton capacity of the RAMAR was insufficient to serve a typical IS machine that requires an 80 ton capacity.

Fusion et Affinage Rapide (FAR) (Saint-Gobain, 1974) (Fast melting and refining)

The Fusion et Affinage Rapide (FAR) system combines flame fusion and electrical refining. (Mattmuller, R., et. al. FP 2 281 902 [197]; Barton, 1993) Preheated by furnace gases that have passed through a recuperator, an agglomerated batch with caustic soda as a binder drops onto an inclined hearth. Rough melted by flames from a set of intensive burners, the melt falls into an electrically heated refining compartment where a permanent state of convective foaming is maintained by the presence of solids and bubbles. The strongly heated melt contains sulfate. Any remaining large bubbles rise to the surface in the second refining compartment.

Barriers to further development of FAR were materials of construction, reliability of the method, and glass quality.

Fusion et Affinage Rapide Electrique (FARE) (Saint-Gobain, 1984) (Rapid electric melting and refining)

The Fusion et Affinage Rapide Electrique (FARE) system replaces the flame melter of FAR with a single stirred electric melter. (Barton, J.L., et al. Euro PO 135 446 (1984)) Total residence time for melting, "boiling," and clearing compartments is about one hour. Except for the position of the exit, FARE works on principles similar to FAR and RAMAR systems. All gases from the melter and foaming zone escape through the batch charger, which doubles as a heat exchanger and SOx scrubber.

Development barriers of FARE were materials of construction, scale-up, and reliability.

Cyclonic melters

Cyclone furnaces with their short residence time and rapid heat exchange have been proposed for use in preheating the batch materials of sand, lime and dolomite before they are brought into contact with fused sodium carbonate. In a cascade of cyclones at a temperature well above the melting point of soda ash, the components are melted separately and mixed with hot solids in an original venturi system that projects the mixture downward into a separation chamber. Hot gases escape from this chamber through the cyclones and the recuperator, preheating the air for the main burner, which is placed in a refractory-lined cyclone. (Battelle's Pyroflex, 1991) (Anon. *Glass Intern*. (1991), [6] 39–41); Barton, 1993).

Development barriers to cyclonic melters have been materials of construction, scale-up, limited glass compositions, and glass quality.

VORTEC Cyclone Melting System (Vortec CMS, 1991)

The Vortec cyclone melting system, a preheating/melter design, injects fuel, batch and air into a first cyclone, a counter-rotating vortex combustion-preheater. Solids suspended in hot gases are ejected into a horizontal cyclone melter. The material is ejected with the combustion gases into a separation chamber on which the recuperator that heats the combustion air is mounted. For this technology, coal might be used as a fuel, or gas produced by a cyclone gasifier may be used. [Glass Production Technology Int'l, Sterling Publications Ltd. (1991) (Barton, 1993)]

These cyclone melter devices are frequently noted in the Russian glass technology literature.

(Chubinize, 1989) A sophisticated system, the vertical vortex combustor is similar to that used by the Advanced Glass Melter developed by the Gas Research Institute, and is designed to accept all types of fuel: gas, liquid, pulverized coal or coal slurry.

Innovative technology for emissions reduction

A number of attempts have been made to develop technology to reduce emissions that result from glass manufacturing processes. All-electric melting eliminates most air emission concerns, but it is not always an economically practical solution in glassmaking. Use of electric power rather than fossil fuels to comply with environmental regulations is rarely economical and can be technically hazardous. Some add-on technologies can curtail emission rates of NOx, SOx, particulate, CO, halides and heavy metals from fossil fuel furnaces, but add cost and no product value. Yet glass makers prefer some process revisions that add costs and show compliance, although capital investment is lower. Control techniques for solid emissions and SOx have included electrostatic filters, bag-houses and scrubbers, techniques that have little impact on the furnace operation. To control NOx emissions, glass manufacturers have treated with ammonia injection, use of pure oxygen and progressive combustion or other radical changes in the combustion technology. (Barton, XVI ICG, 178-9, [1992])

Two innovative techniques that require slight to major modifications to furnace design are the Körting Gradual Air Lamination and the SORG LoNox Furnace. The Körting process increases the oxygen in the combustion flame, while the SORG process cools the combustion air from the regenerators to address the high thermal efficiency, thereby reducing NOx generation, particularly in container-glass furnaces. (Barton, 1992)

Körting Gradual Air Lamination (Widemann, 1987)

The objective of Körting Gradual Air Lamination is to reduce NOx formation. This system applies to end-fired furnaces. Combustion air is added progressively to an initially oxygen-poor flame. At the top of the regenerator chamber, a fraction of the preheated air is extracted by a high-temperature venturi. This air is carried to the opposite end of the furnace through a ceramic duct and injected into the flame at several points as it turns in front of the end wall (Korting Gradual Air Lamination). (Barton, 1992; Wiedmann, U. Euro P O 305 657, 1987)

Similar technology, OEAS, developed by the Gas Technical Institute and commercialized by Combustion Tec, uses a retrofit technology for air staging with existing burner configuration to reduce NOx.

Sorg LoNox Furnace (Pieper, 1989)

The LoNox furnace was developed by Nicholaus Sorg GmbH and Co. KG, West Germany, to reduce NOx and other pollutants without adding on pollution controls or sacrificing melting or energy performance. To reduce NOx generation, the Sorg LoNOx furnace uses much cooler combustion air than that produced by other furnace regenerators, which are responsible for the high thermal efficiency of container glass furnaces. In the Sorg LoNOx furnace, batch is preheated as it floats on the surface of molten glass with the very hot combustion gases; the cullet is heated when these gases are much cooler.

Preheating of the batch, the inside of the furnace, the gas, and the cullet compensates for the reduced preheating of the air. Burners are located in the melting zone only. The combustion gases leave this compartment and give up their heat in four stages. First they flow upstream through a preheating zone where they heat the batch floating on the surface. They leave the furnace through radiant recuperators that heat the combustion air, and then enter convective recuperators that preheat the gas. Finally, they are passed through a preheater for cullet. A special tank design includes a shallow melting area with bubblers, a preheating zone with a sloping bottom, and a deep refiner.

The first installation of the LoNOx melter was a 200-metric ton, natural gas-fired container furnace at Weigand Glas Steinbach, Germany, in late 1987. This somewhat complex furnace design has been successfully introduced for tableware and container glass melting. (Moore, Ronald H., "LoNOx melter shows promise," *Glass Industry*, **71**[4], 14-18 (1990))

Conclusion

Continuous glass melters in operation today have evolved from the basic design of a furnace created by the Siemens Brothers of Germany in the middle of the 19th century. Improvements to the melters have been efficient and reliable enough that the Siemens furnace technology has continued to serve the needs of glassmakers. But the high capital costs for building or rebuilding, limited flexibility of operation, high costs of fuels, and environmental regulations have catalyzed efforts to seek new glassmaking technology.

Over the past 30 years, major innovations have been developed for glass melting but with varying degrees of success. The fragmentation of glass manufacturing into the four major segments of float glass, container glass, fiberglass, and specialty glasses has made for the development of numerous technologies. As advancements have been made in refractory materials, instrumentation and computer modeling, state-of-the-art equipment, firing techniques, and fuel replacement, many of the technological developments in this area are worthy of reconsideration. Selected technologies are presented in detail for reference and further study by glass manufacturers.

The objectives of research and development for innovations in glass manufacturing have been to replace or renovate combustion heated furnaces to comply with clean air laws; recycle glass industry wastes and used glass products; develop electric melting facilities with longer furnace life and improved glass quality; and replace melting tanks with smaller, less expensive, more flexible melters. Particularly in the last half of the 20th century, glass scientists and engineers have explored all aspects of the glass melting process—preheating batch and cullet; melting with preheating systems; nonconventional melting systems, regenerative, recuperative, electric, oxygen-fuel; waste vitrification; refining; and emission control systems. Of the innovative technology developed and tested, some has found its way into the mainstream of glass manufacturing. Others have been set aside for lack of funding for continued development, inadequate materials for construction, scale-up problems, unreliability, limitation of glass compositions that could be processed, lack of process control, production of poor glass quality, safety issues, high net cost or environmental failures.

Innovations in glass melting systems have involved melting and refining by conventional and non-conventional means. A segmented furnace system has been suggested as the most feasible alternative to continuous tank furnaces. Segmented systems explored by TNO in the Netherlands and PPG Inc. in the United States address the problem encountered by continuous tank furnaces of recirculation flows into the melting tank that limit or, which limit the maximum residence time of molten glass in the tank. The key components of the segmented system that offer the greatest promise are batch preheating, driven dissolution in the fusion process, and innovative refining. The PPG P-10 process is one of the most evolutionary advances in glass melting of the 20th century. This system optimizes each phase of the glass fusion process, combining techniques for melting, refining and homogenizing soda-lime glass. In addition, it was designed to be nonpolluting and minimize residence times. The British Glass industry designed the Glass Plasma Melter to demonstrate energy savings in manufacturing soda-lime silica glass.

Accelerated melting systems have been designed to agitate the batch so that it never remains undisturbed on the surface of molten glass. Innovative approaches have been taken to develop melters that have a melting rate proportional to a volume rather than to a surface area and will allow production demands to be met by smaller furnaces. Among these innovative technologies are Submerged Combustion Melting (Glass Container Industry); GI-GTI Submerged Melter; Advanced Glass Melter (Gas Research Institute); and systems for nuclear waste vitrification. To address the shortcomings of electric furnaces, i.e., glass quality is insufficient and furnace refractory corrosion, a number of innovative technologies has been patented. Among these technical innovations are suspended electrodes and refining zones for electric melters.

Batch preheating has been an area of considerable study because much heat from the energy intensive process of glassmaking is lost through exhaust gases that could be used to preheat batch and cullet. Energy costs and emissions can be reduced through this technology. The E Batch system developed by BOC Gases in 2001 is the most recent technology that has been developed. It is unique in that it has been designed to be integrated with oxy-fuel-fired furnaces, and it incorporates exhaust gas cleaning to a stringent regulatory level. The Nienburger Glas Batch Preheater has been one of the most successful preheating technologies explored. Furnace exhaust gases and a batch and cullet mixture are in direct contact inside a hopper, and furnace energy savings of up to 29 percent have been reported in five installations in Germany.

Non-conventional methods that combine melting and refining include the Rapid Melting and Refining (RAMAR) system developed by Owens Illinois, which has never been used in production but bears features worthy of consideration for future melters. Saint-Gobain has developed the FAR system, which combines flame fusion and electrical refining and the FARE system, which replaces the FAR flame melter with a single-stirred electric melter.

Environmental regulations to restrict emissions from fossil fuel furnaces have encouraged consideration of all-electric melters, which eliminate most air emissions concerns but are not economically feasible. Two innovations for emissions control are considered: Körting Gradual Air Lamination and the Sorg LoNox furnace.

The variety and extent of innovations in glass melting technology that have been researched and developed—or abandoned—over the last quarterof the 20th century depict the exhaustive search for revolutionizing the glass melting process to meet the long-range needs of glass manufacturers into the 21st century. The technologies reviewed here suggest the vast potential for a revolutionary glass melting system.

Use of Sodium Sulphate in Glass Batch

Part II- As a Refining Agent

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Abstract

A review of the use of sulphate in glass batch as a refining agent has been presented. Sodium sulphate alone or in combination with reducing agents serve many purposes starting from accelerating glass batch reactions, controlling redox of the melt, fining of the glass and production of amber colour. The reactions going on in the glass batch containing sulphate- reducing agent are varied and a large number of studies have been made in recent years to understand the reactions In the first part of the article published in the previous issue its influence on glass batch reaction and melting has been dealt with. In the second part the refining action of sulphate has been discussed.

Introduction

Three actions are completed before a glass goes to the working end for conditioning and formation of the glass article. They are: batch melting, refining and homogeneisation. Benefit in production may be gained by cutting down the time for any of the operations. The endeavour is to accelerate the three processes as much as possible. Once the batch is melted and the surface is covered with mirror like glass refining takes over which starts from the melting end to the refining area. Refining is cleaning of all gas bubbles from the melt. The homogeneisation phase makes the glass uniform and remove cords and other inhomogeneities. The gas bubbles, seeds or blisters originate from entrapped air in the batch or are produced due to the gases released during decomposition of the raw materials. Glass composition, solubility of the gases in the glass, viscosity, temperature, addition of refining agents which help to sweep off the bubbles by initiating movement in the glass batch and increasing their size or by bubble coalescence and gas diffusion all play an important role. Salt cake alone and in combination with a reducing agent has become the most favoured refining agent in modern container and flat glass industry. The temperature at which commercial glass production takes place makes it also the most suitable refining agent. Large amount of work have been done on this in the last two decades to understand the refining action of salt cake[1,2,3,4,5,6,7,8]. Whereas, hot stage microscopy, analysis of seeds and blisters using gas analysis methods like mass spectrometry were done earlier the present investigations mainly depend on study of the chemistry of the glass-sulphate combination, and direct measurement of gas evolved during refining[1,3,5] in a sealed and controlled atmosphere furnace with on-line measurement of evolved gases coupled with chemical analysis of the glass. Efforts to identify the sulphur species and their specialisation in glass are also being studied[9]. The mechanism of glass refining with salt cake alone or with a reducing agent is gradually becoming clear. It may be mentioned here although it has been found to be most favoured refining agent the process is far from simple and great care has to be taken for its successful application. This paper reviews the work done in the recent past.

Two stages in the refining process may be identified namely primary refining and secondary refining. During primary refining the gases released by the refining agent do not only help in rising of bubbles but also help to strip the dissolved gases from the melt and remove them. In the secondary refining which occurs on cooling, the fine seeds dissolve in the melt because of higher solubility at lower temperature. However, this solubility may increase the risk of reboil especially at inhomogeneities like refractory surface. The discussion below will concentrate on nucleation of bubbles, increase of their diameter and velocity of rise to escape after coming to the surface. The current in the glass tank has also an important role to play. The current may bring the glass from the bottom to the top and help them to release the gases to the furnace atmosphere.

As the glass batch is heated up. The liquid formed by the melting of the double carbonate of $CaCO_3$ and Na_2CO_3 eutectic (see part I) reacts with the silica forming silicates and releasing CO_2. Since the batch is porous the CO_2 escapes easily and the gaseous atmosphere is such that outside air cannot reach the glass surface. When the

Those wanting to see part 1 of the article may refer to July-September, 2010 issue of Kanch.

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glass formation starts some CO_2 gets entrapped in the liquid but its solubility in the glass becomes more and more low as the glass becomes acidic due to dissolution of silica. As glass formation continues large bubbles coalesce and moves to the surface by channels formed due to the collapse of large bubbles. The small amount of CO_2 that remains entrapped in the glass along with the gases of air entrapped in the melt and water are removed by primary fining. Gas analysis of bubbles has shown that the bubbles of entrapped air are mainly nitrogen and the ratio of nitrogen to argon is the same as in air.

Formation of glass bubble from the melt: After the major large bubbles escape from the melt during settling down of the batch fine CO_2 and other gas seeds remain in the melt. The glass melt also dissolves gases from carbonate, air and decomposition products of fining agents. A homogeneous nucleation of bubbles cannot occur unless the super saturation of the gas in the melt is very high of the order of thousand times. This is because the free energy needed to produce new surface of nucleating bubble is very high due to the high surface tension of the glass melt. Therefore, homogeneous nucleation i.e. probability of bubbles forming at any place of the melt are the same, does not occur. The gaseous species should therefore migrate to the fine seeds because of differential partial pressure and make the seeds to grow. When the partial pressure of the gas in the bubble and in the glass are the same no transport takes place.

Bubble nucleation and rise: Bubble nucleation occurs by heterogeneous nucleation i.e. at inhomogeneities where entrapped gases work as nucleation sites. It is most often the silica grains. The bubbles form on the surface of the grain and are detached from the surface once the buoyancy is greater than the surface tension force holding it to the surface of the grain and can be written as

$$(\rho_{glass} - \rho_{bubble})g\, V_{bubble} \geq \sigma_{inter}.\, P \qquad \ldots(1)$$

Where, ρ_{glass}, ρ_{bubble} are the densities of the glass and bubble, g is acceleration due to gravity, V_{bubble} is the volume of the bubble, σ_{inter} interfacial surface tension and P is the perimeter of the bubble.

Once the bubble detaches itself from the nucleation site it rises and the terminal velocity is given by Hadamard-Rybczynski equation

$$V_t = \rho_c\, g\, r^2 / 3\eta_c \qquad \ldots(2)$$

Where, Vt is the terminal velocity

ρ_c is the density of the continuous medium, here glass

r is the radius of the dispersed phase, here bubble

η_c is the viscosity of the continuous medium

The viscosity of a standard glass decreases with the rise in temperature and the terminal velocity increases with temperature.

As it rises a shearing and retarding laminar force acts on the bubble wall. The top of the bubble gets expanded and there is a surface tension gradient between the top and lower part. This opposes the shear force and the bubble wall is immobilized. The speed of rise of a solid dispersed particle in a continuous medium is given by Stokes law for fall of a solid sphere in a continuous medium. It is about 1.5 times smaller than the terminal velocity.

$$V_{stokes} = 2\rho_c\, g\, r^2/9\eta_g \qquad \ldots(3)$$

If the surfactant is soluble in the liquid phase and is able to diffuse quickly to the upper part of the bubble the surface tension gradient is eliminated and the bubble continues to rise at the rate given by equation 2. At a glass melting temperature of above 1500°C the diffusivity is high enough and the bubble rise rate was found to obey the equation 2[10].

During sulphate and sulphate-carbon refining several reactions take place that produce gases which may dissolve in the glass or escape depending on the prevailing situation. This reaction as given by Beerkens:

$$SO_4^{=}(melt) = SO_2(gas) + 1/2O_2(gas) + 1/2O_2^{-}(bonded) \ldots(4)$$

The physical solubility of SO_2 and O_2 in the glass melt is very small and they will migrate to the surface and escape or they may diffuse into the existing bubble and the bubble size will increase. It will move up faster as the velocity depends on the square of the radius. On the other hand the partial pressure of other gases originally within the bubbles and which were in equilibrium with the melt will decrease. As a result gases like CO_2, H_2O etc. that were dissolved in the melt will diffuse to the bubbles stripping the melt of these gases which could later create reboiling.

Parameters that control suphur solubility in the glass: During melting of batches containing sulphur or sulphur compounds some sulphur dissolves in the glass in the form of various valence species like $S^{(6+)}$, $S^{(4+)}$ or $S^{(2+)}$ Sulphur solubility decreases with increasing temperature. It increases with increasing basicity of the glass that is reflected by the Na_2O or alkaline earth content of the glass. The Fe^{2+} /Fe^{3+} ratio is a measure of the basicity of the glass. The higher the ratio the lower is the basicity and is a parameter to determine the redox state of the glass. Although the sulphur solubility decreases with decrease in basicity after a minimum the sulphur solubility increases very sharply and is the requirement for the production of amber glass. It also depends on the water content in the furnace atmosphere. In oxy-fuel fired furnaces where, the water vapour pressure is high there is often foaming due to evolution of SO_2.This is often explained as due to the reduction of partial pressure of gases in the ambient atmosphere over the glass due to dilution by the water vapour pressure. In oxidized glass S^{6+} is the sulphur species with corresponding oxygen partial pressure of 10^{-4} atm. and above. S^{2+} (sulphide) are the species in equilibrium with p_{O2} pressure of less than 10^{-6} atm .The S^{4+} (sulphite) are the species present in between. It has been shown[7] that the p_{O2} ambient on the melt is not the only parameter that controls the species but the Na_2O activity of the melt has also a role to play.

Gas evolution analysis

The knowledge of refining by sulphate or sulphate-carbon combination has been advanced by a few experiments notably among them Ruud Beer kens. What is given below draws largely from his experiments and observations. Evolved gas analysis (EGA) has been carried out by some experimentators to understand the gas evolution during fining of glass by sodium sulphate alone1,3,4 or by sulphate-carbon combination. The glass is melted in a silica crucible. The evolved gas at the temperature of study is flushed out with a carrier gas nitrogen and is directly fed to Infrared Spectrometer which measures the amount of CO, CO_2, SO_2. Next the water is removed in a cooler and the oxygen is estimated by electrochemical oxygen analyzer that can measure parts per million of oxygen. Results of runs made by Beerkens are shown in following figures.

When no additional reducing agent is added After the CO_2 evolution due to glass batch reaction the sulphate decomposition takes place at two stages one between 1100°C to 1300°C and the other more vigorous between 1400°C to 1550°C. The first peak is due to the sulphate sulphide reaction that occurs due to the sulphide formation by reducing contaminants in the commercial glass batch and may be represented by the reactions:

$$Na_2SO_4 + 2C = Na_2S + 2CO_2 \quad \ldots(5)$$

$$3Na_2SO_4 + Na_2S = 4Na_2O + 4SO_2 \quad \ldots(6)$$

Over 1400°C decomposition of salt cake takes place with release of SO_2 and O_2. These gases remain *physically* dissolved in the melt but cannot form bubble themselves. The gases diffuse to the surface or migrate to the existing bubbles making them grow and rise. The second peak beyond 1400°C has a SO_2: O ratio of 2:1 and may be represented by the decomposition of sulphate alone

$$Na_2SO_4 = Na_2O + SO_2 + ½ O_2 \quad \ldots(7)$$

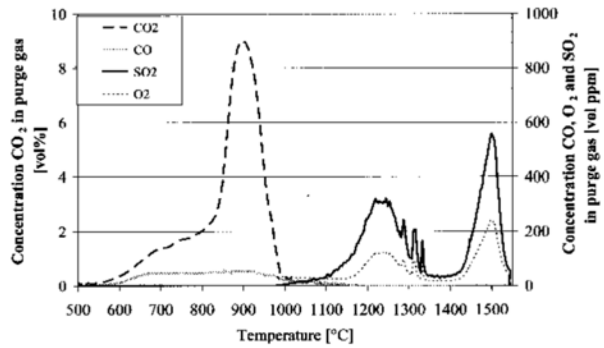

Fig.1: Gas evolution from batch when no reducing agent is added. The gas evolution between 1100 to 1300°C is due to the reaction of organic contaminants in the batch. CO_2 evolution is due to the decomposition of carbonate batch material (Ref. 5)

This is in fact near the boiling point of Na_2SO_4. The Na_2O goes in the glass and the two other gases having low solubility in the glass are released.

The fining onset temperature is shown in fig 2. The X- axis has been given in °K. The onset temperature is 1300°C. The pressure that is generated depends on the amount of salt cake and also on the moisture content.

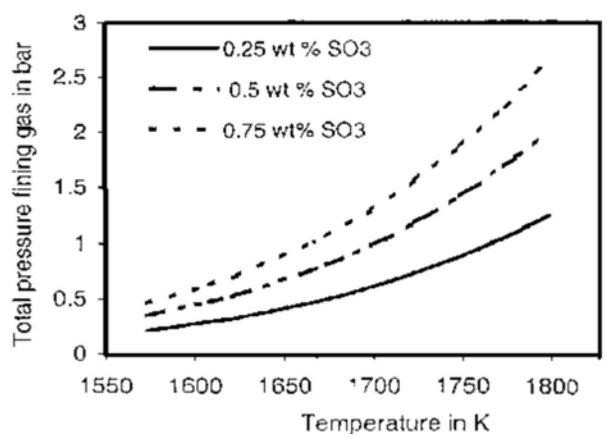

Fig. 2: Total pressure of evolved gases with the amount of sulphate used. (Ref. 8).

When a reducing agent is added: Usually sulphate refining is carried out by use of carbon along with sulphate and is called sulphate- carbon refining. In this case the carbon source may be coke, coal or anthracite. EGA study with 0.5 wt percent of the batch of SO_3 (as Na_2SO_4) is added along with 0.05 wt. percent of batch of coke is shown in fig. 3.

The reaction of carbon with salt cake starts at similar temperature as with Na_2S. The gas evolution continues

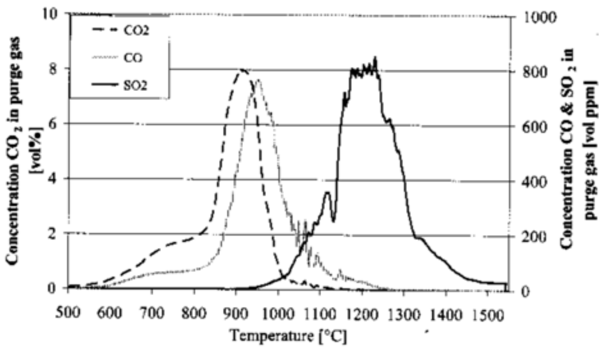

Fig. 3: Gas evolution in a float batch with C: SO_4 wt. ratio of 0.5. The SO_2 evolution is between 1100 and 1350°C. High Temperature gas evolution does not occur as all sulphate is consumed. The carbon monoxide evolution is due to the reaction of evolved CO_2 with reducing agents. (Ref. 5)

from 1100°C to 1350°C. As shown above the salt cake decomposition peak is between 1400°C to 1500°C. The evolution of CO is between 800°C-1100°C and may be due to the reaction

$$4C + Na_2SO_4 = Na_2S + 4CO \qquad \ldots(8)$$

The Na_2S finally reacts with the remaining salt cake over the wide range 1100°C to 1350°C.

The role of water in ambient atmosphere and in glass: Laimbock[1] has experimented with a glass melt in which 1 % Na_2SO_4 was added. The glass was melted in ambient atmosphere and in a water/air mixture. Samples were withdrawn at a given interval and also after raising the temperature. Samples were analysed for SO_2 via wet chemical analysis and water content by infrared transmission spectroscopy on polished glass sample. Results are shown on Table 1. It may be noted that a large amount of sulphate was lost in 55 vol%water/45 vol % air atmosphere and the water content of the melt also rose whereas the water content in the air atmosphere remained almost constant at 130 ppm.

Table 1. Sulphate retention and water content of the base glass in different Ambient water atmosphere (Data from ref. 1)

Temp °C	Time (Hrs)	Ambient atmosphere		55 vol % H_2O/air atmosphere	
		Sulphate (wt. % SO_3)	H2O (ppm)	Sulphate (wt. % SO_3)	H_2O (ppm)
1400	2	0.56	134	0.55	237
1440	4	0.55	135	0.33	591
1480	6	0.36	128	0.13	824
1500	7	0.27	123	0.10	824

The higher the water content the lower is the onset temperature and sulphate loss takes place much below the temperature where refining is needed. In an ambient atmosphere the gas evolution starts at 1480°C and again at 1500°C and 1520°C whereas in a 55 vol % H2O/45 vol. % air the gas evolution starts at 1440°C and again at temperatures of up to 1520°C at 20°C interval. In the former case the water content remains at around 130 ppm whereas, in the later case the water content of the glass goes on increasing from 591ppm at 1440°C to 819 ppm at 1520°C. The sulphate as SO_3 content reduces from 0.33 ppm to 0.1ppm. This water content is that dissolved in the melt. It may be noted that water dissolve in glass in the form of OH- which goes in the glass structure and is released at higher temperature or by reaction with oxidizing agent.

Role of source of carbon in refining: The source of carbon is also important. It may be used as coal, coke, charcoal or anthracite coal. The last is a purer forma of carbon and has higher density. It is oxidized slower than charcoal for example. If dense carbon is used the amount needed may be less than charcoal for example. The oxidation of anthracite starts at a temperature 200°C higher than charcoal.

The role of molar ratio of C: SO_4 on refining and sand dissolution. In strongly reduced glass where the carbon or sulphide content is high the sulphide-sulphate reaction takes place at below 1300°C and tends to consume most of the sulphate releasing large amount of gas. The bubble growth rate was about1.86 x 10^{-7} ms^{-1} . This growth rate is for maximum refining. At high temperature the bubble growth rate is very low and fining action is poor. The bubbles released at low temperature cause foaming and helps dissolution of sand or sand relics.

At a carbon sulphate ratio of 0.5 to 1 SO_2 bubbles are nucleated at medium temperature and sand dissolution is accelerated. The second generation of bubbles starts at 1450°C due to sulphate decomposition. If the ratio is zero the gas release takes place at 1500°C and if sand grains are still available the bubble nucleates on the sand grains and both sand dissolution and refining are accelerated.

The results have been summarized in Fig. 4 where the bubble growth rate d in ms-1 has been plotted against temperature. The curves are for various C: SO_4 molar ratio. The temperatures range at which accelerated formation of foam and sand dissolution occur have been shown as a range. Refining after foaming and sand dissolution is most efficient at a ration of 0.5. At a very high molar ratio of greater than 1.5 little salt cake is left for high temperature refining. The total time required to obtain a well melted glass will therefore depend on the sand dissolution time and refining time.

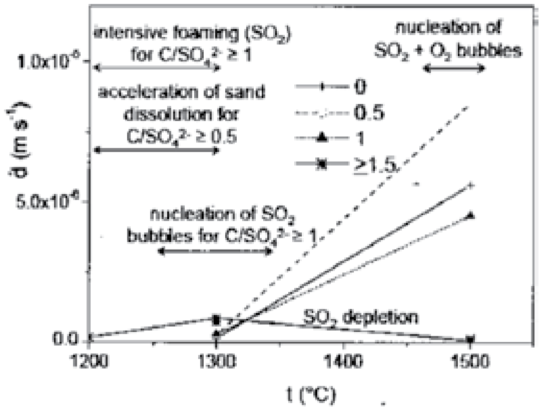

Fig. 4: A summary of melting behaviour affected by sulphur reactions In melt (ref 3)

The amount of salt cake has therefore to be adjusted to have refining action at higher temperature. The exact amount of the sulphate to be used may be determined by trial and may be specific for a furnace.

Conclusion

The addition of salt cake or in combination with carbon is an effective system for obtaining a well refined finished glass. Three processes are working. Depending on the molar ratio of C: SO_4 foaming, sand dissolution and bubble nucleation for refining, which may occur at different temperatures. Foaming may occur at lower temperature and may be released between the batch pile and molten glass. Foaming may help sand dissolution. Unmelted sand and sand relics which come over to the surface for lower density than the glass may react with the molten salt cake and form silicate and SO_2 gas. The undissolved sand acts as a nucleation site for bubbles. At higher temperature of over 1400°C the salt cake reaches its boiling point and SO_2 and O_2 gases are released bringing about fining. Whatever fine bubbles remains may be absorbed in the melt during cooling.

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Glass Terminology

Batch- The mixture of raw materials (often silica, soda or potash, and lime) that is melted in a pot or tank to make glass.Cullet, as well as minor ingredients such as colorants, can be added to the batch to help the melting process

Crystal- A popular term for colorless lead glass, which has a high refractive index and consequently is particularly brilliant. In the United Kingdom, glass described as crystal must contain a defined percentage of lead oxide. Today, the word is often used to describe any fine glass tableware

Cullet- broken or waste glass suitable for remelting

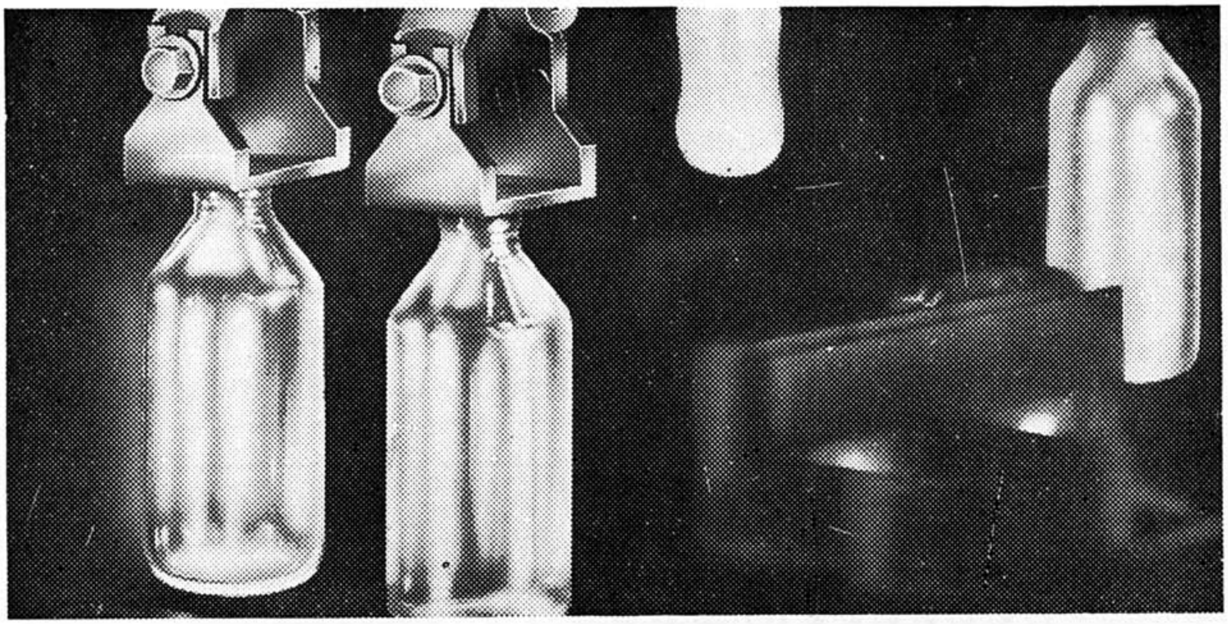
Furnace- An enclosed structure for the production and application of heat. In glassmaking, furnaces are used for melting the batch, maintaining pots of glass in a molten state, and reheating partly formed objects at the glory hole

Optical glass- Glass of extreme purity and with well-defined optical properties, which was originally created for making lenses and prisms

Refractory- A substance, usually clay with a high silica content, capable of resisting high temperatures. Furnaces and pots are made from refractory materials

Sandblasting-The process of removing glass or imparting a matte finish by bombardment with fine grains of sand that are propelled by compressed air

Soda- Sodium carbonate. Soda (or alternatively potash) is commonly used as the alkali ingredient of glass. It serves as a flux to reduce the fusion point of the silica when the batch is melted



The Glass Industry in India – An Analysis

The Indian glass industry is more than hundred years old. Today, the glass industry is estimated to be more than US $2.5 billion. The growth of the Indian economy has given a fillip to the growth of glass industry in India. India has been able to maintain stable GDP growth rate despite global downturn. Some of the factors which have contributed to such growth are:

- Huge geographic & demographic spread
- Rising middle class population
- Increasing disposable income especially in the rural–agri sector
- Increasing employment opportunities specially in Service sector
- Easier availability of finance
- Booming Infrastructure & reality sector, especially through PPP route

Glass being chemically inert and pure, and thus safer to be used, has resulted in increased popularity and demand among consumers. Some of the key properties such as transparency and recyclability make glass the most suitable medium of packaging of liquor, pharmaceutical/ lifesaving drugs and food items. The perception of glass as having a high quality or premium image compared to plastic and metal is also facilitating its growth. Majority of raw materials required by the industry are available indigenously, providing excellent scope for growth and development.

In the recent years, the demand for float glass has outpaced real GDP growth during the last few years. This is the result of growing Indian economy, where demand is boosted by the booming automotive and construction sectors. Innovations have extended the range of uses for glass and allowed it to play a greater role in the world in which we live. In a country like India where temperatures vary from 00 centigrade to over 450 centigrade, in many cities, usage of laminated and glazed glass play an important role in conserving energy.

In addition to, factors like increasing demand from emerging markets of India and China, rising cosmetic sales, changing lifestyle, increasing per capita income are also driving the growth of glass industry.

Container Glass Industry

The container glass industry in India is quite old and has remained a cottage industry for a long time. In recent years, the industry has transformed and developed from rudimentary mouth blown and hand working processes to a fully automated production on a large scale. The container glass industry in India is approximately US $ 1 billion. The installed capacity of both small and large players of the Indian glass container industry is over 7000 MT per day. There are 10 medium and large container glass manufacturers. Besides, there are several small manufacturers in the semi/unorganized sector with smaller furnaces having melting capacity of less than 500-600 MT per day. This segment of the glass industry enjoys its growing market share with its advantages of being healthy, hygienic, pure, eco-friendly and many more.

The major consumer industries for container glass are liquor, beer, pharmaceuticals, soft drinks, food and other (non-CSD beverages) segments. Export has a 10 per cent share of the total container glass industry off takes. The Alcobev segment uses more than 60 per cent of India's glass container production, followed by food at 15 per cent, pharmaceuticals at 12 per cent, carbonated beverages segment contribute between 3-4 per cent of the total demand and rest by others.

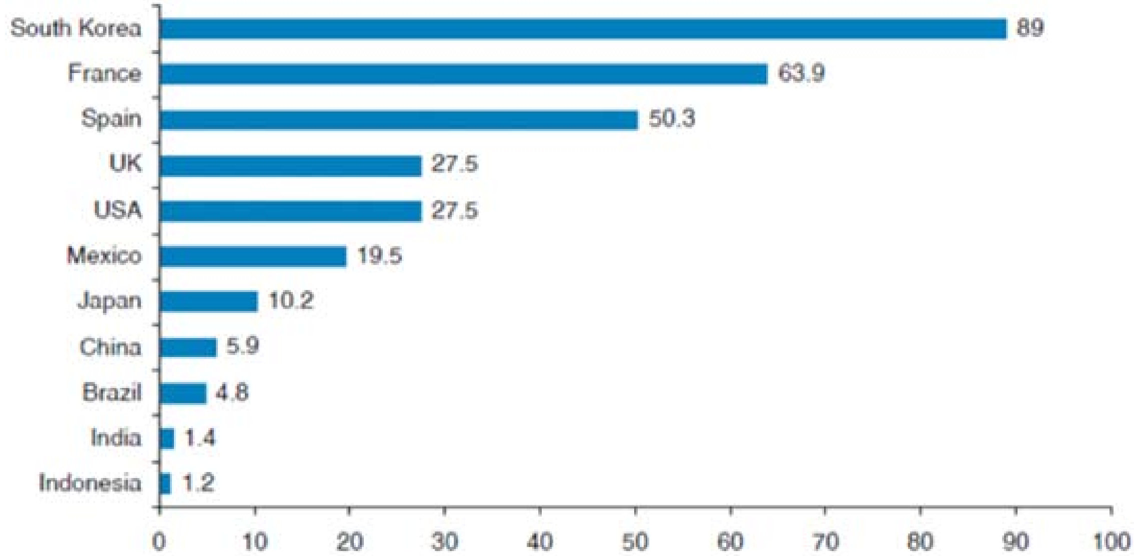
The major growth driver for the container glass industry is the low per capita consumption of 1.4 kg in India as compared to 27.5 kg. in US and 10.2 kg. in Japan and strong economic drivers for end-user segments (liquor and beer, pharmaceuticals, food, cosmetics, etc.).

Float Glass Industry

This segment of the glass industry is still at the nascent stage with just 8 float glass lines compared to China having 196 lines. India's total installed capacity for float glass is around 4700 tons per day with worth around US $0.75 billion. There has been an increase in demand for float glass as a result of increased investment from the construction and automotive sectors. Float glass manufacturers are gearing up to meet this demand and are planning to increase their installed capacities. It has been growing with a CAGR of 13% over the last five years. The major source of revenue comes from Architectural – 85 per cent, Automotive – 10 per cent and others – 5 percent.

The float glass market of India has huge growth potential. It is seen that general awareness about glass as a building material is increasing. The construction and automobile sectors which are the largest users of float glass are expected to grow with a CAGR of 20% and

Per Capita Glass Consumption



Source: IBEF, CRISIL Equities

15% respectively. Once the legislation for the usage of right type of glass for windows etc. is legislated by the government, the usage of float glass will get a further boost. Low per capita consumption of glass in India, which is 0.88 kg only, compared with other developing countries such as China -12 kgs, Thailand 9 Kgs, Malaysia 13 kgs, Indonesia 4 kgs, is a clear indicator of huge potential for growth of this industry.

Tableware

During the last decade tableware segment of glass industry has made strong efforts to improve quality of glass tableware manufactured in India. It is heartening to note that by adoption of latest technology they are now producing international quality glass tableware including those of opal and crystal glass. However, tableware segment of the industry is facing tough competition from imports from China and other countries. Price difference at which imported glass tableware are being sold in the Indian market suggests not only dumping of goods in the Indian market but also evasion of customs duty. Urgent steps therefore need to be taken for checking this unhealthy competition. Indian industry has made concerted efforts to increase exports. During the last few years the exports have increased many fold and presently export from India are around to Rs. 35 Crores.

Other segments

Some of the other segments in glass industry which have been growing in recent years on the basis of strong export growth are glass fibre& wool, ophthalmic glass, glass lampware, bangles, table/ kitchenware, mirrors, glass beads and false pearls.

Indian glass industry is at the early stage of maturity, but demand for glass is growing steadily. Aggressive and organized efforts on the part of manufacturers and processors are expected to achieve higher levels of awareness among glass specifies and users. In the next five years, the Indian float glass market will move to higher maturity levels. Further, constant technical innovations by manufacturers are keeping customers constantly interested in glass and glass products.

The growth of organized retail, infrastructural growth moving in tandem with the growth in the Indian economy has acted as catalyst for glass industry. It has increased the growth rate of packaging industry as well as the requirement of infrastructural materials. Glass being chemically inert, impermeable, FDA approved and environment friendly has distinct advantages over other forms of material. Also due to the constant lifestyle changes and the growing consumer consciousness about health, hygiene and eco-friendly products, glass is expected to grow at a higher rate in coming years.

The glass industry is still estimated to grow at a healthy rate largely driven by rapid Indian economic growth of 7-8% per annum, growing export potential to Europe, America and rest of the world (Increasing demand of superior packaging standards for the international market) and improved technologies being adopted by the glass manufacturing companies who are investing in innovative and state of the art technology for world class products.

Coming of Age

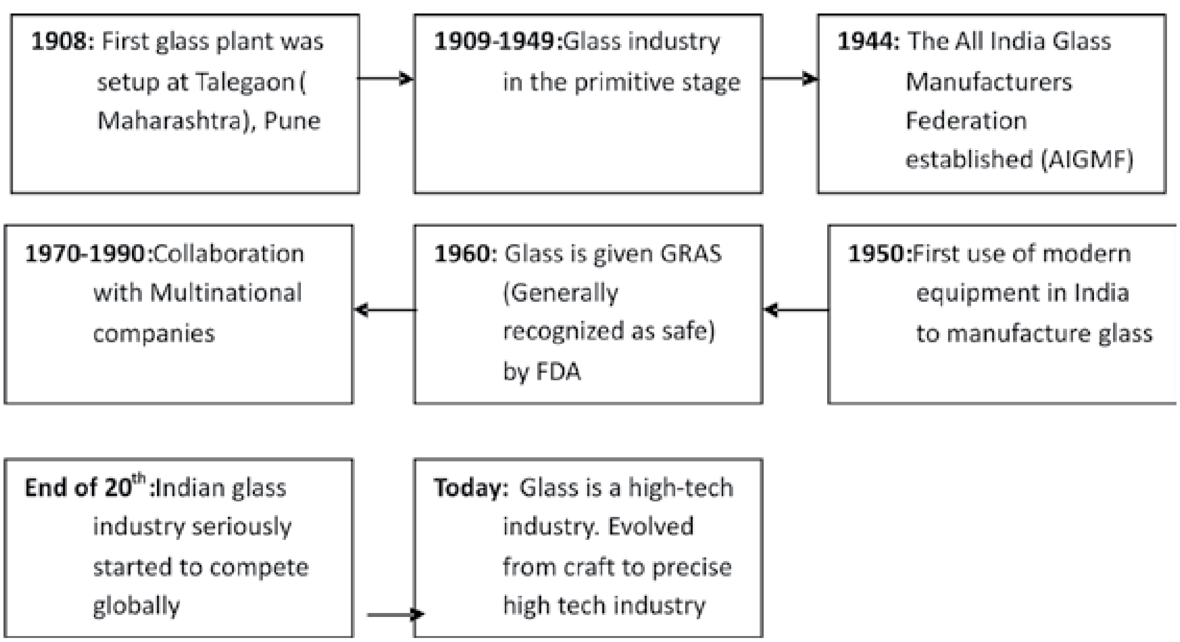
Glass industry is one of the oldest in the world. Glass Industry in India remained in the form of a cottage industry till the beginning of 20th century . The industry has made laudable strides moving from the traditional mouth blown process to automatic light weight container manufacturing technology, manufacturing of Float Glass, opal & crystal ware as also extra clear low iron textured solar glass

Glass industry remained in the primitive stage till 1950; glass melting took place in pot furnaces and small tank furnaces were fuelled by either coal or gas-although some furnaces at the coastal cities used furnace oil. It was towards the end of the decade when Indian glass industry seriously started competing globally by using modern equipment's for melting and production of glass. Improved furnaces were installed to conserve energy and reduce the cost of production. Easy availability of raw material further improved the cost efficiency and flat glass industry upgraded to float process. Glass found its use in various industries such as beads, glass fibre& wool, tableware, ophthalmic/optic fibre for cable. The industry is progressing steadily and will hopefully reach global standards in the weaker sectors as well as in those that are currently strong.

Today, glass is a High-Tech Industry employing the latest state of the art technology. It has evolved from a manual craft to a fully automated high-tech industry. Modern glass plants are capable of making millions of glass containers per day, which are used for products from wines and spirits, to foods and juices as also cosmetics and pharmaceuticals. Innovative glass packaging continues to give longer shelf life and valuable shelf appeal to products packed there in and is good for the earth because it is made from virtually inexhaustible raw materials, is 100% recyclable, refillable, and reusable. Consumers choose glass to preserve the taste and purity of foods & beverages.

In the last 10 years, demand for float glass and its consumption has increased manifold because of its usage for architectural purposes. There has been a great demand for using flat glass in structural glazing and curtain walls, which has resulted in a phenomenal increase in the availability of flat glass in terms of type, composition and characteristics. Indian architecture in recent years has evolved progressively toward the use of green building materials with an increasing number of projects now applying for green building certifications. Glass usage has thus increased as per the requirements of green buildings. Furthermore, developers have become more demanding in terms of glass performance and processing quality. This has led to an increase in the use of high-performance glass in contrast to the ordinary reflective glass that formerly dominated the landscape in India. Thus the emphasis on proper processing infrastructure to process such glass has assumed greater significance.

- pegged at around US$ 435 million.



USE GLASS AND SAVE ENVIRONMENT

Glass containers are the most suitable media for packaging all types of foods, chemicals & pharmaceuticals, soft drinks, beverages, liquors etc. According to a 2006 survey conducted by Newton Marketing & Research of Norman, Oklahoma, glass is the preferred packaging material for consumer health and the environment.

Consumers prefer glass packaging because:

- It helps to maintain the purity of food and beverages (78 percent),
- It preserves product's taste or favour (75 percent),
- It Maintains the integrity or healthiness of foods and beverages (82 percent)

On the other hand, it has also been found that the presence of chemical Bisphenol A used in plastic container and drinks cans affect the functioning of intestines. National Institute of Agronomic Research in Toulouse found that the digestive tract of rats react negatively to even low doses of the chemical, also known as BPA (*Reported in Times of India, New Delhi 16th December, 2009*).

The use of glass is of critical importance in the present day when deteriorating environmental conditions have set alarm bells ringing for protection of environment in the interest of human health and well being. There is urgent need for preservation and improvement of environment. Increase in use of glass will go a long way in surging ahead towards achieving this objective.

Some of the properties of glass which make it the most eco-friendly packaging material are :

- **Glass is made from abundant raw material -** It is either made from cullet or raw materials which are easily available and locally procured.
- **Glass is inert -** It does not react with any kind of packed content and is thus a 100% neutral packaging medium.
- **Glass is non-porous -** It does not allow water and air to seep through and thereby it offers the highest shelf life to packed content.
- **Glass is safe & healthy -** Glass has been proved to be safe and healthy for consumers and the environment for more than 3,000 years.
- **Glass is irradiated -** It is the best packaging material for sterilised products.
- **Glass is recyclable -** It is 100% recyclable. It does not lead to generation of any solid waste, thus saving land fill space. This is a major advantage from environment point of view in the present times, when municipalities are finding it difficult to find space to dump urban waste.
- **Glass is resistant to chemicals and solvent -** It is used for packaging of chemicals and solvents as it does not react with them.
- **Glass ensures hermetic seal -** It provides air tight packaging for products thus providing longer shelf life. It is the most preferable product for vacuum and carbonation.
- **Glass is transparent -** The customer is afforded the facility of visually examining the content from outside the pack.
- **Glass has best recycling performance -** It is a cradle-to-cradle packaging - meaning it can be recycled infinitely to be re-made into new bottles or jars as good as those manufactured by using fresh raw materials.
- Glass is best packaging material in preserving taste, aroma and nutritional values of the food.
- Glass containers can be made in any shape & design.
- Use of flat glass in doors and windows permits use of sun light and saves energy.
- Use of glass in partitions saves wood and checks felling of forests.
- Glass protects material from higher temperatures.
- Glass can be used for high speed filling. Thus, saving time and increasing profits.
- Glass containers made from cullet or weight

reduction technology saves energy. Every ton of glass recycled saves 322KwH of energy, 246 kg of CO2 and 1.2 tonnes of virgin raw material.

- Glass harnesses the heat of the sun which is to warm structures and act as a prime ingredient in 'passive solar' designed buildings.
- Glass reduces the quantity of waste to be treated or dumped. In addition to reducing environmental damage, it helps in savings on waste transport and disposal costs.

Glass does not

- contain phthalates, Bisphenol A or hormone disruptors
- pollute seas and coast lines
- adversely affect marine life
- consume the world's scarce resources in manufacture
- need oxygen stabilisers to improve barrier properties
- give off harmful GHGs, if landfilled

GLASS HASPUREAND CLASSY IMAGE WITH SUSTAINABLE PACKAGING FUTUTRE

Secretariat
The All India Glass Manufacturers' Federation New Delhi

Indian Glass Directory 2011

AIGMF will soon publish revised edition of Indian Glass Directory.

It will include details of glass manufacturers as well as others connected with glass industry including suppliers of raw materials refractories, chemicals, machinery & equiment, consultants, etc.

The Directory will also include details of manufacturers of secondary glass products such as toughened/ automotive glass, decorative articles, ophthalmic glasses, fiberglass products etc.

Advertise your products in the Indian Glass Directory. Revised edition to be published soon.

Advertise in KANCH

KANCH is the leading choice for advertising within the glass industry. With several years publishing experience, unrivalled coverage for the worldwide glass manufacturing community with up-to-date news, editorial and features, as well exhibitions; KANCH is the best medium to communicate with stakeholders.

The advertising options range from front cover to half page advertisements, loose and bound inserts, plus much more. We understand your needs as an industry and are committed to assist you in making your advertising most profitable. Raise awareness of your brand and product portfolio by establishing contacts to suit your company's requirements.

Advertisement Tariff:

Coloured	Indian Companies (Rs.)	Foreign Companies (US $)
Ordinary full page	4000.00	225.00
Extra Inside Cover Page	4500.00	250.00
Inside Cover Page	5000.00	275.00
Back Cover Page	6000.00	325.00
Front Cover Page	7500.00	375.00
Centerspread (two pages)	10000.00	450.00
Black & White		
Full page	2000.00	125.00
Half page	1000.00	80.00

The print area is 17x23 cm for full page advertisement and 11.5 x 17cm (Rectangular) for the glossy front-cover four colour advt.

The advertisement material (4 Colour soft copy if it is a coloured advertisement) along with a Demand Draft / Cheque of the requisite amount – payable to The All India Glass Manufacturers' Federation, New Delhi may be sent to the Federation office address given below. Foreign companies are requested to send the Demand Draft of the requisite amount in US Dollars. Demand Draft be made in the name of The All India Glass Manufacturers' Federation, New Delhi, payable at New York.

Payment can also be remitted through bank/wire transfer to AIGMF Account, details are as under:

Remittance from abroad to:

Bank of Baroda, New York, SWIFT BIC :

BARBUS33, FEDWIRE/ROUTING NUMBER:

026 005 322, giving full particulars of Beneficiary i.e.

Account No.	:	05860200000294
Name	:	The All India Glass Manufacturers' Federation
Bank	:	Bank of Baroda
Branch	:	Parliament Street, New Delhi
City	:	New Delhi, India

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Account No.	:	000701239715
Name	:	The All India Glass Manufacturers' Federation
Bank	:	ICICI Bank Limited
Branch	:	9A, Phelps Building, Connaught Place, New Delhi
IFSC Code	:	ICIC0000007

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Additional Advertising Opportunities

AIGMF Website

AIGMF's new website: www.aigmf.com is an invaluable resource for visitors and offers a vast array of advertising opportunities. The website is promoted across entire Glass fraternity bringing many visitors to the site providing excellent exposure to your company's products and services. Advertisment will provide direct link to your company's website.

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Customs Notification No. 30/2011 Dated 04/03/2011

REGARDING LEVY OF ANTIDUMPING DUTY ON IMPORT OF GLASS FIBRE AND ARTICLES. ORIGINATING IN. OR EXPORTED FROM. PEOPLE'S REPUBLIC OF CHINA

Notification No. 30/2011-Customs
New Delhi, the 4th March, 2011

G.S.R. (E). - Whereas in the matter of imports of Glass Fibre and articles there of (hereinafter referred to as the subject goods), falling under heading 7019 of the First Schedule to the Customs Tariff Act, 1975 (51 of 1975) (hereinafter referred as the said Customs Tariff Act), originating in, or exported from, People's Republic of China (hereinafter referred to as the subject country or China PR) and imported into India, the designated authority in its preliminary findings vide notification No.14/28/2009-DGAD, dated the 2nd June, 2010, published in the Gazette of India, Extraordinary, Part -I, Section 1, dated the 2nd June, 2010, had come to the conclusion that-

(a) the product under consideration had been exported to India from the subject country below normal values;

(b) the domestic industry had suffered material injury on account of subject imports from subject country;

(c) the material injury had been caused by the dumped imports of subject goods from the subject country;

And had recommended imposition of provisional anti-dumping duty on the imports of subject goods, originating in, or exported from, the subject country;

And whereas, on the basis of the aforesaid findings of the designated authority, the Central Government had imposed provisional anti-dumping duty on the subject goods vide notification No. 75/2010-Customs, dated the 14th July, 2010, published in the Gazette of India, Extraordinary Part II, Section 3, Sub-section (i), vide number G.S.R. 598(E), dated the 14th July, 2010;

And whereas, the designated authority, in its final findings vide notification No. 14/28/2009-DGAD dated 6th January, 2011, published in the Gazette of India, Extraordinary, Part I, Section 1, dated the 6th January, 2011, had come to the conclusion that-

(a) the product under consideration had been exported to India from the subject country below its normal values;

(b) the domestic industry had suffered material injury on account of subject imports from subject country; and

(c) the material injury had been caused by the dumped imports of subject goods from the subject country.

Now, therefore, in exercise of the powers conferred by sub-section (1) read with sub-section (5) of section 9A of the said Customs Tariff Act, 1975 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, on the basis of the aforesaid findings of the designated authority, hereby imposes on the goods, the description of which is specified in column (3) of the Table below, falling under heading of the First Schedule to the said Customs Tariff Act as specified in the corresponding entry in column (2), the specification of which is specified in the corresponding entry in column (4), originating in the country specified in the corresponding entry in column (5), and exported from the country specified in the corresponding entry in column (6) and produced by the producer specified in the corresponding entry in column (7) and exported by the exporter specified in the corresponding entry in column (8), and imported into India, an anti-dumping duty equal to the amount arrived at by applying the percentage indicated in the corresponding entry in column (9), of the said Table.

Explanation

For the purpose of this Table, "Glass fibre" means glass fibre and articles thereof, including glass roving, glass chopped strands, glass chopped strands mats but excluding glass wool, glass yarn, glass woven fabrics and chopped strands of a kind generally treated with polyurethane or acrylic emulsion meant for thermoplastic applications, micro glass fibre used in battery separator, surface mat or surface veil or tissue.

2. The anti-dumping duty imposed shall be levied for a period of five years (unless revoked, superseded or amended earlier) from the date of imposition of the provisional anti-dumping duty, that is, the 14th July, 2010, and shall be payable in Indian currency.

3. The rate of exchange applicable for the purposes of calculation of anti-dumping duty under this notification shall be the rate which is specified in

Table

Sl. No.	Heading or Subheading	Description of goods	Specification	Country of Origin	Country of Exports	Producer	Exporter	Percentage of CIF value
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
1	7019	Glass Fibre	Glass Fibre	China PR	China PR	M/s Shandong Taishan-PDO Glass Fiber Products Co., Ltd.	M/s Shandong Taishan-PDO Glass Fiber Products Co., Ltd.	20.89
2	7019	Glass Fibre	Glass Fibre	China PR	China PR	M/s Shandong Taishan-PDO Glass Fiber Products Co., Ltd.	Taishan Fiberglass Inc.	20.89
3	7019	Glass Fibre	Glass Fibre	China PR	China PR	M/s Taishan Fiberglass Inc. (CTG)	M/s Taishan Fiberglass Inc. (CTG)	20.89
4	7019	Glass Fibre	Glass Fibre	China PR	China PR	M/s Taishan Fiberglass Zoucheng Co., Ltd.	M/s Taishan Fiberglass Inc. (CTG)	20.89
5	7019	Glass Fibre	Glass Fibre	China PR	China PR	M/s Jushi Group Chengdu Co Ltd	M/s Jushi Group Chengdu Co Ltd	18.67
9	7019	Glass Fibre	Glass Fibre	China PR	China PR	M/s Jushi Group Jiujiang Co. Ltd	M/s Jushi Group Jiujiang Co. Ltd	18.67
7	7019	Glass Fibre	Glass Fibre	China PR	China PR	M/s Jushi Group Co Ltd ('Jushi, Tongxiang'	M/s Jushi Group Co Ltd ('Jushi, Tongxiang'	18.67
8	7019	Glass Fibre	Glass Fibre	China PR	China PR	M/s Chongqing Polycomp International Corporation (CPIC)	M/s Chongqing Polycomp International Corporation (CPIC)	7.46
9	7019	Glass Fibre	Glass Fibre	China PR	China PR	Others	Others	40.91
10	7019	Glass Fibre	Glass Fibre	China PR	Any country other than China PR	Any	Any	40.91
11	7019	Glass Fibre	Glass Fibre	Any country other than China PR	China PR	Any	Any	40.91

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 Customs Act.

[F.No.354/95/2010 –TRU]
(Sanjeev Kumar Singh)
Under Secretary to the Government of India.

"He who Plants a tree,

Plants hope."

— Lucy Larcom

The European Commission Directive No. 2011/8/EU

dated 28th January, 2011

REGARDING AMENDING DIRECTIVE 2002/72/EC AS REGARDS THE RESTRICTION OF USE OF BISPHENOL A IN PLASTIC INFANT FEEDING BOTTLES (*Text with EEA relevance*)

THE EUROPEAN COMMISSION,

Having regard to the Treaty on the Functioning of the European Union, Having regard to Regulation (EC) No 1935/2004 of the European Parliament and of the Council of 27 October 2004 on materials and articles intended to come into contact with food and repealing Directives 80/590/EEC and 89/109/EEC (1), and in particular Article 18(3) thereof, After consulting the European Food Safety Authority,

Whereas:

(1) Commission Directive 2002/72/EC of 6 August 2002 relating to plastic materials and articles intended to come into contact with foodstuffs ([2]) authorises the use of 2,2-bis(4-hydroxyphenyl)propane, commonly known as Bisphenol A (hereinafter 'BPA'), as monomer for the manufacture of plastic materials and articles intended to come into contact with foodstuffs in accordance with the opinions of the Scientific Committee on Food (hereinafter 'SCF') ([3]) and the European Food Safety Authority (hereinafter 'the EFSA') ([4]).

(2) BPA is used as monomer in the manufacture of poly carbonate plastics. Poly carbonate plastics are used amongst others in the manufacture of infant feeding bottles. When heated under certain conditions small amounts of BPA can potentially leach out from food containers into foods and beverages and be ingested.

(3) On 29 March 2010 the Danish Government informed the Commission and the Member States that it has decided to apply the safeguard measures provided for in Article 18 of Regulation (EC) No 1935/2004 and to temporarily ban the use of BPA for the manufacture of plastic materials in contact with food intended for children aged 0-3 ([5]).

(4) The Danish Government substantiated its safeguard measure with a risk assessment provided on 22 March 2010 by the National Food Institute at the Technical University of Denmark (hereinafter 'DTU Food'). The risk assessment covers the evaluation of a comprehensive study carried out on animals exposed to BPA in low doses monitoring the development of the nervous system and the behaviour in newborn rats. DTU Food has also evaluated whether the new data changes its previous evaluation of the toxic effects on the development of the nervous system and behaviour possibly caused by BPA.

(5) In accordance with the procedure provided for in Article 18 of Regulation (EC) No 1935/2004 on 30 March 2010 the Commission asked the EFSA to give its opinion on the grounds adduced by Denmark for concluding that the use of the material endangers human health, although it complies with the relevant specific measures.

(6) On 6 July 2010 the French Government informed the Commission, and on 9 July 2010 the Member States, that it has decided to apply the safeguard measures provided for in Article 18 of Regulation (EC) No 1935/2004 and to temporarily ban the manufacture, import, export and placing on the market of feeding bottles containing BPA ([6]).

(7) The French Government substantiated its safeguard measure with two opinions issued by the French Food Safety Authority (AFSSA) on 29 January and 7 June 2010 and the report published on 3 June 2010 by the National Institute of Health and Medical Research (INSERM).EN 29.1.2011 Official Journal of the European Union L 26/11

(8) On 23 September 2010 the EFSA adopted the opinion of its Panel on food contact materials, enzymes, flavourings and processing aids (hereinafter 'the Panel') on BPA responding to the Commission's

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([1]) *OJ L 338, 13.11.2004, p. 4.*

([2]) *OJ L 220, 15.8.2002, p. 18.*

([3]) *Opinion of the Scientific Committee on Food on Bisphenol A, expressed on 17 April 2002. SCF/CS/PM/3936 Final, 3 May 2002. http://ec.europa.eu/food/fs/sc/scf/out128_en.pdf*

([4]) *Opinion of the Scientific Panel on Food Additives, Flavourings, Processing Aids and Materials in Contact with Food on a request from the Commission related to 2,2-BIS(4-HYDROXYPHENYL) PROPANE (Bisphenol A) Question number EFSA-Q- 2005-100, Adopted on 29 November 2006, The EFSA Journal (2006) 428, p. 1. and Toxicokinetics of Bisphenol A, Scientific Opinion of the Panel on Food additives, Flavourings, Processing aids and Materials in Contact with Food (AFC) (Question No EFSA-Q-2008-382) Adopted on 9 July 2008, The EFSA Journal (2008) 759, p. 1.*

([5]) *Bekendtgørelse om ændring af bekendtgørelse om materialer og genstande bestemt til kontakt med fødevarer, Lovtidende A, Nr. 286, 27.3.2010.*

([6]) *LOI n o 2010-729 du 30 juin 2010 tendant à suspendre la commercialisation de biberons produits à base de bisphénol A, JORF n o 0150 du 1 juillet 2010, page 11857.*

request of 30 March 2010 as well as covering the evaluation of the specific neurobehavioural study evaluated in the Danish risk assessment and the review and evaluation of other recently published studies on BPA ([1]).

(9) In its opinion the Panel concludes that based on the comprehensive evaluation of recent human and animal toxicity data, no new study could be identified, which would call for a revision of the current tolerable daily intake (hereinafter 'TDI') of 0,05 mg/kg body weight per day. This TDI is based on the no adverse effect level of 5 mg/kg body weight per day from a multi-generation reproductive toxicity study in rats, and the application of an uncertainty factor of 100, which is considered as conservative based on all information on BPA toxicokinetics.

However, in a minority opinion one Member of the Panel concluded that the effects observed in certain studies raised uncertainties which may not be covered by the current TDI which should therefore be considered temporary until more robust data becomes available in the areas of uncertainty.

(10) The Panel noted that some animal studies conducted on developing animals have suggested other BPA-related effects of possible toxicological relevance, in particular biochemical changes in brain, immune-modulatory effects and enhanced susceptibility to breast tumours. These studies have many shortcomings. The relevance of these findings in relation to human health cannot be assessed at present. In case any new relevant data becomes available in the future, the Panel will reconsider its opinion.

(11) Infant formula or breast milk is the only source of nutrition for infants up to the age of 4 months, and it remains the major source of nutrition for some additional months. In its opinion of 2006 the EFSA concluded that infants aged 3 and 6 months fed using poly carbonate infant feeding bottles have the highest exposure to BPA, though below the TDI. For this group of infants the level of exposure to BPA decreases once feeding from poly carbonate bottles is phased out and other sources of nutrition become dominant.

(12) Even if the infant has sufficient capacity to eliminate BPA at worst-case exposure the EFSA opinion pointed out that an infant's system to eliminate BPA is not as developed as that of an adult and it only gradually reaches the adult capacity during the first 6 months.

(13) The potential toxicological effects may have a higher impact in the developing organism. According to the opinions of the Scientific Committee on Food of 1997 ([2]) and 1998 ([3]) certain effects, in particular endocrine and reproductive effects on the immune system and the neurodevelopment are of particular relevance to infants. Reproductive effects and neurodevelopmental effects of BPA have been studied extensively in standard multi-generation toxicological tests and in other studies, which took account of the developing organism and did not reveal effects in doses below the TDI. However, studies which could not be taken into account for setting the TDI due to many shortcomings showed BPA-related effects of possible toxicological relevance. These effects, in particular those on the biochemical changes in the brain, which may affect neurodevelopment, and on immune modulation are reflecting the area of particular concern for infants highlighted in the SCF opinions of 1997 and 1998. In addition, the EFSA opinion of 2010 mentions the enhancing effect of an early exposure to BPA on tumour formation later on in life when exposed to a carcinogen. Also in this case the sensitive stage is the developing organism. Thus the infant can be identified as the particular vulnerable part of the population as regards those findings for which the relevance for human health could not yet be fully assessed.

(14) According to the EFSA opinion of 2006 poly carbonate feeding bottles is the main source of exposure to BPA for infants. Alternative materials to poly carbonate that do not contain BPA exist on the EU market, in particular glass and other plastic infant feeding bottles. These alternative materials have to comply with the strict safety requirements set out for food contact materials. Therefore, it is not necessary to continue the use of BPA-containing poly carbonate for infant feeding bottles.

(15) Given that there exists a possible particular vulnerability of infants to potential effects of BPA, although also the infant is deemed to be able to eliminate BPA and even where the risk, notably to human health, has not yet been fully demonstrated, it is appropriate to reduce their

([1]) *Scientific Opinion on Bisphenol A: evaluation of a study investigatingits neurodevelopmental toxicity, review of recent scientific literature on its toxicity and advice on the Danish risk assessment of Bisphenol A EFSA Panel on food contact materials, enzymes, flavourings and processing aids (CEF) (Question Nos: EFSA-Q- 2009-00864, EFSA-Q-2010-01023 and EFSA-Q-2010-00709) adopted on 23 September 2010, EFSA Journal 2010; 8(9):1829.*

([2]) *Opinion of the Scientific Committee for Food on: A maximum residue limit (MRL) of 0,01 mg/kg for pesticides in foods intended for infants and young children (expressed on 19 September 1997).*

([3]) *Further advice on the opinion of the Scientific Committee for Food expressed on 19 September 1997 on a Maximum Residue Limit (MRL) of 0,01 mg/kg for pesticides in foods intended for infants and young children (adopted by the SCF on 4 June 1998).*

exposure to BPA as much as reasonably achievable, until further scientific data is available to clarify the toxicological relevance of some observed effects of BPA, in particular as regards biochemical changes in brain, immune-modulatory effects and enhanced susceptibility to breast tumours.

(16) The precautionary principle referred to in Article 7 of Regulation (EC) No 178/2002 of the European Parliament and of the Council of 28 January 2002 laying down the general principles and requirements of food law, establishing the European Food Safety Authority and laying down procedures in matters of food safety ([1]) allows the Union to provisionally adopt measures on the basis of available pertinent information, pending an additional assessment of risk and a review of the measure within a reasonable period of time.

(17) Taking into account that there are uncertainties in the present state of scientific research with regard to the harmfulness of BPA exposure to infants ([2]) through poly carbonate infant feeding bottles that would need to be clarified, the Commission is entitled to take a preventive measure regarding the use of BPA in poly carbonate infant feeding bottles on the basis of the precautionary principle which is applicable in a situation in which there is scientific uncertainty, even if the risk, notably to human health, has not yet been fully demonstrated.

(18) Thus, it is necessary and appropriate for the achievement of the basic objective of ensuring a high level of human health protection to obviate sources of danger to physical and mental health that may be caused to infants by BPA exposure through feeding bottles.

(19) The Commission evaluated the infant feeding bottle market and received an indication by the relevant producers that voluntary action by the industry for replacements on the market are ongoing and the economic impact of the proposed measure is limited. Therefore, all BPA-containing infant feeding bottles on the EU market should be replaced by the middle of 2011.

(20) Until further scientific data are available to clarify the toxicological relevance of some observed effects of BPA, in particular as regards biochemical changes in brain, immune-modulatory effects and enhanced susceptibility to breast tumours, the use of BPA in the manufacture and placing on the market of poly carbonate infant feeding bottles should be temporarily banned. Directive 2002/72/EC should therefore be amended accordingly. The Authority has a mandate to monitor new studies to clarify these endpoints.

(21) Following the evaluation of the technical and economic feasibility to implement the proposed measure it is concluded that the measure is no more restrictive of trade than is required to achieve the high level of health protection chosen in the Union.

(22) The measures provided for in this Directive are in accordance with the opinion of the Standing Committee on the Food Chain and Animal Health,

HAS ADOPTED THIS DIRECTIVE:

Article 1

In Annex II, Section A of Directive 2002/72/EC, the text in column 4 under the reference number 13480 as regards the monomer 2,2-bis(4-hydroxyphenyl)propane is replaced by the following:

'SML (T) = 0,6 mg/kg. Not to be used for the manufacture of poly carbonate infant (*) feeding bottles

Article 2

1. Member States shall adopt and publish, by 15 February 2011 at the latest, the laws, regulations and administrative provisions necessary to comply with this Directive. They shall forthwith communicate to the Commission the text of those provisions.
   When Member States adopt the provisions referred to in paragraph 1, they shall contain a reference to this Directive or be accompanied by such a reference on the occasion of their official publication. Member States shall determine how such reference is to be made.
2. Member States shall apply the provisions referred to in paragraph 1 in such a way as to prohibit from 1 March 2011 the manufacture of, and from 1 June 2011 the placing on the market and importation into the Union of, plastic materials and articles intended to come into contact with foodstuffs and which do not comply with this Directive.
3. Member States shall communicate to the Commission the text of the main provisions of national law which they adopt in the field covered by this Directive.

Article 3

This Directive shall enter into force on 1 Feb 2011.

Article 4

This Directive is addressed to the Member States.

Done at Brussels, 28 January 2011.

For the Commission
The President
José Manuel BARROSOEN

(1) OJ L 31, 1.2.2002, p. 1.

(2) As defined in Commission Directive 2006/141/EC (OJ L 401, 30.12.2006, p. 1).

(*) Infant as defined in Directive 2006/141/EC (OJ L 401, 30.12.2006, p. 1).'

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International refractory production and application conference
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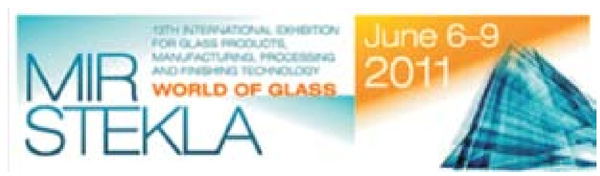

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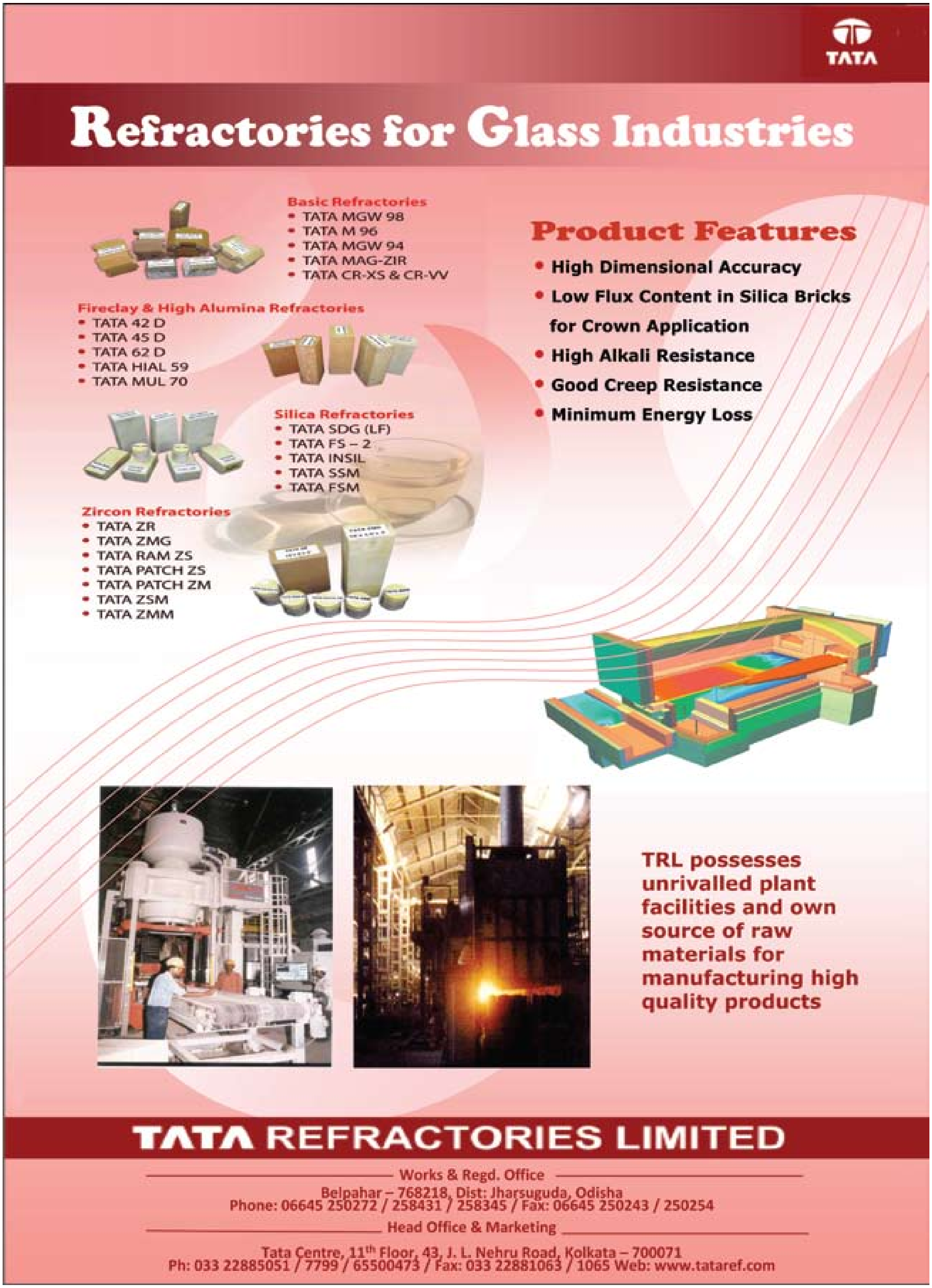
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