SGT NEWS

More from the Society of Glass Technology annual meeting

The Society of Glass Technology 2005 annual meeting in Sheffield featured industrial sessions with particular emphasis on the raw materials suppliers to the glass industry. Nick Kirk of British Glass and Glass Technology Services presented a summary of the Colourite project funded by WRAP.

The aim of the project is to maximise cullet additions for containers. Green or amber to flint is the holy grail of glassmaking. Was it ever possible? Many possible techniques were reviewed and some investigated experimentally. The full report on this work is held on the WRAP website: www.wrap.org.uk/materials/glass/

Decolourising does work: just dilute the colour with lots of clear! The base glass can use selenium to reduce the effects of other colorants. This can become expensive and selenium is volatile and its effective use is always in question, and a rise in prices for the metal puts a question on its economic use.

Could the metal ions in the glass be reduced to the metal and alloyed out? This is feasible through the chemistry using aluminium and silicon, but the energy needed and the high numbers of metallic inclusions makes this very difficult.

Wet chemistry can be used: alkali fusion with potassium hydroxide can be used, but an acid wash with hydrochloric and nitric acid would only remove surface contamination and not the bulk contamination.

Predictions of future colour collected all indicate a growth in the amount of glass available. The quality of the source becomes a problem; while the typical local authority kerbside collection initiatives are not sorted for colour, mixed glass will rise from 30% to 60-70%. The technology is improving for colour sorting but the capital costs are such that only a small number of centres in the UK could operate adding transport costs.

There are acknowledged gaps in availability: clear and amber shortages, with a surplus in green.

WRAP funded a separate project to look at the acceptance of colour by the consumer. There is quite a spread across the European Union, what could be called green in one country might be acceptable as flint in another.

The SGT Glass Batch Furnace and Refractory Technical Committee established a sub committee on cullet. Their work, including practical trials, looked at the various sampling methods in order to determine best practice. The aims of the sampling regime were: to gain a representative sample of cullet throughout the container industry; to collect multiple samples at intervals of three weeks; to collect cullet from both suppliers and factories; and then analyse the cullet quality. There was little difference in accuracy in taking a 5kg sampling rather than a 50kg sampling.

Cullet quality was not as bad as some users had predicted. Composition was almost the same throughout: flint more contamination than wanted 97% average; green was predominantly green, maybe of a better quality, less pyroceramics; amber was well mixed, maybe with up to 25% green, but low in other contaminants. Cullet sampling is ongoing, with monitoring of heavy metal content.

Dr John Parker at the University of Sheffield is developing a predictive colour model: a spreadsheet for setting up the batch based on the practical investigations and including various colour–decolouriser systems. This will include some training and awareness for the eventual operators.

Alan Reynolds the chairman of the SGT Analysis and Properties Technical Committee looked at UK glass sands. The Office of National Statistics indicates that 1.9 million tonnes of glass sand was produced in the UK in 2004. Today's sand sources in Chelford and King's Lynn are not finite but are producing half of the sand for the UK industry. This might not be so in 15 years' time.

Will any glass sand be needed? Recycling cullet replaces some of the need but demand is still increasing from the early 1980s recession and reshaping of the industry. The same amount of glass sand will be needed as we use today.

Estimated reserves in the public domain: Chelford will finish in 2012-14; Kings Lynn 2015 or a bit later; Redhill has 6 million tonnes.

Sand with planning permission but dormant: Blubberhouses has some 35 to 40 million tonnes with permission for 15 million tonnes extraction.

When looking at future sand reserves - the big numbers are in Scotland. This puts a pressure on transport distances.

Minerals Planning Guidance note 15 from the UK government (www.odpm.gov.uk) provides some indication of predicted policy. No permission refusals have been given but the government is beginning to be more protective and voluble interest groups can put pressure in specific locations. The countryside is being protected as a "play" area.

Ball clays are being protected in Dorset. Proposals for the Rodel aggregates quarry on Harris Island in Scotland were eventually withdrawn. The same is happening in France, where eight out of 24 minerals currently worked might not be worked in 2025.

Processing needs affect the viability of some operations. A nearby close resource with higher cost separation might be more expensive than a more distant one with minimal processing needs. Lots of English sands need extensive processing to get rid of iron and other impurities.

Handling adds to the cost versus road transportation - sand needs to use the cheapest form of transport to as near as possible to the factory. Belgian sand has been imported into the UK for a very long time. It is very pure, cheap to produce, and competitive but a small price increase could affect viability;

Ukraine and southern Russia have immense sand deposits with good, cheap rail transport. Sand from Guyana in South America could be loaded straight into the boat.

Perception of colour and consumer choice might determine the success of initiatives to introduce a little more green into clear glass. Gareth Tuck, Psychology of Design, Institute of Psychological Sciences, Leeds University has begun a project to survey this acceptance. Could consumers accept tomato ketchup in a green bottle? Several coloured containers were used with a limited range of contents.

Triangulation methods were used to survey not just focus groups: these included: eye tracking and facial EMG. Colour detection by

President
Dr J M Parker
FSGT

Honorary Secretary
Mr J Henderson
FSGT

Treasurer
Mr R Duly
FSGT

consumers was measured to see if they affect the purchasing decision. For the fillers and brand owners glass contributes to their brand values, and they demand clear above all else.

Structured focus groups were interviewed. A baseline profiling was first made followed by colour glass profiling. This included participants' perception of the green tinted glass containers: cued and uncued.

There are many issues to consider, the number of products, the likely products affected by a change of colour. One problem was the surprising availability of green tinted flint glass containers! Sample size was an issue as was the customer's perception in the shop compared to that in their homes.

Focus group studies showed that the colour of the product was quite important when inside a tinted container. For beers and spirits the participants tended to trust the brand. For lighter tints of green and creamy products there were lots of negative comments. Ketchup had a negative overall response to green tinted glass but some thought it was spicier in appearance.

An un-cued survey was made at a wine shop close to the University. The yellow label used was well received, an additional factor to the colour choice to be considered. A slight green and a combination with beer were acceptable, because many beer bottles are already green.

The CAPDeCo assessment model was used to analyse answers by a group being surveyed. The model uses a 1-7 scale response to a core base of 64 adjectives.

For this survey sprayed green samples were used to get standardised colours, a store set up was replicated to try and balance this with controlled data. Three products were tested this way and the data was analysed. An initial outcome was the reduced negativity with water based products. Further work on more products is planned.

ContainerLite is a project financed by WRAP. Its aim is to make bottles lighter so if they are discarded there is less glass going to the tip, less to transport.

Andy Hartley described how the project brings brand owners with the clout and drive to reduce their weight into a partnership with other parties: WRAP - providing money; Faraday group of universities – as lead partner and project manager; Leeds University psychology department – investigating customer perception; Leeds University business school – providing a business survey; British Glass/Glass Technology Services – providing glass technology/testing, Allied Glass, Beatson Clark, etc. – the glass manufacturers.

The brand owners included Coors, Britvic, Diageo (Co-Op, Marks & Spencer also), with Coors the most enthusiastic. There are 2 million tonnes of container glass used every year in the UK, in 7 billion items.

The ContainerLite project had a commitment to get a 10% reduction of the weight of 75% of the product range (equating to a 30,000 to 50,000 tonnes of glass saving). This would help generate a momentum for lightweighting by the major brand owners.

The benefits would be a saving of raw materials, a reduction in waste and its environmental impact. The outcome contributes to a company's packaging waste targets and is in line with integrated product policy and eco design.

The design of lighter bottles can mean the same bottle but thinner walls or a different shape. It is a proven technology but it is waiting to be applied to a wider range of products. There is a limit to how much saving in weight can be done before a redesign of the container is needed, which would attract direct opposition from the brand owners' marketing people.

Lightweighting has been shown to contribute and some products have already come down in weight. Significant changes can be made without altering the shape but the best changes come from making the bottles small and dumpy.

One brand owner was considering a radical change of the bottle; this hasn't yet come through from consumer testing, but it is a major identity change. Cod liver oil bottles are coming through the lightweighting project.

Coors is key, as a major brewer and bottler; if it goes for a lightweight bottle then it will bring along the rest of the industry. Radical redesign is possible. An established methodology for lightweighting has now been set up and this can be used again to further the operation.

One postscript for the glassmaker: for the brand owners, weight lost means less to pay the container manufacturer!

Crystallisation 2003

The proceedings of the Seventh Symposium on Crystallisation in Glasses and Liquids have been published by the Society of Glass Technology. The meeting was held in July 2003, the submitted papers were peer reviewed and the accepted ones published in the appropriate issues of *Glass Technology* and *Physics and Chemistry of Glasses* in April 2004. The proceedings collects the papers into one volume.

A4, 200 pages, £30 SGT members (£50 non-members).

Congress papers in print or CD

The *Physics and Chemistry of Glasses* special proceedings volume is now complete. The refereed papers have been passed for publication and the volumes are now available for distribution. There are 97 papers accepted for publication in the volume, totalling 512 pages.

The volume is available for £100, and £50 to members.

The *Glass Technology* International Congress on Glass special proceedings volume has 80 papers in the volume, totalling 394 pages.

The volume is available for £80, and £40 to members.

Groups of papers can also be ordered from the SGT website, members can pay for sets of four papers for £10, non-members pay £10 for three papers. Once payment is cleared, the papers will be sent by email as Adobe Acrobat files to the customer.

A CD-ROM with Acrobat versions of all the available presentations at the conference can be bought for £35.

ESG 2004 Proceedings

Peer reviewed Proceedings of the Seventh ESG, Athens, Greece held on 25–28 April 2004 are published in the April issues of *Glass Technology* and *Physics and Chemistry of Glasses*. *Physics and Chemistry of Glasses* has 208 pages made up from 44 papers. All the papers have been processed through the full refereeing procedure used for standard journal papers.

Glass Technology has 180 pages made up from 38 papers. All the papers have been processed through the full refereeing procedure used for standard journal papers.

A complete bound version of the proceedings, 408 pages, A4, can be bought from the Society of Glass Technology price £100 non-members, £80 members. SGT members choose either *Glass Technology* or *Physics and Chemistry of Glasses* or pay for both. Members will receive the other journal for £30.

Society of Glass Technology
Unit 9
Twelve O'Clock Court
21 Attercliffe Road
Sheffield S4 7WW
UK.
Tel: +44 (0)114 263 4455.
Fax: +44 (0)114 263 4411.

Apsley Pellatt on glass making

Publications by Apsley Pellatt, senior and junior, 1807-1848

Edited by Michael Cable

This is the fourth volume in a series that shows how understanding of glassmaking advanced from the 17th to the 20th centuries through the writings of important authors of that period. It brings us back to England at the beginning of the 19th century and concerns the activities and writings of two London glassmakers, father and son, both named Apsley Pellatt.

Apsley Pellatt senior (born 1763) seems to have begun his career as a London glass merchant. He then became joint proprietor and manager of the Falcon Glass House, the firm trading as Pellatt and Green from 1803 to 1831. Apsley senior died in January 1826. Apsley junior, the eldest son, inherited the firm and remained in control until his own death in 1863.

Falcon Glass House was established on the south bank of the Thames in London, probably by Francis Jackson who was in partnership with John Straw, in 1693. Jackson appears to have been a financier very active in the glass industry and was celebrated for organising resistance to a War Tax on Glass between 1695 and 1699.

He probably died soon after 1700 and the business continued under the name of William Jackson and Co. Several changes of ownership occurred during the 18th century but flint glass is known to have been made there from at least 1774. The firm of Pellatt and Green ran the works from 1803 but abandoned it in 1814 and moved to Holland Street. Its name was changed to Apsley Pellatt and Co in 1831 and remained so until at least 1874, the year when it last registered a new design.

Apsley junior was born in November 1791. He entered his father's business in 1812 and must have shown aptitude for its technical side; his first patent, granted in 1819, was for enclosing medallions or ornaments of pottery, metal or refractory in glass. He published a pamphlet, largely to advertise that process, in 1821.

A patent granted in 1831 was for improvements in making pressed ware. The patent shows his concern with achieving the highest possible quality of ware, for example by using accurately made and properly engineered moulds.

He devoted much time to studying glassmaking and became an acknowledged authority on both ancient and modern techniques. His firm's products became well known for both their quality and their artistic design. His crowning literary achievement, the main reason for this book, was the publication of *Curiosities of Glass Making* in 1849.

Apsley junior was keenly interested in technical matters. He offered Michael Faraday the use of the Falcon Glass House when Faraday was asked to investigate the manufacture of homogeneous optical glasses in 1824. In his *Curiosities* . . . he mentions with approval the advances in optical glass manufacture made by Georges Bontemps: Bontemps worked for several years at Chance Brothers, probably from 1848 when Chance began commercial production of optical glass.

At some stage in his career, Apsley junior was able to visit glassworks at Venice, in Bohemia, at Liége in Belgium, and Baccarat in France. In his 1831 patent he describes the use of the *Robinet pump* as an aid to blowing: Bontemps (1868) records that this device had been invented in 1821 by a blower of that name at Baccarat.

Apsley junior served as both Assistant Royal Commissioner and Local Commissioner for the Great Exhibition of 1851. He was a juror at the Exhibition of 1862 and author of the report on glass manufactures shown on that occasion.

TECHNICAL CONTENT

Apsley senior was in 1807 granted a patent for sturdy glass lenses to illuminate the interiors of ships and that is the earliest document reproduced here. Two features suggest some practical experience; the patent says that it might be desirable to make one surface of the lens frosted so that such lenses mounted in buildings cannot act as burning glasses but goes on to say that "this precaution is unnecessary in ships decks as the traffic on them in a short time grinds or roughs the upper surface". It also says that such lenses, mounted convex surface inward, are an improvement for lanterns in ships' powder magazines.

Apsley junior begins his recorded career with his 1819 patent for "Encrusting into glass vessels and utensils white or other coloured, painted, or otherwise ornamented figures, arms, crests, cyphers, and any other ornaments made of composition, metal, or other suitable material". He exploited that process to enclose white medallions in glass. In the patent he describes his method but gives no information about the material that he uses. He heats his medallion or other object to red heat then seals it between two layers of glass sometimes by inserting it into a tube which is then collapsed as the air is sucked out. The statement that "Composition, metal, or other suitable material" may be used, suggests little understanding of fractures caused by differences in thermal expansion.

His 1821 pamphlet on the *Patent Crystallo Ceramie or Glass Incrustations* begins with a broad historical review and only mentions the incrustations near the end. Pellatt states that a Bohemian manufacturer had attempted such a process "about 40 years ago" with very little success but that French manufacturers had succeeded in enclosing small medallions in glass. He claims he has made important advances in the quality, size, and range of objects used in this way. These white opaque medallions encased in glass are generally called *sulphides* but that appears to be due to a mistaken belief that sulphur played an essential part in their production.

In his 1831 patent "Improved Mode of Forming Glass Vessels and Utensils with Ornamental Figured Patterns impressed thereon" Pellatt extends his process to use similar material as a mould to impress fine detail onto the surface of blown glass articles. There he gives a little information about the material used for the cakes bearing the detailed ornaments which are set in the walls of his moulds. He says that it is "an earthy composition such as used by glass cameo makers for moulds and which will bear a strong heat". Later he says that "equal parts of plaster of Paris and finely pounded brickdust may be used for that purpose" and that "the cakes are to be dried then taken to red heat".

Clearly his brilliant white material cannot be a sulphide. The only place where Pellatt mentions sulphur is in his description of how to make complete moulds of his "composition" to form large numbers of articles; he there says "for a rare specimen of an ornamental vessel or utensil a model may be made in wax or cast in sulphur".

The 1845 patent is rather a surprise given what we already know about Pellatt and the luxury wares for which his firm was

LOCAL SECTION CONTACTS

For details of forthcoming local section events in your area, contact the following. All SGT members and non-members welcome.

London
Mr M Holden
BH-F (Engineering) Ltd,
4A Churchward,
Southmead Park, Didcot,
Oxon OX11 7HB
Tel: 01235 517202

Midlands
Mr R Nickels
4 Boundary Way, Crompton,
Wolverhampton,
West Midlands WV6 8DL
Tel: 01902 762070

North East
Mr W Brookes
82 Whitfield Crescent,
Penshaw, Houghton Le Spring,
Tyne & Wear DH4 7QY
Tel/Fax: 0191 584 3100

North West
Dr D Martlew
Pilkington Technology Centre,
Hall Lane, Lathom,
Ormskirk, Lancs.
Tel: 01695 54210

Scottish
Mr D A Rennie
United Glass Limited,
Glasshouse Loan,
Alloa FK20 1PD
Tel: 01259 218822

Yorkshire
Ms R M Sales
20 Blackbrook Drive,
Sheffield S10 4LS,
Tel: 0114 230 6179

North America
Dr A G Clare,
School of Ceramic Engineering and Sciences, New York State College of Ceramics at Alfred University, 2 Pine Street,
Alfred, NY 4802-1296, USA.
Tel: 607 871 2392

India
Dr J Mukerji,
Central Glass and Ceramic Research Institute,
PO Jadavpur University,
Calcutta 777 032, India
Tel: 473 3496

recognised. The first process in this patent is the use of slag from copper smelting as a raw material. From the information given it was to be used for the manufacture of bottles, at that time considered the crudest form of glassmaking. It would produce a blue-green glass so cannot have been intended for top quality wares.

The second claim is for the use of a tank with an inclined base and tap hole for the rough melting of various mixtures of raw materials which might need to be remelted and refined in normal pots. That again suggests wares of relatively low quality.

Another claim describes the making of multi-coloured panels for windows, skylights or transparent roofing by sealing together pieces of different coloured glasses thereby eliminating the leading of traditional stained glass. The last claim is for a completely different but potentially very useful product: flanged lengths of tubing that could be "fastened together end to end for conveyance of water and other fluids".

His first recorded contribution to the Institution of Civil Engineers in 1838, the year in which he was admitted as an Associate, was to contribute his own knowledge about maximising heat release from coal and coke in glass melting. His second address to the Institution in 1840 was a celebrity lecture about making flint glass fit for optical purposes.

CURIOSITIES OF GLASS MAKING

Apsley Pellatt was interested in the history of glassmaking and in advancing its understanding but his book was mainly addressed to interested amateurs. It derived from three lectures upon "The manufacture of flint glass and the curiosities of glassmaking" that he gave at the Royal Institution in the 1840s.

Pellatt describes all the important stages in making about 30 different products, but says little about the technical details that would interest glassmakers. His first section is an updated version of the historical part of his *Memoir* from 1821.

The second part is about glass manufacture and includes a brief discussion of making coloured glasses. The third part describes the manipulation of glass to make a wide range of various products, including grinding, cutting and engraving. The book ends with a set of coloured plates of objects or fragments that Pellatt considered to be of particular interest.

Pellatt's text demonstrates a detailed knowledge of many aspects of glassmaking. Annealing is a particularly interesting case. Scholz in 1820 gave a very clear account of how a hot core of glass trapped in an already solid shell cannot contract as it should and how that leads to undesirable stresses and even fracture.

Pellatt points out that a freshly drawn piece of barometer tube forty inches long will contract by quarter of an inch if properly annealed but by only an eighth of an inch if cooled quickly. He also correctly notes that gauge glasses for steam boilers could sometimes break very easily, especially if their insides were cleaned.

Pellatt's cure is not so easy to understand. He says that such badly stressed wares may be placed in either a sand or water bath and slowly heated to boiling point then kept boiling for several hours and finally slowly cooled. He says that "this process has scarcely ever been found to fail." If that be true its explanation must be sought more in the attack of the glass which leaches out alkali from the surfaces, altering their composition and thus decreasing the thermal expansion of the surface layer.

Apsley Pellatt on Glass Making will be published in July 2006. *Georges Bontemps on Glass Making* will be published later in the year.

The Art of Glass: *The World's Most Famous Book on Glass Making*. A5 (210 mm x 148 mm), 436 pages, ISBN 0-900682-26-4. Paperback. Fourth print. £25 (£20 SGT members + £3 postage).

Bosc D'Antic on Glass Making: *Including essays on the manufacture of faience and the assaying of ores*, published 1758–80. A5 (210 mm x 148 mm), 250 pages, ISBN 0-900682-44-2. Paperback. £25 (£20 SGT members).

Early Nineteenth Century Glass Technology in Austria and Germany: *The works of Professor B. Scholz and Factory Superintendent Kirn* 1820–37. A5, 340 pages. ISBN 0-900682-45-0, £25 (£20 SGT members).

Orders can be made through the Society's website.

UK to host ESG and ICG glass industry meetings

The Society of Glass Technology annual meeting will be held at Sunderland in the UK on September 10-14 this year, and will also incorporate the European Society of Glass Technology (ESG) and the International Commission on Glass (ICG) meetings for 2006. The entire event will be titled "Glass; the Art of Science".

Topics under discussion at the event will include furnace technologies and refractories; melting and forming; water and sulphur in glass; energy; environmental issues; glass products and quality control; surfaces; sol-gel processing; nucleation and crystallisation; glassy and glass-ceramic nanomaterials; glasses in optics and photonics; novel glasses and applications in medicine, dentistry and biotechnology; glass art; and the history and heritage of glass. Sessions will also be held for young researchers.

Nearly 200 papers have been offered either as oral or poster presentations. Technical sessions will start with a keynote paper and will be presented in English. The subjects covered by the papers are expected to include structures; refining and melting; structure and properties of glass forming melts; art meets science; environment; biomaterials; water and durability; water and corrosion; modelling of forming; history and heritage; modelling of other aspects of the glassmaking process; history and heritage; sol gel; industrial added value; crystallisation; batch and raw materials; and mechanical properties.

A full social programme is also planned as part of the event. This aspect of the conference will include visits to places of interest; receptions; the conference banquet; and an all-day excursion, and will also include a separate programme for accompanying persons. Accommodation has been reserved at the University of Sunderland and there are also major hotels nearby.

A wide range of sponsors, including the publisher of *Glass* and its sister journal *Glass International*, are providing financial support to the event. ***Full details from the Society of Glass Technology and from the website www.esg2006.co.uk***

Society of Glass Technology
Unit 9
Twelve O'Clock Court
21 Attercliffe Road
Sheffield S4 7WW, UK.
Tel: 0114 263 4455
Fax: 0114 263 4411