

SGT NEWS



Compiled and published by DMG World Media on behalf of the Society of Glass Technology

THE USE OF STAINED GLASS IN EUROPEAN CATHEDRALS

ANALYSIS AND PROPERTIES COMMITTEE

A second round of analyses has begun for the new certified references for amber and green coloured glasses. The first round of analysis was very promising and with a wide range of state-of-the-art analytical facilities available to the committee the tests should be complete by the start of 2000. The data will then be collected for statistical analysis and the standard samples are expected to become available following approval by council in October 2000.

The amber glass was provided by United Glass and the green glass by PLM Redfearn.

The laboratories have all followed ISO guidelines for the production and traceability of analytical data. The main cause of concern has been the continuing movement of staff within the industry and the means of keeping in touch with their successors.

Years spent as a choirboy with ample time between hymns gave the young David Martlew the opportunity to observe the stained glass of the Victorian church he attended. As well as a kernel of appreciation of the art of making glass that was to lead to a PhD and career at Pilkington, there was also the chance to read and interpret the stories being told to worshippers. Dr Martlew related his observations on the beginnings of stained glass within the cathedrals of Europe and the use of their colour images to a joint gathering of the SGT's North West Section and the Institute of Materials North West Ceramics Division held at Pilkington Technology Centre, Lathom.

For a population which generally could not read, the colour images of stained glass in cathedrals were the equivalent of today's multiplex cinemas. Medieval craftsmen with the tools and technology of the time were bringing stories from the bible to the masses, making the religious centres a place of pilgrimage.

The glass was made by the crown or muff processes: a bubble was blown and spun by the crown method, or a bubble was blown and swung then cut open and flattened over stone surface by the muff method. There was a limited size for the panes of glass made by either process and the surface of the glass produced by the muff method was scarred. Methods

were available to produce coloured glass, however, its control was not always repeatable because of a lack of understanding of colour chemistry. Stains or paints could be fired onto the glass surface. The glass was assembled into the windows using lead strips and a mix of linseed oil and chalk to fix it into place.

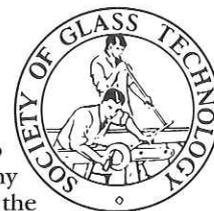
The images created by the medieval craftsmen were simple cartoons, hard lines defining the picture. In some ways, the manuscript illustrations were transferred to stained glass for teaching purposes. The windows were 'read' from left to right from the bottom to the top, with the principal character usually at the top. Visitors to cathedrals were always on the left as they progressed around the interior starting with the north wall first, then the east, south and west walls. Each window told a separate story with specific images readily interpreted by the people of the time, but in some ways lost on the modern visitor.

Windows were expensive to build so sponsors were sought from among the successful businessmen of the time, in addition to the powerful guilds. Many windows have images at the bottom which advertise, at eye level, the generosity and power of guilds or the rich individuals. ■

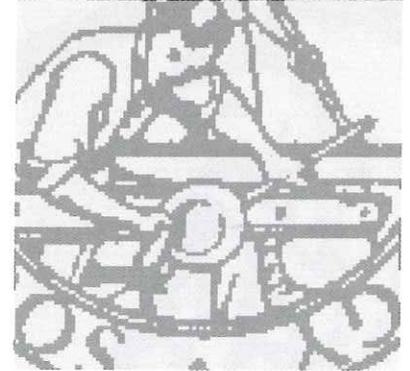
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FURNACE WASTE HEAT UTILISATION FOR REDUCING ENERGY CONSUMPTION AND EMISSIONS



The economics of using more of the waste heat from the furnace are becoming viable as energy costs increase and the carbon tax becomes reality. Mark Wickham of Alstom Energy Systems described the various options to a meeting of the SGT's London Section at a meeting hosted by United Glass, St Albans.

Heat recovery already takes place in the glass industry, regenerators and recuperators are used to preheat combustion air and fuel. Waste heat boilers have been used to recover further energy. The temperature of gases leaving the regenerator and recuperator varies between 300°C and 550°C. Oxy-fuel fired furnaces produce a smaller volume of exhaust gases, however, their temperature may be greater than 750°C with no

regenerators to recover this heat. One of the best methods for recovering the heat is to heat the batch, either directly or indirectly.

Batch can be heated indirectly by directing hot gases over metal plates which exchanges the heat to the batch on the other side. Zippe has been responsible for the development of the indirect method.

Of the two methods currently used to transfer heat, the direct method lets the gas pass through the batch which is itself electrically charged to help collect ionised particles from the exhaust gases. In this case the batch preheating system also acts as an electrostatic precipitator saving expenditure on an additional emissions cleaning process. Edmeston has recently sold the rights for its direct preheating system to

Praxair. Irish Glass Bottle has been demonstrating the direct heating technology. The project had to be limited to only heating in-house cullet because of the smell associated with the release of organic compounds from foreign cullet.

In 1988, Nienburger Glas in Germany was one of the first companies to adopt batch preheating using the indirect approach. The company demonstrated that the method provided a payback within two campaigns on a 200 tonne/day cross-fired regenerative furnace - 14 years. This may not be a sufficient to satisfy city institutions lending capital for such a project, however, if the energy tax was taken into consideration then any technology which helps save fuel will be attractive. ■



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GLASS OPPORTUNITIES 2000 - MIXING TO MELTING

The 2000 Spring Meeting will be held at the World of Glass, St. Helens from 7-9 June. The chairmen of the Technical Committees have assessed the submitted papers that have arrived and have accepted papers on: *glass conditioning improvements through computer aided engineering; improving environmental emissions and economics of glass melting through batch preheating; optimising batch formulation and furnace operation; effects of internal radiation and natural convection on glass conditioning; flexibility in glass conditioning system design; learning by degrees* and a joint presentation and discussion of the proposals and relevance of the BSI sand standard by the chairs of the Analysis and Properties Committee and Glass Batch, Furnace and Refractories Committee. Further papers have been solicited from members of the Technical Committees as well as an approach to the keynote speaker.

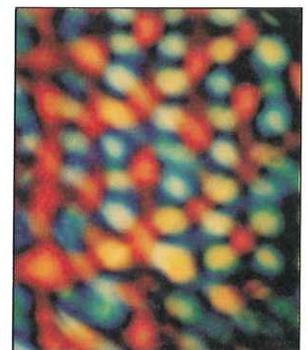
The next notice for the meeting will be circulated early in the new year.

For further information contact the Conference Department, Society of Glass Technology, Don Valley House, Savile Street East, Sheffield S4 7UQ, UK.

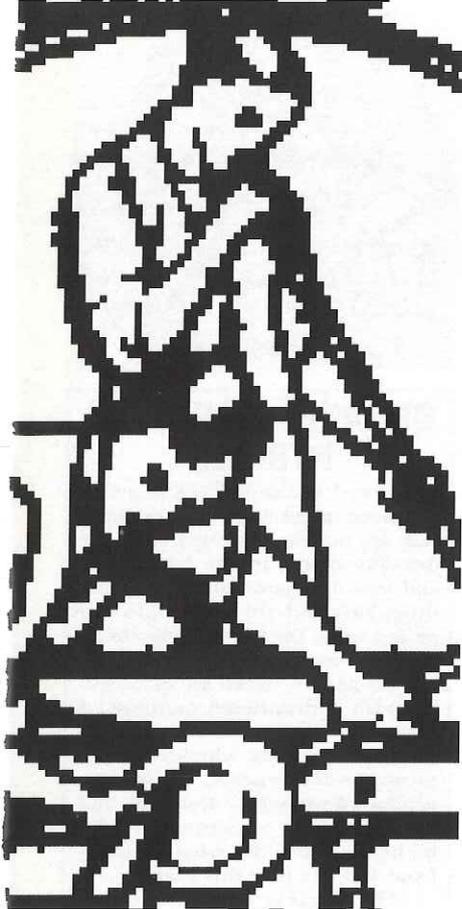
BASIC OPTICAL STRESS MEASUREMENT IN GLASS BY H W MCKENZIE & R J HAND

Practical methods used to measure stress in glass are analysed by this 1999 publication. Users of photoelastic techniques in the glass industry, both in day-to-day quality assurance and in more specialist fault-finding applications, will find the information in this book relevant to their needs and that it provides an improved understanding of the measurements being made.

The book has 96 pages, 51 line drawings and 21 colour pictures. ISBN 0-900682-27-2. Price £27.50 (£17.50 to Society of Glass Technology members).



Cover of the book (Pilkington plc).



SGT NEWS



Compiled and published by *dmg world media (uk) ltd* on behalf of the Society of Glass Technology

CONSERVATION OF GLASS AND OTHER ARTEFACTS

Glass artefacts from any age are susceptible to long term damage if stored under the wrong conditions. Conservators face a delicate task in stabilising such objects, particularly when the glass is associated with other materials.

Lynne Kelley, of the National Museums and Galleries on Merseyside (NMGM) described the work of the Conservation Centre in Liverpool to a joint meeting of the North West Section of the Society of Glass Technology and the Institute of Materials' North West Ceramics Committee.

The NMGM has eight sites with a variety of exhibits ranging from old master paintings and social history artefacts to Etruscan glass and space suits. The museums have 450 entries on their database of various stained glass articles ranging from the 13th century to the present day.

NMGM's award-winning Conservation Centre is the first national conservation centre in the UK and the only one of its kind open to the public. It is housed in the former Midland Railway Goods Depot, which was built in the 1870s on Queen Square in the heart of Liverpool's main business and shopping district. HRH The Prince of Wales opened the centre in 1996 and it was voted European Museum of the Year in 1998.

Visitors to the centre can discover how world-class conservators preserve and restore everything from fine art and sculpture to space suits and ancient archaeological treasures. They can see a conservator at work via a live video link, take part in hands-on

activities, have a behind-the-scenes tour, and get an expert's opinion on looking after heirlooms. The centre is open Monday to Saturday, from 10am to 5pm, and on Sunday from 12 noon to 5pm.

Ms Kelley is also the chair of the Ceramic and Glass Conservation Group (CGCG) of the UK Institute for Conservation (UKIC). The CGCG was formed in 1984 as a recognised association for conservators and restorers of ceramics, glass and related materials. Its members come from the private and institutional sectors and its main activities have been geared towards dissemination and promotion of technical and professional information, ethical practice guidelines and support to all practising conservators, restorers, conservation scientists and art historians.

The group organises visits to institutional studios, museums and relevant exhibitions and publishes information on the profession, meetings, queries from the public, research papers by members and students and its current projects in *Conservation News*, the UKIC magazine. It aims to develop links with technologists in order to increase understanding of the materials used in conservation.

The centre's studios are used by full-time staff and students on internships. The studios are equipped with fume cupboards and are well lit by natural and artificial light.



IN PRINT

The February issue of *Physics and Chemistry of Glasses* has peer reviewed papers on strengthening mechanisms of epoxy-based coatings on glass, electrical behaviour of superionic conducting AgI-Ag₂O-TeO₂ glasses, structural study of rubidium and caesium silicate glasses by Raman spectroscopy, structural order of extruded calcium metaphosphate glasses, X-ray absorption investigation of TeO₂-BaO-TiO₂ glasses, X-ray photoelectron spectroscopy of sodium aluminosilicate glasses, early crystallisation stages in a heavy metal fluoride glass prepared under normal and weightless conditions, Judd-Ofelt parameters and radiative properties of Pr³⁺ ions in cadmium borate glasses, and physical properties of stannosilicate glasses.

The February issue of *Glass Technology* has peer reviewed papers on processing and properties of glass strengthening by ormosil coatings, numerical simulation of cap and thread interaction for a glass container, and glass composition measurement using laser-induced breakdown spectrometry. The issue also has the 2000 consultants listing, book reviews, Society news and feature articles.

Both publications have abstracts from the latest scientific, technical and business publications from around the world, giving a greater overview of the latest developments in glass.

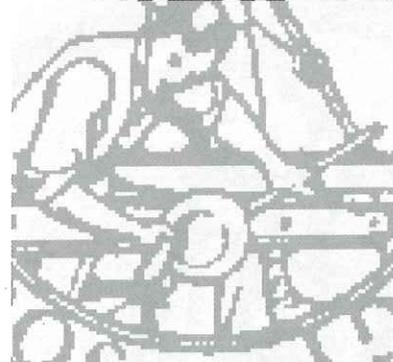
The Society has a commitment to publish all referred papers within nine months of their acceptance.

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Conservation follows three main strands of prevention, intervention and restoration. Preventative conservation involves storing and displaying artefacts in safe materials in appropriate conditions and protecting them from damage. For example, display stands for Chinese snuff bottles are customised so that they can be handled without direct contact, while a Venetian goblet is kept at 42% relative humidity in order to check the deterioration of irreversible crizzling.

Interventionist conservation entails dismantling, cleaning, reassembly and making good previous conservation attempts but there is more to it than simply sticking things back together. Missing areas of artefacts can be substituted by an epoxy resin cast into moulds made from dental wax. The adhesive used to reassemble broken pieces needs to be chosen with care as its strength has to be weaker than the materials it is joining and its viscosity needs to achieve minimum separation without being absorbed into the pores. Shadowing caused by the absorption of adhesive is impossible to remove and if a piece breaks again then the damage may go beyond that of the initial break. Furthermore, the adhesive has to match the refractive index of the material, be reversible and comply

with the many health and safety regulations. Sellotape leaves far too much residue on a surface and causes more harm than good.

Restoration may lead to the replacement of missing parts, repainting, restoring surfaces and making mechanisms work again. For example, a new glass cover may be made for a broken clock face rather than piecing together the original.

The conservator always has to always consider the ethics of restoration and conservation. Should missing areas be filled so that they match the original piece or should the repair be obvious so that museum visitors can make their own deductions? Whatever the decision, high standards of record keeping are used to ensure that conservators in the future have as much information as possible to achieve their goal. Photographs are taken at every stage of work as an additional aid to record keeping. In 50 years' time, materials used in the late 20th century may be viewed as inappropriate as the methods used at the start of that century. Probably they will but they were the best available at the time and at least there is full documentation.

The centre does not yet have a dedicated stained glass conservator and funding is sought for such a post. ■

ORGANIC-INORGANIC HYBRIDS

Advanced technologies require advanced materials. Designer materials are making their way from the drawing board to the laboratory and into the marketplace. Organic-inorganic hybrid materials are poised to be the building blocks to making structures, morphologies and properties, which are inaccessible with conventional methods. A three-day conference on organic-inorganic hybrids, which is aimed at materials experts, engineers, product developers, designers and the inquisitive entrepreneur, will be held at the University of Surrey from 12 to 14 June this year.

The Society is a co-sponsor and member of the scientific advisory committee for the conference, which is being run by the Paint Research Association. Professor Angela Seddon, of the Department of Materials, University of Nottingham, is to represent the Society as a session chair. Further details are available from the Society and a conference programme will be circulated in February.



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GLASS CONFERENCES IN 2000

The Society's Spring Conference from 7 to 9 June at the World of Glass in St Helens will look at glassmaking issues, from mixing batch to conditioning.

A keynote lecture by Dr Bill Pardoe, of Pilkington, will open proceedings on 8 June and the following session has papers on batch preheating by Dick Marshall, of BOC Gases, USA, and optimising batch formulation and furnace operation by David Myers, of Appleby Calumite. Margaret West, of Sheffield Hallam University, and John Osborn, of Beatson Clark, will have a joint discussion on standards for glass batch components.

The afternoon session begins with a talk on batch plant, followed by Drs Gordon Richardson and John Parker presenting a joint paper on the options for training and continued education. Dr David Martlew, of Pilkington, will present the last paper of the session on the evaluation of a Victorian glass tank furnace. After a short break, Mr John Clark will deliver his presidential address, followed by a short talk by the winner of the 1999 Student Project Prize and the Society's annual general meeting. The conference dinner is to be held at the World of Glass that evening.

Friday morning, 9 June, begins with a look at the potential of glassmaking refractories by Geoff Evans, of Glassref Consulting. This will be followed by Alan Stephens, of BH-F, discussing glass conditioning improvements through computer-aided engineering and glass chemistry in the furnace by Professor Michael Cable, of Sheffield University. The final session starts with Ken Paul, of Emhart, who will discuss the effects of internal radiation and natural convection on glass conditioning. Richard Sims, of Sorg, will look at flexibility in glass conditioning design and Andy Hartley, of British Glass and Glass Technology Services, will talk about melting issues at the start of a new century.

The World of Glass, an interactive learning centre for families, schoolchildren and the community, has new conference facilities which the Society will use. The centre is based on collections, such as the Pilkington Glass Museum, and it uses a refurbished Victorian glassmaking furnace as its focus. The St Helens Stakis Hotel is next door to the centre and other hotel accommodation is a short drive away.

Visits to at least two local glassmakers will take place on the Wednesday afternoon. The provisional programme for the conference is to be circulated in February. For more information contact the conference department at the Society. ■