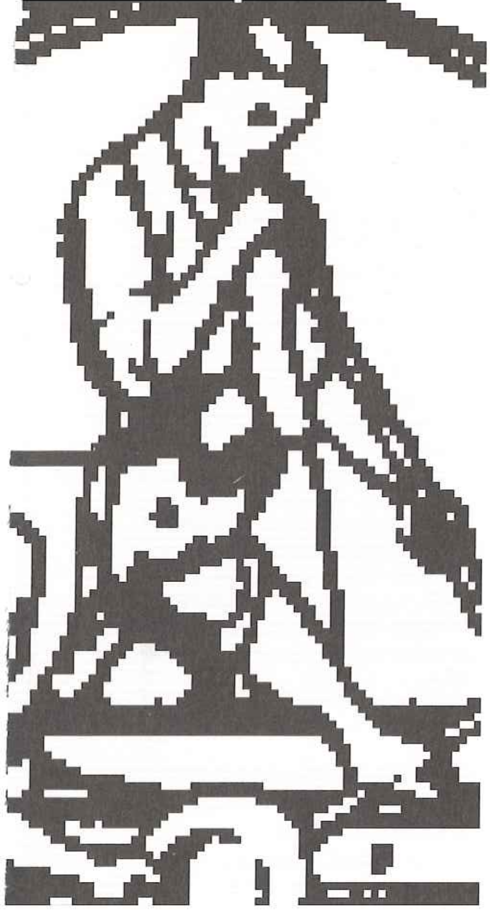

NO 3. 1994

# SGT NEWS

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## LEHR DESIGN DEVELOPMENTS

**A brief history and review of the development of lehr designs for the glass manufacturing and assembly/fabrication industries was described to the London Section by Harry Holt of Stein Atkinson Stordy in a joint meeting with the Institute of Refractories Engineers at United Glass. Tom Ensor reports.**

The first reference to a lehr and the origin of the word itself was found in an article on 'modern glass' in 1827. As production rates gradually increased, so did the use of lehrs. Construction was similar to a tunnel kiln, with shuttle cars loaded with ware. At least one example of this type survived until 1950. Firing was by coal or oil.

The advent of the mesh wire belt allowed lehr design to progress to the insulated steel tunnel concept that is commonly used today. Over the years, the huge increase in bottle production speeds has meant that lehr widths have increased from one metre to five metres, with wider units contemplated. Tunnel lining, once mild steel, is now stainless, at least in the higher temperature areas.

As production speeds have increased, so the requirement to heat the ware on entry to the tunnel has diminished. The problem is now one of cooling and temperature uniformity across the increasing lehr widths. Computer control is now a widely requested feature, again to enhance control. Mathematical modelling is being used to determine glass temperature and stress levels.



### COLIN MAYERS AWARD

**Glass Training and the Society of Glass Technology are organising the Colin Mayers Award for young people working in the UK glass industry. Entrants must submit a written presentation of 1000 words plus diagrams on an engineering-oriented project which has design content, practical applications and demonstrates originality.**

**The award of £150 also includes a certificate and free Membership of the Society. Entrants must be under 25 years of age at the closing date of 31 October 1994. Further details may be obtained from the Society.**

## DEVELOPMENTS FOR THE HAND-MADE SECTOR

**New melting, feeding and decorating equipment are among the latest introductions for the hand-made glass industry. Peter Hoar reviewed some of these developments at a meeting of the Midlands Section.**

Furnace technology is an area where new products and processes are constantly being developed. Sismey & Linforth has launched a range of three furnaces for use in studios, test laboratories and colour melting.

The neat and tidy designs are easily installed, the maximum capacity of the largest is 115kg and a recuperator option is available. The company also has a new 300kg day tank with either silimanite or fusion cast refractory options.

Eurofusion has announced a large intermediate day tank with a five tonne capacity, capable of melting 1.5 tonne/day. Either tin oxide or molybdenum electrodes and gas/recuperator combinations are available.

The Lindner feeder was highlighted as a useful machine for large gob low speed combinations.

CONTINUED ▶

**CONTINUED ▶** Blown ware is said to be made easier with this screw action feeder. Gob weight is tightly controlled. A platinum coating ensures that there is good wear life.

For the preparation of ware prior to decoration, an automated marking machine was noted which cost only £10,000. A manual flat bed grinder, however, was one case where the human component could perform as flexibly and more efficiently than automatic rivals.

Scalloping bowls using a Colin Mayers machine with a vacuum chuck holding the piece in place was also described.

## IN PRINT

**The June 1994 issue of *Glass Technology* has the first part of a major overview of glass ceramics by Graham Partridge. Part 1 looks at their development properties and bulk applications. Part 2 in the August issue will illustrate their uses in joining, minor applications and future uses.**

**The special feature for the June issue addresses pollution, the financial aspects of its control, emissions and furnace design to meet future regulations. Papers on an infrared study of corrosion processes in glass, the chemical separation of amorphous silica from quartz and the sulphate mass balance and foaming threshold in soda-lime glass are also included.**

***Physics and Chemistry of Glasses* has a wide selection of papers on elastic constants in glasses, x-ray spectroscopy study of iron phosphate glasses, an assessment of glass stability criteria, thermal stability and crystallisation of telluride glasses, glass formation in CuO-$P_2O_5$-$Fe_2O_3$ glasses, devitrification on reheating of infrared transmitting glasses, pressure induced acoustic mode softening in gadolinium metaphosphates and Judd-Ofelt parameters of rare earth ions in ZBLA.**

# HOT END INSPECTION AND LINE EFFICIENCY

*Society of Glass Technology, 20 Hallam Gate Road, Sheffield S10 5BT. Tel 0742 663168. Fax 0742 665252.*

**Feedback of quality information to the IS machine as quickly as possible will reduce the number of rejects. There may already be many thousands of containers out of specification before cold end inspection occurs after the lehr. Jorgen Laessoe Engineering has developed a vision inspection system for the hot end which cuts down the response time. PLM Redfearn installed the first system in November 1991. Two years on, the company hosted a presentation by Jorgen Laessoe to the Yorkshire Section.**

Hot end inspection does not replace cold end inspection. Instead it provides a first filter, which helps correct defect sources from the IS machine. The Jorgen Laessoe vision-based system can only provide data on the sidewall, surface finish and check dimensional integrity. However, its position near the last section after coating means it can measure the performance of individual moulds.

Statistical information from the hot trend analyser can thus be used on graphical displays to show each mould's performance and alert the operator before critical thresholds are broken.

The system consists of a light box for background illumination and a camera in a protective housing. The computer is installed in the operator's room. A spacing of around 10% of the container diameter is needed and the throughput is 10 containers/sec.

Containers are examined from one viewing angle, so some 'leaners' for example will be missed but not enough samples to affect the reliability of statistical control.

The possibility of adjusting IS machine control parameters before production runs out of tolerances is an important factor in improving yield. Rather than waiting for faults to be seen by the cold end inspection equipment after the lehr, the hot end is informed almost instantaneously, saving many thousands of rejects.

The system installed at PLM Redfearn has improved line efficiency by 3% or 10 million containers over two years. Defects identified visually rather than dimensionally are rejected immediately and the risk of freaks being shipped to the customer is further reduced. Increased line speeds mean that handling has become more of a problem and arguments between hot end and cold end over lost ware have increased. By continuously measuring the number of containers entering the lehr, the problem area can be identified.

## WINTER-KLEIN LECTURE

Dr Phil Gaskell will deliver the 1994 Winter-Klein Lecture at the Sixth International Conference on Non-Crystalline Materials (NCM6) in Prague on 29 August.

The Anuita Winter-Klein Prize provides the winner with an opportunity to address a major conference on the principal theme of their work. The Academie des Sciences chose Dr Gaskell in recognition of his new model of the atomic structure of glasses.

NCM6 is the sixth in a series of triennial conferences on the structure of non-crystalline materials. The aim of the conference is to bring together both experimental and theoretical scientists engaged in structural studies of inorganic glasses, amorphous solids and liquids. Further details may be obtained from the Society.

## EMISSION CONTROL QUALIFICATION

### MR K E H TEISEN WRITES:

I must quickly report that the table shown at the bottom of page 1 of *SGT News*, No 1, 1994, (*Glass*, December 1993) is incomplete. It will give the reader still struggling with the legislation the impression that for "new processes" the figure for particulates is 250 mg/m$^3$ at normal temperature and pressure. It is not; it is only 100 and has applied since 1991.

This also applies to SOx, NOx, chlorides and fluorides. New processes have to satisfy the limits which existing furnaces need to meet in 2001.

# PLATINUM GROUP METALS FOR HIGH TEMPERATURES

**Some of the world's most precious metals are used in everyday applications by the glass industry. Platinum group metals may be pricey but their unique properties at very high temperatures ensure their continued use. Peter Raw of Engelhard described the history of these metals and the best ways of getting value from them to a joint meeting of the North West Section and the Institute of Materials North West Ceramic Group.**

The group of metals which includes platinum, rhodium, palladium and iridium all have very high melting points (°C): Pd 1554, Pt 1772, Rh 1963 and Ir 2454. They do not readily oxidise. Three companies – Engelhard, Heraeus and Johnson Matthey – are responsible for their supply, which comes from mines in South Africa, Russia and North America. Total production levels are (in tonne/year): Pt 120, Pd 120, Rh 12 and Ir 1; this also reflects their respective abundances. Production from the ore to the metal used to take nine months – this is now three/four months.

The glass industry consumes only 2% of the total platinum produced per year, the major consumers being automotive catalysts (38%), in jewellery (37%), investment (6%) and industrial catalysts (5%). The glass industry consumes only a small amount (2-3 tonne/year) because it is a very efficient recycler. Between 95% and 99% of the original fabrication is usually available for recovery.

Platinum group metals all have high melting points and good corrosion resistance. They do oxidise but the rate is so low that the effect is minimal.

A reducing atmosphere can create a Pt-Si compound which readily attacks grain boundaries – a platinum crucible would soon crumble in a sooty atmosphere. Platinum can be alloyed readily. Solid solution strengthening by rhodium increases both the melting point and the overall strength. There is a cost penalty, however, since Ph is much rarer and more expensive. Oxide dispersion strengthening using very fine yttria or zirconia particles improves strength five_fold and lifts the melting point to 1850°C.

The glass industry's biggest consumer of platinum is in the production of glass fibres, which uses the metal fibre bushings. Dispersion strengthened alloys are helping to increase service lives beyond 12 months, while reducing the overall cost by using less rhodium.

Thin flat glass for solar cells and LCD displays is made using a single orifice bushing slot. This enables a flat product to be made with outstanding quality.

Platinum was used by float glass manufacturers to clad stirrers but they have been replaced by cooled mild steel which is coated with glass, giving a substantial cost saving.

Quality is always being demanded in the production of optical glass and here platinum-iridium alloys with oxide dispersion strengthening become the choice replacement of many competing materials. The oxide dispersion prevents even the small amount of inclusions which occur with other platinum alloys.

Large amounts of platinum are being used in crystal and container glass feeders, double crucibles for optical fibres and furnaces for optical glass. The metals are also commonly used within the laboratory, eg in casting dishes, tongs and tweezers.

Platinum group metals are expensive. Many companies own their own inventories. Around 20-30 tonnes is annually made into bushings, while similar amounts are used in feeder systems and linings; all is sourced from scrap. The metals can also be leased at a nominal charge to cover wear and tear, a useful option for short-term operations without the expenditure. This approach also serves as protection against movements in the metal markets. ■

## FIRST NORTH AMERICAN SECTION MEETING

**The Society of Glass Technology's North American Section holds its first meeting in Pittsburgh on Friday 3 June 1994. Speakers in the two morning sessions will present discussions on environmental regulations, glass byproducts from industrial wastes, the Clean Air Act and fibre manufacture, bottle cullet for insulation glass, oxy-fuel firing and melting lead glasses for TV tubes.**

**There is a plant visit arranged for the afternoon to Kopp Glass, the Pittsburgh-based producer of technical, signal and industrial glass, lenses and filters, coloured glasses and heat-resistant borosilicates. A banquet has also been arranged for the evening.**

**Full details are available from Dr Alix Clare, New York State College of Ceramics at Alfred University, 2 Pine St, Alfred, NY 14802, USA. Fax 607 871 2392.**

*LOCAL SECTION CONTACTS*

*For details of forthcoming local section events in your area, contact the appropriate Honorary Secretary.*

*All SGT members and non-members welcome.*

*London*
*– Mr M C Brew, United Glass Ltd, Porters Wood, St Albans, Herts AL3 6NY. Tel 0727 59261*

*Midlands*
*– Mr R W Fisher, Sismey and Linforth, Unit 94, Heming Rd, Reddich, Worcester B98 0AE. Tel 0527 529810.*

*North East*
*– Mr J Henderson, 44 Woodside Ave, Throckley, Newcastle upon Tyne NE15 9BE. Tel 091 264 4775.*

*North West*
*– Dr D J Bridson, Pilkington Glass, Prescot Rd, St Helens, Merseyside WA10 3TT. Tel 0744 692358*

*Scottish*
*– Mr D A Rennie, United Glass Ltd, Glasshouse Loan, Alloa FK20 1PD. Tel 0259 218822.*

*Yorkshire*
*– Miss R M Sales, 20 Blackbrook Drive, Sheffield S10 4LS. Tel 0742 306179*

# GLASSFIBRE MANUFACTURE

**If a light could be shone down the total length of glass fibre produced annually, it would take one year before it reached the end. Dr K Loewenstein outlined the production of bulk fibre to the Institute of Materials Chiltern's Section at the University of Hertfordshire, Hatfield.**

Both World Wars have provided the impetus for glass fibre production. WWI required a substitute for asbestos, WWII used glass fibre as a reinforcement of epoxy resins for aircraft radomes. Today transport is the largest consumer of fibres, with both thermosetting resins and recyclable thermoplastics.

Glass fibres are also used for insulation and sound absorption. Glass fibres are produced by two routes, either direct melting straight from the batch or the older method of remelting marbles. Both methods require raw materials of 300 mesh or finer, which have to be mixed by air blending in a sealed environment. The melting furnace required for fibre production is typically $1m^2$-$1.2\ m^2$ per tonne produced per day. The conditioning zone is used to bring the molten glass to a temperature suitable for fibre formation. The glass then flows down through platinum bushings with 1mm-2mm diameter nozzles. It is then attenuated into strands which are gathered to form the fibre.

Bushings are a major item of investment. They have to be made from solid platinum in order to withstand high temperatures and wear rates. Their usual service life is between 9-12 months. Two years is exceptional. There are usually 800-1600 nozzles per bushing but this can go up to as many as 4000. About 30 tonnes of platinum-based alloys are used as bushings, equivalent to £240 million (Pt = £8/g).

Fibres are pulled onto drums via an applicator which applies the sizing. The end use of the glass fibre determines the components used to make up the size: Starch is used for fibres which are used in fabrics; direct reinforcing sizes incorporate a silane coupling agent which forms a chemical link between fibre and matrix; antistatics are used to prevent fibres from clinging to everything during spray up or chopping for example. Once gathered in rolls, the glass fibres are sent on to the next forming stage. This usually entails cutting the fibre into a manageable size, eg chopped strand mat or roving. Continuous fibres are used in filament wound constructions or woven products.

# A STANDARD FOR PRODUCT SAFETY

**Product liability legislation has placed the burden of responsibility on the supplier. John Patrick outlined the setting up of a Guidance Standard within GEC at a joint meeting of the London Section and the Institute of Quality Assurance.**

Glass is brittle and if broken is dangerous and can cause injury. Failures in any products have led to serious consequences. Legally, a company can be fined and the individual responsible gaoled; bad publicity from an incident can seriously damage a company's reputation and even force them out of business; there is a moral duty on the manufacturer to consider the safety of the consumer; and any foreseeable misuse, such as using a screwdriver to open a paint pot, should be considered.

Section 6 of the Health and Safety at Work Act requires companies to provide information on the safe keeping, use, disposal and modification of their products. Any changes should be notified to the customer.

The Consumer Protection Act enabled an injured person to sue for damages without proving negligence or having a contract with the supplier. This applied to personal loss only and concerned any product, not just consumer goods. This in effect extended the Health and Safety legislation to all customers. A code of conduct provides a statement of the moral stance taken by the company.

A Guidance Standard assists those responsible for ensuring products are as safe as is practically possible. The Standard gives advice on setting up, assessing the potential dangers. It traces the areas which influence the product, ie internal transfers or cost mechanisms. A questionnaire has to be filled in; it is big enough to uncover any inconsistencies and get at the truth. An audit team is then sent in to interrogate and suggest improvements. If a safety incident occurs for any product , it has to be reported back to a Product Safety Group.

GEC instigated the Product Safety Standard to complement the introduction of BS 5750. As with all new systems it has had to overcome inertia but it is now working successfully. A manual has been drawn up to provide guidance and define areas of responsibilities, from design to training, to inspection and testing. ■

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