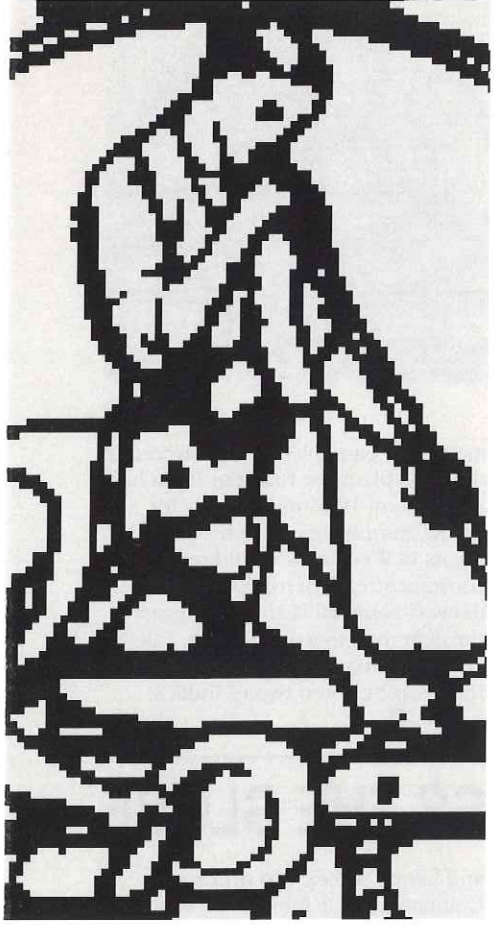

NO. 4 1996

SGT NEWS

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IN PRINT

August *Glass Technology* has refereed papers on: Finite element contributions to glass manufacturing control and optimisation, part 1, creep forming of flat glass volumes; properties of Ge-Si-As-Se-Te-N chalconitride glasses as infrared transmitting materials; and numerical simulation of bubble behaviour in glass melting tanks, part 3, bubble trajectories.

***Physics and Chemistry of Glasses* has refereed papers on: The role of zinc cations in structural ordering in sodium zinc silicates; density measurements of $xCs_2S+(1-x)B_2S_3$ glasses, correlation with short range order; EPR study of Mn^{2+} doped silica glasses prepared by sol-gel process; nitridation of mixed alkali phosphate glasses; ultraviolet absorption edge studies of heavy metal oxide glasses; role of Ti ions in fast ionic conduction in solid borate electrolytes; an examination of classical nucleation theory in a phase separating binary glass; FT infrared spectroscopy of the devitrification of lithium germanate glasses; nonlinear optical properties of B_2O_3 based glasses: binary Ag_2O-B_2O_3 and ternary AgX-Ag_2O-B_2O_3 (X=Cl, Br and I) glasses; and a Letter to the Editor entitled 'Do hydrogen ions really cross a glass membrane for pH measurement?'**

INTEGRATED SYSTEMS IN A GLASSWORKS

The constant improvement of microprocessor power and the move to open system architectures has enabled the implementation of plant-wide control systems. Gavin Bennett of Honeywell Control Systems discussed the systems which are being introduced to the glass manufacturing industry at a meeting of the Yorkshire Section hosted by Hepworth Refractories' Technical Centre, Worksop.

Integrated systems can help maximise productivity and throughput in any working environment, by pulling together all the control signals and sensor readings into a single unified network, which then feeds this information into production management systems. This data can then be used to reduce costs by the efficient use of manpower and energy, thereby maximising profit and return on investment.

While the cost of installing these information systems is not negligible, payback comes in both subjective and objective ways: The way information can be held and distributed; time spent collecting and accessing data can be reduced or even automated completely; operatives can be cross-trained, enhancing multi-skilling; networks can be connected and integrated so productivity can be assessed rapidly and rescheduling can be easily implemented; and finally, services can be amalgamated on one system.

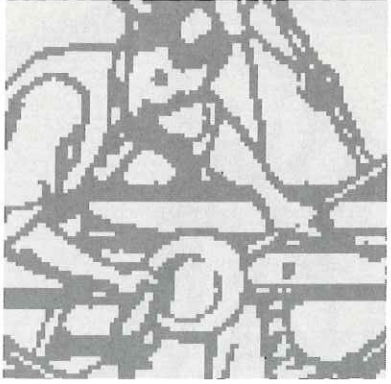
The route to reaping the rewards from such system integration does have its obstacles. Open systems are a relatively recent innovation and existing plant control equipment may not be new enough to be compatible. Shopping around for the best plant and equipment at the right price can result in the purchase of plant with different interfaces or none at all.

Interconnectivity is needed between plant and the information technology so that the processes, interfaces and protocols all speak the same language. Supplementary units may be required. Tying it all together means agreeing protocols, operating systems and networks. These systems must be able to deal with several types of information such as data from temperature probes and video pictures from cameras monitoring furnace depth.

Coping with the physical reality of the factory environment has to be one of the greatest obstacles. High temperatures, dirt and electrical interference all make communications difficult. Changing the electrical signal into light and using optical fibres gets around the electrical interference. Optical fibre is as cheap as copper cable and electro-optic converters are of the same order of cost.

Honeywell's TDB 3000 systems have become established on float and fibre lines, their modular systems also being designated for container manufacturers and including expert systems and integration with camera signals.

One of the mantras of high quality production has always been measure, measure and measure again. Integrated systems provides a means to that end. ■



MINERAL EXPERIENCES IN INDIA

The recent relaxing of trade restrictions in India has opened up what was previously a highly protected economy. Large investments have been made by, amongst others, the major glass manufacturers. At a London Section meeting hosted by United Glass, Mike Lavender of Hepworth Minerals and Chemicals detailed some of the background behind the company's recently commissioned sand plant in Uttar Pradesh.

India has a population of 883 million people. At current rates of growth, it will have a population of 1.38 billion by 2020 and will have overtaken China as the most populous country. India is only a third of the size of China, so the population density is phenomenal to anyone new to the country.

The infrastructure is extremely poor in Western terms, with average maximum speeds of 50km/h on the roads. Even with only one car for every 350 people, the roads are crowded and there are 60,000 fatalities every year.

The economy is one of the fastest growing in the world, creating wealth and the demand for new houses and cars. Every major car manufacturer is developing some sort of presence in the sub-continent.

Float glass plants were first proposed in 1988. Guardian is one of three to have opened facilities to date. This means there is an opening for a good quality raw materials supplier and Hepworth set up Uttar Pradesh Hepworth Sands Pty to meet this demand. The sand plant is 500km from New Delhi and 40km from Allahabad.

It can process up to 300,000 tonnes/year, making it the largest plant in India.

Sand for processing comes from rock which is drilled and blasted, then crushed, classified and stockpiled. The Fe_2O_3 content is 0.07% and this can be improved should the customer require it. The sand plant has its own office and laboratory complex to ensure quality is maintained.

TRANSPORT CHALLENGES

There are some difficulties, particular to India, in the supply of raw materials. Sand has to be delivered to the glass plants by road but India has a maximum 10 tonne capacity for trucks. Supplying one of the float plants in West India would require a constant stream of trucks on the delivery route all year round, even through the monsoon season. Sales tax forms may also be needed for transport between two of India's states. ■

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BORATES ACROSS THE GLOBE

Boron is widely available as a trace element throughout the world but commercially mineable deposits are found in only a handful of locations. At a meeting of the London Section, Chris Peers of Borax Europe explained where these sources are and their history, including the development of the RTZ Borax mine at Boron, California. The meeting was hosted by United Glass, Porters Wood, St Albans.

Borates are regularly used in many types of glasses but mainly in glass for insulation and textile fibres, borosilicate glass and frit ceramics. The glass industry accounts for 42% of the total sales of borate minerals.

Boron is not common; its abundance in the Earth's crust is 10ppm, the 37th most abundant element. In sea water it is ranked 12th at 4.6ppm. There are more than 150 minerals containing varying proportions of boron. Borax and kernite are sodium borate hydrates. They contain the greatest amount of boron, are easily dissolved in water and hence, are easy to process. Colmanite, a calcium borate is not soluble in water; ulexite, a sodium calcium borate is the most abundant boron mineral; datolite a sodium silicon borate is also difficult to process but is abundant in Russia; and szaibelyite is a magnesium borate mainly found in China.

GEOGRAPHICAL SPREAD

The regions most abundant in boron minerals are California, USA and Turkey. Of the 1.2 million tonnes of B_2O_3 produced annually, 84% comes from these two areas. The next largest deposit is in the Andean mountains in South America. This area has small independent mining operations. Russia is fourth, followed by China and then Tibet. Tibet, where there are 57 lakes known to contain borates, was the principal historical source of the mineral.

The first source of boron compounds were produced in Tibet in the early 1800s. Supply was erratic and the materials expensive, encouraging the search for alternative sources. In 1856 in Red Bluff, California the first borax deposits were discovered. This was soon followed by exploitation of ulexite from salt flat deposits in Nevada and Death Valley. In 1913 colemanite was found in a well in Kramer district, California. Large borate and kernite deposits were discovered in 1928 in Boron. Underground mining began at this site in 1928 and in 1957, an open pit and adjoining plant were developed. In 1980, kernite mining started for boric acid production. ■

GLASSFILE - POOL OF ABSTRACTS

The Pool of Glass Abstracts is an associated member of Technical Committee 1 (Information and Communications) of the International Commission on Glass. It is a literature database which is available as an on-line source of information on glass by accessing the host system ESA in Frascati, Italy. The Society of Glass Technology has strengthened its links with Glassfile and will be supplying abstracts of the papers published in *Glass Technology, Physics and Chemistry of Glasses* and any conference proceedings to speed up their availability on-line. By the end of 1996 Glassfile will be preparating for launch on the Internet. Further information on Glassfile can be obtained from Dr A Tucci, coordinator-Glassfile, Stazione Sperimentale del Vetro, Via Briati 10, 30141 Murano-Venice, Italy. Tel +39 41 739422, Fax +39 41 739420, Email Spevet@unive.it.

SGT NEWS

NORTH EAST HOSTS A SUCCESSFUL SPRING MEETING

The Society of Glass Technology's Spring Meeting at the Ramside Hall Hotel, Durham proved a great success, attracting over 100 delegates. The meeting, which was held on 30 and 31 May concentrated on the demands placed on furnaces and refractories in the modern production environment.

Factory visits to Philips Components and Newell began proceedings on the morning of the first day. They were followed in the afternoon by the opening of two sessions of the conference, starting with the keynote lecture by Professor Jack Wenzel. The North East Section, as local hosts, provided a company of traditional folk dancers and musicians for the early evening entertainment at their reception. The second day consisted of three conference sessions and culminated in the presidential address of the outgoing SGT President, Roy Nickels.

FACTORY VISITS

The conference venue was only a short distance from Philips Components' television and computer screen assembly factory on the outskirts of Durham. Components are brought together at this site to make up completed cathode ray tubes. Processes include the application of screen phosphors, frit sealing of the funnel to the screen, insertion of an electron gun and evacuation of air from the completed product. The visit complemented the most recent Fellows luncheon which included a visit to Philips' Simonstone plant.

While some people made their way to the Philips factory, a coach set off for the heart of Sunderland to visit the Newell plant. Newell bought the European production sites of Corning Consumer in order to gain a valuable foothold in the European marketplace. Corning still operates on the Sunderland site producing chemical process and industrial glassware. Some of the utilities are shared between the two operations or operated by one for the other. One example of this is the batch plant which is on the Newell site but serves both companies.

Newell has a single furnace, the first oxy-fuel fired unit in the UK. The tour took visitors along the production line from the batch plant to the furnace, the three forehearths and pressing machines, along the lehrs to the manual inspection and packaging areas. At the time the three production lines were making casserole dishes, their lids and a two pint measuring jug. The tour also included the machine shop where moulds are stored, repaired and rechromed.

KEYNOTE LECTURE

Professor Jack Wenzel of Rutgers University presented the keynote lecture on pharmaceutical glass packaging. He began with a brief history of the New Jersey glass industry and Rutgers University. By the time the university was founded in 1810, New Jersey already had an established glass industry. Pharmaceutical ware featured strongly with catalogues of designs available to supply the thriving medicine and patent medicine markets.

Professor Wenzel went on to explore the modern trends in pharmaceutical glass packaging. One of the driving forces for change in this market has been the American Parenteral Drug Association. Parenterals are preparations for injection into the body; as such their packaging requirements are extremely strict. The package must be chemically inert, impermeable, easy to sterilise, transparent to allow inspection of the contents or coloured for protection and rigid. Glass can meet all these requirements. It is, however, prone to brittle fracture and relatively heavy.

Glass compositions used for pharmaceuticals can be classified by type: Type I, borosilicate glass, is the most resistant and is used for most injectables; types II and III are soda lime silica glasses; type III is the least resistant and is suitable for pills and powders.

Using ionising radiation to sterilise sealed containers of drugs is becoming more common. Glass containers had problems here initially because the radiation gave rise to electron hole pairs in the glass, discolouring it. The problem has since been largely solved with the addition of 1% cerium oxide to the base glass.

Professor Wenzel also highlighted a number of other advances which have improved the quality of pharmaceutical glassware including: Lightweighting; coatings which increase strength; clean room production and inspection lines; and ISO 9000 quality assurance systems.

CONFERENCE PAPERS

The day was completed with the first four papers of the conference. These started with Geoff Alcock of Lumonics describing the use of high power lasers for marking codes on the surface of glass. Lumonics is sponsoring research at Hull University in order to gain some insight into the effects of laser marking on the glass surface.

After tea, Jeff Garner of Pilkington detailed developments in the design and shaping of automotive glazing. With the average modern car having 10% more glazing than those of five years ago, the specifications have become more rigorous. Manufacturers now have to make complex shapes with much greater accuracy.

Following Jeff Garner, Mike Damsell of Combustion Tec talked through many of the

CONTINUED ▶

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 P West, United Glass Ltd, Porters Wood, St Albans, Herts AL3 6NY. Tel 01727 59261.

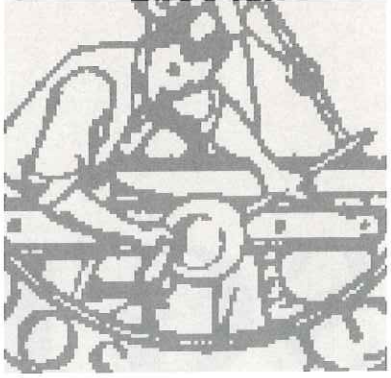
Midlands
– Mr C Baldwin, Stein Atkinson Stordy Ltd, Midland House, Ounsdale Road, Wombourne, Nr Wolverhampton WV5 8BY. Tel 01902 324000.

North East
– Mr J Henderson, 44 Woodside Ave, Throckley, Newcastle upon Tyne NE15 9BE. Tel 0191 264 4775.

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

Scottish
– Mr D A Rennie, United Glass Ltd, Glasshouse Loan, Alloa FK20 1PD. Tel 01259 218822.

Yorkshire
– Miss R M Sales, 20 Blackbrook Drive, Sheffield S10 4LS. Tel 0114 2306179.



changes experienced by glassmakers who have converted to oxy-fuel combustion.

The last speaker of the afternoon was John Le Blanc of BOC who discussed the effect oxy-fuel combustion on the crown in soda lime silica glass melting furnaces. Ratholing, which had been seen off with the adoption of crown insulation at the end of the 1950s, has occurred on a number of converted furnaces. BOC's research suggests that this is principally because of a shift in the sulphate condensation zone into the silica brick. To overcome these problems high temperatures should be maintained in the hard silica refractories, heat-up should be controlled to give tight seals in the crown, high furnace pressures should be avoided and a fused silica castable cap over the crown should be considered.

LOCAL SECTION RECEPTION

The North East Section hosted an evening of traditional entertainment on Thursday. Folk dancing, music and singing were demonstrated by the Benfieldside Folk Group; they also performed morris dances, a clog dance and rapper sword dancing. The evening was sponsored by Northumbria Water and included a demonstration of the company's woven fabric screen filters for treating waste water.

DAY TWO

The second day started with a report from Jonathan Bentley on the progress British Glass has been making with its transfer plasma arc melting and ultrasound refining. The pilot scale plasma furnace has been constructed and used to produce near marketable quality glass. The first commercialised result is likely to be a plasma boosting system, competing with electric and oxy-fuel boost technologies. Scaling up ultrasound refining requires some redesigning as the sound has a limited penetration depth in the glass.

Later, Peter Schill of Glass Service of the Czech Republic presented some impressive simulations of glass melting furnaces. The company uses two models, one for the melt and one for the combustion space to produce 3D steady state models of the whole furnace. So far over 100 furnaces have been modelled.

The concerns about ratholing which had been aired previously were taken up by Gerard Duvierre in a paper on SEPR's research into the problem. The SEPR solution is to use AZS fused cast refractories in the furnace crown areas with the highest temperature loading and fused alumina further downstream.

Jordi McGrath of Irish Glass Bottle detailed recent experiences in operating the Edmeston heat transfer and emission control system. The installation uses waste gas from the furnace to preheat cullet. At the same time dust is removed from the gas stream by giving it an electrostatic charge, making it stick to the cullet. Initial problems arose due to a smell caused by organic contamination of foreign cullet. Re-engineering of the system has been necessary but emissions have now been cut and energy savings have been significant.

Other papers presented included: A report from Julie Evens of Johnson Matthey on the benefits of ACT technology; a presentation from John Green of Pilkington Technology Management on assessing the value of research and development; a talk on the construction of a 'furnace in a box' by Charles Lucas of AFT; a paper from British Glass on the implications of emissions legislation; and a discussion of the energy saving possibilities of monolithic crown insulation from Professor Stan Lutskanov of Lubisol Engineering.

The papers presented at the Spring Meeting will be published in the August, October and December issues of *Glass Technology*. Professor Wenzel's keynote lecture will be presented as a review paper in 1997.

PRESIDENTIAL ADDRESS

Thoughts of a travelling glass man - 30 years reflection of the glass industry.

In celebration of the Society's 80th year Roy Nickels, the outgoing President, related his experiences working in an industry that has captivated him for 30 of those years.

He came to the industry as a chemist to Turner Brothers in Dungannon. The team in Dungannon was learning the new all electric melting process together and his role was to analyse the glass produced for zirconia. In those days the furnace had a predicted campaign life of 3-6 months.

On joining Stein Atkinson Stordy Mr Nickels was part of a thriving suppliers' community providing equipment worldwide. Unfortunately, at the time most high technology equipment was being sold abroad, while lower technologies were going to the home market. As an example, he cited a glassfibre plant in Japan where he was commissioning engineer 28 years ago which even then had a waste gas cleaning system.

As time passed most sectors of the glass industry globalised. Eastern Europe and Asia became major customer bases and since then Asia has begun investing in the UK. So, where Stein Atkinson Stordy used to supply the steelworks at Cardiff and Ravenscraig, now SAS is providing equipment for CRT and TV manufacturers in the same places.

For the future, Mr Nickels hopes the industry will develop techniques and training and encourage innovation. Guidance on career paths for new entrants to the industry and more recognition of the status of the Chartered Engineer are also needed.

ANNUAL DINNER AND DANCE

At the end of the formal conference members and their guests gathered for the Annual Dinner and Dance. The loyal toast was given by the President of the Society, Roy Nickels. The toast to the Society was given by Bill Lee and to the guests by Dr Peter Sewell, the President-Designate. The response for the guests was made by John Wilkin, director of the Engineering Employers Federation (Northern Section). Entertainment after the meal was provided by the Arthur Mowett Band. Ladies gifts were donated by Newell.

Before the meal the Recorder of the Board of Fellows, Terry Harper invited the President to present Fellowship scrolls to Professor Jack Wenzel, Robert Montgomery, Alan Reynolds, Roger Picton, Sydney Parke and Trevor Ward. Earlier in the day Mike Perkins, who could not attend the dinner dance, was presented with his Fellowship scroll by the President.

Roger Picton was also presented with the SGT Golf Trophy, having seen off all opposition on the hotel's golf course.

The table raffle prize of a cut glass decanter, sponsored by Parkinson-Spencer Refractories, was won by Mrs Neil McDonnell.

EXHIBITION

Throughout the meeting an exhibition by glass industry suppliers was held next door to the conference hall. Information on services and products were provided by Glass Furnace Technology, British Glass, Lubisol, SEPR, Stein Atkinson Stordy, Teco, Edmeston, Parkinson-Spencer Refractories and Corning Refractories. ■

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