ISSN 0030-1337

July 1990
Vol. 73, No. 7

JOURNAL OF THE OIL AND COLOUR CHEMISTS' ASSOCIATION

JOCCA

- Surfex 90 Review
- Printing Inks

Within each tide pool, the entrance in life. Above ocean, sand and river, the miracle of sunlight. Inside the delicate balance of color and form, the colorist's art.

Sun Chemical brings color to life— Our extensive range of pigments, aqueous dispersions, and colorants for ink, coatings, plastics, and cosmetics are precisely controlled for quality like the radiant precision and wonder of the sun over water.

SunChemical

Sun Chemical Export Corporation
International Operations

Vol. 73 No. 7 JULY 1990

JOCCA

JOURNAL OF THE OIL AND COLOUR CHEMISTS' ASSOCIATION

Contents

Cover: SURFEX 90 (Design John Law)

Forthcoming Features: August—1992; Process Operation (PO); IR & UV Curing Systems, September—Additives and Renewable Resources; PO, Pumping; European Paint Show, October—Physical Testing; PO, Energy Conservation.
Contributions are welcomed at least five weeks prior to publication date.

ISSN 0030 - 1337

ABC
Member of the Audit Bureau of Circulation

SBPIM
The Society of British Printing Ink Manufacturers

An Official Journal of the Society of British Printing Ink Manufacturers and the Paintmakers Association of Great Britain Ltd.

JULY 1990

JOCCA (ISSN 0030-1337) is published monthly by the
Oil and Colour Chemists' Association,
Priory House, 967 Harrow Road, Wembley HA0 2SF, England
Tel: 081-908 1086 Fax: 081-908 1219 Telex: 922670 (OCCA G)
1990 annual subscription rate: UK £82.00, rest of the world (excluding USA) £90.00, USA $180.00.
Single copies £8 ($16).
Air freight and mailing in the USA by Mercury Airfreight International Ltd Inc., 2323 Randolph Avenue, Avenel, NJ 07001. Second class postage paid at Rahway NJ. US Postmaster send address changes to JOCCA c/o Mercury Airfreight International Ltd Inc., 2323 Randolph Avenue, Avenel NJ 07001.

Editorial correspondence should be addressed to the Honorary Editor, and general correspondence addressed to the General Secretary at the Association Headquarters.

Printed by The Herald Press, 17 Rother Street, Stratford-upon-Avon, Warwickshire CV37 6NB Tel: 0789 66261

Malaysia to manufacture titanium dioxide

Malaysia is to become a local global supplier of titanium dioxide pigment by the end of 1991.

Tioxide Group PLC has set up Tioxide (Malaysia) Sdn Bhd to manufacture the pigment. Tioxide Malaysia is the latest member of the Tioxide Group which has eight manufacturing plants in seven countries over four continents. Expansion to Malaysia is in line with the Group's policy of manufacturing at sites close to customers. As the Asia-Pacific region is one of the fastest growing markets for titanium dioxide pigments, Malaysia was selected as a base to service the increasing requirement of customers.

The manufacturing plant will be sited in Terengganu, an eastern coastal state in the Malay Peninsula. Its corporate head office is at Kuala Lumpur, the capital of Malaysia. It was officially opened by the Minister of Trade and Industry, Dató Seri Rafidah Aziz. Also present at the ceremony were Mr Maurice Dumbrell, Board Member of Tioxide Group PLC and Chairman of the Asia-Pacific Group.

The world scale plant will have a production capacity of 50,000 tonnes per annum. Approximately 80% of the production will be exported to Asean and the Asia Pacific Region.

The Malaysian Minister of Trade and Industry, Datuk Seri Rafidah Aziz officiating at the Head Office opening in Kuala Lumpur.

New UK site for DSM Resins

DSM Resins has purchased 46 acres of reclaimed land in a major industrial area of Ellesmere Port adjoining the M53 motorway with excellent road, rail and sea links. The ultimate aim of the project is to bring together on the one site all UK production, development and office facilities for DSM Resins UK Ltd and Freeman Distribution Ltd.

Name change for Trimite companies

Douglas Paints Ltd and North British Paints Ltd have been amalgamated under the name Trimite Scotland Ltd and will continue to be based at Welbeck Road, Glasgow.

RHEOX TO purchase Perchem

RHEOX, Inc, is to purchase the business of Perchem from AKZO NV of the Netherlands. The purchase will be in conjunction with Steetley Minerals Ltd., the minority shareholder of the jointly owned RHEOX facilities of Abbey Chemicals Ltd., located in Scotland and Bentone-Chemie GmbH located in West Germany. The agreement is subject to government approval and includes all patents, trademarks and manufacturing technology for Perchem products.

Perchem is a worldwide supplier of thickeners (flow control additives) to the oil drilling, coatings, ink, grease and cosmetic industries with manufacturing facilities located in the UK and Italy. RHEOX will continue to supply Perchem products to their customers worldwide. Perchem products will be supported by RHEOX technical service and applications laboratories located in Leverkusen, West Germany and Hightstown, New Jersey, USA.

AUGUST JOCCA 1992

£1M milestone for Samuel Banner

Sales of PPG chlorine-based solvents for the metal finishing industry have played an important part in allowing the Liverpool company of Samuel Banner to achieve a major target. Banner's annual UK sales of PPG products, including the Trichloroethylene and III Trichloroethylene degreasers, last year reached the one-million pound mark and resulted in a congratulatory visit by senior management of PPG, the Pittsburgh-based, US manufacturers of the chemicals.

Far East paint shipping

The Far East Cargo Line (FECL) has recently been launched and will be involved with freighting to the Far East. A group of NVOCC operators in Asia and the UK, with a wide range of shipping customers in the paint industry, has formed the new service, which is to be administered under a common policy. The service confers considerable benefits and advantages on its customers, providing the UK paint industry trading two ways in the Far-East with a faster and much improved, reduced-cost, door-to-door import and export service. FECL shipments are handled by 20′ and

40′ containers according to a shipper's specific requirements, and FECL operates scheduled LCL services with a minimum one-departure per week from all Far-East ports, and a greater frequency from main ports.

Seatons Managing Director, John Deheer (right) welcomes Sir Brian Rix CBE, DL guest speaker at the company's recent open day to celebrate its 150 year anniversary.

Seatons celebrates 150 years

John L. Seaton & Co Ltd, who refine and process technical vegetable oils for the surface coatings and other industries, celebrates its 150 year anniversary in 1990. To commemorate the occasion, Seatons held an Anniversary Luncheon at the end of May for customers, suppliers and employees.

Seatons is a major operating division of Croda International Plc, the speciality chemicals group, so it was appropriate that Croda's magnificent Cowick Hall headquarters near Goole in Humberside, should provide the setting for this historic occasion.

Equipment

Colourweigh

Colourweigh, a fully automatic paint blending and dispensing system aimed at reducing stock inventory of colour shades and

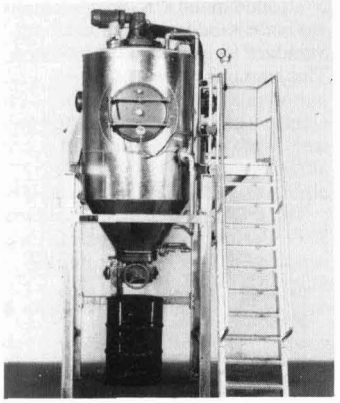
Colourweigh

eliminating losses due to paint age deterioration. Colourweigh has been developed by fluid handling specialists Rexson Systems with the latest technological advances in combined volumetric and gravimetric dispensing and dosing valves coupled to microprocessor control giving the equipment a degree of accuracy to within 0.1 gram. Easily operated, the Colourweigh computer calculates the exact mix required to produce quantities of paint from a ½ litre or less to several hundred litres.

For further information Enter G101

Scraped surface solvent recovery

The new Renzmann 'Roto-Zero' solvent recovery units not only reclaim clean high quality solvent from used washings and waste paints/inks in high yield but can also leave a virtually solvent-free solid residue at the end of the process resulting in greatly reduced waste disposal costs and increased cost effectiveness.



Roto-Zero

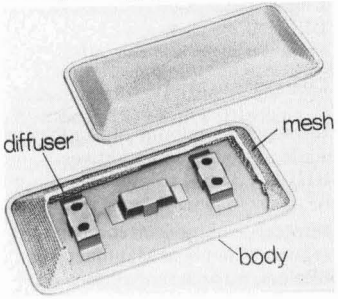
The units feature a unique internal rotating scraper system to maintain heating surfaces at maximum efficiency throughout the operating cycle for recovery of up to 99% of the available solvent and eliminate the need for manual or chemical cleaning.

Heated by steam or electricity, fully flameproof and designed for safe unattended operation these compact, self contained units are available in a range of capacities from 250 to 1,000 litres.

For further information Enter G102

30/98 Aerators

The 30/98 Co Ltd has introduced aerators in two sizes for use in bins and silos. Each aerator consists of a stainless or zinc-plated steel body, into which the air is fed and which contains a cotton or glassfibre diffuser, covered by a stainless or galvanised steel mesh. A normal factory air supply can be used.



The two sizes are 190mm × 95mm and the new large size 305mm × 152mm which allows greater flexibility in optimising aerator spacing and positioning in circular and pyramidal hoppers, large or small. Bulk material <60mesh and ⩽5% moisture content can be handled.

For further information Enter G103

New airless spray gun

The latest addition to Kremlin Spray Painting Equipment Ltd's extensive range of airless spray guns and high pressure pumps is the M 248 spray gun. Kremlin say that in designing the new airless gun they used advanced ergonomics to achieve: a perfect balance; extremely comfortable grip; lightweight; and highly sensitive four-fingergrip trigger.

For further information Enter G104

Literature

CEPE safe powder coatings

The European Committee of paint, printing ink and artists' colours manufacturers' associations (CEPE) has published the 4th edition of "Safe Powder Coatings" brochure. The 4th edition will be published in 10 languages. The layout of the different translations, the numbering of the chapters and paragraphs will make it a very useful book for the powder coatings producers, the equipment manufacturers and the users of the powders. The brochure will be printed in two booklets of 96 pages each, size 24 × 17cm. Booklet A: Danish, Norwegian, Swedish, Finnish, English and German. Booklet B: German, Dutch, French, Italian, Spanish and English. The price per booklet is BEF 250.

For further information Enter G105

Literature in brief

Rheology Handbook — A practical guide to rheological additives. RHEOX 32pp 4 colour.
For further information Enter G106

Infotech — Financial comparison report, "Chemical Manufacturers", "Paints, Varnishes, Adhesives & Printing Inks". £195.
For further information Enter G107

United Nations Industrial Development Organisation Newsletter, PO Box 300, A-1400 Vienna, Austria.
For further information Enter G108

Springer Newsletter on chemistry publications No1/1990.
For further information Enter G109

PIRA. International Packaging Information Sources — Revised new edition. 2000 packaging contacts £130.
For further information Enter G110

Marigold Industrial new colour brochure on rubber and synthetic gloves with COSHH data.
For further information Enter G111

OECD Publications supplement to the catalogue 1990 no 1.
For further information Enter G112

BSI News

British Standard 7079: Part A1: 1989 Preparation of Steel Substrates before Application of Paint and Related Products

This British Standard is identical to International Standard 8501-1; 1988 and to Swedish Standard SIS 05 59 90 Edition 3 1988. It covers the specification of rust grades and the preparation grades of uncoated steel substrates and of steel substrates after overall removal of previous coatings.

Users of the Swedish Standard will feel at home with the new document, as much of the information (particularly the photographic representations) in the British Standard comes from the original SIS 05 59 90. The four steel grades, A, B, C and D are carried forward, as are the Sa and St classifications. A new class of prepared surface, Fl, represents the appearance of flame-cleaned steel, and is supported by photographs. There is some change of detail in the wording introducing the photographic representations, but the emphasis in the new standard is on the visual appearance of the surface. The robust printing method for the photographs has been retained, and the size of the Standard (A5) and the hard-cover format make it suitable for on-site use.

Because the abrasive used to prepare the photographs is controlled in the UK, a supplement has been issued to the British Standard (Supplement 1: 1989). This contains representative photographic examples of the change in appearance imparted to steel when blast-cleaned with abrasives more in line with abrasives in common use in the UK.

The price of the British Standard 7079: Part A1: 1989 (including the supplement) is £210.00 from BSI Sales.

P. W. Munn ■

◇ ◇ ◇

BSI Sales, Linford Wood, Milton Keynes, MK14 6LE.

Meetings

Powder Coatings symposium

A 2-day symposium on Powder Coatings will be held on 24-25 September 1990 at Telford. The symposium organised by PRA in association with Chilworth Technology will be held at the same venue as Finishing '90. For further information contact: Mr D. Dasgupta, PRA, 8 Waldegrave Road, Teddington, Middlesex, TW11 8LD, UK Tel: 081-977 4427.

European chemicals

The European Association for Business Research, Planning and Development in the Chemical Industry has announced details of the programme for its annual conference which will be held at The Hilton Hotel, Budapest, Hungary from 29-31 October.

The ECMRA annual conference is the chemical industry's major business research and market analysis forum. This year's conference theme is "European Chemicals — East meets West".

The Conference will highlight the challenges and opportunities for chemicals and plastics arising from the momentous changes now occurring in Eastern Europe. Speakers from both regions will examine the existing chemicals & polymers businesses and also opportunities for future development and co-operation.

Registration details are available from Reg Bennett, Belmont Travel Ltd, 17 Station Road, Belmont, Surrey, SM2 6BX, England. Tel: 081-661 1818.

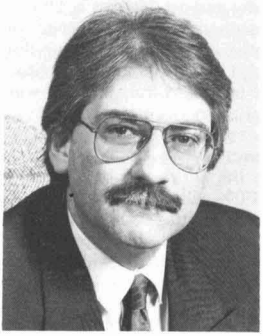
Particle-tech short courses

The University of Bradford will hold the following short courses on particle technology: (1) Solid-liquid separation 11-14 Sept, (2) Particle size measurement and sampling 18-20 Sept, (3) Bulk powder testing 25-27 Sept. For further information contact: Dr L. Svarovsky, Chem. Eng. Dept., University of Bradford, Bradford, West Yorks, BD7 1DP. Fax: 0274 305340.

People

Macpherson Paints restructure trade and retail

Macpherson Paints Limited, Britain's third largest paint manufacturer, based at Bury in Greater Manchester, has been restructured to strengthen and emphasise its total approach to the trade, retail, heavy duty and export markets. The company has reorganised its trade and retail divisions to bring them under one management at Bury and introduced new management structures to cover all divisions.



P. Buck

Mark Brian continues as Managing Director but **Phil Buck** becomes Director and General Manager at Bury with special responsibilities for the strong Trade sector and the revitalized Retail division. The Retail division has been transferred from Haverhill in Suffolk to Bury.

New Chairman for Ciba-Geigy

John S. Fraser has been appointed Chairman and Chief Executive of the Ciba-Geigy UK Group with effect from 1 November 1990.

He will also become chairman of Ciba-Geigy (Financial Services) PLC, Ciba-Geigy (Insurance Services) Limited, the Ciba-Geigy Fellowship Trust and Ciba-Geigy Ireland Limited. He retains his chairmanship of Ciba-Geigy Chemicals Limited and the Clayton Aniline Company.

Mr Fraser (58) takes over the Chairmanship of the Group from Allan A. S. Rae CBE, who will retire in November 1990 after 19 years as Chairman of Ciba-Geigy's UK Group of Companies.

New Harlow Chemical's Chief Executive

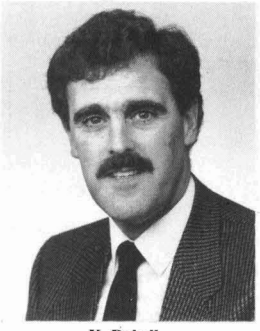
Ian Aldcroft, formerly Managing Director of Revertex Ltd., has been appointed chief Executive of Harlow Chemical Company Ltd., from 1 June 1990. Originally a chemist, Ian Aldcroft brings to Harco a depth of experience in general management, purchasing, operations and product management.

I. Aldcroft

RHEOX appointments

Keith Dobell, Commercial Director for RHEOX Ltd and Manager, Business Development Europe, for RHEOX Inc., joined Abbey Chemicals as UK salesman for plastics additives in 1973. In 1979 he was appointed Midlands Area Salesman for pigments and additives for NL Chemicals.

Keith spent several years in medical laboratories and later specialised in the adhesives and coatings field. Currently based in the UK, Keith has held positions in product management and marketing development.



K. Dobell

David Wood, Managing Director for RHEOX Ltd and Vice President, Sales and Marketing for RHEOX Inc., joined NL Industrial Chemicals Division in 1977 after 20 years with ICI. Most of these were spent with ICI Europa on a variety of Brussels-based assignments. David has been a Brussels resident for more than 25 years.

D. Wood

David was appointed Director of Marketing for NL Chemicals Europe in 1979 with particular responsibility for speciality chemicals and became Vice President of Sales and Marketing Europe for RHEOX Inc., on its formation at the beginning of 1990.

Twin strikers join the Foscolor team

Foscolor have engaged the services of two well-known consultants to promote their recently expanded toll-processing service for the paint industry. **David Sexty,** former Sales & Marketing Director of Degussa (UK) Ltd., will develop business in London and the home counties while **Cyril Williams,** former Northern Area Sales Manager for Cray Valley Products. will handle the north and midlands.

Foscolor are delighted to obtain the assistance of two such eminent personalities whose breadth of experience and market knowledge will significantly strengthen the company's representation in the paint and allied industries. ■

SCM Chemicals: The June US Focus referred to SCM Pigments Div. rather than the correct company name SCM Chemicals. We apologise for any confusion.

SURFEX 90 Review

With 2,294 registered visitors, 103 stands and more than 125 companies represented, SURFEX 90 confirmed the success of the 1986 and 1988 Exhibitions. SURFEX is now well established as the leading exhibition for the UK surface coating industries and the principal public forum for the Association.

For the first time at SURFEX a computerised system was introduced for visitor registration. Although there were some teething problems, which will be rectified for SURFEX 92, the system enabled an early and comprehensive analysis of the visitor profile to be produced and will assist the organisers in planning for SURFEX 92. Additionally, an exit poll of some 10% of all visitors was also undertaken, producing valuable feedback on the "customers" attending the Exhibition.

Among the interesting statistics emerging from the visitor profile were analyses by job function (Table 1), employee category (Table 2), company size (Table 3).

Further analysis showed that approximately 25% of the visitors were members of the Association. Approximately 50% of all visitors came from the North East and North West regions, with a sizable number coming from the Midlands. However, confirming the experience of previous SURFEX Exhibitions, only 5% of the visitors came from outside the United Kingdom.

The exit pole of visitors showed that 24% were making their first visit to SURFEX, 43% first attended in 1988 and 33% attended in both 1986 and 1988. Almost 70% of the visitors preferred Harrogate as the location for future Exhibitions. 69% of visitors rated the stands very good in technical content, 61% considered the design of stands to be very good and 63% considered the stands easy to locate. However, some 13% of visitors found stands difficult to locate and this aspect of the Exhibition will be given consideration by the Management Committee.

At the time of going to press, 75% of exhibitors had responded to a detailed questionnaire on their views on the Exhibition. 80% of the respondents were happy with the location of their stand and 90% were satisfied with the layout of the Exhibition. There was overwhelming support and approval for the publicity provided by the organisers and almost one third of the Exhibitors expressed a preference for a larger stand at future SURFEX Exhibitions. Harrogate was the preferred location for a majority of exhibitors, but a significant number of exhibitors expressed a preference for other locations for the Exhibition, although there was no clear preference for another location.

Exhibitors in the Auditorium were given special consideration, extra publicity and incentives for visitors to view their exhibits. As a special attraction, all registered visitors were given a free prize draw ticket for deposit in the Auditorium as an incentive to visit the stands. Prizes were sponsored by JOCCA, Sun Chemical (Pigments) Ltd, Vinamul Ltd, Schering Industrial Chemicals and Carrimed Ltd and comprised a satellite receiving system and hi-fi unit. On day one the delighted prize-winner was C O'Leary of Dow Corning and on day two K Umpleby of Macpherson Paints. Despite these incentives there was still some disquiet amongst exhibitors in the Auditorium at the lack of visitors and this will be one of the major items to be considered by the Management Committee.

For the future, the basic formula for SURFEX will remain the same. The policy of limiting stand sizes and maintaining cost-effectiveness through modular construction will be maintained. There will be a response to exhibitors requiring larger stands, but this will not be out of proportion, nor will the modular stands be abandoned. What is desperately needed is more high class exhibition space within the Harrogate complex if it is to remain the venue for SURFEX. The SURFEX organisers have consistently sought the views of exhibitors, visitors and the Association and this policy will be maintained. Important decisions on the future of SURFEX, the Association's sponsorship of the Brussels 1991 European Paint Show and SURFEX 94 will be made in the autumn. In the meantime, SURFEX 92 is firmly in the calendar for Spring 1992.

Table 1

Job Function

Director	16.5%
Technical Manager	11.6%
Production Manager	3.3%
Sales Manager	14%
Laboratory Manager	6.2%
Chemist/Technologist	26.4%
Purchasing Manager	2.4%
Consultant	2.6%
Other	17%

Table 2

Employee Category

Adhesives/Sealants	17.3%
Leather/Fabric Coatings	1.2%
Paint/Varnish/Lacquer	28.4%
Plastics	3%
Powder Coatings	2.4%
Painting/Printing Inks	10%
Wallpaper/PVC Sheet	0.4%
Wood Finishes	0.9%
Suppliers to the above	29.7%
Consultants	2.4%
Agents	1.4%
Other	12.9%

Table 3

Number of Employees

1 – 24	19%
25 – 49	10.6%
50 – 99	13.6%
100 – 249	19.5%
250 – 499	14.2%
500 – 999	10.3%
1000 plus	12.8%

Mr C. O'Leary (L) Dow Corning, one of the winners of the auditorium prize draw receiving his gift voucher from General Secretary, Mr Chris Pacey-Day.

SURFEX Dinner

The Majestic Hotel was again the venue for the Exhibitors' Dinner, organised by Peter Stanton on behalf of the West Riding Section. The Dinner had already become established as one of the highlights of SURFEX and this year's Dinner was no exception. Over 500 exhibitors, their guests, Association officers and staff, Past Presidents and distinguished guests of the Association were seated in the magnificent hotel ballroom and

Best small stand — Boud Marketing.

Best large stand — The Shear Company.

enjoyed an excellent meal and entertaining speeches.

Rob Lewis, Chairman of the West Riding Section, was toastmaster for the evening and the Loyal Toast was proposed by OCCA President Graham North.

The Chairman of the Exhibition Management Committee, Fred Morpeth, welcomed guests to the Dinner and extended a special welcome to the guest speaker, Professor John Oakland, and the Association guests Dr A W Arbuckle, President SDC, Dr D Gearey, President ICorrST and Mr J Hemmings, Chairman BResMA, Past Presidents and Members of Council.

Awards were made to exhibitors for the best large and small stand at the Exhibition which had been judged to have made the most effective use of the stand area. The 1990 awards were made to Boud Marketing for the best small stand and The Shear Co Ltd for the best large stand.

Particular thanks were expressed to members of the organising Committee, Jim Hemmings and Lionel Morpeth and to staff for their efforts in mounting the Exhibition and to the West Riding Section for their organisation of the Dinner.

The unusual choice of Professor Oakland as the guest speaker was justified by his excellent speech, combining humour and a serious message as he stressed the impact and importance of quality management on the surface coating industries.

What was new and of interest at SURFEX 90?

Following our May circular to exhibitors at the time of going to press, we have received feed-back reports from the following companies, outlining what was new on their stand and what was of particular interest to visitors.

Newly formed in February 1990 **Abicolor Europe Ltd** used SURFEX 90 for the official launching of its products. The main products on show were its range of Horizontal bead mills. In particular a large number of visitors showed interest in the Abilab 100 laboratory mill. Many visitors have booked trials for both laboratory and production units. Clients were interested to learn of the new approach and many new innovations attached to the range of machinery. Alan Taylor (MD) said the show was the very best way to get started.

On the **AKZO Chemicals** stand: Epilink® R8088, hailed as a significant advance in water dispersible epoxy technology, stimulated considerable interest throughout the duration of the exhibition. The Siccatol® SR range of driers, for lead free paints were well received as was Ketjensil® SM405, a precipitated amorphous hydrated aluminium silicate, which was recommended as a partial replacement for titanium dioxide in emulsion paints. Of the Thixotropic additives exhibited Perchem Easigel®, the easier dispersing organoclay, continued to be the forerunner.

One of the most outstanding instruments seen at SURFEX 90. was the remarkable new hand-held colour measuring Spectrophotometer, the Model 968, manufactured by X-Rite, and exhibited by **Analogue and Digital Services Ltd** of Marlow, the European distributor. This instrument is unique in design and is a totally portable, hand-held colour spectrophotometer with no wires or cables attached. This go-anywhere

SURFEX 90 Dinner — Top table guests (L to R): Graham North (OCCA President), Jean North, Prof. John Oakland (Guest Speaker), Fred Morpeth (Chairman Exhibition Management Committee), Vera Morpeth and Rob Lewis (Chairman, West Riding Section).

design enables spectral data to be collected almost anywhere, anytime. the Model 968 is simple to operate and as precise and accurate as many laboratory-based instruments of greater size and cost.

The main product range exhibited at SURFEX 90 by **ARCO Chemical** was ARCOSOLV (Propylene Glycol Ethers and Acetate). Once again, the ARCOSOLV range was successful by attracting a large number of visitors to our stand. In addition to that, new products were introduced to the public during the above exhibition. These are: Allyl Alcohol, BDO (Butanediol). THF (Tetrahydrofuran), NMP (N-Methyl Pyrrolidone) and finally Fibersorb, Superabsorbent Fiber. The public showed a great interest in these products.

Bayer's Inorganic Chemicals and Pigments Business Groups featured five lines of specialist products, including several new grades recently introduced, at the SURFEX 90
Exhibition at Harrogate. Baysilone resins, including the new AC 3450 XT hard methyl grade, have applications in household and industrial areas. The range of Baysilone impregnating agents has been increased by a water thinnable grade, LD, which is suitable for façade coating or dipping applications. Bayertitan titanium dioxide pigments included two new grades: Bayertitan R-KB-5 and R-KB-6, which are micronised rutile pigments, with Al_2O_3 stabilised crystal lattice coated with aluminium and zirconium compounds and organically treated.

Visitors to the **BIP** stand were primarily seeking the latest information on the extensive range of 'Beetle' amino coating resins, especially the newer, high technology products including partially and fully methylated melamine and mixed ether resins. However, on display for the first time at SURFEX there were also details of 'Beetafin' aqueous polyurethane resins for coatings and adhesives, plus 'Beetle' amino resins for paper, textiles and non wovens. These products too attracted considerable attention.

Blythe Colours Pigments Division was delighted to have the opportunity of welcoming so many old and new friends to its stand at SURFEX 90. The Blythe "Kera Collection" of specialist pigments aroused considerable interest throughout the two days of the exhibition and many enquiries were received relating to the KERATRANS Transparent Iron Oxides, KERAFAST Mixed Metal Oxides and KERAFLECT Camouflage Pigments. Blythe now looks forward to SURFEX 92.

SURFEX 90 was a very successful show for **Bohlin Reologi,** a leading manufacturer of rheological instrumentation. The portability of the hand-held Visco-88 instrument was appreciated by many people for on-site QC rather than the customary procedure of taking samples to the laboratory which can give false readings, as samples may change whilst away from the manufacturing environment. The new instruments and accessories at the show generated a lot of interest for both QC and development applications in the Paints and Coatings Industry.

Boud Marketing Limited featured two new interesting products: BML SOLID GLASS SPHERES — for use in resin systems and coatings to lower viscosity while increasing filler loadings. BML LIGHTWEIGHT GLASS MICROSPHERES — hollow glass microspheres for use in lightweight systems. Their established products were also of considerable interest: SIOKAL — Micronised feldspar. CELLULOSE FIBRES — for use in textured coatings, epoxy screeds, adhesives and sealants. BML PIGMENTED QUARTZ & BAUXITE — for use in floor screeds and wall coatings. QUARTZ SANDS AND POWDERS — ranging from maximum 10 microns to pebbles.

A feature common to most visitors to **Bromhead & Denison** stand was the desire for environmental friendly coatings. Hence there was considerable interest in the Primers based on K-White, a non-toxic anti-corrosive pigment in combination with water-soluble alkyds and epoxy esters. Test panels from salt-spray exposure demonstrated that water-borne primers on K-White could out-perform solvent-based systems. K-White was particularly outstanding with ICI Haloflex for which remarkable formulations have been developed.

At SURFEX 90 **Buckman Laboratories Ltd** again had many enquiries regarding our current product range which includes Busan 11M2-Fire Retardant pigment, Butrol 23-Anticorrosive pigment and the Busan range of in-can preservatives and fungicides. It was, however, our new development products which attracted most interest. We previewed our new in-can preservative BL1104 and our new Ultra Violet Light Absorber BL774. Samples of the preservative BL1104 are now available and samples of BL744 will be available in the near future.

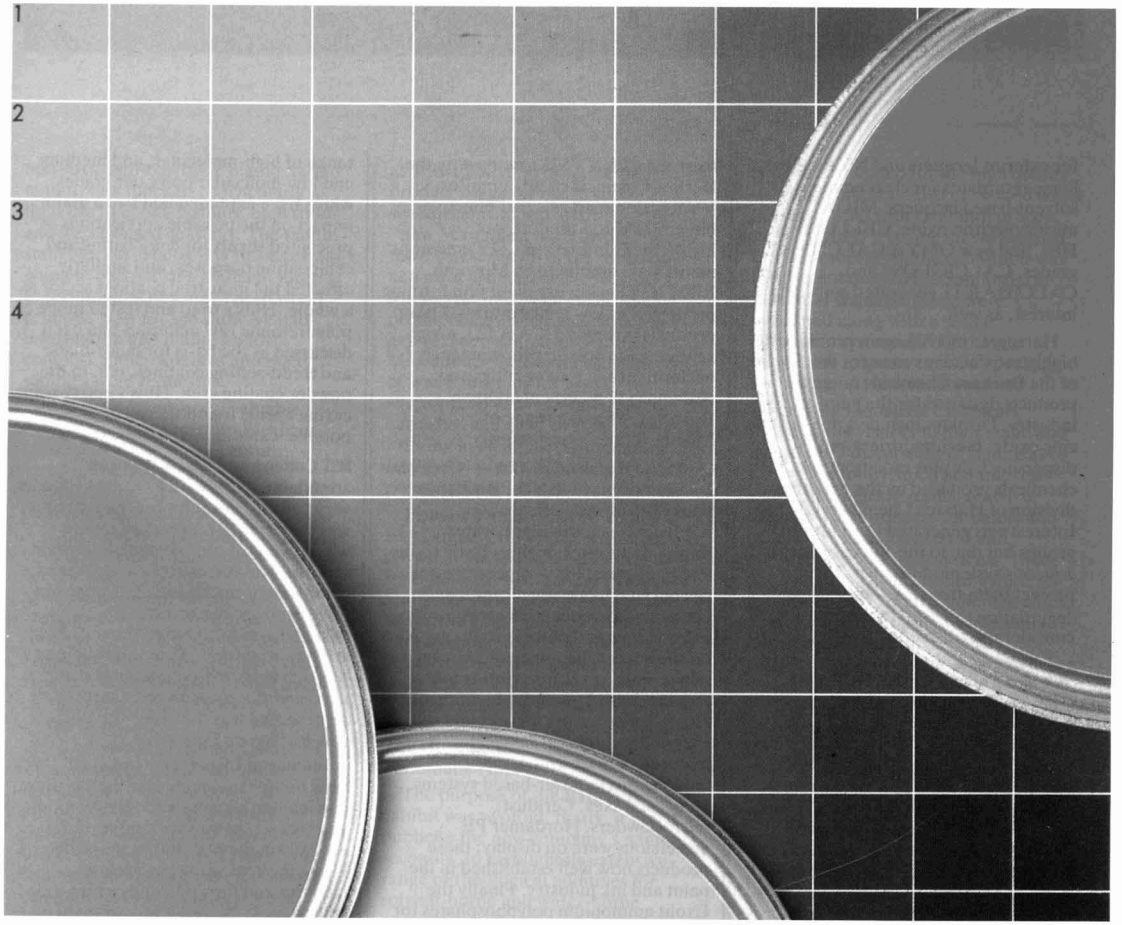
Customer reaction to the new Salt Spray Cabinets displayed by **C & W Specialist Equipment Ltd** was, without exception, very favourable. The ease of operation, accuracy of control and maintenance free running were all factors appreciated by existing and potential customers. Great interest was also shown in the Multi-Cycle Composite Cabinets available from this company for Salt Spray/Humidity/Dry Heat Testing already widely used in the automotive and allied industries.

Rheology Specialists, **Carri-Med Ltd,** exhibited the CSL Rheometer at SURFEX 90. The instrument is ideal for characterising the rheological properties of paints, inks & coatings, and hence generated much interest at the SURFEX Exhibition. Working on the Controlled Stress principle, the instrument does not force the sample to move at a pre-defined shear rate, instead it is able to subject the material to the small stresses due to gravity. The ability to work at such low stresses enables the user to emulate levelling, brushmarks or sag. In addition the CSL Rheometer can also reach the higher shear rates that are also associated with paints, inks & coating applications.

Colourgen featured two new software products: The Industrial Paint Colour Control program can incorporate a ready-made Sandosperse database co-developed by Colourgen and Sandoz. This was launched with a series of presentations by both companies. The Colourgen Visualiser helps consumers to select colour schemes for the interior and exterior of their homes. It shows photographs of typical house and room sets on a computer screen and enables the user to colour them with a large palette of stored shades or with colours introduced via a Colourgen CS-1100 Spectrophotometer.

Cookson Laminox Limited featured their new LAMINOX synthetic micaceous iron oxide pigments for use in metal protective coatings. LAMINOX S is a technically advanced form of MIO recommended for intermediate and finish coats. Independent weathering trials in aggressive environments have demonstrated superior long-term durability of coatings incorporating this pigment. LAMINOX F has a very fine lamellar structure and was specially developed for primers, employed either as the main pigment or used in conjunction with inhibitive pigments to improve the anticorrosive properties.

It was noticeable, report **Croxton & Garry,** that many of the enquiries we received were for "high-tech" products designed for use in new and developing areas of technology. Of particular interest were ESACURE photoinitiators for UV cure systems, UVASORB untraviolet light absorbers



4/7840/1E

Good impression.

Binders and additives for the printing-ink industry

When it comes to printing-ink manufacture, Hüls, with our impressive spectrum of products, must be the right partner for you, too.

Our ketone, synthetic and polyester resins; our adhesion promoters, dispersion agents, titanate additives, solvents, waxes and plasticisers – all have proved their mettle for ages. So they can also help you to find the right answers to your ink problems.

Send for our new brochure for the printing-ink industry. Or have a word with us. It will give you a good impression of what we can do for you – with priority.

Application fields:

- Printing inks
- Flexoprinting inks
- Screen printing inks
- Rotogravure printing inks
- Film lacquers
- Nitro lacquers
- Heat sealing lacquers
- Food packaging lacquers
- Can coatings
- Toners and pastes

HÜLS AKTIENGESELLSCHAFT
Dept. 11 22, D-4370 Marl
Telefax 0 23 65/49 41 79

In U.K. please contact:
Hüls (U.K.) LTD.
Edinburgh House · 43-51 Windsor Road · Slough · Berkshire SL 1 2HL
Phone 07 53/7 18 51 · Fax 07 53/82 04 80

hüls

Enter G202 on Reader Reply Card

for exterior lacquers and NYACOL flame retardants for clear aqueous or solvent-based lacquers. MIOX micaceous iron oxide, CELLOSIZE HEC and new OMYA CALCITE grades, CALCIGLOSS and CALCIDAR IT generated considerable interest, as well.

Harrogate in 1990 again provided a highly satisfactory venue for the display of the **Durham Chemicals** range of products designed for the paint industry. Displays included zinc dust, zinc oxide, biocides, driers and dispersing aids plus radiation cure chemicals produced by the organics division of Harcros Chemicals UK Ltd. Interest was generated in all product groups but due to the current interest in aqueous systems and the need to protect them from microbiological degradation the biocide range attracted considerable attention.

Two new products were introduced by **Eiger Torrance** at SURFEX 90 creating significant interest to visitors at the Stand. The new "SF" SELF FED MOTORMILL with its inbuilt pumping mechanism was appreciated as being a step to overcoming two main problem areas associated with horizontal bead mills. Whilst the integral pumping impellor removes the need for a separate feed pump it provides up to 10 times the normal throughput rate for wash solvent. With particular emphasis on laboratory use, the new EX DRIVE fully flameproofed variable speed motor drive unit was demonstrated by controlling a Mini 50 MOTORMILL which proved to be extremely popular.

Foscolor's main theme at SURFEX 90 was the new range of 'Q' Series dispersions for water-based inks and coatings. The level of interest shown by visitors was very pleasing particularly in the QC Pastes. Each colour in the range is formulated with the maximum pigment content providing optimum flexibility for the formulation of high strength, thin film inks and coatings. Visitors also showed considerable interest in Foscolour's new facilities for the manufacture of liquid tinters and concentrates.

At SURFEX 90 **John Godrich** introduced the new range of Salvis Thermocenter Ovens. Unique in their construction, low cost, programmable they have low energy and space requirements. Also announced was a new company John Godrich (MTS) Ltd supplying jet aerators and mixers for the effluent treatment side of industry. The jet aerators are low cost, very efficient, easy to fit with no moving parts in the waste water being treated.

The high performance Emultex VV57 series emulstion paint binders were featured with VV573 foremost on the **Harlow Chemical** stand. Emultex VV568, designed as a cost effective binder for wood primers was highlighted. Interest in LOV emission paints was stimulated by Mowilith LDM7410 having excellent film forming properties at low temperatures. Other products included UCAR 123, a high solids acrylic polymer showing high performance in roof coatings and sealants; a new cement additive Revacryl 388 and a range of "Foamstopper" antifoams.

On the **Hoechst UK Ltd — Chemicals Division** display were the Beckopox epoxy resins and special hardeners — particularly water thinnable systems; highly elastic resins and hardeners; low temperature and phenol free hardeners; formulated epoxy-based systems for etch-primers, can coatings and powder coatings. Also on show were the Albertol, Alresat and Alpex resin range for printing inks, together with Mowital, Mowilith and Hostaflex polymers for inks and paints. Mergel biocides and fungicides were featured, demonstrating their applications in water-based systems. Hoechst waxes, Ceridust micropowders, Hordamer PE dispersions were on display, these products now well established in the paint and ink industry. Finally the Exolit ammonium polyphosphates for use in intumescent systems were on display and generated much interest.

Hoechst UK Ltd — Pigments Division has been a leader in the development of organic pigments this century. They were responsible for discoveries such as Hansa Yellows, Lake Reds, Naphtol AS Pigments and Diaryl Yellows, and have more recently been responsible for the introduction of perylene pigments, dioxazine violet and a wide range of Benzimidazolone colours. The emphasis at SURFEX 90 was to demonstrate how more recent developments can enable manufacturers to produce better products more efficiently: many of the above pigments are now prepared in a form which gives the manufacturer a product with specific properties in line with increasing demands, such as high opacity, improved flow properties and ease of incorporation into their system. The stand display covered various aspects of our pigments business, from printing inks for packaging, aqueous inks, solving paint problems through to wood colouring.

Hüls has been exhibiting its wide range of binders, resins and additives. Technical staff particularly coatings, manufacturters were especially interested in DYNAPOL, Hüls wide range of high-molecular, and medium and low-molecular polyester grades which have extended and had a major impact on the possible applications of precoated sheets for coil-coating and can-coating purposes, and similarly effected the industrial coatings sector as a whole. Hüls's tried and tested range of polyurethane raw materials had been discussed as the basis for tailor-made and trend-setting coatings, e.g. in the powder coating area. Hüls's epoxy resin curing agents found special interest in potable water approved pipe coatings.

ICI Colours and Fine Chemicals' attendance at SURFEX 90 proved to be very fruitful. On show for the first time was the new 'X' range of pigments which aroused considerable interest in visitors. The Blues, Reds and Greens complement the existing ICI range and offer even greater technical performance in all types of paint. From greater brightness, flow and rheology through to increased tinctorial strength, gloss and flocculation resistance. Also represented was the 'SOLSPERSE' range of hyperdispersants.

Industrial Dispersions Ltd used SURFEX 90 to emphasise their position as a leading dispersion house providing a service to the surface coating industry not only in the UK, but world-wide. Using their versatile production facilities and flexible policies they are able to meet the exact requirement of their customers by custom or toll manufacture. The Exhibition confirmed that the surface coating industry recognises the advantages of using the specialist dispersion house which gives them the benefit of cost savings, greater in-house flexibility, cleaner working environment with fewer health and safety problems

Product demonstration samples on the Viking stand proved to be a notable attraction with particular interest being shown in **Kirklees Chemicals** new environmentally friendly binder VIKING 3000 for "Solvent-Free" paints. VIKING 2900 the newest 'high-binder' for decorative paints featured in 'one-coat' systems together with the introduction of the Yorkshire polymerisers first full acrylic binder VIKING 4110. On a different tack VIKING 1645 a ready to use wood adhesive to the latest DIN standard was very popular with visitors.

Lawrence Industries were extremely pleased with the success of the SURFEX 90 Exhibition and we had particular interest shown in the use of ASP170 and ASP RO low oil absorption extenders for titanium dioxide replacement in gloss paint systems. A large number of enquiries were also received for samples of Halox

non-toxic anti-corrosive pigments and tannin stain blockers, particularly in their use in epoxy systems, high solids and water-based coatings. The tannin stain blocker, Halox BW100 is certainly going to become of significant interest to formulators of water-based wood primers. New for the show we had information on Dualite hollow composite microspheres and many samples were requested.

SURFEX 90 proved a valuable exhibition for **Magnesium Elektron Limited** in terms of sales enquiries received and useful technical discussions. It is probable that two or three new customers will be obtained over the next twelve months as a result of the exhibition. The most important interest was in Bacote 20 — Ammonium Zirconium Carbonate — in surface coatings where good environmental properties are necessary. More interest than MEL expected was shown in zirconium oxide for various high temperature applications.

Thickness meters, microscopes, refractometers, gloss and colour measurement was the range of equipment from **Meta Scientific Limited**. Quality control of many different types of material for colour is becoming increasingly important. The new LK100 for colour quality control generated considerable interest as it has been designed to measure powders and granules specifically. The measuring area is 15cms diameter and the sample is simply poured into a tray and measured. The ability to work with expanded scales means that dark colours may be reliably controlled. The new coating thickness meter "Duocheck SP" also created plenty of interest as this meter identified ferrous and non ferrous probes automatically and allowed storage of many readings for later print out or analysis. The memory block will store 8,000 values and full statistics may be called up by the touch of a key.

SURFEX 90 gave **Netzsch Mastermix Limited** the opportunity to exhibit their new PMD-VC 50, development disperser, together with the LME 20 horizontal bead mill, and gravimetric filling machine. Thus catering for the complete production environment. For the first time, Netzsch thermal analysis equipment was exhibited alongside the production plant equipment, and generated a great deal of interest — This collaboration of two Netzsch companies further strengthens Netzsch's position in the industry.

Norwegian Talc UK Ltd, following their acquisition by the Ernström Group in January, took the opportunity at SURFEX 90 to promote their full product range for use in coatings, sealants and adhesives under their "new" Company logo. In addition to the interest shown in the well-known and established range of Microdol, Micro Talc and Mica particular products shown to have attracted genuine new enquiries included the Michemlube/Michem Emulsion range of wax emulsions for wood stains/preservatives, water-based varnishes and clear over lacquers for printing inks; lightweight mineral additives (Silcell®) continued to show potential possibilities.

Pearson Panke report they had a good Exhibition. Considerable interest was shown in the following new instruments from their extensive range: Erichsen Statistical Mini Glossmaster which shows the gloss value and full statistical data on a single display. the cost effective DRV 400 Viscometer complete with software. The Gel RVN for determination of viscosity and gelation of resins and 2 pack systems. The latest version of the Pearson Panke Automatic Applicator.

The purpose of the **RHEOX, Inc** exhibit was twofold: firstly, it was to publicise the new company's name; secondly, to highlight its extensive range of rheological additives for solvent-borne and water-borne applications. Significant interest was shown in the well-known BENTONE, M-P-A, THIXATROL rheological additives for solvent-borne coatings. However, even greater interest was expressed in the RHEOLATE urethane associative thickeners and other grades for water-borne systems indicating the growing concern for environmental aspects. RHEOX sells its products within the UK via its two sales agents KRONOS Limited and Steetley Minerals Limited.

Rhône-Poulenc Chemicals exhibited with its overall group identity and was able to incorporate the product ranges of both Manchem Ltd and Bevaloid Ltd in its comprehensive range of raw materials for the surface coatings Industry. Of particular interest at SURFEX 90 were: MANCHEM coupling agents, MANOSEC driers, MANALOX water repellants, BEVALOID foam control agents, BEVALOID dispersants and BEVALOID hammer finish additives and RHODOPAS polyvinyl acetate homo and copolymers and RHODOPAS styrene acrylic emulsions for interior and exterior paints both flat and silk.

The main feature of the **Sandoz Chemicals** stand was based on the "fast" range of Sandorin and Graphtol pigments intended for the high quality industrial market. Also presented was a poster printed with Graphtol process pigments in UV curing inks. However, the main success of the exhibition was the presentation of the Sandosperse industrial stainers. These were promoted along with a colour prediction system and automatic dispensing to give a turn-key package for industrial paint manufacture.

Schering Industrial Chemicals received 184 visitors to their stand and recorded 77 discussions of significance for further follow up. Their interests were: 34 for epoxy resins, reactive diluents and hardeners for paints and coatings, 5 for epoxy resins and hardeners for flooring systems, 16 for polyamide resins for printing inks, 15 for nitrocellulose and pigmented chips, 7 for blowing agents and surfactants. Our new products were well received — samples and data are being despatched.

SCM Chemicals Limited report: The consistent quality of the TiONA range of titanium dioxide pigments produced by the environmentally preferred Chloride route, is widely recognised. This has been endorsed by accreditation to BS5750 and ISO 9002. The full range of TiONA products were on display, with particular interest generated in: TiONA RCL-628 for superdurable applications such as coil, automotive and long life architectural coatings. TiONA RCL-535 durable versatility without compromise on performance in water and oil-based systems.

The centrepiece of the colourful award winning **Shear** stand was the specially painted model car demonstrating the superior colour properties obtained when using well dispersed Transparent Iron Oxide concentrates in modern pearlescent finishes. The competition to assess the correct pigment ratios was won by Mr Iain Peters of Sun Chemical Pigments Ltd. Great interest was also shown by the many visitors in the displays of Transparent and Ordinary oxide dispersions used in wood finishing coatings.

Shell Chemicals stand featured a major new ten million pounds UK epoxy resin plant investment giving enhanced product quality and consistency achieved by using greater purity resin feedstocks (produced within the Shell Group) allowing milder reaction conditions to be used in the epoxy resin manufacture which leads to reduced batch to batch product variation. This increase in product quality and consistency means that Shell Chemicals are able to tailor make to tighter specifications to suit individual

customers needs and produce resins that will enable our customers to fully optimise their formulations and systems.

Silberline Limited exhibited a range of high performance "Silver Dollar" pigments; SPARKLE SILVER PREMIER GRADES. They also exhibited a range of AQUAVEX passivated, water-based pigments. The SPARKLE SILVER PREMIER GRADES and AQUAVEX pigments generated most interest, reflecting a growing trend throughout the industry towards water-based systems. The AQUAVEX series offer the following advantages to paint and ink formulators: a) Solvent free, low dusting pigment. b) Easy dispersion and c) A proprietary passivating agent.

At SURFEX 90 **Steetley Minerals** exhibited their full product range with particular emphasis on new products and technologies. There was considerable interest in the exhibit displaying the benefits of hectorite over bentonite organoclays. Fine high brightness dolomites also generated a high level of interest. Other new products which proved popular were the Hungalu range of aluminium pastes, Raybo paint additives and S.I.R. epoxy resins.

Stort Chemicals Limited report that the EFKA high molecular weight dispersing agents — EFKA 46 & EFKA Polymer 401, which enable the production of genuine universal pigment concentrates, created great interest. More and more industrial paint companies realise that the use of universal pigment concentrates are the only quick and efficient method to manufacture the wide range of colours and qualities their customers require. The proven factory success demonstrated by EFKA-based concentrates was a major talking point.

Colour formulating was the theme of **Strastint (UK) Limited** at SURFEX 90 this year with the first showing of the CCMI laboratory colour matching system and POS retail matching computer. Strastint report considerable interest in these computer systems as well as in their solventproof and flameproof machines for dispensing industrial paint colourants to tint small special batches. Among paint companies placing orders at SURFEX 90, Harlequin Paints of Brompton-on-Swale told us that they had waited for this opportunity to see all of the offerings from colour computer suppliers before confirming their order with Strastint for a CCM system. This new colour matching system will enable Harlequin to be even more responsive to their customers' colour needs.

Sud-Chemie AG and their UK Agent **Production Chemicals Limited,** featured their range of TIXOGEL and OPTIGEL Gellants. Many enquiries were received, for TIXOGEL VP with its wide range of application and easy dispersibility in solvent-based systems. Also, for various OPTIGEL grades which provide thickening, gelling, anti-settling and anti-sagging properties for water-based systems. Major applications of OPTIGELS include: emulsion paints, water-thinnable paints, dispersion adhesives and cement screeds.

Sun Chemical showed three product areas, all of which created intense interest. The standardised High-solids presscake product lines for both inks and coatings generated much interest not only with regard to wetting and dispersion, but also with regard to dust control and handleability. The new Perylene 179 pigment generated styling interest in OEM, in particular the High-solids presscake physical form. Flexiverse and Sunsperse 6000 aqueous dispersions continued to be of general interest to all our visitors.

Thomas Swan & Co Limited were exhibiting a range of chemicals and equipment. Casamid 792 is a new matt curing agent for dark coloured epoxy powder coatings. A compact range of purpose designed test instruments from G. L. INSTRUMENTS were being exhibited for the first time. The range included inexpensive heat sealers and tensile testers. Recently launched are a five point heat sealer, ink specials and a 45° peel tester. BIOCODE can use biotechnology to detect markers. Two important potential applications in the coatings industry are indisputable identification of the source of a particular product and film weights can be determined by using a quantitative analysis technique.

Although the whole additive range from **Tego Chemie Service** generated considerable interest, the defoamers for water-based systems were the main highlights. Tego Foamex 1488 for emulsion paints and water thinnable coatings based on acrylic and epoxy resins. Tego Foamex 805 for emulsion paints and water-thinnable coatings based on polyurethane resins and polyurethane acrylic resin combinations. With the trend moving definitely towards water-based systems these two defoamers will play an increasing role in formulations for the future.

Charles Tennant & Co (London) Limited report: Considerable interest was shown in low free formaldehyde and high solids amino resins for industrial coatings (Dyno Cyanamid) and newly developed alkyd and polyester resins for woodfinish and industrial applications (Dyno Industrier). New thermoplastic acrylic resins were featured with particular emphais on aqueous systems and additives (Du Pont). HYPALON Chlorinated Polyolefins were introduced for the first time as replacements for Chlorinated Rubber (Du Pont). Furthermore strong demand was noted for Phenolic, Maleic and Esterified Rosin Esters (Propinave).

Tennant KVK Limited report Exhibited were Pigments and Pigment Dispersions on behalf of the following Principals — Kemisk Vaerk Koege A/S, Runnymede Dispersions Ltd, Cabot Cabron Ltd, Paul Uhlich and Co and Pinova AG. Interest centred on dispersions for water-based inks offered by K.V.K. pigment preparations for use in U.V. paint and ink systems from K.V.K. and Runnymede, Polyvinyl butyral pigment dispersions for packaging inks from Runnymede and the ranges of pigment tinters for paint applications from Pinova AG.

Wengain report a very satisfactory level of response to the products displayed this year and feel that SURFEX 90 produced a higher quality of visitor than ever before. In the printing inks area, particular interest was shown in the new range of Magruder Aquaflo acrylic chips for aqueous systems which have recently been introduced to the UK market. A large proportion of paint industry enquiries covered the new non toxic anticorrosive pigment, Wacor ZBP-M, launched in 1990 by Waardals of Bergen.

Products on show at SURFEX 90 for the first time from **Yorkshire Colour Systems** included the Datacolor MMK and GK 111 systems for the quality control and assessment of metallic paint finishes. These instruments are widely used by the major car manufacturers in Europe and by IDAC in the UK. Yorkshire Colour Systems also exhibited the ACS product line for the first time in their role as the new UK and Eire agents for ACS Inc. of America. Yorkshire Colour Systems are now the UK and Eire agents for both Datacolor AG of Switzerland and ACS Inc of America. ■

Pigment developments for the printing inks for the 90s

by C. Bridge, Ciba-Geigy Pigments, Hawkhead Road, Paisley, Renfrewshire PA2 7BG, UK

Abstract

The likely technical changes in printing, ink and pigment making are reviewed, from the viewpoint of the organic pigment maker. The possibilities for the pigment maker to make a contribution to the successful implementation of these changes are described, by reference to those pigmentary properties which require optimisation to meet the need.

Consideration of pigment developments for the 90s has to be based on the likely changes which are foreseen in the printing and ink making industries, and to society as a whole. However, the timescale required to develop a new pigment is in general considerably greater than the average development time for a new formulation within the ink industry, and so the pigment makers have to be attuned to these likely changes in order to plan their R & D programmes to deliver the new products when they are required by the ink maker.

The pigment maker has, therefore, to continually ask the questions:

- ☐ What changes are foreseen in printing technology?
- ☐ What changes are likely in the making of inks?
- ☐ What new types of ink formulation may emerge?
- ☐ What changes may be required by society of the pigment making and using industries?
- ☐ How can the pigment maker assist in these changes?

This paper reviews those items which we see as the likely changes which will require pigment development work, and indications as to how some of these changes may be assisted by the pigment maker.

I have to say from the outset that it is unlikely that any major new chemical types of pigment are likely to emerge for the printing ink industry, but this still means that there are many opportunities for pigment developments in the fields of surface chemistry, the effect of crystal morphology modifiers on size and shape of the pigment crystals, as well as in the process technology for the manufacture of pigments, which in itself may lead to new types of product offer.

Pigment developments arising from changes in printing technology

It is likely that in the year 2000 the major printing processes will remain in essence as they are now. However, certain changes in formulation are likely which are reviewed later.

It is possible that 'waterless' lithography may make a breakthrough during the 90s which may be sufficiently large to classify this as a different type of process by the end of the century. This is likely to require a new range of pigments to achieve the correct ink properties, with different resination, etc., but there are at present few formulation guidelines which will allow the pigment maker to start work. This may be a useful area for collaboration between resin, pigment, ink and plate maker.

It is clear that imaging methods such as ink jet, laser and LED xerography will grow at a greater rate than printing as a whole, with colour usage growing at a high rate. This may well result in the development of:

- ☐ pigment dispersions with guaranteed particle size distribution for ink jet
- ☐ dyes developed solely for ink jet usage
- ☐ pigment makers preparing coloured xerographic toners

Pigment developments arising from changes in pigment and ink making

The question has to be asked continually: 'What is the most cost effective and environmentally friendly way of getting from pigment raw materials to finished ink?' together with a supplementary question: 'What may be gained in ink quality by an alternative method of ink production?'

This is an area in which pigment makers have traditionally been helpful in changing methods, for example by the development of more easily dispersing grades of pigment, by developing products which reduce the need for chipping in nitrocellulose, etc.

The question is being addressed now in a much more fundamental way, however, by consideration of the whole process of going from pigment raw materials to finished ink, and this may change fundamentally the role of pigment maker and ink maker, with the ink maker becoming less involved in achieving the dispersion than previously.

Figure 1 depicts the routes which are commonly available today for the preparation of Azo pigments for lithographic inks, with an indication of the pigment/ink maker boundary – and even this is arbitrary in the case of a company involved in both pigment and ink making. It is likely that this boundary will have moved by 2000 to that shown in Figure 2, with the ink maker concentrating on formulating skills and service, since he will be supplied with very easily dispersible pigments which he can stir into his finished ink formulation, or with high concentration dispersions, which require only letdown with varnishes.

Figure 1
Ink making-1990

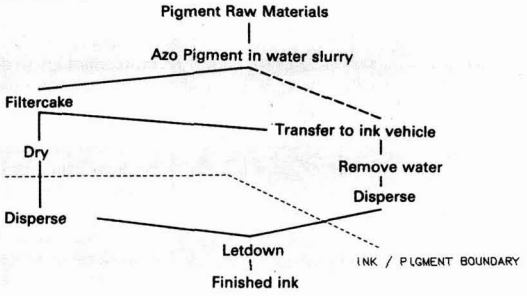
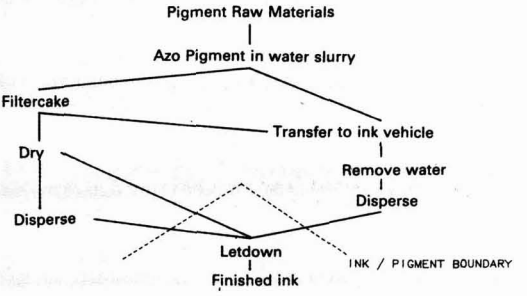


Figure 2
Ink making-2000



Several patents covering potential approaches have appeared, e.g. Ref 1, 2, 3. The aim is to achieve either cost savings and/or technical improvements. In general the approaches are more appropriate to high volume ink usage, but with the increasing globalisation of the pigment and ink industries this may be less of a restriction than it was in the past.

Pigment developments arising from formulation requirements

1. Lithography

The main challenges arise from the need to produce heatset inks which are capable of printing at even higher speeds than are achieved now. The main problems are seen to be in:

- ☐ achievement and maintenance of the ink/water balance with inks of lower viscosity (mainly a problem with process magenta)
- ☐ faster ink setting and lack of smearing (mainly a problem with process yellow)
- ☐ reduction of ink misting

The pigment maker has to assist in the achievement of the inks for the 90s by the provision of pigments with even tighter control of rheological (i.e. particle size/shape) properties, and of materials, including impurities such as salts, which may affect the ink/water balance. In addition there will be changes in the technology required to achieve small (and so transparent) particles with a move away from the 'traditional' rosin derivatives which are used in high quantity at the moment, but which are a factor acting against the fast setting/low smearing characteristics which will be required.

Gloss requirements are expected to increase as this is traditionally seen as a mark of 'quality', and this is a continuing requirement on the pigment maker. This requires a control of the particle size/shape achieved in the dispersion, and the pigment resination is also of importance.

There is also a requirement for cleaner shades, particularly in process magenta, and this may mean a greater control of pigment raw materials, and the use of alternative shading and crystal growth inhibiting materials. This requirement for cleaner shades, mainly in the secondary colours, may even lead to the use of seven colour printing by the turn of the century for the highest quality jobs – the prospect has started to be discussed already in West Germany. This would be an intriguing prospect for the pigment and ink maker! We have to ensure that the choice of shade is determined by what is practically achievable, and not by the scanner manufacturers based on some theoretical considerations.

Newspaper coldset printing of colour is growing rapidly in much of the world. So far it is true to say that no pigment range has been specifically developed for this usage, but that pigments developed for other areas have been screened for suitability. This is unlikely to meet the needs of the inks for the next generation of presses, and development work to help to overcome the problems, mainly rheological in nature, and so greatly influenced by the pigment, is required. This target is made more difficult by the low margins imposed on the ink maker, and passed to the pigment maker, which restrict the possibilities for a solution.

2. Radiation curing inks

The likely impact of legislation on the emissions from printing plants will encourage the growth of 100% solids radiation curing inks, particularly for lithography, but perhaps also for some speciality gravure printing based on low viscosity cationically cured systems. In addition the investigation of waterborne UV curing systems is currently popular. So far no pigment maker has specifically developed pigments for these usages, largely because the market, even for the longer established offset UV systems, is not large enough to finance the work which would be required. However, it is clear that the pigments normally offered for offset inks are often not the most suitable, and major improvements could be made if there was a real demand (i.e. market) for improved process pigments.

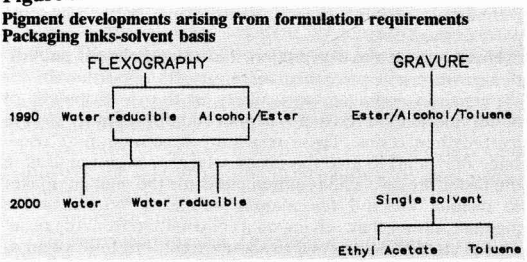
3. Flexographic and gravure packaging inks

This is a most interesting area for the pigment maker at the moment. Social pressures are changing the face of formulation for these processes rapidly, and in some ways the UK is not at the forefront. The main pressure arises from the need to reduce the emissions of solvents from printing plants, either by recovery, incineration, or by a change to water-based formulations.

Recovery is relatively expensive to install, but many large gravure printers have chosen this route, with a change to the use of a single solvent ink system to make the recovery cost efficient. In Italy this process is far advanced, but there are also systems operating in Scandinavia, West Germany, Spain and Portugal. The solvent chosen as the base for these inks is ethyl acetate. In Japan there are similar pressures and the move is being made to inks based on toluene, as the packaging resins developed there have good toluene release, better than traditional European systems.

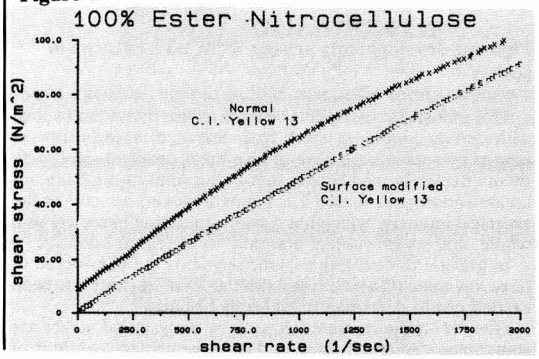
These trends are summarised in Figure 3 showing the situation in 1990, and that projected for 2000.

Figure 3



These types of formulation pose problems for the pigment makers, as many of the pigments used give massive flocculation in ethyl acetate or toluene, e.g. C.I. Pigment Yellows 12, 13, 14, 83, Orange 34, Reds 2 and 112. There is a lot of work being done to overcome these problems, by changing the nature of the pigment surface, but it will require some time before there are effective solutions for all types. As an example of what can be achieved, Figure 3 shows the shear stress vs. shear rate curves for an untreated C.I. Pigment

Figure 4



Yellow 13 pigment, and a treated pigment, in a nitrocellulose gravure ink based on ethyl acetate only as the solvent. It can be seen that the untreated pigment shows clear Non-Newtonian flow behaviour, which is typical of a flocculating system, while the treated pigment shows a much more Newtonian flow pattern, and in addition this treated pigment shows improved transparency and gloss.

The rapid development of high quality water-based flexographic inks to replace the alcohol based types has led to a demand for pigments giving the high gloss expected from the solvent based systems. Again there has been no real development of pigments specifically for water-based inks until recently, with the exception of 'elaborated' forms such as predispersed forms, chips, etc. This is an area of active work by pigment makers, but is difficult as the requirements of good flocculation resistance and high dispersibility in water-based systems are in principle contradictory if the pigment is to be made in water, as is necessary for good economics. Solutions which have been offered so far have tended to be too high in surface active materials which give foaming and wetting problems.

4. Publication gravure

In most of the world, publication gravure inks are largely based now on toluene only as the solvent, and most printers have effective solvent recovery systems installed, and the presses are enclosed. There is logically no reason to move from this position. However, it is possible that illogical reasoning may require a move from toluene to water-based inks. This will mean that publication gravure will no longer be competitive with lithography, and this may happen in some parts of the USA.

However, on the assumption that toluene based publication gravure will stay, then there are still opportunities for pigment development, particularly in the development of better flocculation resistance in poor stabilising resins, such as hydrocarbon resins. These resins are becoming more used, since they tend to give the faster solvent release required in the faster presses. The requirement is for the pigment maker to include the full flocculation stabilising system in the pigment, rather than relying on a contribution from the resin. This is already being done to some extent, but this optimisation will proceed further.

It may be that the consideration of the most effective routes from pigment raw materials to finished ink may lead to either the preparation of pigment dispersions or very easily dispersible pigments by the pigment maker. Already certain yellows can be dispersed by high speed stirring only, and it would be possible to achieve this with rubine and blue in toluene systems, in fact this was achieved in the past, though the quality of the inks being made now is higher than at that time.

Pigment developments arising from the concerns of society

Our industrial society has become aware that it has to deal with certain problems which have arisen from industry. As part of that society we have to face these problems and solve them effectively, and ensure that in the solution we have not created another problem. The pigment makers are part of the chemical industry, which has a poor reputation in society as a whole, and so are subject naturally to increased attention.

In general the existing organic pigments are considered to have low toxicity, and a substantial amount of study has been carried out to determine their likely hazards.

However, the raw materials used by the pigment maker are sometimes a greater hazard, and improvements in handling of these materials have been made, and continue to be made by the major suppliers.

It may be that in certain areas, however, that there may come legislation which restricts the use of certain pigment types.

The main problem areas are likely to be:

□ C.I. Pigment Red 53:1 (Barium Lake Red C) because of the possibility of extracting Barium from the pigment. This restricts the use in food packaging, but may also restrict the use in water-based inks if effluent controls are not rigidly enforced.

□ Basic Dye complex pigments where the dyestuffs and the heavy metals may cause greater problems in the future.

Both of the above would create problems in obtaining suitable bright substitutes for packaging inks – though C.I. Pigment Red 2 may be a reasonable, though higher priced, alternative to Red 53:1.

Another problem which has arisen is that of Copper Phthalocyanine in water-based inks, where there is discharge in the water effluent from the printer or ink maker. It is common practice for many water authorities to analyse for copper by treatment of the effluent at high temperature with a strong mixture of nitric acid and hydrochloric acids. It so happens that this is one of the few ways of extracting copper from copper phthalocyanine, so that any effluent containing any copper phthalocyanine may give a copper level exceeding the limits. It has to be recognised that copper phythalocyanine can pass unchanged through the body without loss of copper (i.e. stomach acid cannot remove the copper), and that a common way of preparing alpha form copper phthalocyanine is by solution in 98% sulphuric acid, at up to 60°C, again without loss of copper – the copper is held more tightly in copper phthalocyanine than in any other organocopper compound. This argument has now been accepted by the Federal authorities in the USA, though not necessarily by all State authorities. In Europe the argument is only just beginning, but has caused problems in West Germany and the Netherlands. There is no justification, however, for allowing any pigmented material to any water stream, and printers, ink makers and pigment makers should stop this practice.

The consequences of a ban on the use of copper phthalocyanine in water-based inks would be far-reaching. There is no alternative which is better in environmental terms, and all alternatives are much more expensive. Whatever was used would require a change in the process colours used, and would result in dirtier shades in the secondary colours. The answer is to observe good practice, i.e. do not discharge pigmented residues into the water table, and to answer the question logically, in that the copper analyses are an artifact of the test method, and do not relate to the impact of copper phthalocyanine in vivo.

Conclusion

It can be seen that there are many challenges ahead, and that there will still be much work to do together in meeting the mutual problems of ink and pigment making.

We can be sure that all of the predicted changes will not happen in the 90s, but most of those given here are at least being explored already. We can be sure also that other changes not predicted here will begin to occur, though given the time scale of pigment development others are not likely to make a significant impact by 2000.

I shall look forward to reviewing my predictions at the 'Printing Inks for the new decade' seminar in the year 2000.

References

1. Patent Kokai Sho 63-95270 (Toyo Ink).
2. EP Application 0285713 (Sun GPI).
3. EP Application 0273236 (BASF).

■

Resin developments for tomorrow's inks

by R. H. E. Munn, Cray Valley Products Ltd, Farnborough, Kent BR6 7EA, UK

"Printing Inks are an enigma to the resin industry and many resin companies with great talents have floundered in attempts to provide us with new polymeric materials. Yet our future as ink makers depends largely on the continuous flow of new and novel resinous products".

So stated a Mr D. J. Carlick of the Sun Chemical Corporation in an article which he wrote in 1984 which appeared in the American Ink Maker. I quote this because it does sum up my own impressions and it is for this reason that I present this paper with some trepidation. But why should there be this apparent reluctance of the resin maker to devote more time and effort in developing new resins for printing inks?

One reason must stem purely from simple commercial considerations. A large consumer of coating resins is the paint industry, an industry which in many ways is similar to that of printing inks in that the resinous binders perform the same function as in printing inks:

1. To efficiently bind and carry the colouring material.
2. To meet the often complex physico-chemistry of the various application processes.
3. To dry and bind the colouring material to the substrate.
4. To provide the required properties of the dried film.

However, it is interesting to look at the relative sizes of the two markets in terms of their resin usage. (Table 1).

Table 1

Estimate of West European consumption of major raw materials ('000 TONNES)

	INK	PAINT
Resin	200	2,000
Pigment	100	1,400
Solvent	200	1,600

In such terms it can be seen that the paint industry uses about ten times more resin and naturally is a more attractive market for the resin producer. It is also interesting to look at the spread of resin types used by the ink industry (Table 2) which indicates that a very high percentage of the resins used can hardly be regarded as high added value materials and have, with continuous modifications, been around for many years.

Table 2

Usage of major resin types in West European ink industry ('000 TONNES)

Rosin and Derivatives	50
Acrylic (solutions and emulsions)	22
Phenolics	15
Hydrocarbons	12
Alkyds	9
Oils	9
Cellulose Derivatives	4
Polyamides	3

This as it may be, I have little doubt that the real reason for the use of the word "enigma" in my original quoted statement and for the apparent scant appearance of new and novel resinous products is that for the most part the resin industry does not really understand the intricacies (or witchcraft) of printing inks and even less the restraints put upon the ink formulator by the complexities of the various printing processes. By comparison, paint is so much easier in that the methods of application — brushing, spraying, dipping, roller and curtain coating — although presenting their own individual problems are not beyond the apprehension of the resin chemist and can for the most part be evaluated in the laboratory without resorting to the purchase of expensive specialised test equipment.

There are other important differences between ink and paint technology which make the resin formulators' task difficult. Paint is normally applied at dry film thicknesses of around 25 microns. At such thicknesses, it is relatively easy to obtain adequate pigment dispersion to give the required colour strength and opacity. In inks where film thicknesses are but a few microns it is necessary to achieve optimum and stable dispersion and the wetting characteristics of the binder become all important. Easy dispersing, high cost pigments aid the ink formulator in reaching this goal and it is therefore not surprising that the pigment industry devotes much time and effort in satisfying the requirements of the ink maker. Indeed, the ink industry is a lucrative user of pigments; 55% of all organic pigments and around one third of pigmentary carbon black produced go into inks.

Each of the various printing processes has its own particular requirements in terms of the organic solvents which are permissible. Letterpress and litho inks use weak aliphatic distillates with the trend towards lower aromatic contents giving additional solubility problems. Many liquid inks, particularly those used for food packaging applications use alcoholic solvents. This imposes serious restraints on the development of new polymeric binders. In spite of these problems, resins specifically for inks have been developed and in particular one could mention isophthalic alkyds for litho inks, alcohol soluble polyamides and urethane polymers for flexographic and gravure inks, aqueous solutions and emulsions of vinyl and urethane polymers as well as oligomers and reactive monomers for both ultraviolet and electron beam curing. Improvements of course have also been made to the traditional hard resins based on rosin — maleics, fumarates, resinates — and even the commercially attractive C5 and C9 hydrocarbon resins to meet the requirements of better solubility, faster setting and improved print quality.

When it comes to entirely new polymer types, the position is often different. Here there can be little doubt that ink formulators have to evaluate, adapt and modify film forming polymers often developed for other industries to meet their specific requirements working with little technical input from the resin suppliers. In speaking of "resin developments for tomorrow's inks" which is the title of this paper, it is therefore difficult to be precise and I hope you were not expecting me to give you a definitive list of the resins you will be using in the 90's. Certain trends are evident and these apply to the majority of the coatings industries be these ink, paint or even adhesives. There is much that we can learn from developments in these other industries. These may be listed as follows:

1. The desire for faster production speeds.
2. The reduction or elimination of organic solvents in the face of environmental pressures.
3. The impact of new substrates particularly those of a polymeric nature.
4. Greater emphasis on Health and Safety aspects leading to the tighter control of raw materials and the protection of

operators.

5. A desire towards the use of renewable resources.

These influences are already dictating the direction of developments within the coating resin industry and Table 3 attempts to indicate those areas which may well be germaine to the ink makers requirements in the present decade.

It is not surprising that radiation curing and water based resins feature so prominently in this list and history has proved that both technologies go a long way to meeting the requirements of the ink maker. In terms of achieving faster drying, UV curing is an answer and already the resin industry has recognised the large potential which exists in the graphic arts sector for suitable materials. We have seen improvements in both the quality and suitability of reactive monomers and oligomers and indeed, being now the biggest user of the UV drying process, more effort is now being devoted to developing improved materials specifically for the ink industry.

There remains many problems to solve if the use of UV curing is to extend beyond its present use in lithographic inks, overprint varnishes, screen inks and metal decorating inks and indeed, achieve greater penetration into these existing markets. Improvements in litho properties are being sought and there is a need to improve wet-on-wet performance in multi-colour printing. In liquid inks, flexographic and gravure, UV curing could be the means to achieving improved adhesion on to impervious stock as well as eliminating or reducing the use of organic solvents. However, at the present state of the art, resin viscosity is too high and curing speed is probably inadequate for the ink thicknesses and printing speeds prevailing. The combination of UV curing and water-borne reactive systems may be the answer. For sure, UV curing monomers and oligomers will receive their fair share of development time in the '90s.

Water-based ink resins are not new and indeed dominate in inks for printing Kraft paper and corrugated board. Readers of certain newspapers will also appreciate the "clean hands" characteristics of water-borne news inks.

Table 4 indicates the general properties of the water-based resins currently available.

It can be seen that no one type gives all the properties desired and present technology is one of compromise. On absorbent stock, the drying speed of water-based resins is normally just adequate. In more critical applications where greater resistance properties are required and application is on to impervious substrates, problems still exist. Print quality, drying and resistance properties all need to be improved. Press stability in terms of preventing drying on

Table 4

Comparison of water-based media

	Solution	Colloidal Dispersion	Emulsion
Particle size	<0.001μ	0.001-0.1μ	>0.1μ
Molecular weight	Low	Medium	High
Viscosity	High	Medium	Low
Solids content	Low	Medium	High
Pigment dispersion	Good	Fair	Poor
Flow	Good	Fair	Poor
Resolubility	Good	Fair	Poor
Drying	Poor	Fair	Good
Resistance Properties	Poor-Fair	Fair	Good

stereos and ensuring resolublity of the ink is a continuing problem. As a possible route towards the elimination of organic solvents in both flexographic and gravure inks for foil and film there can be little doubt that water-based inks are the way ahead but ultimately it will need legislative pressures to trigger their wider usage.

In all sectors of coating technology one can see a trend towards water-based coatings and as a consequence the resin industry is devoting much time to the development of new resins. The polymer chemist can now control both particle size and even shape, both having radical effects on pigment dispersibility and pigment loading. More exotic (and expensive) monomers are being made available and experience in the paint industry shows that even when used at low levels they can have dramatic effects on film performance such as adhesion, gloss and resistance characteristics. The use of "core-shell" techniques whereby the polymer particle consists of a separate core onto which is grafted a shell of polymer of different composition can yield emulsions giving good film forming properties with minimal levels of coalescing additives. Again, I have no hesitation in saying that the development of water-based resins for printing inks will be an important pre-occupation of the resin industry in the '90s.

The other areas of development indicated in Table 3, although important from the viewpoint of the paint maker, must be considered more speculative when viewed as producing resinous binders suitable for printing inks. In the desire to produce high performance coatings which dry at ambient temperatures, the resin industry has been particularly successful in producing two-pack systems. Typically, there are epoxy resin crosslinked with polyamides or polyamines, hydroxy functional acrylics crosslinked with isocyanates and latterly, acrylics cured with co-reactants

Table 3

Influences and possible solutions

INFLUENCE	SOLUTION	RESIN TYPE
□ Faster printing speeds	▷ Newer drying processes ▷ Ambient temperature curing ▷ Controlled M.W. & rheology	◇ Radiation curing ◇ 2-pack systems ◇ Thixotropic media
□ Reduction/elimination of organic solvents	▷ Lower M.W. resins ▷ Use of water ▷ 100% solids	◇ High solids ◇ Water based media ◇ Radiation curing
□ Newer plastic substrates	▷ Improved adhesion	◇ 2-pack systems
□ Health & Safety aspects	▷ Elimination of suspect R.M.'s	◇ Water based media ◇ Non-isocyanate media ◇ Improved solubility in non-aromatic solvents
□ Renewable resources	▷ Media based on vegetable oils	◇ Alkyd resins

other than isocyanates. Although already used in certain inks and varnishes, relatively slow drying, limited pot-life and insolubility in acceptable solvents have precluded their more general use. However, the non-isocyanate two-pack acrylics have properties which are approaching the ink makers requirements. They do not have the solvent restrictions of the isocyanate types and alcohols can be used as diluents together with stronger ester solvents. They give fast, lacquer type drying which is followed by chemical crosslinking which gives highly resistant coatings of good adhesion to a wide variety of plastic substrates. Extended pot-lives are also possible. The development of these systems has been initiated by the needs of the automotive and transport industries both for the original paint finish, particularly on plastic substrates and for repair paints.

Several cross-linking mechanisms are available and the chemistry of these systems is now reasonably well defined. However, to achieve ambient temperature curing powerful catalysts are often required which in addition to presenting possible health hazards, can have adverse effects on water resistance. At the present state of the art the preference is for epoxy/carboxy or hydroxy/carboxy reactions, these functional groups being built on to an acrylic polymer backbone. In certain quarters there is a distinct and often unfounded reluctance to use isocyanate containing polymers and these new non-isocyanate materials are now gaining commercial acceptance not only on health and safety considerations but also on technical merit. This could be a potential area of development for new ink media.

Mention has already been made of radiation curing and water-borne resins as prime candidates for the elimination of organic solvents. In the paint industry another approach is the use of the so-called high solids resins. Alkyds, saturated polyesters, thermosetting acrylics and amino resins have been developed and although their usage in Western Europe remains relatively small, in the USA they are finding their niche in certain industrial coatings in order to comply with strict regulations controlling the emission of organic solvents into the atmosphere. The use of such resins in printing inks is generally precluded because of their poor solubility in acceptable solvents and their low molecular weight dictates the use of high temperatures to bring about drying and subsequent crosslinking to give resistant and adherent coatings. However, it is an area which is receiving much attention and some associated developments may have spin-off for the ink industry. For example, these resins have low viscosity in their solvent-free form and the evaporation of solvent after application is not sufficient to build up the viscosity in order to prevent excessive flow and sagging on vertical surfaces. This has highlighted a need for efficient rheological control which is effective both during the initial flash-off of the solvent after application and subsequently during heat curing where it needs to compete with a lowering of viscosity brought about by the heat input. Thixotropic binders have been used for many years in the paint industry, particularly in decorative paints and were instrumental thirty years ago in the development of the now well-known dripless paints for the Do-it-Yourself painter. However, the viscosity regain characteristics of these resins are too slow to prevent excessive flow in high solids systems.

There have been recent developments in thixotropic media and additives which now enable much faster viscosity regain after shearing and which are applicable to a whole range of polymer types including alkyds, saturated polyesters and acrylics. The trend towards faster printing speeds, particularly litho printing, has indicated a need for some form of heat resistant thixotropy; these present developments may yield some interesting products for the ink maker.

Allied to the trend towards non-aromatic distillates in paste inks is the work that the resin manufacturers are doing to develop resins having acceptable performance when used in low solvent power isoparaffinics. White spirit, an aliphatic hydrocarbon containing some 18% aromatic content has been used for years as the essential solvent in decorative paints. However, certain doubts have been voiced particularly in Scandinavia as to its acceptability on health considerations. Many of you will no doubt have heard of the "Danish Painters Syndrome" where some evidence suggests that this is caused by white spirit. As a consequence, some interest is now being focussed on the replacement of white spirit by non-aromatic isoparaffinic type solvents which can have the added advantage of extremely low odour. These solvents have rather poor cutting characteristics and if used in conventional resinous binders, typically long oil alkyds, they give much lower solids at application viscosity than normal white spirit. Reduction in molecular weight of the polymer will compensate for the loss of solids but this is generally accompanied by sacrifices in speed of dry, rate of hardening and tendency to yellow. Techniques have been found to overcome these deficiencies in alkyd resins and there may be some scope in the use of such media in paste inks.

Lastly, let us consider the whole thorny question of renewable resources. It is probably true to say that the most effective coating resin which utilises raw materials based on renewable resources is an alkyd resin based on citric acid, esterified with glycerol and modified with a vegetable drying oil! The citric acid comes from lemons, the glycerol is obtained by splitting a vegetable oil and the drying oil has a vegetable origin. Not that such a resin is likely to be very useful but it does show that alkyd resins come top of the list in the stakes for the use of renewable resources. Several years ago it was proposed that coating polymers should be made from sucrose but so far as I am aware, nothing of any real use came out of this work. I understand that in the USA soya oil is now replacing mineral oil in newsprint inks.

The recycling and re-use of paper is now a favourite subject for debate and must be of some concern to the ink industry. But how do you de-ink if the trend is going to be towards the use of tougher, more adherent and resistant inks? Your guess is as good as mine! One thing is for sure, both our industries face dilemmas; you can't have your cake and eat it, you win some you lose some! Only by working closely together on the technical front and appreciating and sharing each others problems and recognising that R&D is an expensive exercise which needs to be financed, will the resin industry provide you with new and novel resinous products for the '90s. ■

Paper presented at the OCCA/SBPIM Symposium, "Printing inks for the 90's", 22 March 1990, Birmingham.

The impact of ecology on the development of flexo/gravure inks

by C. W. Patterson, BASF Coatings + Inks, Ellis Ashton Street, Huyton, Liverpool L36 6BN, UK

I would like to begin with a definition of ecology. Ecology according to the Oxford English Dictionary is the study of the interaction of organisms with their environment and in this article I wish to examine the impact of ecology on the development of flexo and gravure inks.

The fundamental aim of most companies is to make a profit. They do this by attempting to provide their customers with products that meet their requirements at a price thats right. Meeting this demand requires the company to steer its research and development effort in the right direction. In order to do this it is necessary for the supplier to identify future market trends.

For the coatings industry there are three major factors which govern these trends and I will now discuss these factors highlighting the effects of ecology.

Economic Climate

Current economic forecasts for the UK in 1990-1991 paint a bleak picture with predictions of high interest rates being maintained together with reduced levels of domestic demand and manufacturing output. In this economic environment the ink manufacturer and packaging converter will face increased competition for market share.

In the past such competition, spurred by a poor economic climate has usually meant that ecological considerations are disregarded.

However the recent COSHH regulations together with forthcoming environmental legislation, both of which will be discussed later, will mean that any review of the performance or cost effectiveness of current or new ink formulations by the ink manufacturer or packaging converter will have to take greater account of ecological factors.

Note the use of the term 'cost effective" as opposed to cost reduction since it is the cost of the total ink package that is important.

The formulation of an alternative ink system using inks 10% more expensive than the original set supplied to the converter may still prove cost effective and benefit the environment for example by reducing packaging costs.

Collation packs enclosing individually wrapped items such as confectionary have in the past relied on laminate forms. Such laminates typically have a base web of polyethylene for heat sealing purposes. However, an alternative is offered in the recently developed high performance heat sealing inks. These inks designed for the reverse printing of co-extruded polypropylene give excellent ink to ink heat seal bond strengths. The use of such inks on collation packs, although requiring a slightly higher film gauge removes the need for a heat sealable laminate structure. This change can benefit the converter by reducing raw material, processing and energy costs. Further ecological benefits may arise from reduced solvent emissions in cases where solvent based adhesives were used or improved health and safety conditions where isocyanate based adhesives were used.

Technical Innovation

The second major factor affecting liquid ink development is that of technical innovation. This may occur in a number of areas associated with ink manufacture or packaging conversion.

1. Substrate Change

Flexible packaging converters use a very wide range of substrates such as Paper, Cellulose film, aluminium foil, Polyolefin films, Nylon, Polyester, PVC, and metallised substrates.

In this paper I will concern myself with those substrates which have had or may have the greatest effect on the environment.

a) Cellulose

Cellulose film is derived from totally renewable sources and is fully biodegradeable. However, its production requires the use of a number of toxic and hazardous materials which can pose pollution hazards. The market for regenerated cellulose film has been in decline for the past 15 years though recently a leading film manufacturer reported an increase in the sales of, and number of enquiries regarding the use of cellulose film.

This turnaround has been attributed to the prominence of green issues.

b) Polypropylene

Polypropylene films unlike cellulose materials are not biodegradeable and so pose a pollution problem after use. However, they can be incinerated producing useful quantities of heat without toxic byproducts.

Concern for the environment has prompted a number of film manufacturers to attempt to develop biodegradeable polyolefinic films. These films have tended to rely on the incorporation of starch so that on biodegradation the mechanical integrity and not the chemical integrity of the film is disrupted.

However, many manufacturers believe that the least cost solution would be the recycling of products.

In the last decade we have seen an increase in the number of initiatives for the recycling and re-use of packaging materials. Indeed, milk bottles and beer bottles are commonly re-used. Re-cycled glass, paper and aluminium products are gaining consumer acceptance and becoming more commonplace. The next logical step would appear to be the recycling of polyolefins.

Such a move would be frought with difficulties since it would initially require separation of the plastic waste from other household rubbish. This separated plastic waste would still consist of mixed plastics namely polyethylene, polypropylene, polyester, PVC and nylon. The substrates may also have undergone a number of conversion processes. They may have been printed, laminated, metallised or PVdC coated. These problems limit the end uses of such recycled material to technically uncompromised applications.

2. Ink manufacturing changes

No major changes in ink manufacturing techniques have been observed in recent years though improvements in the performance of both horizontal and vertical pressurized bead mills have been seen. Better chamber or pot design and more efficient ink pre-mix facilities have lead to greater ink throughput rates and reduced energy requirements for the production of ink bases and dispersions.

Even with these improvements milling still remains an energy intensive procedure. However, recent advances in surfactant technology, commonly used to improve pigment wetting, now allows increased pigment loading into ink dispersions. These dispersions of increased colour strength can lead to a reduction in mill production requirements and consequently a reduction in the energy used for milling.

3. Printing process advancement

Although the basic processes of flexography and gravure printing remain unchanged the degree of sophistication in press design and ancillary equipment have advanced. This may be seen in the greater use of computers at press side for example in controlling web tension or print design registration. Their use can lead to substantial improvements in machine efficiency and significant reductions in levels of print waste which benefits both the converter and the environment.

Legislation

Health and Safety legislation and environmental legislation have had one of the most profound effects on the development of inks.

Most recently we have seen the introduction of COSHH regulations and later this year the governments environmental bill is expected to be read into law.

This bill, due to be followed by a white paper on environmental protection next September, establishes the concept of Integrated Pollution Control to be operated by Her Majesty's Inspectorate of Pollution. This body will assess the contribution made by a manufacturing concern to water, air and land pollution as a whole. This manufacturing concern will require HMIP authorisation to continue operations.

One of the purposes of this legislation is to allow or ease the formation of a common legislative framework for pollution control through the combined European market sometime after 1992.

This is more easily said than done since legislation governing ink manufacture is different in all countries for example the USA places strict limits of Volatile Organic Compound or VOC emissions but allows the use of lead pigments in flexo and gravure inks. Italy similarly has strict emission control legislation but uses TDI containing materials and Germany allows the use of UV diluents which have been on the SBPIM exclusion list for many years.

I could go on listing these legislative differences but these facts highlight the question.

What price ecology?

It also raises questions about the nature of any Europe wide pollution control legislation? After 1992 will we see moves by the European Commission to compile the strictest environmental and health and safety legislation of each member country into one directive?

If so are the UK ink manufacturers and packaging converters ready for such a change? To this end I wish to examine the impact of current and forthcoming UK legislation on the ink and converting industries.

COSHH

Regulations governing the 'Control of Substances Hazardous to Health' in the workplace, commonly referred to as COSHH came into force on 1 October 1989. These regulations which required employer compliance by 1 January 1990 are an extension of existing pieces of health and safety legislation and lay down the essential measures for the control of virtually all hazardous substances in the workplace.

I am sure most of you are familiar with these regulations however, I would like to outline them briefly.

In meeting COSHH regulations the employer must:

1. Determine the hazard posed by a substance.

Having determined the hazard the employer must then:

2. Assess the risk to people's health from the use of the substance in the workplace.

After hazard determination and risk assessment the employer is required to:

3. Remove the hazard or limit employee exposure.

The hazard must be removed however, this may not always be practicable and in these cases should be adequately controlled.

For certain substances, where the risk to health is through inhalation the Health and Safety Executive set occupational exposure limits. Under COSHH there are two types of exposure limit, firstly:

The maximum exposure limit or MEL. This is the maximum exposure level permitted during a time averaged 8-hour period. It must not be exceeded indeed exposure to the hazardous substance ideally should not occur but in those cases where it does then the levels of exposure should be as low as practically achievable and should not exceed the MEL.

and secondly:

Occupational exposure standards or OES limits. It is sufficient for these OES limits to ensure that the exposure level is reduced to the standard level given in HSE guidelines.

Given that the employer has removed or established effective controls for the use of a hazardous substance it then becomes necessary to:

4. Maintain and test control methods.

The provision of control measures in itself is not sufficient. The employer and employee in their own interests must ensure that they are properly applied. COSHH places specific obligations on the employer to ensure that all control measures are effective and efficient, and they can do this by:

5. Monitoring specific employee exposure and providing health surveillance.

and by thoroughly

6. Training and informing their employees.

In considering the effects of these regulations on the ink maker then one must also consider general health and safety legislation and to do this I feel it would be beneficial to consider the formulation of an ink.

An ink can be said to be made up from the four following components:

1. Pigment
2. Resin binder
3. Additives
4. Solvent

I would like to consider the impact of these regulations on each of these components in turn.

Pigments

One area of concern has been pigments containing certain heavy metals for example cadmium and lead based pigments. These are no longer used in the UK within flexo and gravure ink formulations.

Binders

The most notable legislation governing binders is that which limits the use of formaldehyde containing coatings and resins which evolve excessive levels of formaldehyde on curing or processing.

Controls in other areas governing for example the storage of NC or alternatively the use of isocyanates in coatings and adhesives for the UK both appear to be working well and no further legislation appears imminent.

Additives

Additives for ink use such as waxes, adhesion promoters or release agents cover wide ranging areas and I would like to highlight a number of areas of current concern.

1. Plasticisers

In recent years we have seen the withdrawal of certain plasticisers used in food wrap cling film. Their withdrawal resulted from concern over the migratory aptitude of such plasticisers. It is possible that such concern could have a

marked effect on the ink manufacturing industry.

2. Cross linking agents

Many end use specifications require exceptional performance from the ink coating. In a number of cases this may require the use of a cross linking agent which can chemically bind discrete polymer units together to form a 'superlattice" with improved resistance properties. However, there is concern over some of the cross linking agents used. These agents are very reactive materials and can react with chemicals present within cells in the body with potentially harmful effects.

3. Mineral Hydrocarbons

Within the last year we have seen considerable concern over the use of mineral hydrocarbons as food additives. This was translated by the consumer into fears over the use of hydrocarbons, for example solvents, waxes or antifoams within ink formulations. However, inks are not food additives though it serves to highlight the potential impact of allied legislation on the ink industry.

And finally we come to the largest component of a solvent based ink namely:

4. Solvent

The forthcoming environmental bill on being passed into law will have an unprecedented effect on solvent usage for both the ink manufacturer and packaging converter.

One element of the wide ranging bill is concerned with reducing the levels of volatile organic compounds (VOC's) emitted by various industries into the environment and the best practicable means of achieving this. Such legislation will bring us into line with the USA, Germany, Italy and the Scandanavian countries all of which have strict VOC emission control legislation in place.

This legislation will be overseen by Her Majesty's Inspectorate of Pollution, who, in consultation with representatives of the printing industries, have drawn up draft regulations governing atmospheric emissions from printing concerns.

The regulations will apply to any converter using more than 20 tons of solvent annually and will require them, using the best practicable means to:

1. Ensure all emissions are free or essentially free from persistent mists, droplets or fumes.
2. That the emissions are colourless and practically odourless as detected at ground level in the vicinity of the emission.
3. That the concentrations of organic substances, measured as carbon do not exceed.

Aromatic solvent	100 mgm^{-3}
Aliphatic and other solvents	150 mgm^{-3}
Alcohols from water-based inks	250 mgm^{-3}

Notably, in the case of alcohols emitted in the printing of water-based inks the VOC limits are increased to 250 mgm^{-3}.

According to the Flexible Packaging Association it is estimated that 26 representative member companies of the FPA exhausted 26,000 tons of solvent to the atmosphere alone. Therefore serious reductions in the levels of solvents emitted by the printer or packaging converter will be necessary to meet the proposed limits.

Assuming no move in current ink and printing technology then the converter has two options if he is to comply with these limits. He can employ:

1. Solvent incineration

This is the most acceptable solution from a technical viewpoint. However, the cost is disturbing. Figures supplied by the FPA estimate that a move to solvent incineration allowing for initial investment, running costs and depreciation will cost £20.3 million per annum for all of its members. This is approximately equivalent to 4% of all the members' combined annual turnover. Therefore this solution does not appear feasible on economic grounds.

One must also take account of future possible legislation to limit carbon dioxide emissions as a move to reduce the threat of global warming. Solvent incineration would result in increased emissions of carbon dioxide consequently the use of such a method to reduce solvent emission levels although expedient in the short term could very well prove to be financially and ecologically expensive in the long term.

The second option is that of:

2. Solvent recovery

This option presents a number of problems principally due to the requirements of the printing process namely:

a) Solvent concentration

Large volumes of air are used in drying the print making it necessary to concentrate the solvent before recovery. Such solvent concentration can lead to risks of explosion. It also makes it necessary to remove the water, originally present in the air used for drying the print, from the recovered solvent. The second problem is that of:

b) Mixed solvent

Using typically unmodified solvent based inks such a process would lead to the recovery of mixed solvent. These mixed solvents could prove difficult to re-use resulting in the generation of large surpluses of such materials. These solvents would either have to be dumped incurring high waste charges or separated into the constituent components. However, the practicality of such solvent recovery — solvent separation systems remains doubtful.

One method of addressing this problem would be the adoption of single solvent ink system. In Italy where the majority of liquid ink printing uses the gravure process and where VOC legislation is already in place they have seen the move to single ester based solvent systems in order to facilitate solvent recovery.

Such a move in the UK is improbable as:

1. Flexography is still widely used.
2. It places considerable constraints on ink formulation.
3. Higher potential for odour and taint particularly with coated films.

However, converters have a third option in any moves to reduce solvent emissions. They may consider the use of new or developing technologies and I would like to devote the remainder of my paper to consider three particular areas, firstly:

High Solids Coatings

These are based on low molecular weight binders. However, the viscosity of these binders and inks based on these materials are considerably higher than a typical flexo or gravure ink. The viscosity of such systems can be lowered to the correct application viscosity by employing heated ink ducts. Similar techniques are used to apply solventless adhesives. The USA has dabbled with this technology however they have only minor experience with pigmented vehicles, and experience of such systems in the UK is even more limited.

Radiation cured flexo and gravure inks

Radiation curing provides one of the means to move away from solvent based inks. These systems rely on radiation either from an ultra-violet source or electron beam gun to initiate polymerisation of the applied coating.

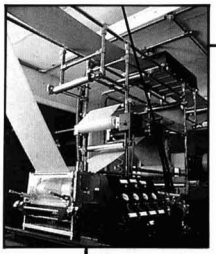
Allied Colloids

Coatings & Specialities Division

Allied Colloids

For over fifty years Allied Colloids has been dedicated to manufacturing speciality polymers for a wide range of industries. A commitment to quality and safety has transformed this major independent British company into a multi-million pound organisation with activities world wide.

An increasing involvement with surface coatings and consumer industries has led to the formation of the new Coatings and Specialities Division.



Adhesives

One of the world's largest producers of pre-paste adhesives for wallcoverings, Allied Colloids is supplying its COLLAFIX range of non-aqueous dispersion adhesives to wallcovering manufacturers in many countries. These single stage application products offer many advantages to the producer and possess the paste characteristics desired by the end user. Our specialists can advise on selection of the appropriate Collafix grade to suit your requirements.

Paints and Coatings

Allied Colloids' reputation as a supplier of additives for water-based paints is second to none. These "essential ingredients" include:-

DISPEX	—	Dispersing agents for pigments and fillers
VISCALEX	—	Alkali soluble thickening agents
RHEOVIS	—	Associative acrylic thickeners
GLASCOL	—	Film enhancing polymers

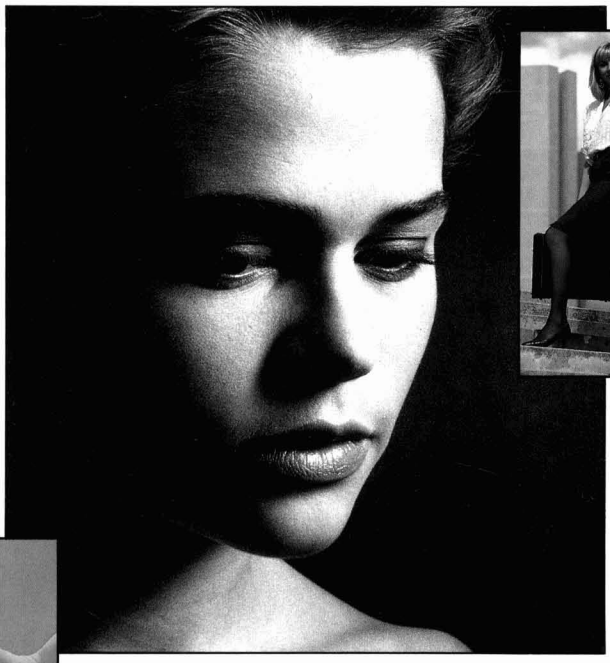
Many years experience of the paint industry coupled with continuing research into new polymers and additives have resulted in Allied Colloids products for emulsion paints being used by major paint companies all over the world.

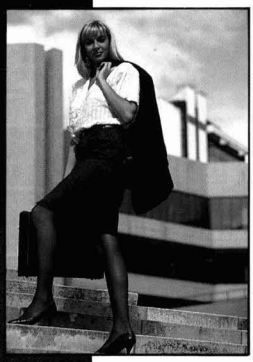
Personal Care Products

The highest level of quality control together with rigorous safety checks in the laboratories ensure that Allied Colloids SALSORB and SALCARE ranges are truly the products of "Caring Chemistry".

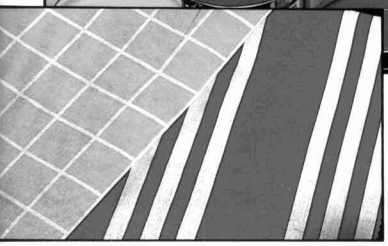
SALSORB is a highly effective range of super-absorbent polymers that can be incorporated into a wide variety of hygienic disposables including diapers, feminine care products, incontinence pads and draw sheets for hospital beds.

SALCARE products are a new range of body friendly synthetic polymers that will enhance the performance of skin creams, hair conditioners and cleansing gels or foams.



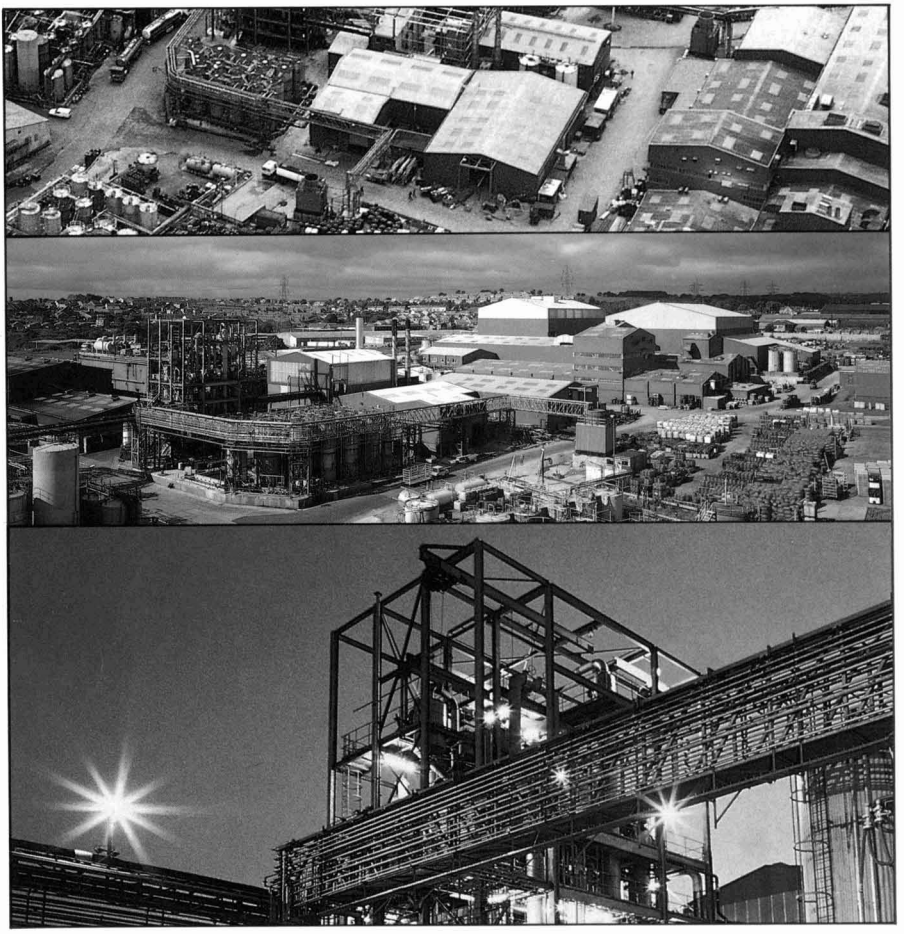


CARING · CHEMISTRY



Inks and Lacquers

An increasing world-wide emphasis on the reduction of harmful solvent vapour emissions has led to Allied Colloids GLASCOL range of aqueous emulsion polymers being extended to include not only cost effective binders for inks onto corrugated board and kraft paper but also new high gloss and heat resistant polymers for inks on to non-porous surfaces such as plastic films and metal foils and more recently the introduction of hard clear and glossy polymers for water-based overprint varnishes.



HEAD OFFICE:

Allied Colloids Limited, P.O. Box 38, Low Moor, Bradford, West Yorkshire BD12 0JZ. Tel: (0274) 671267 Telex: 51646 Fax: (0274) 606499

The coating as formulated for lithographic application typically consists of: Pigment, Oligomer, Diluent, Photoinitiator and Additives.

The diluents normally used in radiation cured inks are higher in viscosity than a normal flexo or gravure ink, thus a true diluent in the form of a monomer is necessary. The use of a monomer diluent can be the basis for a number of problems when considering the concept of radiation cured inks on flexible packaging substrates. These problems are:

1. Cure rate

In achieving low viscosities by the addition of a curing solvent i.e. monomer with its much lower molecular weight, the cure rate is considerably reduced.

2. Crosslinking

The presence of monomer leads to a reduced degree of cross-linking and increases the possibility of monomer remaining uncured and trapped in the ink or varnish.

3. Odour and taint

The uncured and trapped monomer will give rise to odour and taint problems.

4. Toxicity and handling problems

Handling and toxicity of the reduced ink because of the presence of monomer becomes a cause for concern.

5. Rheology

Ink flow out is often inferior to conventional flexo or gravure inks.

Although there are problems I believe considerable effort is being devoted to the development of radiation cured inks for use on flexible packaging substrates. Perhaps one area of development could be that of water-based radiation cured systems.

The use of water as a diluent in these systems could reduce handling and toxicity problems; reduce the potential for odour and taint and meet VOC emission limits. However, extra drying facilities may be necessary to remove the extra water.

The third area for development is that of:

Water-based Ink

What is meant by the term water-based ink?

Well in Europe the consensus of opinion appears to be that water-based inks should contain less than 20% solvent, this solvent being either an alcohol or alcohol/glycol mixture. The ink should be single component and it should be dilutable with water.

Contrary to this implication water-based inks are not new. Gloss and rub resistant water-based inks, for the flexo printing of absorbant stock, have been used to a limited extent in production in place of solvent based inks. Water-based inks for half-tone work are also available as are heat and scuff resistant inks for pre-print work.

However, the largest usage to date for water-based inks has been seen in areas where the technical specification is uncompromised for example cheap and cheerful inks for the printing of paper sack and cardboard boxes.

Unlike solvent based inks the technology behind water-based inks is still in its infancy. However, the advent of VOC emission limits and changing consumer demand may require this technology to 'grow up' very quickly.

As indicated previously the only areas of substantial market penetration for water-based inks are those which have required the printing of absorbant stock such as Kraft.

Therefore the lack of water-based inks suitable for the printing of non-absorbant stock offers the greatest scope for development. Possible areas for water-based ink development are:

Inks for foil

There are a wide range of solvent-based inks and lacquers currently used on foil such as tinted or clear lacquers, heat seal or heat resist lacquers. Inks with 'high' transparency and low odour or inks possessing high scuff resistant properties for embossing. Water-based systems offering similar properties will need to be developed.

Inks for film

This area will present major developmental challenges to the ink maker. This is due in part to the wide range of substrates available to the converter such as polyethylene, polypropylene or polyester and also the end-use requirements or specification. For example the inks may be required to have high gloss, good heat resistance, good deep freeze or water resistance be suitable for lamination or able to accept a PvdC coating.

The development of such inks will require a great deal of effort on the part of the ink manufacturers but I believe we are ready and willing to meet these challenges.

However, no printer or converter should assume that they can immediately replace solvent based inks in their ducts with water-based systems.

These systems are inherently different and as such differ in their physical properties. I would now like to highlight some of the difficulties that may be experienced with water based inks that rely on current ink and printing technology.

1. Slow drying

Water is a slow solvent in comparison with organic solvents. This is due to its high latent heat of evaporation. It takes 970 BTU's to evaporate 0.5Kg of water compared to 367 BTU's for 0.5Kg of ethanol. Therefore water-based inks will dry more slowly than solvent-based inks under normal conditions of printing particularly on non-absorbant substrates.

To compensate for this slow drying rate up to 20% of solvent typically ethanol or isopropanol can be added to the water-based ink while at press viscosity.

It is also possible to assist the drying speed of water- based inks by printing a thinner film since drying rate is proportional to the square of film thickness. Thus if the ink film thickness is halved it dries four times as quickly.

High velocity hot air ovens may also be used to minimise the heat energy required to dry water-based inks.

The printing of thinner ink films to aid drying rate will result in the need for increased pigmentation to give the same colour strength at lower film weight and consequently a higher price per kilo.

Lower film weights will also lead to reduced gloss levels for surface printed inks.

2. Economy

Water-based inks can arguably prove more expensive than some solvent based inks due to the limited number of quality water based resins and pigments available. This is reflected in the premium prices charged for such materials.

3. Substrate

Water-based inks are relatively well established in the printing of absorbent stock. They have yet to make an impression in the market for the printing of non-absorbent substrates.

This non-absorbency can have a profound effect on printability primarily due to the difference in surface tension between water and organic solvents.

Surface tension	Dyne/cm 20°C
Water	72.6
Methyl Ethyl Ketone	24.6
Ethyl acetate	23.9
Ethanol	22.0
Isopropanol	21.4

Looking down the list it can be seen that as we go down the surface tension decreases.

This means that water-based systems are more senstitive to surface energy differences and additives present on the substrate, stereos or ink distribution system.

There are three different approaches to reduce surface tension and improve wetability namely:

1. Addition of surfactants
2. Replacement of water with miscible solvent
3. Increasing ink viscosity

As with most things each of these methods of reducing surface tension have their pros and cons and the method used should be determined on the basis of prevailing conditions.

4. Product resistance

Solvent systems have developed over the years to meet most print requirements such as gloss, heat resistance, water resistance or suitability for lamination.

In any change to water-based inks it will be necessary to aim to have the same print properties. If this cannot be achieved compromises may have to be made such as changes in print design or packaging changes.

5. Colour matching

Some pigments are unstable in water-based systems for example iron blue pigments and some lithol rubine pigments. So there will be instances where exact shade matching as compared to solvent systems cannot be made.

6. Disposal

The fact that water-based inks use water as a diluent does not mean that waste ink can be simply disposed of by dumping it into the drainage system. Indeed the fact that they are based on water may make disposal harder since higher incineration temperatures may be needed.

7. Low retained solvent/odour

Water-based inks contain lower levels of solvent in comparison with solvent based inks. Consequently on drying a water-based ink will have lower residual solvent levels and associated odours. This does not mean that the ink will be without odour as the volatile amines used to impart solubility to the resins and the resins themselves could contribute to the odour.

8. Low fire hazard

Water-based inks can be flammable depending upon the solvent content but in general the flash point is significantly higher than solvent based inks. Indeed those inks containing less than 10% alcohol are generally considered to present no fire hazard.

This could lead to potential economies for the converter by giving him the option of whether or not to flameproof his presses and ancillary equipment. It may also lower his fire insurance premiums.

9. Press behaviour

The rate of evaporation of water in comparison to an organic solvent such as ethanol, from the ink duct is minimal. Nevertheless, water-based inks can show some instability on the press leading to print problems. This arises primarily through the loss of the volatile amine which is present to aid solubilisation of the resin.

The printing characteristics of water-based inks in comparison with solvent based inks may also differ significantly and careful attentionm should be paid to cell structure, cell depth, screen gauge, blade angle or impression levels in fact any factor that may affect ink flow out characteristics on flexo or gravure presses.

10. Press design

In some instances it has been known for water-based inks to cause rusting of the press and doctor blades. This is a problem of press design since it is well-known that an aqueous system of either high or low pH in contact with 2 different metals constitutes a galvanic cell promoting chemical oxidation.

11. Versatility

Water-based resin systems appear less versatile for end use purposes than certain solvent based resins for example nitrocellulose. This may require the converter to hold a greater range of inks in stock when committed to a water based system. Press returns also pose a problem for unlike solvent based press returns, water-based press returns cannot be stored and used at a later date due to their higher tendency to settle out.

12. Wash-up

Water-based resins as mentioned previously depend on the presence of volatile amines for solubility. Water-based inks dried in the cells or etches, unlike dried solvent systems which can be redissolved by solvent are required to be converted by alkalis into soaps possibly in combination with solvent to ensure removal.

Conclusion

Of these three developing technologies water-base looks set to take the lead and once VOC emission limits are in place, if American experiences are followed, then we may see converters move en masse to water-based systems.

I would like to end my paper here but in conclusion I would like to say that the early 1990's look set to become the years of change and development for the ink manufacturing and printing industries.

I hope these will be the years where it is shown that the ink and printing industries can make a profit and still protect the environment ■

Paper presented at the OCCA/SBPIM Symposium, "Printing Inks for the 90's", 22 March 1990, Birmingham.

The Control of Substances Hazardous to Health

by M. J. C. Hewson, British Textile Technology Group, Shirley Towers, Didsbury, Manchester M20 8RX, UK

Abstract

The COSHH regulations represent a major change in health and safety legislation which will affect all those who are involved in the storage, handling, processing and disposal of any substances deemed to be hazardous to health. It is hoped that by their implementation, in conjunction with good practical housekeeping and personal hygiene, that the long term health of all employees will be assured.

Introduction

The Control of Substances Hazardous to Health Regulations are an attempt to unify health and safety into one unified code and covers many of the points already contained in the Health and Safety at Work Act of 1974. COSHH consists of a series of regulations setting achievable objectives with accompanying Codes of Practice giving practical advice and the areas covered include:

- ▷ Health risk assessments
- ▷ Environmental monitoring
- ▷ Maximum airborne concentrations of listed compounds
- ▷ Health monitoring of employees
- ▷ Testing of equipment
- ▷ Instruction, training and supply of information
- ▷ Record keeping

Apart from Health Risk Assessments and Record Keeping all other areas were covered by the HASAWA 1974 although they were perhaps never clearly defined. Therefore, some form of monitoring, exposure control and health surveillance may already have been carried out.

The Control of Substances Hazardous to Health Regulations (COSHH) were introduced in 1988 and came into force on the 1st October 1989 for new processes with a three month interim period allowed for existing processes until the 1st January 1990. COSHH is here to stay and we must all comply, however, it is fair to say that the Health and Safety Executive will not be enforcing the regulations too strictly during the course of the first year providing that companies can show a reasonable degree of progress.

The proposed legislation at present is made up of 19 Regulations, nine Schedules and four Accompanying Codes of Practice and whilst the initial inclination would be to embark on a random voyage of discovery, reading the documentation from cover to cover this is not the recommended approach. The various documents can be reduced to what are seven basic principles:

1. *Assessment of Risks* – from exposure to all substances must be initially considered reviewing their potential hazardous nature and bearing in mind that one should be assessing the conditions under which each substance is used rather than the substance per se. (Reg 6)
2. *Prevention or Control of Exposure* – which may result as a consequence of the recognised risk. (Reg 7)
3. *Application of Control Measures* – needed to reduce the exposure likely to occur if risks are significant. (Reg 8)
4. *Maintenance of Control Measures* – if they are to be effective in reducing the possible exposures. (Reg 9)
5. *Monitoring Exposure at the Workplace* – in order to establish the personal exposure levels, general workroom atmospheric levels and the efficacy of control measures. (Reg 10)
6. *Health Surveillance* – which may be required in certain circumstances to establish as early as possible any medical problems associated with an employee's industrial exposure to hazardous substances. (Reg 11)
7. *Education* – requiring everyone to be informed about the nature of the materials they are handling, what precautions are necessary, emergency procedures and the accepted disposal methods. (Reg 12)

A thorough understanding of these seven basic principles will ensure that COSHH is easier to comply with than might be initially expected and in conjunction with *Record Keeping* the task should not be an onerous one. It is hoped that COSHH will become an integral part of every company policy on health and safety and be considered within future corporate planning rather than as an irritating appendage.

Therefore, in any future planning of new processes involving the use of chemicals or any material which may be deemed hazardous the following points must be considered:

☐ No work may be engaged upon which could result in excessive exposure without a full *Assessment* having been carried out.

☐ An in-house competent person or someone from an outside organisation should be delegated to carry out the *Assessments*. The HSE do not define what a competent person is, but, clearly, he or she must be appropriately qualified to undertake the work. Whilst individual companies may wish to retain the services of an outside organisation ultimately the employer will have to support and abide by the findings of the assessments and can only understand the consequences if personally involved in carrying out the work. Clearly, when in-house expertise is missing then outside expertise in one form or another will be essential.

☐ An *Assessment* can only be deemed acceptable if *All* substances hazardous to health are identified. One must, however, bear in mind that the nature of the hazard changes with respect to how the substance is being handled or processed, for the most toxic of chemicals if tightly sealed in a container will present no hazard, whereas common salt which on face value may be considered safe may present a great hazard if allowed to react with for example oxidising agents.

☐ All *Assessments* of applications and processes must lead to judgements being made about the possible risks. Once identified remedial action needs to be taken.

☐ *Assessments* should lead to the necessary steps being taken to achieve *Control* of exposure. Each individual case will require the use of the appropriate type of equipment.

Practical application of COSHH

It is expected that each individual assessment will require more than one visit to the workplace, an initial overview followed by a more extensive inspection. However, it is true to say that a substances individual application will determine the time spent in completing such an assessment. The solvent contained in a typist's correction fluid, 1,1,1-trichloroethane, must be assessed, however, the frequency with which this material is used in the secretarial environment is such that

excessive atmospheric levels of 1,1,1-trichloroethane will not be reached and any formal assessment will within a few minutes come to this conclusion. On the other hand if the same solvent is to be used in a large plant operation necessitating many litres then a much more formal assessment of many hours' duration will be required. Within each organisation one member of staff must coordinate all the activities even when outside consultants are being used. It should not be considered as a one man job and, therefore, an assessment panel should be organised made up of, for example, a production manager, the works chemist, the works engineer, a toxicologist and anyone else who can contribute. If needs be an outside consultant may also be included. Time to achieve the COSHH objectives must be allocated along with the necessary resources to undertake the practical requirements.

The basic assessment

A simple approach to a basic assessment would consider the following points:

☐ Identification of all materials in the workplace which contain substances which can be deemed to be hazardous to health. It is worth bearing in mind that this is a good opportunity to rationalise the presence of certain materials within each individual workroom and decide which can be disposed of before the assessment commences. Note, however, that disposal must be by an approved method.

☐ Gather all available information about these substances which your company uses. Normally this information is in the form of a Material Safety Data Sheet supplied by chemical and dyestuff manufacturers. However, it is true to say that some are better than others and many leave a lot to be desired. Additional information may be obtained from the Health and Safety Executive, Trade Associations, Research Organisations, etc. It is this information which will allow you to decide whether a full scale formal assessment is really necessary.

☐ Consider each individual work process according to where and how each individual substance is being applied. In the end analysis you will be assessing how that material is being used and not what it is.

☐ Collate any data you may already have on workforce personal or plant monitoring giving an idea on exposure levels.

☐ Is any form of health surveillance being carried out? In the vast majority of cases this will not be necessary, however, at this stage employers may wish to offer the choice of regular voluntary medical examinations. Guidance on how to arrange medical supervision can be obtained from the Employment Medical Advisory Service (EMAS), the medical section of the HSE.

☐ An in-depth inspection of the workplace may then follow taking into consideration all factors which could influence both health and safety.

☐ Identification of all personnel at each stage of the processing who may directly or indirectly come into contact with hazardous materials. This would include maintenance staff, cleaners and visitors who all need to know the risks associated with the substances being processed.

☐ Note all the existing control measures and test their effectiveness. This implies regular testing of e.g. local exhaust ventilation, general ventilation, etc. They must be shown to be hindering the build up of excessive atmospheric levels of undesirable fumes.

☐ The potential exposure levels must be assessed under normal use and if possible, without endangering personnel, under foreseeable misuse. Individual experience together with published information may be sufficient to make valid conclusions.

☐ There may be the necessity for additional information such as extensive monitoring, testing of ventilation and the introduction of medicals.

☐ On completion of all the above the results of any assessment must be kept in the form of written *Records*. The HSE do not stipulate how the records should be kept. However, in order to reduce to a minimum the work that is required the use of a company's existing records adequately supplemented may suffice.

The more complex assessment

Following this basic assessment a more complex assessment may be needed and additional information may include:

☐ Toxicological data giving dose response relationships and Occupational Exposure Limits which are published annually as Guidance Note EH/40 by the HSE and divided into Maximum Exposure levels which should not be exceeded and Occupational Exposure Standards which are recommended levels and it is expected that they will not be exceeded during normal working practices.

☐ Consideration of process factors which may influence substances making them more hazardous. For example, a small beaker of caustic soda solution at room temperature is in itself a hazard leading to skin irritation problems on direct contact. However, raise the temperature of the same solution and the hazard is considerably greater, the solution causing immediate and severe burns. The same material under different conditions results in enhanced risks.

☐ Review the problems of possible workforce hypersensitivity, respiratory problems or personal habits which can exacerbate exposure. Employees can become sensitised to materials such as isocyanates, formaldehyde, etc. Respiratory problems can occur after excessive exposure to dusts, organic solvents, fibrous materials, etc. Personal habits can cause serious problems which are easily avoided. In simple terms do not eat, drink or smoke in any area where chemicals are stored, handled, processed or disposed of. In addition, remove dirty overalls, labcoats, etc., before exiting workrooms and entering dining areas. The dirt carried on such articles of clothing can be inadvertently transferred to foodstuffs. Importantly, one should also remember to wash one's hands before going to the toilet as well as afterwards and certainly before applying cosmetics.

☐ A more comprehensive site survey may be necessary requiring a more detailed analysis of the extent of employee exposure and the efficacy of the installed control measures. A full understanding of the working operation will lead to a better understanding of the health and safety needs.

☐ Expert evaluation and testing of all control measures. Efficiency of ventilation/exhaust systems must be checked at least once every 14 months and atmospheric monitoring conducted to ensure that exposure levels are and remain at acceptable levels. The installation of control measures with efficient exhausting cannot be relied upon to preserve long term health and safety if workroom atmospheres are not analysed.

☐ Air sampling will be required in certain instances to monitor for any changes in working conditions which may not be readily identifiable. Personal sampling is the recommended technique although area sampling can be of value and may be required to warn of impending problems.

☐ Special factors may lead to the necessity of health surveillance with prescribed regular medical checks. There may also be a case for pre-employment screening to ascertain a base level.

Key Points

In understanding COSHH and its implications the following key points may lead to a better understanding:

▷ *Recognise* the hazards within your factory.

▷ *Evaluate* the risks posed by possible exposures.

▷ *Control* the exposure levels thus reducing the risks.

▷ *Monitor* Personnel, workrooms and exhaust systems.

▷ *Train* employees to understand the full implications.

However, in evaluating individual substances prior to making the full assessments take the following course of action:

Firstly, *Eliminate* all toxic and hazardous materials. Secondly, it this fails *Substitute* for less harmful materials. Thirdly, if this fails *Control* the possible exposures to as low a level as is reasonably practicable. Fourthly, and finally, if this fails *Protect* your workforce from exposure using the correct type of personal protective equipment (PPE). It must be noted at this stage that the first priority has to be the control of any exposure by means other than the use of PPE, so far as is reasonably practicable. PPE can, however, be used either to supplement other methods, as a temporary measure whilst repairs are being undertaken or when a genuine case can be made to show that other control measures are not reasonably practicable. The employer must, however, be able to prove this point.

Health is the top priority and it concerns us all not only with respect to the regulations but also how we as individuals go about our everyday activities affecting not only our own health but also that of our colleagues.

Checklist for workplace inspection

It is, or should be, everyone's duty to make sure that what they undertake does not only adversely affect their own long term health but also that of their fellow employees, and a good practical approach to this is highlighted in this checklist which ideally should come as second nature to anyone seriously concerned with health and safety. Whilst a number of the points raised here do not directly relate to the COSHH regulations they are implied and any successful health and safety regime built around the new regulations must start with each individual employee's personal attitude to the subject.

☐ Check that the workplace is operating normally before commencing any operation involving hazardous materials or machinery.

☐ Look for evidence of any contamination and clear it away before proceeding.

☐ Are the personal facilities adequate, i.e. washing, toilets, showers and dining.

☐ Review your own individual working practices. Do you wear protective garments, safety goggles? Do not eat, drink or smoke in workroom areas and wash your hands regularly and especially before going to the toilet. Do you handle and dispense chemicals safely?

☐ Are all the appropriate ventilation systems in your working area functioning correctly?

☐ Check personal protective equipment, it must be well maintained and stored where it will not become contaminated as such contamination may be more hazardous than the substance from which the equipment is supposed to protect you.

☐ Are all materials stored in a safe manner and in such a way that they present no risk? Try not to retain chemicals in workplace areas if they are not required.

☐ Are all working procedures strictly adhered to. It is hoped that they have been so designed that they present the minimum of risks to all personnel. Are they the correct ones or do they need serious revision? Does your company have written procedures?

☐ Check that cleaning facilities are suitable for the materials handled and that the correct procedures will be followed when disposal is necessary.

☐ Do you have the correct emergency facilities and established procedures for evacuations?

Substances hazardous to health

You may be asking yourselves at this stage what one should be considering as hazardous. In many cases this is clearly defined, however, bearing in mind that a hazard is related to how the substance is handled the following categories are defined.

☐ All single chemicals or mixtures as labelled under the CPL regulations.

☐ All exposure controlled chemicals as listed in Guidance Note EH/40 published by the Health and Safety Executive.

☐ All micro-organisms.

☐ All materials which can through processing produce dusts.

☐ All materials which can produce an allergenic response.

☐ All substances which have long term, chronic, health effects, e.g. carcinogenic, teratogenic or mutagenic.

☐ Any substance which when used during any given process might be deemed to be hazardous. This is the "catch all" part of COSHH and becomes important as one must assess the risks associated with individual processes and the combinations of chemicals likely to be used.

In considering each individual substance which may be hazardous to health one must take into consideration various factors:

☐ The different physical forms a substance can take, gaseous, liquid or solid as each form presents its own particular hazard.

☐ Beware of impurities which can present a much greater hazard than the main constituent, e.g. the presence of dioxins in some consumer products.

☐ The fibrous nature of the substance. Asbestos fibres are far more hazardous than the same material in the fused form.

☐ Substances known to cause problems. Cotton dust and byssinosis; oils and greases and skin irritation, isocyanates and hypersensitivity.

☐ Combined or sequential exposures. The exposure risk from a mixture of two substances may be greater than the effects experienced from the individual materials on their own.

☐ Epidemiological data. This attempts to relate the exposure of people to hazardous materials over many years with the occurrence of illnesses and making comparisons with an equal number of the population who have never been exposed to the same hazardous substances. The importance of this lies in the fact that valid judgements can be made about exposing the future workforce to the same levels. The information from such epidemiological surveys can be used to improve working conditions, indicate that long term health problems may not occur or show that a substance should be banned or at least access severely restricted. Thus one should realise the necessity of having to keep records and why such information should be retained for at least 30 years.

☐ Unless otherwise indicated for any process which produces atmospheric dust the levels shouldnot exceed 10 mg/m^3 total inhalable dust and 5 mg/m^3 respirable dust.

Questions you may ask related to the implementation of COSHH

At this point you may very well have a number of questions

and identified problems which need addressing:

What is the purpose of COSHH? – To protect employees resulting from valid decisions having been made about the working environment.

Which personnel should be involved? – Yourselves, i.e. the whole workforce with the assistance of an outside competent person if internal expertise is lacking.

What needs to be considered? – All substances, the effects those substances may have, where they are likely to be found and what exposure may result.

How much work will be required? – This will depend on the nature of the risk, knowledge of previous experiences, conclusions you can make on existing control measures and the validity of existing records.

What hazardous substances are present? – They can be in many forms, gases, liquids or solids; present in storage, processing or handling areas as the product, and as waste material or spillages.

How do I recognise a hazardous substance? – From knowledge, your own experience and from information obtained from outside organisations.

In what way are these substances hazardous? – Three distinct routes are possible, i.e. inhalation through the respiratory tract, ingestion through the mouth and absorption through the skin.

What are the likely health effects? – These can be of an acute nature resulting in immediately obvious problems or of a chronic nature resulting in long term problems, e.g. carcinogens, pathogens and allergens.

What is the potential for harm? – This should become apparent from the information collected and the advice taken.

What is the chance of exposure occurring? – This will depend on the information available and the prevailing working practices. Contamination can result through direct work, indirect work, in storage areas, by handling, accidentally, on entering enclosed spaces, from surface deposits, from contaminated clothing or PPE and via personal contact.

Who could be exposed? – Production staff, support staff, contractors, visitors, supervisors, management, administrative staff, maintenance, etc. In reality anyone having legitimate access to the working areas.

How often is exposure likely to occur? – This will depend on your knowledge of the prevailing conditions in routine and non-routine situations, the level of training given, the relevant information and the reliability of your control measures.

How much exposure will be experienced? — to establish this there may be the need for personal as well as area monitoring and health surveillance which may be mandatory under certain circumstances.

What are the legal consequences? – In reaching your conclusions you must decide whether the risks are negligible or significant and react accordingly. The ultimate responsibility is a dual one between both employer and employee and any legal actions will in future be based on a possible breach of statutory regulations rather than negligence.

Summary

It is hoped COSHH will not become a burden to industry but rather an integral part of company planning. Whilst the first impression may be one of fear and despair one can summarise it all fairly simply in the following manner.

1. List all substances recognised as being hazardous to health, know what they are and collect all the relevant Material Safety Data Sheets.
2. Relate all the substances to the workforce.
3. Relate all the substances to the individual processes.
4. Relate any monitoring of the workroom atmospheres to the processing and the individual operators.
5. Relate medical surveillance to the individual employee on a given process and hence to the specific substances.
6. Record everything such that a link is established between *Substance, Process, Individual, Monitoring, Control Measure, Medical Condition.*

This, therefore, forms the basis of the *Assessment.* The risks are assessed and the necessary changes are made to ensure the long term health of the workforce.

Conclusion

In the final analysis long term Health and Safety at Work is a combination of common sense, good housekeeping and personal hygiene. COSHH is an attempt to formalise this approach and make everyone think more deliberately about health. In any training programme it is important to motivate people to help themselves and staff should be encouraged at all times. Lead by example and other employees will adopt your ideas. The last option would be to ignore COSHH, however, the consequences of this approach do not bear consideration and you may as a result feel the full weight of the Health and Safety Executive's cosh. ■

Earnshaw, K., continued from p.302

Conclusion

Photoacoustics is a technique which lends itself to a wide range of monitoring activities, not solely health and safety monitoring. Within the health and safety field photoacoustics provides a detection system with the flexibility to measure a variety of gases and vapours. Its use in ventilation measurements can provide valuable data on workplace exposure. ■

Solvent measurement using microphones for Health & Safety

by K. Earnshaw, Bruel and Kjaer (UK) Ltd, 86 East Road,
Longsight Manchester M12 5GY, UK.

Abstract

Using a technique discovered in the 19th Century it is possible to use a gas analyser which has a microphone as the detector. In common with instrumentation used for acoustic measurements an accurate determination of gas concentration over a wide dynamic range can be achieved. As well as monitoring a range of gases for occupational exposure the technique lends itself to tracer gas studies so that measurement of ventilation efficiencies of work areas and fume hoods is easily undertaken.

The photoacoustic principle

If a gas is irradiated with light in a chamber, some of the light energy is absorbed by the gas. The energy that the gas receives is then released in the form of heat and this causes a consequent rise in the pressure in the chamber. By modulating the incident light at a given frequency the pressure change is periodic at the modulation frequency of the light (Figure 1). The pressure waves produced are more commonly known as sound waves and are easily measured with a microphone.

The sound intensity from the gas varies according to the nature and concentration of the gas and also the intensity of the light irradiating the gas. The selectivity which is available is due to the gases absorbing specific wavelengths of light characteristic to their nature. The number of gases which are capable of being measured using photoacoustics is in the hundreds.

Although photoacoustics is not commonly known as a measurement technique for gas concentration the effect was discovered towards the end of the 19th Century by Alexander Bell. The problem which arose at the time of the discovery was that the only detector available was the ear and this had profound quantitative limitations. It is only with the advent of the condenser microphone that practical applications have been developed for photoacoustic spectroscopy.

Instrumentation

To measure gas concentrations in the parts per billion levels the condenser microphone is required to do a great deal of work. The temperature increase in the measurement chamber is about 10^{-8} K and this generates a pressure increase of 10^{-5} Pa. A pressure change at this level will cause a microphone deflection of 10^{-14} m. (As a comparison the diameter of an electron is approximately 10^{-14} m.)

The building blocks of a photoacoustic monitor are therefore:

(a) the chamber containing the gas sample.
(b) the light source.
(c) a method of modulating the light source.
(d) a detector for the sound.
(e) a signal processor.

If the light source does not have a restricted bandwidth then some form of optical filter is also required (Figure 2).

Production instruments have increased complexity in order to provide greater precision in analysis. By fitting two microphones opposed to each other in the measurement

Figure 1

The gas absorbs light proportional to its concentration and converts it to heat. Temperature fluctuations, as the light is chopped, generate pressure waves.

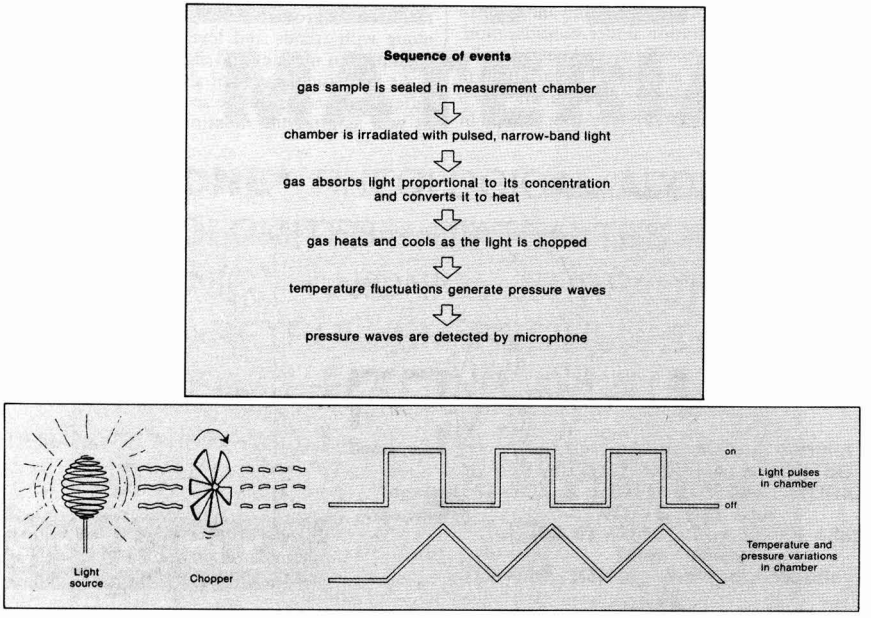
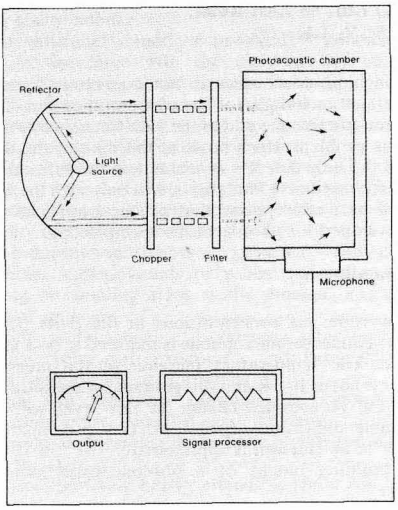


Figure 2
The essential components of a photoacoustic set-up.



chamber the signal to noise ratio is improved. With an increase in gas concentration in the chamber the two microphones are pushed away from each other while external vibrations will move the microphones in the same direction and therefore provide a net signal due to the gas concentration. A sampling system brings the gas to be measured to the measurement chamber and with a carousel wheel capable of holding several optical filters different gas concentrations in the same gas sample can be determined (Figure 3).

People familiar with infra-red techniques of gas analysis will be aware of the interference that can be caused by the presence of water vapour in a monitoring environment. Water has a strong infra-red absorption spectrum and this can boost the apparent gas concentration under consideration. Calibrations of instruments are typically carried out using dry gases and as monitoring situations are subject to variations in the humidity levels it can be difficult to ascertain whether a change in measured gas concentration is due to a change in the real gas concentration or a change in the humidity level. An optical filter can measure the water content of the environment and by knowing the effect that water has on the measurement of the gas of concern a correction can be applied to each result obtained. this ability to compensate for an interfering compound can be used to distinguish between similar organic compounds, only one of which may be giving rise for concern.

Practical measurements

When considering the practicalities of carrying out a measurement, the dynamic range of the analyser and the accuracy is very important. It can also be useful if the instrument can provide you with information on the current gas concentration below an alarm level rather than only providing concentration information when a level of concern has been reached.

Microphones are a very stable detector and the use of them for acoustic measurements has shown the wide dynamic range that they are capable of. For gas analysis the dynamic range of the instrument is five orders of magnitude, for example, from one part per million to ten per cent. The lower detection limit does vary from gas to gas as the photoacoustic technique depends upon the strength of the pressure signal that the gas produces. Some lower detection limits are:

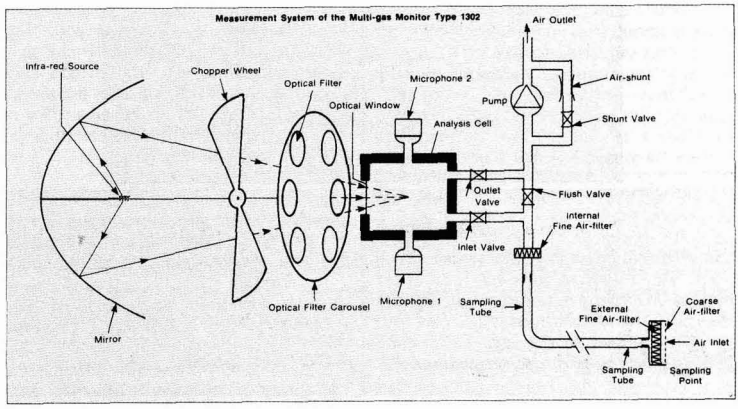
(a) n-butyl acetate	0.02 ppm
(b) carbon tetrachloride	0.01 ppm
(c) diethyl ether	0.03 ppm
(d) ethanol	0.04 ppm
(e) formaldehyde	0.06 ppm
(f) methanol	0.04 ppm
(g) toluene	0.04 ppm
(h) xylene	0.04 ppm

The zero drift is typically about the detection threshold over a period of three months. As a result of this, calibration is not generally necessary more frequently than four times per year.

A measurement regime may consist of the *in situ* sequential analysis of a working environment for several gases at a time. Data can therefore be collected on the relationships that one gas may have to another in terms of their relative production rates from a process. Peak concentrations can be ascertained along with trends and levels averaged over a period, for example ten minutes and eight hours.

As the basic data is not altered by obtaining the averages, different averages can be seen during a measurement period as well as after the monitoring has ceased and the data is

Figure 3
Measurement System of the Multi-gas Monitor type 1302.



being reviewed. If the activities carried out are likely to give rise to a great variation in the gas concentration then an analysis system which provides data on the peaks as well as the averages over a period are important.

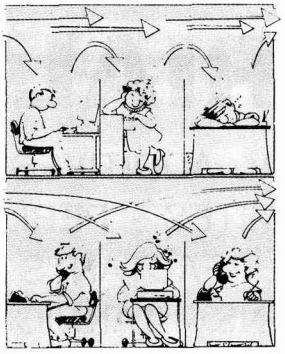
The monitor can collect a gas sample from up to fifty metres away. By using a small diameter sampling tube, and requiring only a small amount of gas for analysis, breathing zone measurements can be carried out without causing significant interference in the normal working practices or causing errors due to altering the airflows in the area. (See Photo 1).

Photo 1

The measurement of a gas concentration at a point does not provide information on the length of time that the gas is present in the area unless its production rate is known or the efficiency of the ventilation has been measured. Airflow characteristics in a working environment are important. Although an adequate supply of fresh air is provided to an area with the intent of improving air quality by removing pollutants, a poor air flow may give rise to problems (Figure 4).

Figure 4

The distribution of ventilation air in a room affects the air pollution level at each place.

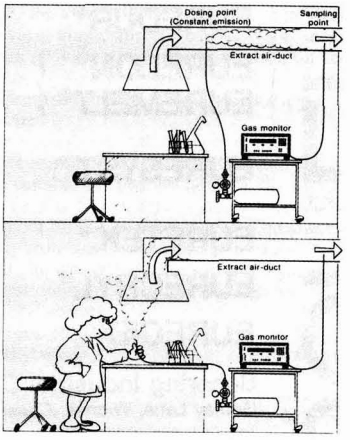


Measurements of ventilation rates can be carried out readily by using tracer gases. A tracer gas is usually a colourless, odourless, inert gas. Sulphur hexafluoride has proved to be very popular as it can be measured at very low concentrations and is not found in the ordinary environment.

Many premises have fume hoods to remove pollutants from the working environment. Using a tracer gas the efficiency of the fume hood in terms of its capture rate can be determined. The technique is to monitor initially the tracer gas concentration downstream of the fume hood by dosing the extract duct with a constant concentration. The same tracer gas concentration is then used at the operator position and the concentration monitored in the duct as before. The ratio of the gas captured by the monitor from the sample released at the operator position to that measured from gas released in the duct is the capture efficiency (Figure 5). If a series of measurements around the operator position are carried out a map of the capture efficiencies can be established.

Figure 5

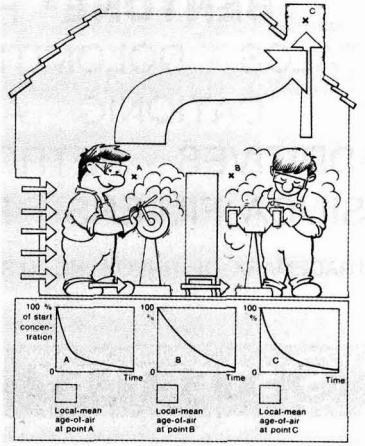
A simple method of determining the effectiveness of a fume hood using a tracer gas.



The philosophy of the fume hood can be expanded to the general working environment. Although workers may nominally receive the same fresh air and have the same level of workplace pollution removed the real situation may be different. A working environment can be dosed with a concentration of tracer gas and then the source of the gas shut off. As the fresh air introduces itself into the workplace the level of the tracer gas will decrease. If this decrease is measured at the air extract duct then the average age of air of the room can be calculated. When several points in a room are monitored areas of stagnant air can be established (Figure 6).

Figure 6

By measuring the age of air at different points in a room stagnant areas can be identified as at point B.



Continued on p.298

Perstorp Creative Base for profitable R & D

by S. Nordberg, Perstorp AB, S-28480 Perstorp, Sweden

Abstract

A company is the people involved in its activities. Unfortunately the balance sheet is incomplete as the main aim of all development, knowledge, cannot be quantified in terms of money. Knowledge requires freedom and motivation. Artificial organizations and functional limitations are inhibitors, as are all hierarchies and prestige-protecting rigidity. Perstorp has during two decades built up it's Creative Base to provide a profitable growth and renewal for the corporation.

A company is the people involved in its activities. The items in the balance sheet are merely the tools for these activities. Unfortunately, even the balance sheet is incomplete, as the main aim of all development, knowledge, cannot be quantified in terms of money. We are still caught in the accountant's rut, compelled to translate everything into monetary capital. One thing held in common by monetary capital and the capital of knowledge is that they are valuable only if they can be used meaningfully and in the proper mixtures. Those of us who enjoy gardening know that plants that get too much or too little, whether of water or fertilizer, will not bloom and certainly not bear fruit.

How, then, shall we best develop this human capital?

First and foremost, one must bear in mind that knowledge is not gained through coercion or regulation. Knowledge requires freedom and motivation. Artificial organizations and functional limitations are inhibitors, as are all hierarchies and prestige-protecting rigidity.

I would like to describe our approach at Perstorp AB, where I have been working for twenty-four years and, since joining the Corporate Management Group in 1970, I have been actively developing these very matters.

When you are sailing or running orientation in the forests, the compass is a vital aid in seeking and reaching new and unknown goals. Likewise, one must always have a "compass", i.e. a business idea, before setting out into the wilds.

The business idea of Perstorp Corporation may be summed up in the corporate motto, "CREATIVE CHEMISTRY". This motto conveys the message that we are a chemical company and that we deal with various forms of speciality chemicals, not basic chemicals. It also means that we are constantly developing.

In order to give a bit of more substance to this business idea, we have for the past 13-14 years been using a few key words, our 5 "commandments". These key words are quite simple and the formulation might even be regarded as somewhat banal. But it is precisely the simplicity of formulation that allows the message to be conveyed in many contexts, both internally and externally.

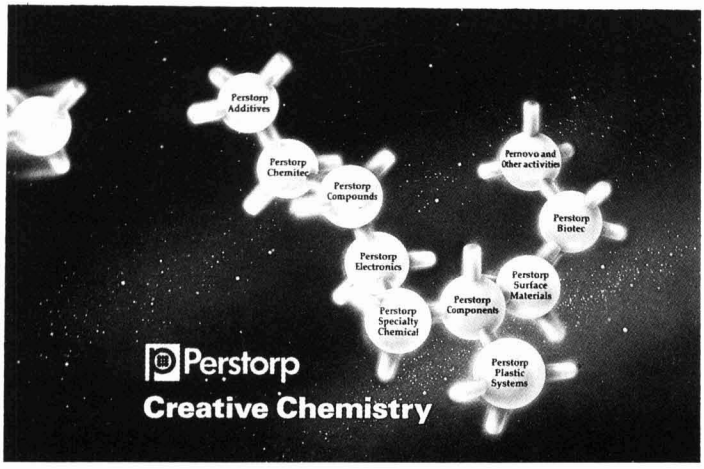
The most important aspect of these 5 "commandments" is that they will be understood and accepted by as many of our people as possible, throughout the corporation, and thus constitute the joint strategy that makes the company an active and successful chemical corporation, not merely some investment company. It is therefore also important to keep the same message for a long period of time.

The results have proven that it works and one contributing factor is the very strong "corporate culture" found in Perstorp. The company has a century-old tradition of continually finding new markets and new products by attracting creative people and giving them freedom to develop themselves and the company. The Perstorp Corporation subscribes to the traditional business philosophy of making profits by providing the market with products manufactured by the company. The only stock trading we engage in is the acquisition of companies for long-range integration in the corporation. During the latest fiscal year we acquired 6 companies.

Now let's have a look at our 5 "commandments".

NICHE ORIENTATION
We must become leaders within narrow fields.

INTERNATIONALIZATION
We must work on a worldwide basis.



DECENTRALIZATION
We must take our decisions close to the market.

FLEXIBILITY
We must have freedom of activity.

CREATIVITY
We must work for continual corporate renewal.

The first two commandments deal primarily with our products and markets, while the other three are highly personnel-orientated and contribute to liberating the human resources of all of our employees. Let's take a closer look at these commandments.

NICHE ORIENTATION is a matter of survival for Perstorp. We have total sales of SEK 6 billion, e.g. USD 1 billion, and are as international chemical company very small compared with our colleagues/competitors which are the giants Höechst, Bayer, BASF, ICI, etc. They are all many, many times bigger than us and we are unable to compete with power. We have to be very good e.g. to be at least among the top five in the world in our very narrow niches. And we are. We are number one in sales of Pentaerythritol, Trimethylolpropane, Formaldehyde processes and Amino moulding compounds. We are number three in decorative laminate and so on.

But to maintain a leadership we have to be INTERNATIONAL. Sweden with its 8 million people is a market which is too small to give any critical mass for R & D, production and marketing. We also need to be within the trade blocks with our main products. Today we have more than 50% of our employees and of our production outside Sweden in 12 countries.

DECENTRALIZATION is a process we are continually working with at the Perstorp Corporation. As a rule, each decentralization measure is met by resistance on the part of the central units that are to relinquish some of their responsibility. The arguments against decentralization are always the same: "The administration won't work. It's going to be more expensive."

Initially it is, in fact, somewhat more expensive, but efficiency has always improved. The team spirit is better in small groups and each person is forced to cope with many different duties. This means variety and thus a more interesting job. But most important of all for job satisfaction is the fact that in smaller groups it is easier to see the immediate results of one's own efforts.

For Perstorp, with its strong niche orientation and with more than 80% of its sales outside the Swedish home market, it is necessary to be highly decentralized. Decisions must be taken close to our customers. Hence we have ten business areas, each of which comprises several divisions or subsidiaries. Even our service units for data processing, invoicing, office services, personnel administration, etc, work as companies with their own boards. Altogether we have some 80-90 highly independent units in the corporation.

This high degree of decentralization provides a good basis for FLEXIBILITY. Rigid bureaucracy, mazes of rules and regulations as well as die-hard habits are the enemies of all renewal. At Perstorp we strive to keep fixed routines to a minimum. We want each employee to assume responsibility for his or her own actions. I don't mean to imply that we operate on a laissez-faire policy, but that we draw up certain frames in which one must continually create one's own options for the purpose of countering outside activities while optimizing one's own gain. Of course, this may occasionally lead to a decision that is not the best, but mistakes may be allowed if we learn from them.

Where marketing is concerned, flexibility is our great strength, as we must often compete with the huge international chemical giants. They have far greater resources, and therefore we must always be faster and better in our decisions and actions.

Our way to be better is through our fifth commandment, CREATIVITY.

This commandment became one of our watchwords over fifteen years ago, when the word "creativity" was not so trendy and overused as it is today. But for us it is not a mere trend, it is something vital. This very commandment refers to our CREATIVE BASE, which is what makes us different from many other companies that could claim that the first four commandments apply just as well to them.

Creativity and the ability to attract creative individuals are characteristics of Perstorp's century-old history. Continual renewal and heavy emphasis on research and development have brought about the unique system for corporate development we have at Perstorp.

The fundamental principle of this CREATIVE BASE is DECENTRALIZED R&D.

Until the beginning of the 70s, we had a very centralized research unit. The problem was that contacts were poor between the researchers and those running the factories or those who had contacts with the customers. A vacuum can easily arise around central research departments. In our case, this was manifested by major projects that were insufficiently related to market demands.

The decentralization implemented in 1970 made each division responsible for its own R&D. The aim was to achieve the right team spirit in each division, as well as greater customer-orientated development. This was a bold move, since it was accompanied by high profitability demands on the divisions. When profits decline, it is easy to become short-sighted and cut funds for R&D as well as for long-range marketing. It is also a matter of critical mass for R&D.

We counteract this problem by means of our RESEARCH FOUNDATION.

This foundation was actually instituted some 30 years ago and we regularly allocate new funds for its activities. If one of our units has a long-range project, perhaps risky, but of interest to the corporation, it may be granted funds below the line from the Research Foundation to undertake this project externally, e.g. at a university or college or research institute. This also allows greater flexibility thanks to the fact that projects which subsequently prove not to fulfil expectations can much more easily be discontinued than if they had been built up on the unit's own fixed resources. This approach also affords numerous stimulating contacts with the universities and the scientific community for many more people than when centralized research units are used.

All Research Foundation projects are reviewed by a Research Council consisting of 6 professors from different universities and institutes, representing different disciplines. At the same time, they act as a "sounding board" for our R&D people and follow our activities critically in order to be able to offer new ideas and views.

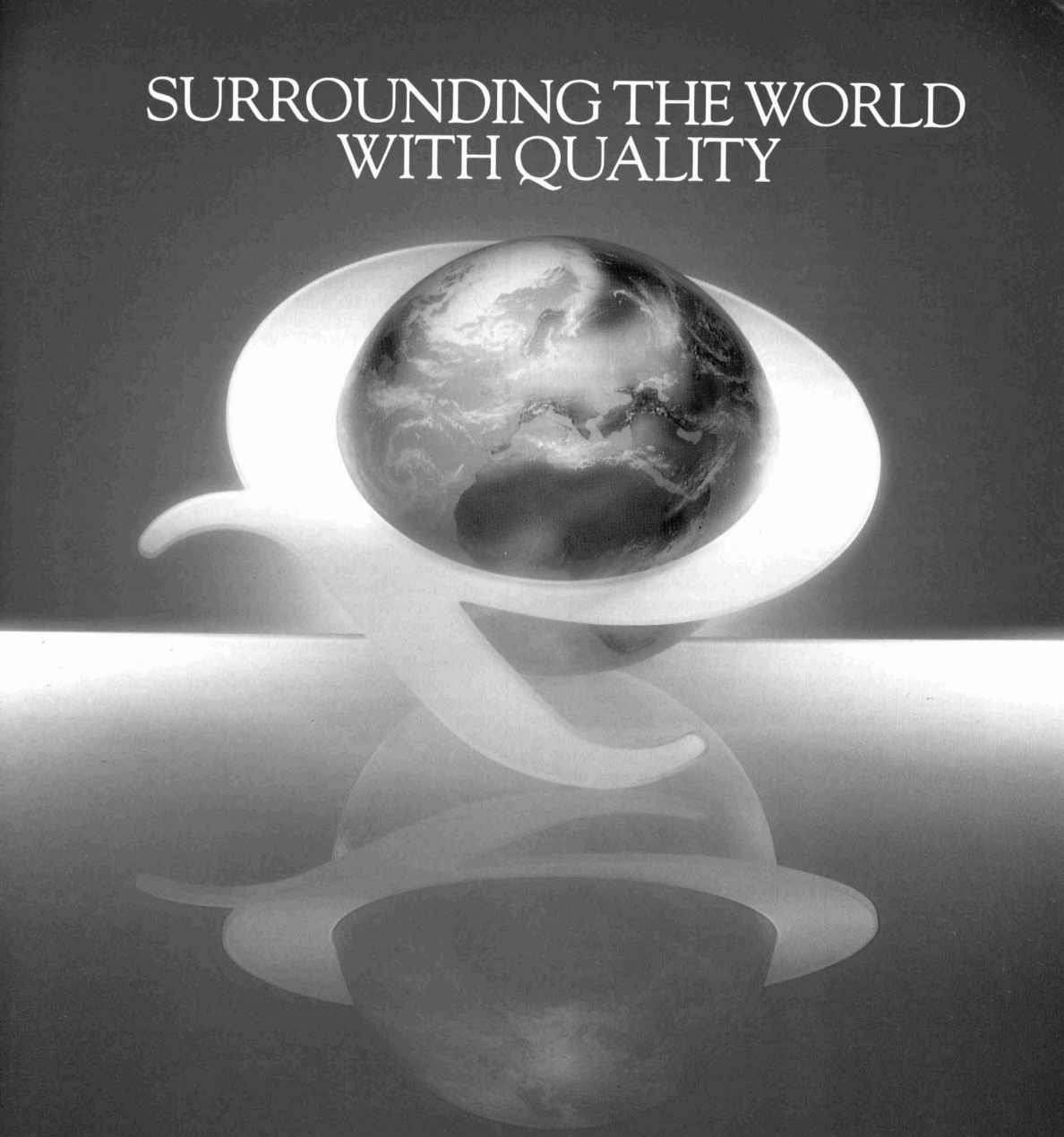
The Research Foundation also has its own contact secretaries for continuous improvement and cultivation of contacts with the universities and colleges, as well as other research organizations. They also assist in intra-corporate contacts.

However, if we are to be able to hold a dialogue with a university, we must continually build up our level of knowledge. For this purpose, we also have a foundation for our own R&D, the so-called PRESIDENT'S FUND.

This fund is actually a kind of expense account where we each year allocate a considerable sum for R&D. This fund may also be used for market development, e.g. the introduction of new products or an attempt to enter an entirely new market.

It can also be used for projects where we want high secrecy

SURROUNDING THE WORLD WITH QUALITY



ISO 9002
FIRST REGISTRATION
IN CHLORIDE

FIRST REGISTRATION
IN SULPHATE

In 1989, Tioxide became the first titanium dioxide manufacturer in the world to achieve registration to ISO 9002 for both chloride and sulphate processes.
Today, Tioxide is actively pursuing world-wide registration, with its six European sites and Australia already registered to ISO 9002.
The control, discipline and experience that have been gained by registration are now being applied to our environmental and safety programmes and to the many other activities that are an integral part of our vision of Total Quality Management.

Tioxide Group PLC Tioxide House 137-143 Hammersmith Road London W14 0QL

BSI REGISTERED FIRM
NATIONAL ACCREDITATION OF CERTIFICATION BODIES

CERTIFICATE NUMBERS
Q6041/FM09359
FM09652/FM09047
FM1992/M10177

Tioxide

Quality in Partnership

Enter G211 on Reader Reply Card

and have to run them in-house.

The grants from these funds need not be paid back and they do not affect the profitability of the recipient. They have a joint board of trustees, namely, the corporate management, and decisions can be taken quickly, as we meet formally every month.

Quick decisions are essential for creative persons. Thus we treat ideas as perishables. If one fails to make use of an idea quickly, it may be forced aside by another or simply forgotten. I, therefore, have a special "programme account" from which I can immediately grant funds for feasibility studies or small pre-projects up to SEK 100,000 or USD 15,000. Since these applications need not pass through the decision-making hierarchy, they are a way to bypass the administrative system and thus efficiently make use of ideas and opportunities. It's not so much money, but in a very decentralized organization even some thousands USD may be too much for a slim budget. But the only way to go from an idea to an innovation is to get money.

Our system of by-passing bosses may terrify you, but it works. When I myself was an operative responsible for our activities in laminates and plastics in the late 70s we had an idea-campaign for selling more decorative laminate. Somebody suggested to put the laminate on the kitchen floor instead of just on the worktops. That should give much more sales. As I had been a plant manager for laminate I just refused the idea as silly. We had tried that in the 60s and it was too hard and slippery etc. But they asked the Research Foundation for a small grant from the programme account and went to the Royal Institute of Technology in Stockholm where they got comparative tests against wooden parquet. Our stuff was much better and they showed me the results so I just had to agree to start a development programme for laminate flooring. Today we are selling with good profit for SEK 200 millions and discussing a new plant in continental Europe.

The sense moral is "The worst for ideas are bosses, the best is money!"

The total amount of money we are spending each year through the Research Foundation and the President's Fund is about 1% of our worldwide sales. Our R&D-expenditures are about 4-5% in average.

The Research Foundation has given us very active contacts with the universities. We also have a great need to recruit people trained in technology, science and economics. Thus when the University of Lund, 60 km from our head office, brought up the notion of a RESEARCH PARK called IDEON, we were naturally among the first to participate in its birth.

Here we collaborate on projects, primarily with the Chemistry Centre, but also with other parts of the university and other IDEON companies. We are very satisfied with the results achieved thus far at IDEON and we are in the process of increasing our involvement in the university.

It is not easy to collaborate with a university but it's very stimulating. It takes time and you have to take part in their activities as much as possible. I'm myself a board member of the University of Lund and of IDEON, etc. and it gives me a broad contact net.

But IDEON is of course not the only research park of interest to us. We are studying the other research parks that have since appeared in Sweden, as well as several abroad in connection with research projects at various universities.

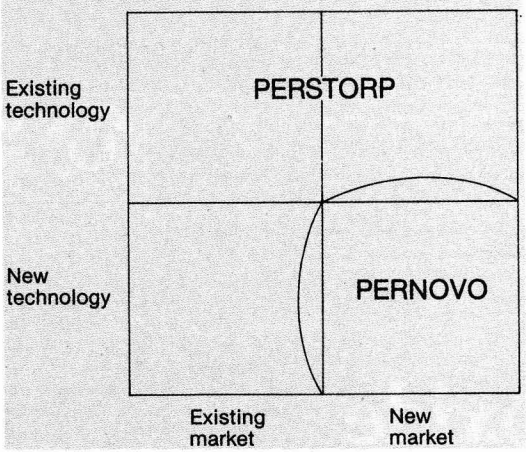
It could be pointed out that decentralized R&D will concentrate on areas too close to existing activities, and thus not to lead to ventures into complete new fields. This is quite right, and therefore we have our own new business development company, Pernovo, to focus on these fields.

Pernovo identifies business areas of interest to us, possibly involving new technology and new markets for the corporation. Through acquisition or collaboration, we gain a base of knowledge. When the new activity has grown enough to become a division or business area, it is "sold" to the corporation. If it does not fit well into the corporation, we sell it externally.

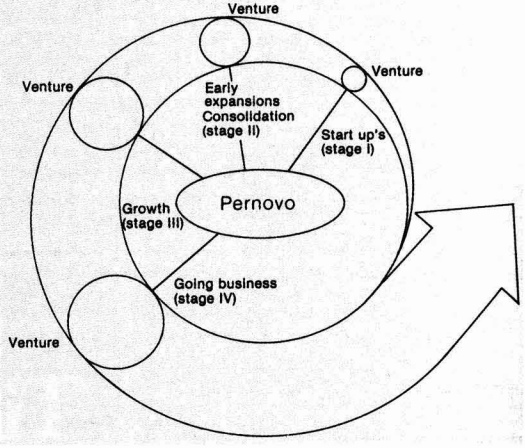
When in 1984 we restarted Pernovo after 10 years operation we found that 20% of our sales came from activities delivered from Pernovo to the corporation. Unlike most other new-venture companies, Pernovo has succeeded in its very difficult task. Many factors have contributed to this success. First and foremost it is the people we have had and now have at Pernovo, but also the very patient attitude Perstorp has towards development projects. We know that it takes time to convert an idea into a commercially profitable product. A period of ten years is nothing unusual. Furthermore, Pernovo has always been represented in corporate management and has in this way been able to obtain support of everyone in management.

The network of contacts has played a major role for Pernovo, which each year processes hundreds of ideas and proposals for new activities. A further token of the value Pernovo places on the enterprising spirit of its people is the fact that all projects are formed into limited companies to

Development of new business



Management of growth phases



elicit the team spirit and the freedom to fight for results instead of simply reporting project costs for a development grant.

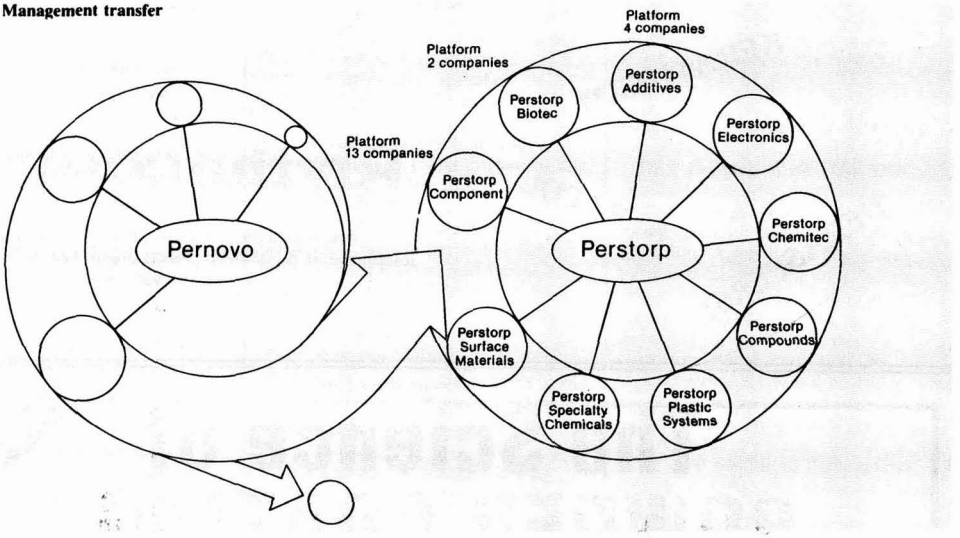
The use of our CREATIVE BASE to develop knowledge is, of course, part of the comprehensive task of fulfilling our Economic Formula as well as part of the Perstorp Steering System. The Steering System implies that we, at various stages during the year, work with our long-range goals, resource requirements and utilization of our resources. This work also shows that we need people of widely differing types in the company. We need visionaries and planners just as much as operators, but with an overall entrepreneurial spirit.

It is important that as many people as possible are given the opportunity to assume responsibility of their own for a share of the activities. This responsibility must be measureable, if not in economic terms, then at least so the individual can notice the results of his or her efforts. Motivation and encouragement play major roles here, and there must also be a great deal of understanding that certain activities may later prove to have been wrong. Such mistakes must be accepted as part of the learning process.

But for people to dare to take decisions, there must be certain guidelines or frames that outline the common goals. Historically these have been provided by religion and legislation. Unfortunately, there is always a danger in becoming lost in details and entrapped in regulations. In this respect bureaucracy is detrimental to creativity. Good guidelines should work to give people the flexibility required for the free use of their personal resources.

However, personal resources alone will not be enough to achieve renewal. Other tools will also be required. In this context, money is a general tool that can be transformed into knowledge and other resources, and this is what our CREATIVE BASE accomplishes.

Management transfer



Appendix

"As from this year Perstorp has also an Environmental Fund similar to the President's Fund. From the Environmental Fund we support information, communication, studies, process-and product developments and research in the environmental field."

Budapest seminar featured coatings advances in the East and West

By Abel Banov
Co-publisher/editorial: American Paint and Coatings Journal

Budapest – Coatings experts from the erstwhile Soviet – controlled nations of Eastern Europe joined their counterparts from the West here in early spring for the Ninth Annual Central European Seminar of the Paint and Lacquer Industry, which was actually the first since the end of Russian control.

The Hungarian Chemical Society, whose section on coatings is headed by Dr L. Kovacs, a famed polymer chemist, sponsored the three-day seminar, which was at the Atrium Hyatt Hotel. Mrs Mary Loky, a high-ranking member of the Hungarian Chemical Society staff, was in charge of arrangements. The seminar was followed by a two-day Coatings Show organized by Polymers Paint Color Journal.

Results of a painstakingly thorough study of what happens to exterior paint when exposed to solar radiation at different times of year was explained in the first plenary session by Dr K. Rehacek, of the Forschunginstitut fur Angrichstoffe, at Prague. His paper was entitled: "The Loss of Weight of Coatings at Weathering – an Objective Criterion of Outdoor Resistance of Painting Materials".

Dr Rehacek's paper revealed why some coatings last longer than others, permitting those sufficiently interested to understand why some resins work better than others and why selection of pigment for exterior exposure is crucial.

The seminar also featured papers on recognition of under-coating corrosion and how to prevent it; improved polyesters for coatings vehicles; silane-treated fillers and their use; acrylic additives for waterborne coatings; two-component isopolyester urethane coatings for plastics; function of levelling agents in powder coatings; and hydrodynamic processes in the flow of non-Newtonian liquids near walls of silicone organic coatings – a contribution from Russia.

Eastern technologists shared about equally, the number of papers presented with those from the West. German served as the common language of most of the conferees, who mixed freely and conversed without hesitation about their work. A surprising number of attendees spoke English, some just adequately.

Featured the first day of the meet, following the initial plenary sessions, was an afternoon visit by many of the attendees to the largest plant of six operated by the state-owned coatings company, BUDALAKK, where visitors from the West were amazed to find computer controlled production and automatic color matching systems – all developed by plant personnel, with the help of West German and Dutch companies that supplied equipment to specifications of company engineers.

(A visit by this writer to the BUDALAKK plant and a privately conducted tour of the main plant of BARV y LAK, a state-owned company at Prague, revealed production technology at least as far advanced as any of the several state-of-the-art plants visited in previous years in Great Britain or any in the United States, and in the case of the Czech facility, very likely somewhat ahead – all designed by plant personnel. Material handling, both of intermediates and finished goods, however, is primitive at both plants, because of limited funds for purchases, which makes the production automation all the more amazing.)

Solar energy and surface loss

Dr Rehacek's work started with exposure of coated stainless steel panels one month after application, to see how solar energy affects protective coatings.

Actual measurements of thickness reductions in milligrams were carried out, he reported. Not surprisingly, the sun in April and October was found to take the least toll. June sun exposure took 0.14 mgm from the surface, while in December only 0.10 mgm was lost.

After a while, thickness of a coating will stabilize, he found.

The study, which covered 10 years, checked out titanium dioxide and red iron oxide to determine effects of pigment choice.

Alkyds were also studied.

Iron oxide absorbed solar energy far more readily than TiO_2, it was learned, and reduction of film thickness was 10 times greater than when TiO_2 was used.

TiO_2, however, absorbed more radiation as Pigment Volume Concentration (PVC) was increased.

A nine-year study of mechanical effects of resin selection and pigment was carried out under Dr Rehacek.

TiO_2 was found to influence the loss of thickness in a tested alkyd melamine formulation, some 50 per cent over five years. Acrylic dispersions tested in the same manner lost less surface.

At 15 per cent, PVC, acrylic dispersions had less loss than clears.

With TiO_2, aromatic isocyanates paints lost 4 microns in the first year of exposure, but this was less than that of alkyd melamines.

Dr Rehacek concluded that monitoring reduction under various conditions of seasonal sun exposure should be a key consideration in measuring a coatings' effectiveness and as a way to determine potential degradation and, in the case of enamels, loss of gloss.

Determining undercoat corrosion

Dr L Behmel, of BUDALAKK, demonstrated how electrochemical testing through a coated surface was able to confirm presence of undercoat corrosion. Applying an alternating current through a test area, he was able to plot a "polarization current" He found that at a certain point on the resulting curve undercoat corrosion can be confirmed. By experimenting he found how to determine from the curve when corrosion is starting and when it has progressed.

He used conditions that came as close as possible to real-life situations to establish his procedures, then verified results under actual weather conditions.

Hot melts for coatings

Copolyesters obtained by polycondensation of several components can be controlled to produce amorphous, and moderately crystalline and highly crystalline products in their uncrosslinked state. These results were a function of glass transition temperature and molecular weight, according to Dr H. F. Huber, of Hüls.

By varying the portion of the molecule between various other functional groups, both hydroxyl and carboxyl, he was able to change physical characteristics of the copolyesters over a wide range, achieving what, in effect, was a selection of hot melt products that, when properly used, were effective in coating applications.

Included in the groupings, according to charts presented at the session, were alkylene, cycloalkylene, arylene

and alkylarylenes, among others.

Depending on the molecular weight of the products, he was able to get uncrosslinked materials that were very brittle; very glassy ones; and granulatable, very strong, tough and resilient products with very high cohesion. The latter were highly crystalline. The moderately crystalline products were also strong and granulatable: jelly-like at some point, they had high cohesion when used as coatings. The products with a glass transition temperature greater than 100°C were very brittle and amorphous, but could be granulated; those just over 50°C Tg were liquid and had cold flow; they had high cohesion.

Silane-treated fillers were found by F. Hofmann, of Quartzwerke GmbH, to permit formulation of anticorrosion primers without heavy-metal pigments.

Silicate fillers were treated with silanes and combined with various binder systems, such as polyurethane and epoxy urethane powders to provide corrosion protection. He gave extensive examples of successful use and how silane treatment is accomplished and why it succeeds.

The flexibility of acrylate monomers was utilized with backbones of methyl methacrylate, n-butyl methacrylate, and styrene to produce additives useful for waterborne coatings, reported J. B. Clarke, of Allied Colloids.

Resulting products with high molecular weight were tough but highly viscous in production, while low molecular weight products had low viscosity and were stiff in use.

He provided dispersion curves to show requirements for optimum dosage under various conditions. By changing the dispersant's cation, scrub resistance can be improved, he claimed, observing that sodium polyacrylate is used instead of ammonium polyacrylate, results are better.

He said that rheological additives for waterborne coatings using the new technology are still evolving. Associative thickeners based on this technology have been found less sensitive to enzymes and reduce requirements for bactericides.

Isopolyesters from Amoco

S. H. Shoemaker, of the Amoco Research Center, told about a low molecular-weight hydroxyl functional polyester developed by his organization that is suitable for coating plastics.

The resin system consists of equimolar parts of isophthalic acid and adipic acid, plus neopentyl glycol and trimethylolpropane. It is crosslinked with aliphatic polyisocyanate resins based on hexamethylene diisocyanate to form the final coating film.

Because they air dry or cure at low temperatures, he said they are ideally suited to be used as heat-sensitive thermoplastics.

The system, he pointed out, offers a desirable balance of flexibility and hardness required for plastic coatings, and has excellent impact strength, hardness, elongation, abrasion resistance and weatherability, plus good chemical and moisture resistance.

Coatings with 70 per cent solids have been successful, he noted. The hydroxyl number found desirable is 160 and the acid number is 7.

An acrylic urethane developed by his group had higher molecular weight and higher viscosity. For the isocyanate in this version, a biuret of hexamethylene diisocyanate was also used, and a lower molecular weight version resulted. Success was also had with a triuret of this isocyanate.

For these resins, dibutyl tin dilaurate was used for a catalyst. While the acrylic would not work with more than 54 per cent solids, the polyester versions came up to 69 per cent.

Materials coated with these materials included a polycarbonate/polybutene/terphthalate used for auto bumpers; a polyether ester; and ABS.

Good adhesion was had on all these surfaces, but ABS caused some problems of lifting, very likely, he said, because methyl ethyl ketone in the formulation attacked the surface.

Gloss and water immersion tests gave good results. Acid and gasoline resistance was good; cold flexibility was excellent. Polyester urethanes were fine, but acrylic urethane failed some of the tests.

Weathering tests proved fine for the versions using triurets, but not for those using biurets.

Levelling agents for powder coatings

Experiments to determine the best levelling agents for powder coating were the subject of a talk by W. Gree of Henkel KGA. He emphasized that certain acrylic polymers were found to have the proper surface tension and molecular weight for powder formulations. He emphasized that colorants and the additive polymer must be compatible.

He showed how his group had developed a method using a Teflon plate to establish how much of these additives are needed for best results.

Russian paper on hydrodynamics

From Russian scientist N. M. Namedov came a paper on the "Hydrodynamic processes in the flow of non-Newtonian liquids near walls protected by silicone organic coatings".

He provided information on resistance to hydraulic pressure of various silicone coatings and the relation of the roughness of the substrates. Testing included material flow of such materials as solutions of carboxymethyl cellulose and polyvinyl alcohol.

Studies found the effect of surface profile, degree of moisture resistance, and rheological peculiarities of the flowing liquids on hydrodynamic parameters of the flow.

He reported that results of the research have been useful in planning design of extrusion equipment to be used in polymer production, heat-transfer apparatus, and different kinds of distillation equipment.

Acetoacetate chemistry covered

An effective presentation of "Synthesis of acetoacetylated resins and applications for acetoacetate chemistry in thermoset coatings" was given by Francois Vleugels, of the Research Div. of Eastman Chemical Products Inc, who pointed out that this new technology promises to be helpful in development of high solids, lower VOC coatings, utilizing both conventional and non-conventional crosslinking reagents.

Vleugels told about synthesis of acetoacetylated resins of various types, acrylics, polyesters, etc., and improved resin properties that result, especially because they permit a close bonding with the substrate by chelation. He discussed effect on performance when methylene groups are included and when t-butyl acetoacetate is used instead of methyl or ethyl esters.

Very stable carbon-carbon bonds occur when the new esters are reacted with isocyanates. The more hydroxyls replaced by acetoaecetates the better the pot life, he reported.

Acrylic latex advances

Recent advances in acrylic latex technology that resulted in a high performance interior semi-gloss paint, free of all solvents, ammonia and formaldehyde were the subject of the

presentation by D. G. Dowling, of Rohm & Haas Co, of Great Britain.

Used for the formulation, he said, is a 100 per cent acrylic binder, supplied with 50 per cent solids with a Minimum Film Forming Temperature of 16-18°C, combined with a polymeric external plasticiser to reduce MFT virtually to 0°C. Also helping is a new version of the company's opaque polymer that eliminates the strong ammonia odor of the original version. Care is taken to minimize free residual monomer with its odor.

To eliminate coalescing solvents, a polymeric plasticiser is used, as little as 1 per cent of the total formulation, actually 4.5 per cent on polymer solids. Using the opaque polymer with 2-micron calcium carbonate and titanium dioxide, a completely block-free film with good resistance to dirt pickup was produced.

In all, some 49 papers were delivered at the conference, many of them reviewing developments already familiar in Great Britain and other western countries and some that were too badly interpreted into English in the simultaneous translations that accompanies the speakers to be reported.

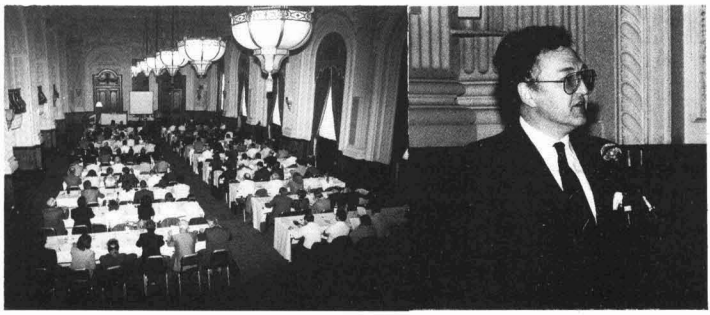
(Some of the latter, when deemed sufficiently important to be translated are included in the reports above.)

Printing Inks for the 90s

A Symposium organised by the Oil and Colour Chemists' Association in conjunction with the Society of British Printing Ink Manufacturers — 22 March 1990.

Those of you who are avid readers of JOCCA will know that over the past year or so OCCA and SBPIM have been talking together about the possibility of joint activities. The Journal has already been designated by SBPIM as one of their official Journals and this Symposium is the first, of what we hope, will be many joint activities.

In setting up this Symposium, the organising committee were very aware of the need for it to be "cost effective" It has not only to give value for money and be relevant to the industry, but in these days of "minimal staffing levels", 2 or 3 days away from the office can result in several inches of paper work to greet one on one's return there, so the time away was to be kept to a minimum — possibly there and back in a day. Judging by the attendance at this Symposium, it would appear to have fulfilled these criteria. 175 delegates from 121 companies attended and it was gratifying that several came from overseas — being able to catch an early plane out of Brussels (for example) and return on the same day.



Symposium delegates in the Grosvenor Suite of the Grand Hotel, Birmingham and (r) Mr C. Dane, President of SBPIM presenting the closing address.

The participants were treated to seven lecturers from raw material suppliers as well as ink manufacturers. Throughout all the lectures there was one common thread — ecology, the need for the industry to be aware of its impact on the environment, and its desire to respond. To respond not simply because there is new legislation but more because there is a genuine desire to produce, as far as is practically possible, products which do not harm the environment.

Dr Chris Patterson (BASF Coatings & inks) opened the Symposium with a comprehensive review of the impact of ecology on the development of flexo and gravure inks. This was followed by Geoffrey Burdall (Usher Walker) who after outlining the origins of newspapers in the UK (in a mere 15 minutes) looked with a certain amount of confidence to the future but indicated here too the influence that legislation will have on ink formulation.

One of the relatively new technologies now finding more commercial application is Radiation Curing which was discussed by Glenn Webster (BASF Coatings & Inks). Advantages seen here were, faster cure speed, reduced solvent emission and lower energy consumption. Though as a relatively new technology the toxicology of the chemicals involved would have had to be well scrutinised from the outset.

The way lithography could be expected to go in the next decade was discussed by Pat Gray (Coates Lorilleux) and Mrs Margaret Barraclough (Print Advisory Services), the latter emphasising the need for liaison between all different parts of the industry.

The first lecture after lunch is generally an unenviable one for the presenter — a surfeit of one of the lower members of the $C_{11}H_{2n-1}OH$ homologous series having produced a somnolent tendency among the participants. However, Chris Bridge (Ciba-Geigy Pigments) strode manfully to the lectern and startled the audience into wakefulness by stating that pigments were probably the most important part of a printing ink (for some inexplicable reason some of the delegates appear not to agree with this). Besides discussing possible technical developments to organic pigments, the influence of legislation on the possible restriction of certain pigment types was touched upon but as he indicated the industry may well have to educate the authorities as well as the public.

The view of another raw material supplier — the resin manufacturer — was put forward by Ray Munn (CVP). Among the trends to be expected in the ink industry were, amongst others, the desire for faster production speeds, the impact of new substrates, the reduction or elimination of organic solvents and greater health and safety aspects. As possible solutions to these requirements radiation curing and water-based resins offer certain possibilities.

Water-based ink systems had been mentioned in several of the earlier lectures as a possible solution to some of the environmental concerns and in the final lecture Mike Barker (Dane) indicated how this was being done for screen inks. Geoff Hutchinson (the éminence grise of the industry) summed up the meeting and chaired the question session.

Brief discussions with a number of the participants indicated a high degree of satisfaction, both with the technical content as well as the timing arrangements. An improvement in the PA facilities would have been welcomed (to which we can heartily

concur) for though it may be amusing to tune into the local taxi network it is rather distracting when possible new legislation regarding solvent emissions is being discussed. Finally, I would like to thank all the lecturers, the organising committee and the staff at Priory House for all their efforts.

S. G. Lawrence ■

SBPIM Annual Conference

The Runnymede Hotel at Egham was the venue on 18 May 1990 for the Annual Conference of the Society of British Printing Ink Manufacturers (SBPIM). Fifty-three delegates, speakers and guests attended the technical and business presentations and the busy day also included the Society's AGM, a ladies' programme and an informal dinner. The Society now has thirty full member companies, two associate members and eleven affiliates, including OCCA. JOCCA has recently been appointed an Official Journal of the Society and the two organisations co-operated in the organisation of the "Printing Inks for the 90s" Symposium earlier this year in Birmingham. OCCA President, Graham North, one of the speakers at the Conference, handed over a cheque for £1,000 to the Society as their share of the profits from the symposium. Preparations are already under way for a spring 1991 Symposium on the interesting topic of Screen Printing which will be organised in conjunction with the Association's London Section.

The presentation of the Conference followed the normal format, being a mixture of technical papers and reports from the society's standing committees. The guest speakers included Michael Levete, recently-retired Director of the Paintmakers' Association, who spoke on CEPE, reviewing past history, present activities and future developments. The speaker highlighted the difficulties that CEPE had encountered in presenting its activities as a significant European organisation and problems associated with labelling and other initiatives being accepted by companies. The introduction of membership for large companies, with some seats on the CEPE board was welcomed and was likely to be beneficial to the growth and status of the organisation.

Continuing the European theme, Tom Spencer, MEP for Surrey West gave an interesting and stimulating presentation on the work in the

Addressing the SBPIM Conference: Michael Levete (Top Photo) and Tom Spencer MEP.

European community and in particular the contributions of the parliamentarians to its development. The principal technical contribution to the meeting was from OCCA President, Graham North, who spoke on a resin maker's view of the ink industry looking at future trends in technology and economic trends within the resin industry. The review covered UV and IR curing inks, conventional litho and letterpress, flexo, gravure and screen inks and new liquid inks systems. It concluded with a plea for the ink industry to tell the resin industry what it required. The final technical paper was presented by John Orpwood of Coates who discussed the impact of the Environmental Protection Bill on the ink making industry, highlighting the additional requirements of the legislators on companies and the control systems required.

The conference received reports on the work of the Finance, Works Management, Technical Committees and the Technical Training Board. The Labour Committee reported directly to the AGM. Among the subjects raised was concern that the average period for debts outstanding had risen to 85 days; it was noted that 21 of the member companies had or were in the process of registering under BS 5750; and, members were asked to nominate representatives to serve on the committees, particularly the Technical Training Board which was in danger of floundering due to lack of support.

Immediately following the AGM the Society's Council re-elected Christopher Dane as President of the Society and Bob Simpson as Vice President.

C. Pacey-Day ■

CALL FOR PAPERS

JOCCA is seeking technical papers for possible publication in the January 1991 issue on

Environmental challenges to the surface coatings industries

The need for conservation of the environment and possible new regulations will provide the Surface Coatings Industry with new challenges in the area of "Green" coatings R&D well into the next decade.

Papers are invited from research organizations, raw material suppliers and paint manufacturers which will discuss their approaches to these challenges.

Papers should be a maximum of ten pages (in double-spaced lines) and may include up to ten tables and graphs (combined total). To be considered, please send a 50-word abstract or brief outline by 1 October 1990 to John Taylor, Honorary Editor, JOCCA, The Wolds, 51A Porth-y-Castell, Barry, South Glamorgan, CF6 8QD. Deadline for the January issue is 15 November 1990.

For further information contact Dr Peter Fyne Tel: 01-908 1086; Fax: 01-908 1219.

OCCA AGM

Thirty-eight members, guests and staff attended the Association's AGM on Thursday 14 June at The Naval Club, London W1. The Club is the venue for all London Section meetings and provides a good range of function rooms and catering facilities for Association meetings. President Graham North chaired the meeting, supported by Honorary Secretary Les Brooke, Honorary Treasurer Brian Gilliam and senior staff. The President welcomed Dr H J Stern, the "father" of the Association with continuous membership from 1925 and also Robert Hamblin, former Director & Secretary.

Members stood in silent tribute to the 19 Association members who died during 1989, including Past President Harry Keenan, coupled with Past President Don Morris who had died on 15 May 1990 and in respect of whom personal appreciations are included on page 315 of this issue of JOCCA.

Les Brooke introduced the Annual Report, now in the third year of its new format. 1989 had seen, at long last, the establishment of the Ellinger-Gardonyi Bequest as a charitable educational trust and the first application of money from the trust was used to provide for a reprint of the Association's Introduction to Paint Technology manual, the provision of text books to assist members of the South African Division in their distance learning studies and to enable additional pages to be printed in JOCCA. The first Ellinger-Gardonyi medal was awarded to Professor Ian Macpherson of Ciba-Geigy at the Chester Conference.

Although the Conference had not been well supported, those delegates who had attended had judged it to be well organised and enjoyable. The Journal had continued to improve during the year and carried a record volume of advertising. The Honorary Secretary paid particular praise to John Taylor's efforts in his role as Honorary Editor to improve and promote JOCCA.

The year had also seen the return of VAT previously paid on membership subscriptions and the thanks of the meeting were expressed to the General Secretary for his efforts in securing agreement with the Customs & Excise. The return of VAT had enabled the Association to establish its Benevolent Fund.

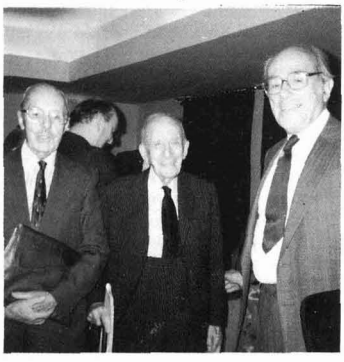
Les Brooke reported that membership had risen by 20 during the year and now stood at 2,089 with 40% of members residing outside the British Isles. Modernization of the fabric of Priory House had continued and commercial tenants had been secured for the ground floor, providing a valuable additional source of income.

OCCA President Graham North addressing the AGM with seated (L to R): Chris Pacey-Day (General Secretary), Les Brooke (Honorary Secretary) and Brian Gilliam (Honorary Treasurer).

The Sections had been particularly active during the year promoting successful symposia and social events. Concluding his introduction to the Report, the Honorary Secretary thanked all headquarters staff for their continuing hard work and support of the Association.

Brian Gilliam introduced his final report as Honorary Treasurer and presented his typically cautious view of the Association's financial performance. He informed the meeting that the surplus of almost £60,000 included a net repayment of £40,000 VAT and also a grant of £15,000 from the Ellinger-Gardonyi Fund which had been used to finance the specific projects referred to in the Honorary Secretary's introductory remarks. However, the Association had achieved its financial target of a small surplus despite a loss on the Chester Conference. It had also expanded support for Sections in the organisation of their technical meetings and the general promotion of their activites. The meeting was reminded that the surplus of funds from SURFEX Exhibitions was not used for the general support of Association activities, but was reserved for special developments and new initiatives.

Dr H. J. Stern (centre) with Dr T. Banfield (L) and Dr H. Hamburg.



In response to a question from Prem Thukral, Brian Gilliam reported that the gross return of VAT amounted to £43,886. In the absence of further questions from the meeting, the President proposed the adoption of the Annual Report and Accounts which were approved unanimously.

The election of Honorary Officers and Elective Members of Council were confirmed, together with confirmation of Fred Morpeth as the Association's President Designate. The General Secretary announced the names of Chairmen of Sections elected to serve on Council.

The meeting approved resolutions setting the level for UK and overseas subscriptions and reappointed auditors for 1990.

The meeting then moved on to the pleasant task of thanking retiring members of Council and Honorary Officers for their work on behalf of the Assocation. Herman Hamburg, a distinguished former Honorary Treasurer, moved a vote of thanks to retiring Council members and in doing so conveyed the gratitude of the Association for the time and trouble taken by members to serve on Council and its Committees. Commenting on the age profile of Council members, he made a plea for new and younger blood to come forward and serve on the Association's senior committees.

Incoming Honorary Treasurer, Norman Seymour, proposed the vote of thanks to Honorary Officers and, in particular, paid tribute to the work of

the Honorary Exhibition Officer, Fred Morpeth, who had been given the task in 1987 of re-launching the Association's Exhibition and turning it into the success of SURFEX today. Generous praise was also paid to the retiring Honorary Treasurer, Brian Gilliam, who had given seven years' service, during which the financial management and fortunes of the Association had undergone a significant change. It was noted that both retiring Honorary Officers would remain on Council. Both votes of thanks were carried by acclamation. The final vote of thanks was moved by Fred Morpeth in his first official duty of his new role in which he praised President Graham North for his conduct of the meeting "doing of the maximum and saying of the minimum". The meeting was closed by the General Secretary with an invitation to members present to participate in the buffet.

Shortly after the close of the meeting the Naval Club, together with a large area of Central London, was plunged into darkness as a result of a power failure, providing subdued lighting for an enjoyable buffet supper.

Minutes of the AGM will be included as a supplement to the August 1990 issue of JOCCA. ■

OCCA Meetings

Midland Section

Polysulphide modified epoxy coatings

The March meeting of the section held at the Claredon Suite, Stirling Road, Edgbaston, heard Dr T. C. P. Lee present an illustrated talk entitled "Modification of Epoxy Coatings With Polysulphides".

Liquid polysulphide polymers were described as condensation products of sodium polysulphide and bis-(2-chloroethyl) formal. The resulting polymer contains about 39% Sulphur, has a low glass transition temperature (Tg) and is terminated with reactive mercaptan (−SH) groups. The excellent fuel resistance derived from the high sulphur content associated with the flexibility derived from the formyl-based polymer are used to good effect in polysulphide based sealants for aircraft wing fuel tanks.

After outlining the basic chemistry of polysulphides, Mortons' elastomeric polysulphide coating LP−R was discussed. Uses for the coating were listed as sealers for concrete containment walls, silage tanks, portable water tanks and where contact with fluids within a pH range of 2-3 to 10-11 could be expected.

LP−R coatings were essentially polysulphides further cross linked by reacting mercaptan end groups in the presence of an inorganic peroxide.

R–SH R'–SH ----- (O) -----R–S–S–R'

Carbon black, Silanes, Plasticiser and accelerators were also present in the coating to promote strength, adhesion and speed of cure.

The modification of polysulphide by reacting the mercaptan end group with a ethylene oxide type functional group resulted in an epoxy terminated polysulphide. The resulting polymer displayed a marked lack of odour due to the loss of mercaptan groups. Combination coatings of low molecular weight epoxy prepolymer, Bisphenol A and/or F type Epoxy and amino or polyamide reaction partners were described.

Particular attention was drawn to improvements in impact resistance flexibility and adhesion observed in polysulphide modified coatings when contrasted with conventional epoxy polyamide or amino systems. Improved exterior durability of the modified coatings were also noted, along with a reduction in viscosity for a given solids content.

The final polysulphide product reviewed by Dr Lee was a new polysulphide dispersion in water. The material was not a film former in its own right, but could be used to modify vinyl polymer coating, improving adhesion, flexibility, chemical resistance vapour permeability and solvent swelling. Trials with Haloflex 202 were described illustrating the benefits of using the dispersion including its use in a Radon gas barrier coating.

This well illustrated and interesting–yet entertaining – talk was closed with a vote of thanks proposed by Brian Fowler and endorsed by all present.

Toxicity with reference to COSHH

The February meeting of the section, held at the Claredon Suite, Stirling Road, Edgbaston, heard Mr P Fanshawe, a consultant in aspects of Health & Safety, present a lecture entitled 'Chemical Handling'. (Toxicity with reference to COSHH.)

Mr Fanshawe introduced the subject, by describing the talk as essentially the same as that given by himself to shop floor managers and other personnel who handle a variety of chemicals and need to know a little about the associated hazards. Many people at shop floor level were, he said, unaware of the Health & Safety at work Act 1974.

The difference between Acute and Chronic affects were described. Acute affects were seen immediately upon exposure to hazardous materials, for example sneezing following dust irritation whereas Chronic affects were not seen until years later. This delay in effect was cited as the justification for retaining 30 year records.

Routes of entry into the body were then discussed. The speaker listed the following in an increasing order of importance: Mouth, Eye, Skin and Respiratory Tract.

Since the Respiratory Tract gave access to the lung with its large surface area, intricate construction and immediate proximity to the blood, gas and vapour phase toxins could be readily absorbed whilst soluble or insoluble particulate materials could obstruct and provide sites for further irritations.

Mr Fanshawe went on to discuss absorbtion through the skin, especially relevant to solvents and other contact liquids, before talking about eye and mouth contaminations.

The speaker gave an excellent but basic working description of the main body organs with reference to effects of toxins before closing with a brief discussion of allergic reactions.

This entertaining talk contained general references to COSHH yet lacked more specific information which many had expected.

After a short discussion of points made, the evening was closed with a vote of thanks proposed by Mr Harry Griffiths.

M. J. Round ■

Obituary

Donald J. Morris
President 1981/83

Deceased 15 May 1990 aged 62

Don always described himself as the young good looking slim brother of Colin. His chirpy humour was the great part of his character that all of us will remember.

His working life was spent in the paint and resin industry, where he made many, many, close friends. He progressed from resin sales in the Midlands to his final position in world-wide marketing, where his circle of associates was widened to encompass people from virtually all parts of the globe. In particular, he had strong connections with OCCA South African Division, which he had represented on Council since 1986.

The membership of OCCA has every reason to be thankful for Don's massive contribution to the affairs of the Association, since he joined in 1954. Honorary Treasurer of the Midlands Section was his first job from 1960-66, he later became Section Chairman 1968-70. His involvement with OCCA Council was truly outstanding, Honorary Secretary 1974-80, President 1981-83. During this period he was involved with all committee work, including quite naturally the OCCA International Working Group. He kept his strong connections with the Midlands after his move to live in St Albans and was a frequent visitor to Birmingham PVL Club and Midlands OCCA Section Ladies Nights, accompanied always by his wife Marian, a perfect partner for him and a wonderful companion for those of us lucky enough to share these occasions with them.

The BPVL Club has also benefited from Don's membership from 1949, he served as Publicity Officer in 1961.

A kind and thoughtful friend, a witty and delightful character, a warm and considerate colleague. During all the 35 years of our friendship I heard no ill spoken of him, except by his golf partners! Many folk in the industry will recall memorable events with our Don, my own specials are the Octoberfest in Munich, "Earthquake Magoons Bar" in San Francisco and the Fishermans Club in Birmingham. He will be sadly missed by us all, but the joyful memories will stay forever.

Don is survived by his wife Marian, their children Gillian, Andrew and Fiona, and grandchildren. Their grief and sadness can be helped by our good wishes and prayers. We offer them our sincerest condolences and continued friendship.

David Penrice ■

All who knew my brother Don would agree that his wit and keen sense of humour, together with his willingness to work for causes in which he was interested, characterised his working life and his brief retirement.

Following the move of Marian and himself to Norfolk in 1988 they both involved themselves with local activities and made many friends, several of whom I have subsequently met with and spoken to. Plainly the shock of Don's death has left a scar locally which can only heal with time.

Don has left a wife, Marian, and children Gillian, Andrew and Fiona. They, together with three lovely grandchildren, will continue to remember and to miss him for the rest of their lives.

For myself I shall miss him as much as anyone. We were always very close. We were both involved in the surface coatings industry all our working lives, both starting with ICI Paints Division in Smethwick immediately after the war. This working in the "industry", membership of the Birmingham Paint Varnish & Lacquer Club and Oil & Colour Chemists Association, continually brought us together.

To the many who have written to and telephoned Marian and myself, please accept our heartfelt gratitude and thanks.

After a full though relatively short life, rest well little brother.

Colin Morris ■

Many members of OCCA Transvaal knew and will remember Don as a very capable President of our Association. Others knew him and will remember him as a very dear and sincere friend. On his cheerful way through life Don endeared himself to all he came in contact with and his passing will leave a gap in our lives that can only be filled with lasting memories. Don loved South Africa and took a keen interest in our short and turbulent history. He enjoyed every minute of his visits to our beautiful country as we enjoyed every moment that he was among us.

Still numbed by the sadness of our loss, I can best express our feelings and innermost thoughts by quoting a few lines used by members of the Memorable Order of Tin Hats on similar sad occasions.

"They shall not grow old as we that are left grow old, age shall not weary them nor the years condemn. At the going down of the sun and in the morning we will remember them."

Our sympathy and thoughts are with his beloved Marian.

R. E. Rouse ■

BSI Committees

Representatives are sought on the following committees:
British Standards Institution:
PVC/1/5 Red Lead Pigments
PVC/1/10 Miscellaneous Pigments
PVC/27/1 Organic Finishes for Aluminium
PVC/27/-/3 Zinc Phosphate and MIO Paints
GME/29/1 Test Sieves
GME/29/2 Test Sieving and other Sizing Methods
RDB/25 Road Marking Compounds

New Members

The sections to which new members are attached are shown in italics together with the country, where applicable.

Ordinary members

Caulwell, J. *(Midlands)*
Corbett, D. S., BSc *(Midlands)*
Harman, D. J., BSc, MSc *(Hull)*
Harrison, I. A., BSc *(Transvaal)*
Iles-Jonas, S. G., BSc, PhD *(London)*
Leech, T. J., BA *(Ireland)*
Masson, C. J. *(Transvaal)*
Pettifor, D. R., BSc *(Manchester)*
Pickering, G. S. *(Ontario)*
Taylor, M. S. *(Midlands)*

Associate members

Canny, D. K. *(Transvaal)*
Fenton, P. J. *(Transvaal)*
Hart, J. R. *(Transvaal)*
McGreary, A. B. *(Natal)*
McIsaac, I. L. *(Transvaal)*
Walker, D. A. *(Transvaal)*
Winnan, G. A. *(Transvaal)*

Registered student

Millen, S. J. *(Bristol)*

SITUATIONS VACANT

SITUATIONS WANTED

SERVICES

PLANT & MACHINERY

CONFERENCE

SERVICES

SITUATIONS VACANT

Sales Technician

Printing Ink Industry

BASF plc and BASF Aktiengesellshaft are major suppliers of chemicals and binders to the Ink Industries of Europe.

To expand these sales in the UK we are looking for an enthusiastic, young, technically orientated Sales Technician to work in the London area.

Ideally you will have an academic or practical qualification in Chemistry or other appropriate field together with technical experience in a relevant industry. Sales experience will be advantageous as will a working knowledge of German. You should possess first class communication skills with the ability to discuss technical and commercial aspects of our products at all levels.

A competitive salary is offered together with contributory pension scheme, PPP and profit share scheme after a qualifying period.

Please telephone 061 486 0735 (Ansafone) for an application form or write to:-
Mrs A Redfern,
Personnel Department,
BASF plc, P O Box 4,
Earl Road, Cheadle Hulme,
Cheshire, SK8 6QG

BASF – The Spirit of Innovation

BASF

Henkel

Technical Sales Representative

Surface Coatings
Southern **OR** Northern Territory

A highly successful business of the multi-national Henkel Group, the Performance Chemicals Division is a leading manufacturer of paints and surface coating auxiliaries which are used throughout industry.

The potential for further growth is considerable and we now require a committed and enthusiastic man or woman to promote sales of our paint and adhesive products throughout Southern OR Northern England in order to achieve performance and profitability targets.

This is essentially a technical and quality orientated sales role in an established, sophisticated and highly competitive market. So we're looking for a degree/HNC level qualification and a sound knowledge of the industry perhaps gained as a Paint Technologist/ Chemist. Experience in a Sales/Technical Service role would be particularly useful.

Above all, you should be able to demonstrate a high level of personal and professional credibility in dealing with existing and potential customers. Comprehensive product training will be given together with full technical and promotional support.

In addition to a competitive salary, our benefits package includes a company car and relocation assistance, where appropriate.

This is a great opportunity to add some gloss to your sales career, so get in touch now with Karen Herrick at Henkel Performance Chemicals, Nopco House, Kirkstall Road, Leeds LS3 1JR. Telephone 081 443 4395.

UMIST

UMIST/CAPCIS

PROJECT OFFICER WITHIN THE COATINGS AND NON-METALLICS GROUP

The Corrosion and Protection Centre Industrial Services (CAPCIS) is a self-supporting consultancy unit based at UMIST. Commercially managed with over fifty full-time professional staff, CAPCIS combines highly qualified corrosion and materials Technologists with experienced high calibre industrial consultants.

CAPCIS is seeking a suitably qualified and experienced Project Officer to support activities within the Coatings and Non-Metallics Group. Applicants should hold graduate or equivalent professional qualifications in coatings technology and preferably have industrial experience. Work is varied and will be divided between short-term commissions, consultancy and contract R & D. The appointment is initially for two years thereafter becoming continuous subject to satisfactory performance.

Initial salary will be commensurate with qualifications and experience and will be within the scale: £9,816-£16,665 per annum or up to £20,469 per annum for the exceptionally well qualified, experienced and more mature appointee. (There is a pay award pending on these salary scales).

The position is pensionable and an annual bonus is payable on completion of two years service.

Applications, including full curriculum vitae and the names of two referees, should be sent to: Dr J E Breakell, Group Manager, UMIST/CAPCIS, Bainbridge House, Granby Row, Manchester M1 2PW. Please quote reference: CAP/R/95.

An equal opportunity employer.

ink-credible

Union Camp polyamide and rosin-based resins are ink-credible.

Inks need the right chemistry to yield their special properties. Union Camp polyamide and rosin-based resins offer a wide choice of properties to meet your needs. Properties such as... high gloss, color development, toughness, flexibility, hold out and more. Their reliable and versatile range of performance includes solvent specific solubility, compatability with a wide range of ink ingredients plus resistance to water, block and rub. We even have a number of developmental resins which are water dispersible. Now that's ink-credible!

Union Camp resins also cover a colorful spectrum of uses in:

◇ Publication and Packaging Gravure
◇ Flexography on paper, board and film
◇ Offset ◇ Lamination ◇ Overprint Varnishes

That's why today so many ink makers turn to Union Camp for a broad range of resins including alcohol soluble and co-solvent polyamides, solution and solid resinates, rosin modified phenolics, alcohol soluble and insoluble maleic modified rosins and specialty resins.

Union Camp has the raw materials, technology, products, manufacturing facilities and support staff to help you add quality to your inks and profitability to your bottom line.

Contact us today for more information on our polyamide and rosin-based resins... they're quite *INK-CREDIBLE*.

Union Camp

CHEMICALS (U.K.) LTD.

Vigo Lane, Chester-le-Street
County Durham DH32RB, England
Telephone (091) 4102631 • Telex: 53163

Enter G213 on Reader Reply Card