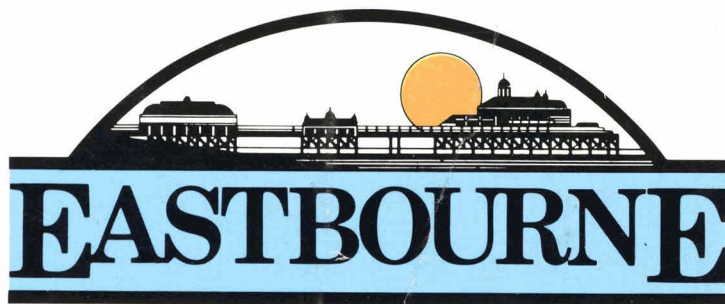
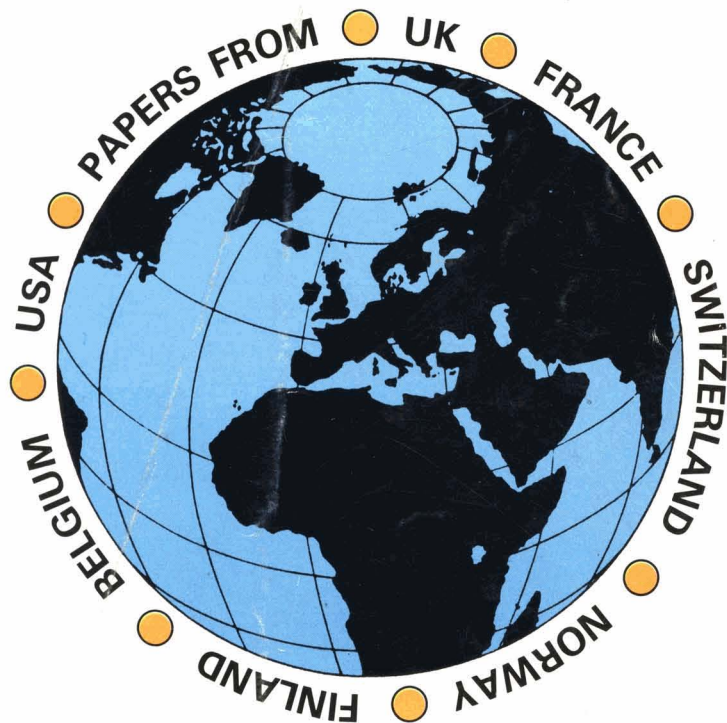


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**SURFEX**  
88

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The British Adhesives & Sealants Association, which is the sole voice of the UK manufacturers, will be participating in SURFEX 88. BASA will have its own stand in the reception area of the exhibition and will actively promote the show to its members. BASA also has, as associate members, a number of suppliers to the adhesives and sealants industry and many of these will also be represented.

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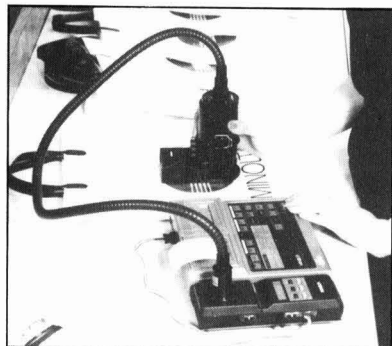
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# Paste inks, past, present and future\*

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## Abstract

The increasing speeds of modern printing presses and high productivity requirements in the printing and conversion of packaging substrates, calls for inks that have maximum stability on the machine yet dry quickly on the substrate to yield quality printing with the required performance characteristics. This is a continuing challenge to the ink manufacturer, especially in the field of paste inks for offset lithographic printing. For the manufacture of these inks, there is a somewhat limited choice of materials compared with the wide range available for flexographic and gravure inks. Economic factors and health and safety legislation have influenced development work and they are likely to have an increasing impact.

The improvements that have been achieved in the setting, drying and film-forming properties of offset lithographic inks are reviewed, emphasising developments in ink media also the techniques adopted to reduce or eliminate spray powder usage and improve productivity (accelerated drying and water-based overprint varnish applications). Ultra-Violet curing offset lithographic inks and overprint varnishes are of increasing interest for the printing of packaging substrates. The instantaneous curing and low odour characteristics have obvious advantages over the conventional inks. Electron Beam Curing inks and varnishes are also attracting attention.

Concerning some other developments in ink media, the "heat-dependent" drying systems are not really suitable for sheet-fed litho printing processes and they are subject to instability problems. On future research possibilities, polymeric materials from oleochemical sources may be potentially useful ink media. On the quality control and evaluation of paste inks there is a need for a more reliable test to predict lithographic behaviour and a better understanding is needed of ink and varnish "refusal" problems in printing.

## Background

A review of progress in paste ink technology is helpful for a discussion on outstanding technical problems and the likely future trends. Applications for paste inks embrace the fields of offset lithography, letterpress, offset letterpress and 'waterless' litho. Of these, offset litho is the major field in terms of commercial volume and technical development. With the availability of tinctorially stronger organic pigments and synthetic resin vehicles replacing the older types of inorganic pigments and traditional linseed litho varnishes, the gap between offset litho inks and letterpress inks was closed making for more versatility e.g. in the preparation of colour finder ranges and matching systems, suitable for both letterpress and offset litho printing.

Below the factors that have influenced progress in the last fifteen years or so are summarised:

1. The demand for inks to print at higher production rates on faster presses.
2. The need for inks for an increasing variety of substrates.

3. The impact of the oil crisis of the mid-1970's; rising prices and shortages of petrochemicals affecting the availability of pigments, resins and solvents.
4. Rising prices continuing in an uncertain economic climate worldwide.
5. Health and safety legislation and growing attention to environmental pollution problems.

Against this background it is hardly surprising that there have been changes in emphasis on ink development and that there will be different priorities in the future. Thus an increasing trend has been the formulation of inks that help the printer and converter exercise maximum economy and efficiency in the use of materials and energy.

An outline of the significant developments in paste inks for packaging applications will be followed by a review of trends in ink media and a discussion on aspects of the chemistry and technology of the inks and drying mechanisms. The mechanics of offset litho machines impose restrictions on the materials that can be used in the inks. Furthermore, the increasing influence of health and safety legislation is likely to create further problems and restrict the use of more novel materials for the inks. For these various reasons a study of the constitutive aspects of inks should help industry to utilize existing pigments and resin technology to better advantage.

## Developments in paste inks

### Some earlier developments

The traditional linseed litho varnishes are deficient in drying and film-forming properties and oxidation drying odours create problems in food packaging. Moisture-setting letterpress inks based on glycol-soluble resin media "dry" faster than oil based inks with no oxidation odours. The main outlets were in corrugated case printing and for printing food wrappers and cartons.

Water-miscible inks a later modification of moisture-setting inks, can be "washed-off" the rollers, plates and blankets with water but the inks dry to water insoluble films on absorbent boards. Here again corrugated case printing was the main outlet but most of this work is now printed by flexography using water-based inks. Water-miscible inks have been used for printing food and confectionery cartons by the letterpress or offset-letterpress (dry offset) processes, yielding prints with an acceptable finish and no oxidation odours. These inks are somewhat lacking in wet and dry rub-resistance and product resistance when compared with oleoresinous-based offset litho inks. They are not suitable for half-tone, four-colour printing of food and confectionery packaging, (hence the trend towards UV offset litho inks discussed below).

\*Presented at the Manchester Section OCCA Symposium, "Printing Inks for Packaging—Recent Changes and Future Trends", University of Salford, April 1986.

## Offset litho inks for carton boards

### General progress

The quality of four-colour gloss quick-setting inks has steadily improved. Oleoresinous/solvent media give faster setting inks on coated carton boards. See Figure 1. The low spray powder requirements and fast "tack free" setting of the inks aids productivity and improves print quality. More recent developments have improved stability on rollers, plates and blankets during the operation of the press. Some types of inks have long term press stability (non-skinning of the ink film on the rollers during overnight stoppages). This is interesting but it can lead to drying and printability problems. The general trend has been in inks which do not skin in partially filled containers or in the machine duct during a working shift.

All offset-litho inks which dry by oxidation polymerisation will generate "volatile" odour bearing compounds during the film-forming process and this is a continuing problem. So called "low odour" inks are formulated on low odour resins and deodorised solvents and reduced content of drying oil compounds. These inks may have unsatisfactory drying performance and rub-resistance, especially on low absorbency boards of low pH and in damp conditions.

### Infra-Red heating

A trend of the late 1970s and 1980s has been to use IR heating by means of short to medium wavelength IR lamp modules that are inserted in the press delivery. There is sufficient heat to accelerate both ink setting by solvent absorption and oxidation drying. The technique is effective with conventional quick-set inks printed on coated carton

Figure 1. Offset lithographic ink on coated paper or board.

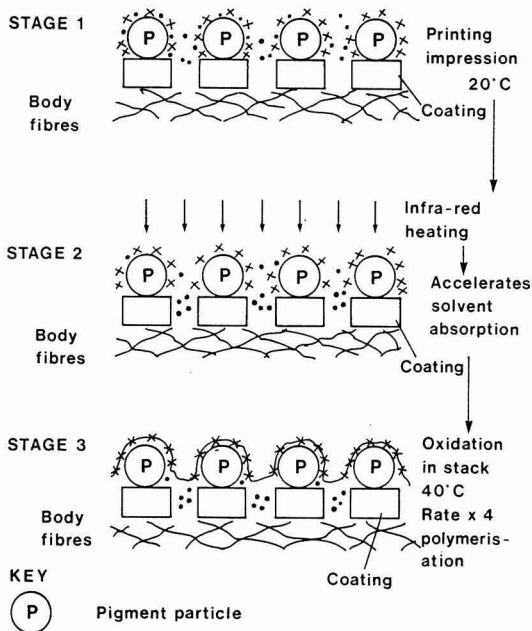
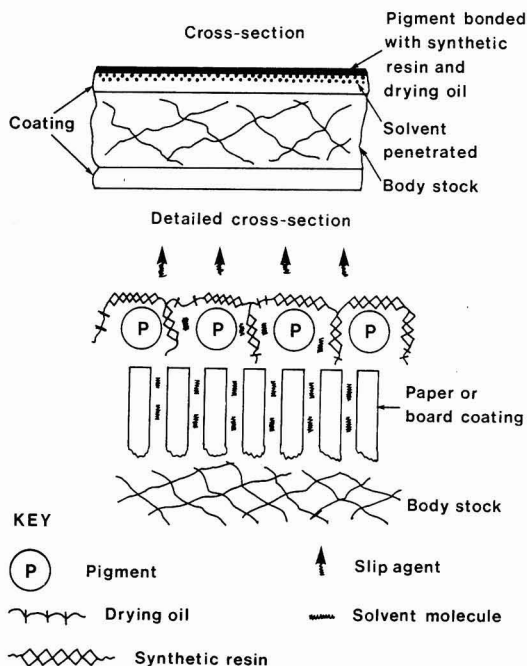


Figure 2. Infra red heating of offset lithographic inks on coated carton boards.

boards. (The mechanism outlined in Figure 2). Productivity is increased and little or no spray powder is needed hence better print quality.

### Microwave heating and low frequency RF (see Figure 3)

Microwave energy was investigated in the 1960s period for the drying of heat-set web-offset inks. It was unsuccessful as the inks were insufficiently "responsive". Microwave energy is more suited to the drying of water-based inks and coatings. The low frequency (27MHz) radio frequency dielectric type of dryer is useful for post-press drying of water-based "overlacquers" and adhesives.

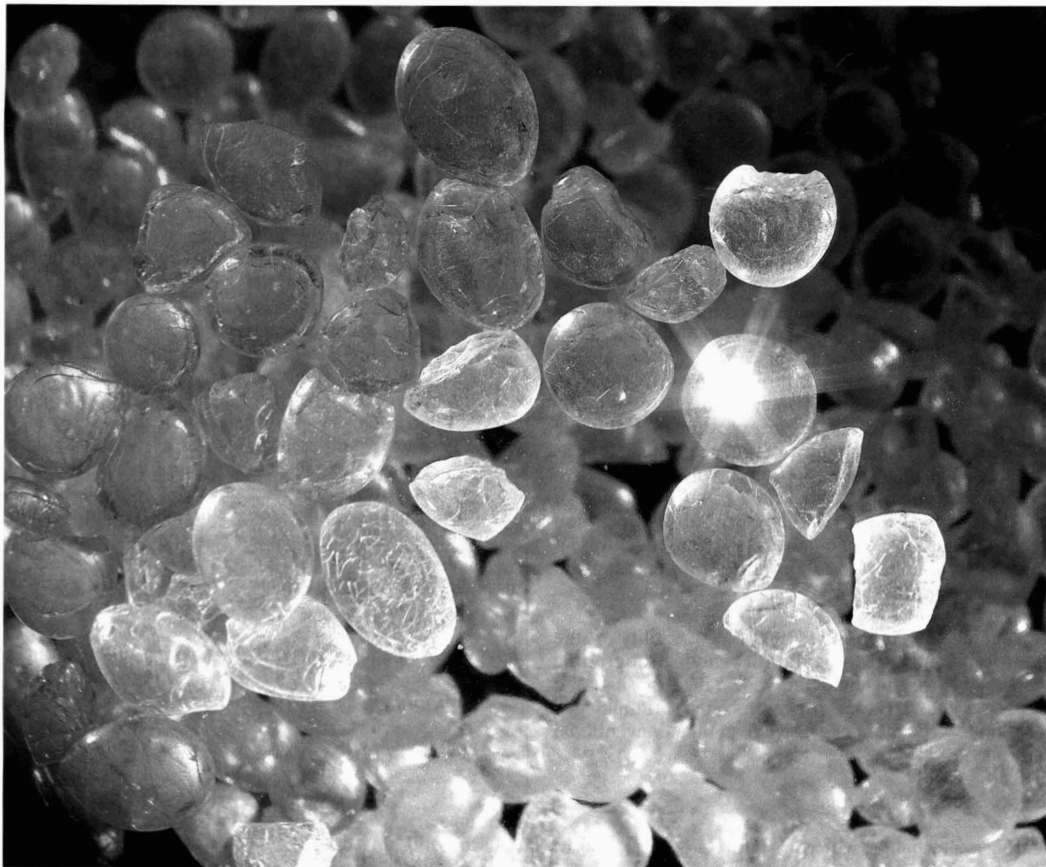
### Water-based over-print varnishes

The wet-on-wet application of water-based varnish, in solution, semi-colloid or emulsion form, to freshly printed litho ink films enables spray powder to be eliminated and the dried varnish film gives added print protection with a gloss finish. Typical devices are the Epic and Dahlgren dampener-coaters and the equipment illustrated in Figure 4. The water-based varnish dries rapidly, sealing the print while the underlying ink films can still absorb oxygen for their drying. Good smoothness of the board coating is essential for a gloss finish. The board absorbency and the size and distribution of the pores in the coating affect gloss and "key" of varnish to the underlying ink film.

### Ultra-Violet curing inks

UV curing inks are used for printing papers, carton boards, some plastic films, metallic foils and metal decoration. UV curing overprint varnishes and lacquers have excellent gloss

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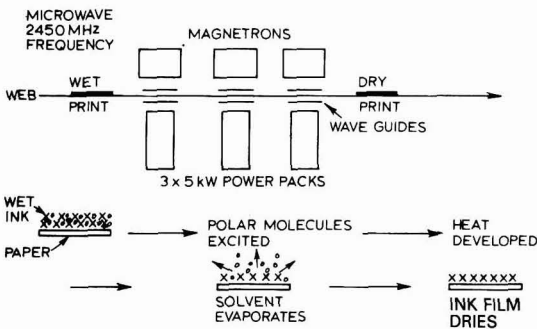


Figure 3. Microwave drying.

potential and the lacquers have been exploited in finishes that can approach "film lamination". Letterpress printing of self-adhesive labels is an expanding outlet for UV curing inks and litho inks have been developed for printing papers and boards for general purpose packaging and for food, confectionery and pharmaceutical cartons and wrappers. The constituents are essentially, pigment, reactive monomers, oligomers, pre-polymers and photoinitiators. The inks cure instantaneously on exposure to a suitable source of UV light radiation by a sequence of reactions as depicted in Figure 5. These reactions involve no oxidative degradation mechanism hence there is no generation of odour-bearing volatiles. The absence of hydrocarbon solvent component is another advantage. Consequently UV curing inks are finding increasing uses for printing food and confectionery cartons.

In general UV litho inks lack the versatility of the conventional inks, in printability and lithographic properties, bearing in mind the wide range of sheet-fed litho presses that are used for multi-colour printing. UV inks continue to be more expensive than their conventional counterparts.

### Electron Beam curing inks

EB curing is a technique with good future prospects. Inks of

Figure 5. Ultraviolet curing inks: mechanism of curing.

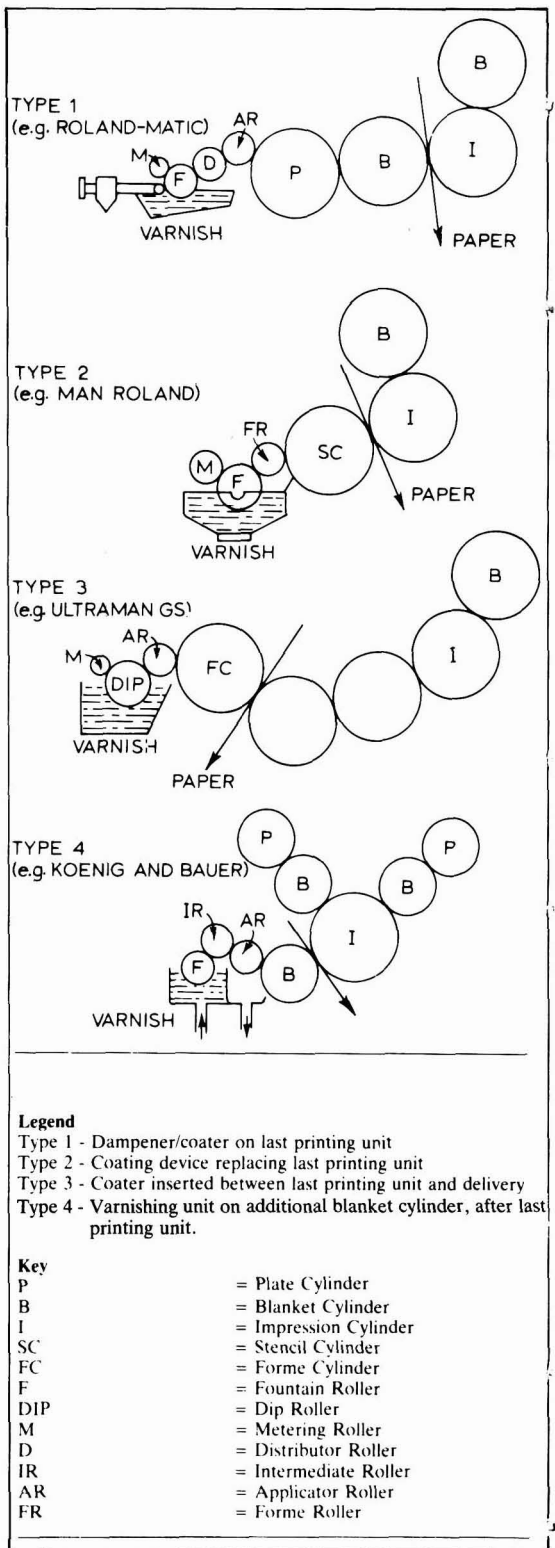
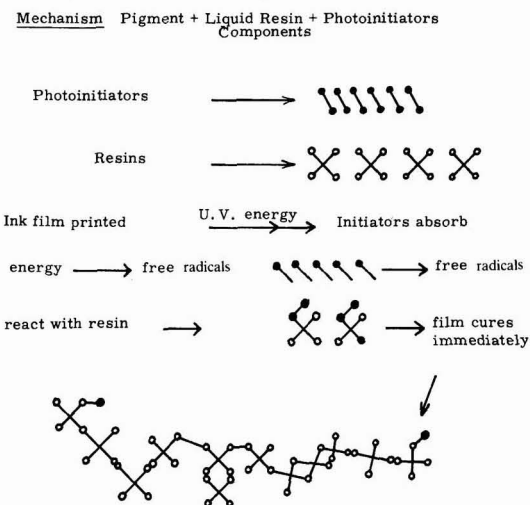


Figure 4. Application of water-based varnish on litho presses.



a chemistry similar to UV inks are cured instantaneously by means of a high energy source of electrons that are accelerated in the process zone. See Figure 6. This is a free radical induced polymerisation, but no photoinitiator is needed in the inks and thick films can be cured.

The capital costs of EBC equipment are higher than those of UV lamp arrays but electricity running costs are lower. EB inks have been used for web-printing of record sleeve stock overprinting with EB cured varnish on a 5-unit press. Printing of milk and fruit juice cartons has also been reported<sup>1</sup>. The low odour of the cured films is a feature.

### Waterless litho printing

There has been a revival of interest in waterless litho printing which is offset printing from a planographic plate but no dampening system is required. The process involves printing the ink from a photopolymer image area and silicone rubber non-image area, giving excellent reproduction and reduced dot-gain compared to conventional offset litho printing. In waterless litho printing there are no problems associated with dampening solutions. There have been difficulties connected with damage to the non-image areas of the plate and in this respect there could be more problems when printing heavier stocks such as carton boards than in four colour printing of coated papers. Factors relating to machine settings (plates, blankets and rollers), plate preparation, ink modification and substrate quality (papers and boards) all need further study.

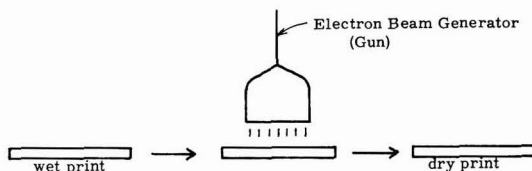
### Trends in paste ink media-improvements and outstanding problems

Figure 7 outlines the principal resins, oil media and solvents used in paste inks with notes on drying mechanisms utilised by the inks. Improvements have been realised but some deficiencies remain.

### Ink media development

Linseed litho varnishes have good litho properties but their setting and drying is slow leading to soft films of poor water, chemical and product resistance properties. The hard resins developed for use in oleoresinous based media confer quick-setting, hold-out, gloss and good drying properties to inks for printing coated papers and boards. The resins re-inforce the oil "matrix" giving harder more compact films. Continued improvements in the properties of rosin modified maleics and rosin modified phenolics resulted in the development of high melting resins suitable for cold-cutting (high shear) oleoresinous varnish manufacture and for higher temperature varnish cooking techniques.

More knowledge has been forthcoming on the behaviour of these resin systems with gelling and complexing agents such as the aluminium alcoholates and derivatives. Long oil o-phthalic alkyd resins (as used for paint systems) were far from ideal pigment dispersing media for litho inks and often poor in litho properties, but they did yield faster drying, harder films compared to linseed litho varnish films and chemical resistance was better. Isophthalic alkyds were developed with good pigment dispersion and litho properties. Faster drying, hard, product resistant films could be obtained even at "long" oil lengths. Another route to media with good pigment dispersion and litho properties and good film-forming characteristics was by the



- Electrons produced in a heated filament.
- Electrons accelerated in the vacuum tube by high potential (e.g. 150 to 300 Kv).
- High energy electrons bombard ink film and cure resin instantaneously (curing carried out in an inert atmosphere).

Figure 6. Electron beam curing.

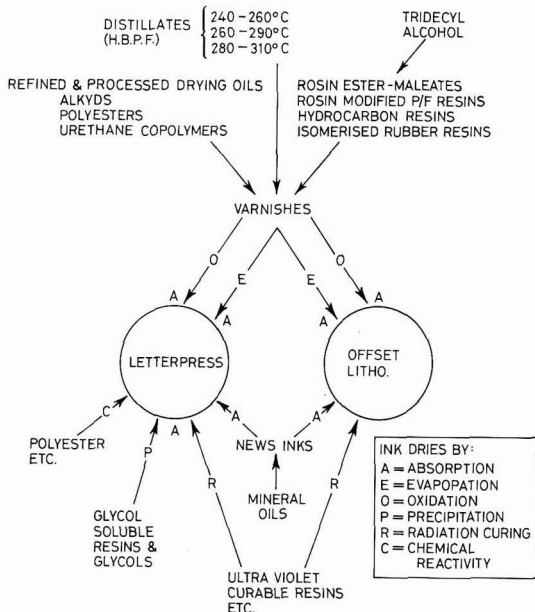


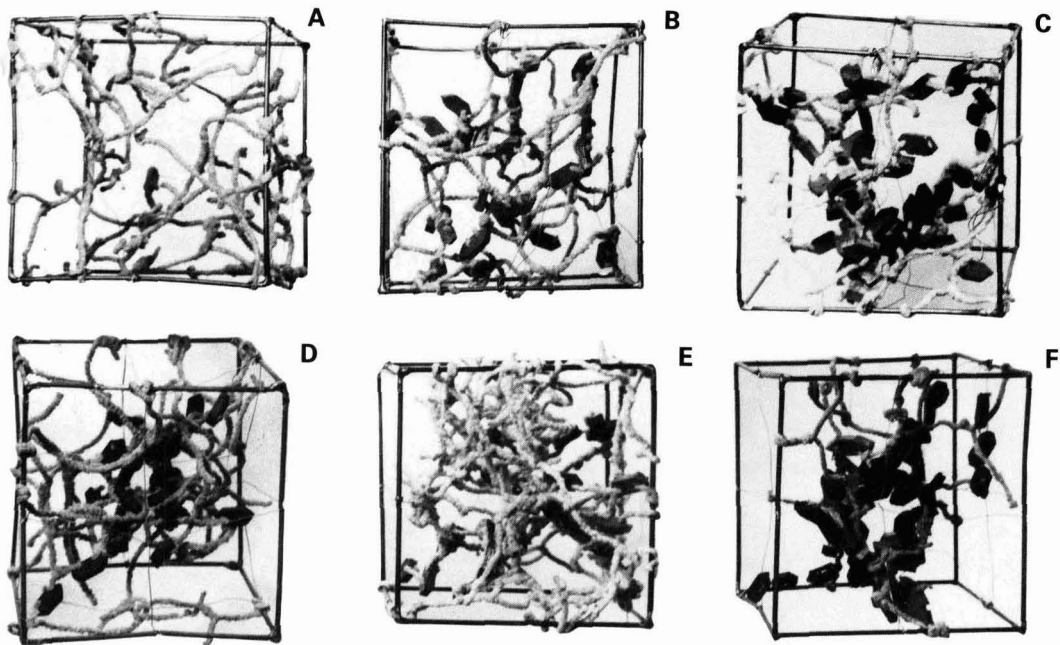
Figure 7. Paste inks—resins, oils and solvents.

introduction of urethane groups into unsaturated triglyceride oils. Urethane modification could also be introduced into alkyd and oleoresinous varnish structures.

### Some outstanding problems

Properties of the various synthetic resin media could be exploited in quick-setting gloss litho inks with optimum litho, flow, and transfer properties and generally good all round film-forming properties but some unsolved problems remained. The substrate has an important influence on ink performance. For high speed printing e.g. in carton work, setting speed, gloss and hold-out properties of the inks is influenced by the porosity and smoothness of the paper or board surface. In contrast to paint film drying, evaporation drying does not operate significantly in sheet-fed litho printing of papers and board substrates, consequently any residual high boiling solvent "trapped" in ink films could have a deleterious, softening effect on the film, retarding the setting and drying. All systems that are dependent for film-formation on oxidative drying will generate some volatile oxidation products resulting from oxidative scission





**A = freshly dried linseed oil film**  
Soft mechanically weak, open structure, permeable to water etc.

**B = dried long oil (linseed) modified glycerol alkyd film**  
Hard, tough film, compact structure, less permeable.

**C = dried styrenated alkyd resin film**  
Hard, tough film, compact structure, less permeable—rapid build-up of high polymer, fast setting.

**D = dried urethane oil film**  
Hard, tough film, compact structure, less permeable—some urethane linkages are hydrogen bonded.

**E = UV cured polymer**  
Hard, tough film, compact structure, low permeability, product resistant—UV cured system: instantaneous cure, high polymer build-up.

**F = Dried oleoresinous ink varnish film**  
Hard resin molecules reinforce film.

**Figure 10. Paste ink media—film formation—3d macromolecules.**

*Table 1*

*Properties of paste ink media (pigment dispersion and litho properties)*

Ink media†	MWD*	Polar groups	PCC*	LP*	Remarks
Linseed litho varnish (40p.)	wide	-OH (low) -COOH	limited	good	Wide MWD limits PCC Hydrophobic dimerised fatty acid chains good for LP
Long oil o-phthalic alkyd (40-80p.)	wide	-OH (high) -COOH	limited	poor	Wide MWD limits PCC Significant content of low molecular weight hydroxylic compounds poor for litho
Long oil isophthalic alkyd (40-80p.)	narrow	-OH (low) -COOH	good	good	Narrow MWD favours PCC Low quantity of OH compounds
Urethane oil (40-50p.)		-NH-COO- -COOH	good	good	
UV curable acrylates: polyol epoxy urethane polyester	depends on components	-OH -NH-COO- -COOH -OH	limited	variable	OH groups on lower molecular weight compounds may increase water sensitivity

\*MWD = Molecular Weight Distribution, PCC = Pigment Carrying Capacity, LP = Litho Performance, †p. = poises.

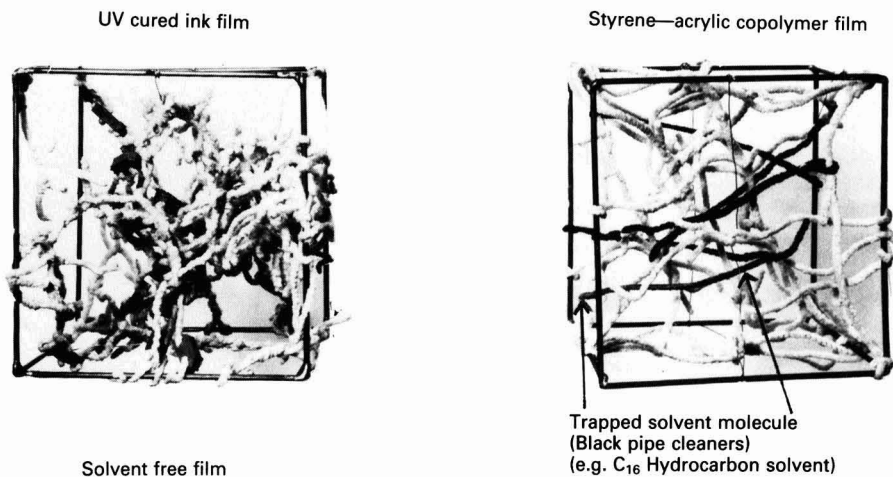


Figure 11. Comparison of UV cured and thermoplastic acrylates.

achieved much commercial success. Maintaining ink stability under hot weather storage conditions may be one problem.

**Solvent-free heat set inks. (catalysed system)**

Offset litho inks for packaging are mainly formulated for sheet-fed printing operations although web-fed printing processes involving UV and EB inks are receiving increasing interest. Solvent-free heat set inks for web letterpress machines were developed in the 1960's to satisfy the Los Angeles Rule 66. Regulations in California. Figure 12 illustrates the curing mechanism. The latent or blocked catalyst becomes active at drying oven temperatures and catalyses the interaction of active components (e.g. polyester-melamine formaldehyde resins) Four-colour letterpress inks printing coated paper webs for can labels was one commercial outlet. The prints had excellent 'nose oil' (perspiration and skin oil) resistance and rub-resistance properties. The inks had somewhat limited shelf-life and commercial interest was not maintained. Another drawback of heat drying systems is that heat sensitive substrates cannot be printed, a difficulty not encountered in EB curing systems.

Heat cured polyester resin systems are being used in the inks for dry-offset printing of two piece metal cans (beer and beverage containers) yielding cross-linked adherent films with the required abrasion, solvent, chemical, oil and product resistances. Non-catalysed inks cure rapidly at the high temperatures of the ovens on can-printing lines.

**Future development**

The field of UV curable inks should expand and attention will be paid to the development of media with improved pigment dispersion and litho properties. EB inks will receive increasing interest and possibly the higher energy of this system of curing will allow more versatility in media development. Health and safety precautions in the handling and use of newly developed materials will continue to require attention.

With the continuing emphasis on press stable inks it does not seem possible that ink setting and drying speeds can be

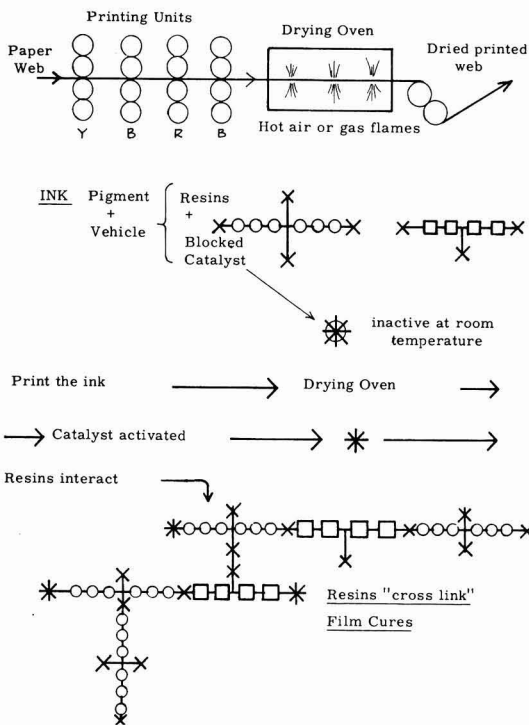


Figure 12. Catalytic drying systems (heat dependent).

improved to any great extent, using existing resins, oils and solvents. Incorporation of chemical agents in the paper or board coating so that the ink film sets or dries rapidly after deposition, by some cross-linking or catalysed drying mechanism, has been investigated but it is too costly and difficult to maintain stability of active chemicals when the paper is stored; also it is very difficult to obtain even distribution of the compound throughout the coating.

In the future more research on polymers derived from oleochemical sources could yield fruitful results. The situation could arise, in the future, when the use of

# Cracks shouldn't just be painted over.

Two-coat systems have proved ideal for surface crack repair. The well known painters rule, "soft over hard", has to be turned upside down. The crack is first bridged with a highly flexible layer of compound based on Vinnapas Dispersion EV 25. Then it is covered with a harder, weather resistant top coating based on our terpolymer Vinnapas Dispersion CEZ 16. The flexibility of the system is such that the two films form a uniform layer. The cracks are thus not just painted over – but are given a long lasting repair.



# EV 25

# Vinnapas® E-Dispersions

our contribution to the subject of  
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Synthetic resin dispersions are nowadays used in many different fields such as the building, textile, paper, non-woven and adhesives industries.

In the sixties, Wacker-Chemie first managed to produce ethylene/vinyl acetate copolymers on a large scale. This was the starting point for a new generation of copolymer and terpolymer synthetic resin dispersions which are today being marketed the world over under the name of Vinnapas E-Dispersions.

With an annual capacity of 100,000 tonnes, Wacker-Chemie is today Europe's biggest and most important producer of ethylene-containing dispersions.



Complete thermal insulation systems, structural and tile adhesives, textured finishes, interior and exterior paints, roofing compounds, concrete additives.

Carpet backing, finishes, flame resistant finishes, coatings, glass fibre binders.

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Filtration fabrics, hospital non-wovens, hygienic non-wovens, non-wovens for household and industry.

Laminating adhesives for furnitures, flooring adhesives, contact adhesives, adhesives for floors, walls and ceilings, packaging adhesives.

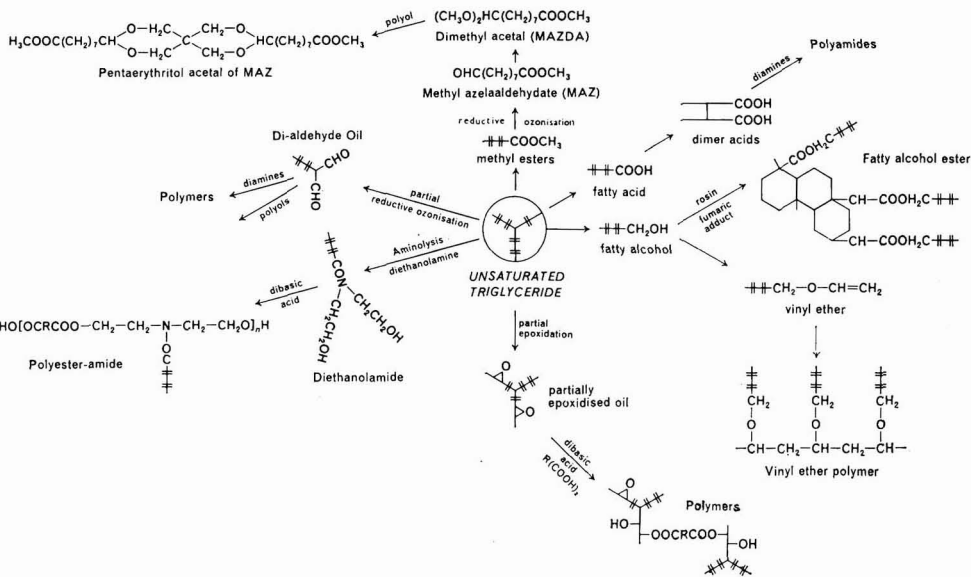


Figure 13. Unsaturated triglyceride reactions.

agricultural sources may become economic due to uncertainties in availability of petrochemical materials. Figure 13 illustrates<sup>3</sup> some reactions of oleochemicals derived from unsaturated triglyceride oils (linseed, soya bean, etc). Only a few of these have been commercially exploited but the potential is interesting.

### Developments in pigments

The need to reduce ink manufacturing costs in a highly competitive ink market worldwide has stimulated interest in 'easy to disperse' pigments, solvent dispersions and resin-bonded pigments. A field of growing interest is the NAD (non aqueous dispersion) type of pigment concentrate but for offset litho inks the present range is limited. A paper<sup>4</sup> comparing the behaviour of various pigments and dyes in UV curing binder systems is a useful contribution to the field of UV ink technology.

### Some aspects of quality control and testing of paste inks

For the evaluation of ink materials and the quality control of paste inks the tests are comprehensive and generally speaking cover most of the properties we need to measure—viscosity, tack, setting, drying, rub-resistance, product resistance etc, but the water-uptake tests for evaluating litho inks are less than adequate for prediction of litho behaviour bearing in mind different presses and printing conditions. This should be a field for continuing research. Aqueous O.P. varnishes for wet-on-wet applications over freshly dried litho ink films have been mentioned and there is also the expanding field of application for UV curable O.P. varnishes over conventional oxidation drying inks. Useful information for determining receptivity can be obtained by use of the "critical surface tension concept"<sup>5</sup>. The present author used a simple 'droplet technique'<sup>6</sup> to measure contact angles of droplets of water and water-alcohol mixtures on different carton board surfaces. The studies showed that some carton boards of low absorbency could cause difficulties when the

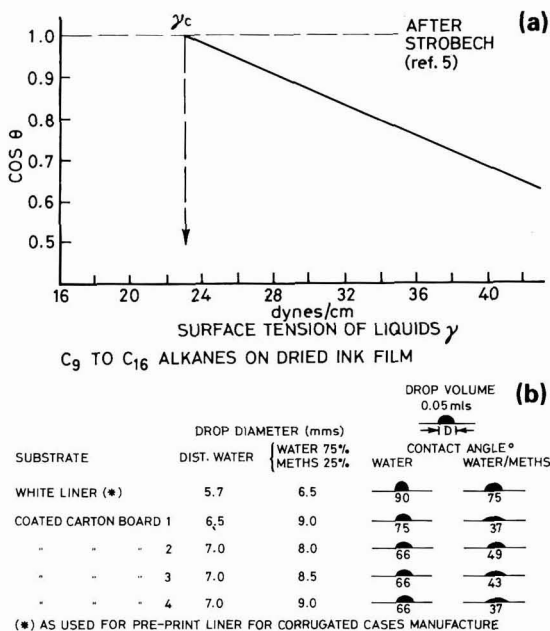


Figure 14. (a) Critical surface tension concept, (b) droplet experiments on paper and coated boards.

litho printed ink film is overprinted with aqueous O.P. varnishes. See Figure 14.

Some 'refusal' problems (repellency and poor adhesion) which sometimes occur when UV varnishes are applied over dried conventional offset litho ink films have been ascribed to the presence of oxidation 'scission' products which are emitted during the drying of the ink film. Insufficient ink drying and low absorptency of the paper or board can adversely affect 'keying'. A glance at Figure 8 will indicate the variety of oxidation scission products

arising from the degradation of unsaturated chains (alcohols, hydrocarbons, aldehydes etc). These compounds could adversely lower the critical surface tension of the ink surface for overprinting and possibly also soften the ink film because some of the volatiles are powerful solvents.

Studies of this kind are fundamental to an understanding of printability problems, just as it is necessary for continuing research into improved ink systems.

### Acknowledgement

Figures 1, 2, 4 and 9 are reproduced by kind permission of PIRA from PIRA IPEX 1984 and PIRA Leatherhead 1985.

# Photoacoustic spectroscopy of printing inks

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### Summary

This article demonstrates that photoacoustic spectrophotometry (PAS) is a useful technique for the characterisation of inks absorbed on paper, films etc. Furthermore this technique can be used to characterise the papers and films themselves. Another useful application of this technique is depth profiling which enables the absorption to be measured as a function of depth.

### Introduction

Transmission spectroscopy in the UV and visible regions is used in the chemical industry to monitor manufacturing processes and to ensure that the final products meet their specifications. Where the product is opaque or highly scattering, for examples solids, powders, gels and pastes, transmission spectroscopy is no longer feasible and optical data can only be obtained by the light diffusely reflected from the surface of the sample<sup>1</sup>. A spectrum of sorts can be obtained by measuring the light reflected from the surface of a specimen as a function of the wavelength of the light. Printing inks are an important example of this approach. As a rule inks are highly absorbing and scattering, and are often not amenable to transmission measurements particularly when the inks need to be measured on papers and other surfaces which are themselves completely opaque.

The reflectance method suffers from two serious drawbacks. Firstly, the diffuse reflectance measurements need to be mathematically transformed in order to obtain the transmission spectrum. This is a complicated procedure which is not always justified on theoretical grounds. Secondly, the intensity of the diffuse reflectance component depends on extrinsic parameters such as particle size and surface smoothness making it difficult to compare different samples of even the same colourant.

In order to overcome these problems a relatively new spectroscopic technique has been developed called photo acoustic spectrophotometry (PAS)<sup>2</sup>. It has been successfully applied in many fields<sup>(3, 4, 5)</sup> and appears to be ideally adapted to measurements of the kind required for printing inks. The principles of PAS were first discovered by

### References

1. PPCJ, 1986, **176**, No. 4159, 40; 1986, **176**, No. 4162, 150.
2. Hercules Inc. USA, GB 2,051, 088A; GB 2,051, 089A; GB 2,051, 090A.
3. Hutchinson, G. H., *JOCCA*, 1973, **56**, 44.
4. Kaden, V. and Eckert, P., *JOCCA*, 1985, **68**, 251.
5. Strobec, C., *Farg och Lack*, 1969, **15**, No. 1, 5.
6. Hutchinson, G. H., paper VI, pp 1 to 7, European Flexographic Technical Association (UK), Report on Seminar, "Ink control on the Flexographic Press", Birmingham, November, 1985.

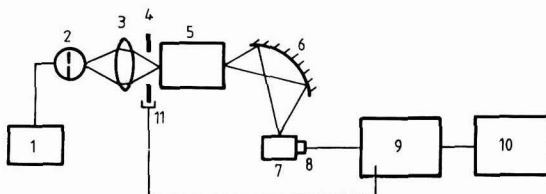


Figure 1. Schematic diagram of the PAS. 1) Lamp psu. 2) Cermax 300 watt co-axial xenon arc. 3) Quartz condensing lens. 4) Chopper (4-500Hz). 5) Spex minimize monochromator. 6) Off-axis elliptical mirror. 7) Photoacoustic cell. 8) Microphone. 9) Lock-in voltmeter. 10) Pen recorder. 11) Reference signal for lock-in voltmeter.

Alexander Graham Bell more than 100 years ago who observed that when a sample in an air-tight enclosure was irradiated with chopped light an acoustic wave of the same frequency was observed. The chopped light causes a periodic heating and cooling of the sample with a consequent similar variation of the pressure of the gas in the sealed cell. This results in an acoustic wave which can be detected by a microphone. Using monochromatic light one can obtain a spectrum of the absorbed light by measuring the microphone output as a function of wavelength. We have now used this technique to examine the absorption of some inks absorbed on paper and other material.

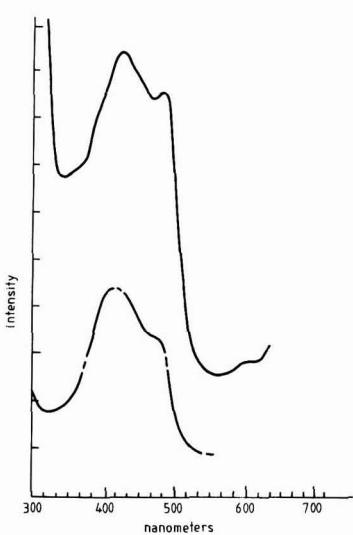
An additional advantage of the PAS method is that the chopping frequency of the light can be varied. Theory and experiments show that at low chopping frequencies the thermal effect penetrates deep into the sample whereas at high frequencies penetration decreases. Thus one can obtain spectra from different levels in the specimen. This is called depth-profiling. Hence one can measure not only the absorption of the ink but by a suitable change of chopping frequencies, also the support medium.

### Experimental

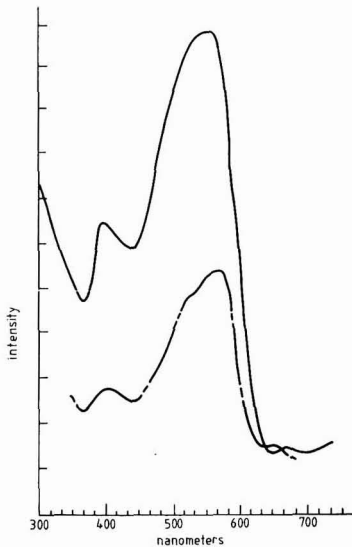
A block diagram of the apparatus is shown in Figure 1. The sample cell is made from rectangular quartz tubing with internal dimensions of  $3 \times 5 \times 5 \text{ mm}^3$ . Thus only very small

\*On sabbatical leave from The Ben-Gurion University, Beer Sheba, Israel.

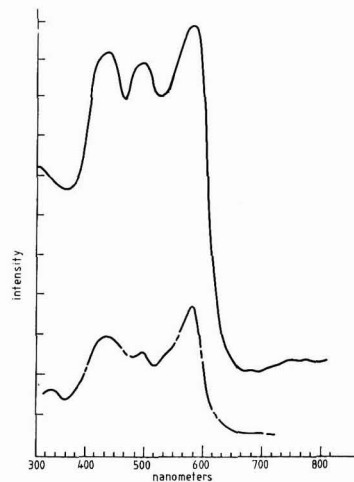




**Figure 2.** PAS spectrum (upper) and transmission spectrum (lower) of Diarylide yellow (colour index pigment Yellow 13) on cellophane.



**Figure 3.** PAS spectrum (upper) and transmission spectrum (lower) of rubrine toner (colour index pigment Red 57.1) on cellophane.



**Figure 4.** PAS spectrum (upper) and transmission spectrum (lower) of mixture of inks demonstrated in Figures 2 and 3.

samples are required. The signals obtained are normalised against carbon black powder which gives 100% absorption of incident light and thus enable fully corrected spectra to be obtained. The spectrum obtained is independent of fluorescence and reflection and largely independent of scatter. There is no requirement for the samples to transmit light as one is measuring a purely absorption effect.

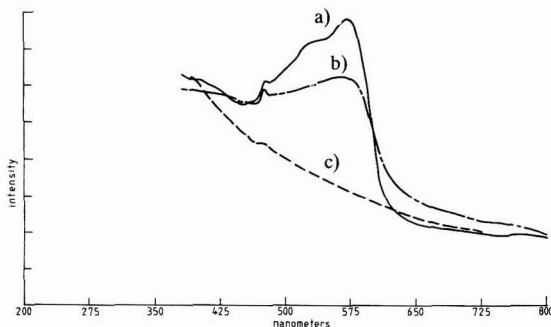
Some of these spectra (Figures 5 and 6) were obtained on a commercial PAS, an OAS400MKII made by EDT. No differences were observed between spectra obtained on this machine or on our own PAS.

## Results

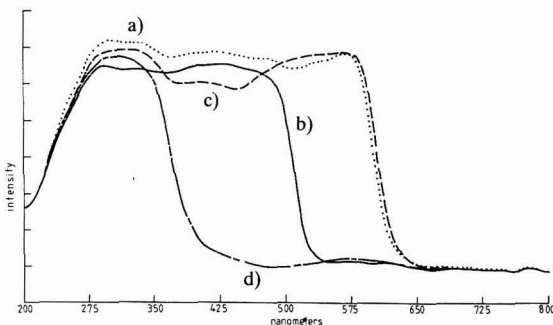
Figures 2, 3 and 4 show the PAS spectra of three inks, yellow, red and magenta on cellophane films. The transmission spectra of these samples are also shown in the same figures. Figure 5 shows the effect of varying the chopping frequency. Three spectra are shown in this figure. The uppermost one is the spectrum of a red ink on a brown card, taken at a chopping frequency of 240Hz. The intermediate spectrum is that of the same sample but at a chopping frequency of 10Hz and the lower spectrum is that of the brown card alone. Figure 6 gives the spectrum of three different inks, yellow, red and their mixture on glossy white paper. Included in this figure is the spectrum of the glossy white paper alone.

## Discussion

Figures 2, 3 and 4 show as expected, the good agreement between conventional transmission spectroscopy and PAS. It can be seen that the spectra of mixtures are the superposition of the individual inks used. This suggests that PAS can be used to resolve the components of inks manufactured by mixing of more than one component and by suitable calibration obtain quantitative information regarding the ratios of these mixtures.



**Figure 5.** PAS spectra. a) red ink on brown card at 240Hz chopping frequency, b) red ink on brown card at 10Hz chopping frequency, c) brown card at 240Hz chopping frequency.



**Figure 6.** PAS spectra. a) yellow ink on glossy white paper, b) red ink on glossy white paper, c) ink mixture on glossy white paper, d) glossy white paper.

Figure 5 also shows that one can obtain the spectra of mixtures but this time on opaque supporting material, a

situation in which one cannot use transmission spectroscopy. One should also note the spectra of the white and brown papers in Figures 5 and 6. This indicates the possibility of using PAS to characterise papers of various degrees of whiteness. In this context characterisation measurements on white cloths made from different materials<sup>3</sup> have been performed. This technique might be useful for the identification and forensic analysis of different papers.

Figure 6 is an example of how varying the frequency of the chopped light causes the PAS spectrum to change. Thus it is quite possible to measure both the ink and its support medium by appropriate use of chopping frequencies.

## Conclusions

It has been demonstrated that the PAS method gives accurate absorption characterisation of ink which is comparable with transmission spectroscopy. It is able to handle inks on all surfaces and can even look at the spectrum of the underlying surfaces.

# Improvements in the dust repellency characteristics of textured coatings

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## Summary

An attempt has been made to reduce dust accumulation on textured coatings, based on thermoplastic acrylic polymers, by incorporating antistatic additive(s) and polymers with pendant ionic groups. The surface conductivity of the different textured paint samples after incorporation of the antistatic additive(s) and polymers with pendant ionic groups were measured by conducting ash tests and surface resistivity measurements with a Rhode and Schwarz Tera-Ohmmeter. The paint samples were applied on panels and kept for outdoor exposure on south facing 45° exposure racks for one year to check the variation in dust accumulation on the paint samples.

From the series of experiments it was to be observed that dust accumulation can be reduced by incorporating antistatic additive(s) and/or polymers with pendant ionic groups in the paint formulation, and textured coatings free from dust can be obtained.

## Introduction

*"An electrified body left in the room for sometime will be covered more with dust than other bodies in the same room not electrified, which dust seems to be attracted from circumambient air"*

Benjamin Franklin

The marked tendency of thermoplastic acrylic polymers to accumulate static charges which result in adhering particles of dust and other foreign matter, has required a study of possible means of eliminating or reducing this property. In general, surfaces protected from static electricity remain clean<sup>1-5</sup>. Static charges can be reduced either by reducing

## Acknowledgements

We wish to acknowledge Dr Cawkill of Fishburn Ink of Watford, who supplied some of the inks and papers used in this study. Figures 5 and 6 were run on an OAS400MKII Photoacoustic spectrometer at EDT Research Ltd, 14 Trading Estate Road, Park Royal, London.

## References

1. Wendland W. M. and Hact H. G., "Reflectance spectroscopy", *Interscience*, New York, 1966.
2. Rosenzweig A., "Photoacoustics and Photoacoustic Spectroscopy", *John Wiley*, New York, 1980.
3. Smith C. W., Al-Hashmi S. A. R., Kushelevsky A. P., Slifkin M. A., Choy R. Y. S., Monro J. A., Culow E. E. and Hewson M. J. C., "Proceedings of the 4th International Symposium on Man and his Environment in Health and Disease", to be published.

the rate of or preventing generation or by increasing the rate of dissipation. Reducing friction generally results in reduction of static charges, but eliminating friction altogether is quite impossible since the textured coatings will always be in friction with circumambient air. Again the geometry of the textured coatings helps dusts and foreign particles to sit on the surface. Thermoplastic acrylic polymers have high surface resistivity and charge decay can occur<sup>6</sup> at very low rate. The practical remedial measures<sup>7-10</sup> for keeping the surface free from static charges are based on increasing the rate of dissipation or leakage. Static charges on polymers dissipate by surface and volume conductivity of charges through the substrate and by loss of charges by radiation to the air. Generally antistatic agents provide their antistatic protection by forming an electrically conductive layer<sup>11,12</sup> on the surface of the coating composition. The following methods have been tried<sup>13</sup>:

- Development of a more electrically conductive polymer
- Incorporation of additives which migrate to the polymeric surface and modify the electrical properties of the surface, e.g. nitrogen compounds such as long chain amines, amides and quaternary ammonium salts, esters of fatty acids and their derivatives, sulfonic acids and alkyl aryl sulfonates, polyoxyethylene derivatives, polyfunctional alkylating agents, polyglycols, polyhydric alcohols, phosphoric acid derivatives, solution of electrolytes in liquids having high dielectric constants, molten salts, metals, carbon black or semiconductors and liquids with high dielectric constant, such as water, which are usually volatile and have a temporary effect only. Antistatic agents

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are generally hygroscopic in nature and form a crosslinked polymeric network in order to become an insoluble aqueous detergent medium. It has been reported that the dust content of air can be reduced by scrubbing with an aqueous solution containing fatty alcohols, alkyl phenol derivatives, alkyl naphthalene sulfonate, tetraalkylammonium chloride, polyvinyl alcohol etc, and this methodology<sup>14</sup> has been implemented for removal of dust from dyestuff production plants in the USSR.

- Copolymerisation of an antistatic resin i.e. a conductive polymer or polymer with a pendant ionic group, with the base polymer.

An ideal antistatic agent should have a low electrical resistivity at low temperature and humidity. It should be odourless, non-toxic, non-flammable and must be easily dispersible in the medium and applicable on different substrates.

The present work describes the relative performance of such additives as stearamidopropyl dimethyl- $\beta$ -hydroxyethylammonium nitrate, sodium hexametaphosphate, bis-(3-aminopropyl)-amine, hexamethylene diamine, and a conductive polymer synthesised from butyl acrylate, acrylic acid and diethanolamine, in improving the dust repellent characteristics of textured coatings.

## Experimental

The ingredients used for paint manufacturing were of commercial quality. The antistatic additives used were guaranteed laboratory reagents. The conductive polymer was synthesised using laboratory reagents in a three necked flask equipped with a stirrer and condenser, while the reaction temperature was thermostatically controlled. The paint samples were prepared in a cylindrical vessel equipped with a cold water jacket and a high speed disperser. The paint samples were prepared using a copolymer dispersion of vinyl acetate and vinyl versatate having a high viscosity, low water absorption and good stability under alkaline condition; particle size - 0.1 to 0.5  $\mu$ ; acid No. 2-3, pH 3-4; tensile strength (at 20°C and 65% R.H.) 30 kg/cm<sup>2</sup>; elongation at break (at 20°C and 65% R.H.) 500%, free of plasticizer.

### Synthesis of the conductive polymer (polymer with pendant ionic group)

This was prepared from acrylic acid (70.0 wt%), butyl acrylate (28.0 wt%) and acrylamide (2.0 wt%) following the emulsion polymerisation technique. Ammonium persulfate was used as initiator and the reaction was conducted at 80°C for 15 minutes till 98% conversion was achieved. The unreacted monomers were removed under vacuum (10mm Hg) at 40-42°C. The emulsion thus prepared was found to have 30% solids. Later, it was treated with diethanolamine at 45°C for 6 hours; pH 7.1, Sp. gr. (30°C) 1.01, viscosity (30°C) 20 poise.

### Preparation of the white textured paint base

This was prepared from titanium dioxide (12.0 wt%), extenders and quartz silica (35.0 wt%), acrylic emulsion 50% solids (38 wt%) and additives/solvents (15.0 wt%) using a high speed disperser at 30-35°C; Viscosity (30°C) 40 poise.

### Addition of antistatic additives and conductive polymers (polymers with pendant ionic groups) to the white texture paint base

Stearamidopropyl dimethyl- $\beta$ -hydroxyethylammonium nitrate, sodium hexametaphosphate, bis-(3-aminopropyl)-amine and hexamethylene diamine were added individually in three portions (0.5 wt%, 1.0 wt% and 1.5 wt%) to the white texture paint base. Conductive polymer, synthesised from butyl acrylate, acrylic acid and diethanolamine, was added to the white texture paint base to the extent of 2.5 wt% and 5.0 wt%.

### Testing of paint samples

The extent of conductivity developed in different paint samples prepared by adding antistatic additives and the conductive polymer to the white texture paint base, in varying proportions, were measured by conducting an ash test and surface resistivity measurements.

1. Ash Test: This consists of producing a static charge on an article by rubbing it twenty five times with a woollen cloth. The charged article is then held towards activated charcoal at different distances. The way the article behaves (the extent of attraction) with the activated charcoal is a qualitative measure of the retained static charge on the article.
2. Surface resistivity: The most accurate method of determination of electrostatic charge is made by measuring surface resistivity with a Rhode and Schwarz Tera-Ohmmeter. Test samples were cut into 5 x 6.25 cm<sup>2</sup> strips and allowed to stand at constant temperature 25°C (77°F) in constant humidity (50% relative humidity) for 24 hrs to reach equilibrium. Surface resistivities were measured in the same constant temperature and humidity room.
3. Outdoor exposure: The paint samples were applied with texture paint roller brush on asbestos panels and kept for outdoor exposure in south facing 45° exposure rack for one year at Howrah, India, to check the variation in dust accumulation on the panels.

## Results

Table 1 shows the results of the ash test and surface resistivity of different paint samples. Table 1 reveals that additive A (1.5 wt%) and additive E (5.0 wt%) have almost the same effect. The effect of hexamethylene diamine (additive D) is also quite encouraging. The surface resistivity data of other additives are around 10<sup>4</sup> megaohms or less compared to 4 x 10<sup>7</sup> megaohms in case of texture paint sample containing no additive. Thus, Table 1 shows the result of effective destaticization on addition of antistatic additives and conductive polymer.

The photographs (Figures 1 to 15) of the outdoor exposed panels also showed the identical result as shown in Table 1.

## Discussion

Textured coatings are becoming increasingly popular both for interior and exterior finishes and a long lasting dust free finish is the ultimate goal. The antistatic additives are hygroscopic in nature and thus help the textured paint to absorb moisture from surroundings and thereby form a double layer which makes the coating conductive. Again,



Figure 1: No Additive



Figure 2: 0.5% Additive A

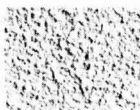


Figure 3: 1% Additive A



Figure 4: 1.5% Additive A



Figure 5: 0.5% Additive B

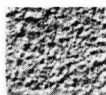


Figure 6: 1% Additive B



Figure 7: 1.5% Additive B

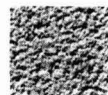


Figure 8: 0.5% Additive C



Figure 9: 1% Additive C



Figure 10: 1.5% Additive C



Figure 11: 0.5% Additive D



Figure 12: 1% Additive D



Figure 13: 1.5% Additive D



Figure 14: 2.5% Additive E



Figure 15: 5% Additive E

Figures 1-15. Photographs of textured painted panels after exposure for one year on 45° exposure racks at Howrah, India. The %'s are wt %'s of the additive added to the texture paint.

Table 1

Measurement of development of surface conductivity in different texture paint samples by conducting the Ash Test and Surface Resistivity measurement (Megaohms).

Methods	Additive														
	0 no additive		A(wt%) 0.5 1.0 1.5			B(wt%) 0.5 1.0 1.5			C(wt%) 0.5 1.0 1.5			D(wt%) 0.5 1.0 1.5			E(wt%) 2.5 5.0
Ash Test (inches)	4.5	0.1	0	0	3.2	2.5	2.0	1.0	0.8	0.4	1.2	0.6	0.3	0.2	0
Surface Resistivity (Megaohms)	4x10 <sup>7</sup>	1.1x10 <sup>4</sup>	2.1x10 <sup>3</sup>	4x10 <sup>2</sup>	4x10 <sup>4</sup>	0.9x10 <sup>4</sup>	0.3x10 <sup>4</sup>	2.5x10 <sup>3</sup>	0.5x10 <sup>3</sup>	1.3x10 <sup>3</sup>	2x10 <sup>4</sup>	4.1x10 <sup>3</sup>	6x10 <sup>2</sup>	4.1x10 <sup>3</sup>	3.9x10 <sup>2</sup>

diethanolamine in conjunction with acrylic copolymer forms zwitterions giving rise to quarternary nitrogen which helps the textured surface in the same fashion.

### Conclusion

Antistatic additives and conductive polymers dissipate

static charge and prevent further static charge accumulation by increasing surface conductivity. Accordingly, the destaticized surface coatings resist dust, dirt and lint attraction. From the series of experiments it can be concluded that antistatic additives and/or conductive polymers can be incorporated as an integral part of the textured paint formulation to obtain a long lasting dust free finish.

## References

1. Johnson, K., "Antistatic agents-Technology and Applications", *Noyes Data Corpn*, Park Ridge, New Jersey, 1972.
2. Antistatic additives and surface treatments for fibres, films and mouldings. A literature survey 1907-1967, 1967, *Science Surveys*, Mountainside, New Jersey.
3. Brushwell, W., *Paintindia*, 1984, **34**, 15.
4. Shashoua, V. E., *J. Polym. Sci.*, 1958, **33**, 65.
5. Rogers, J. L., *Soc. Plast. Eng. J.*, 1973, **29**, 28; 1973, **29**, 52.
6. Medley, J. A., *Nature*, 1953, **171**, 1077.
7. Hersh, S. P., *Polym. Plast. Technol. Eng.*, 1974, **3**, 29.
8. Martin, J. C., *Soc. Plast. Eng. J.*, 1962, **18**, 392.
9. Levy, W. W., *Soc. Plast. Eng. J.*, 1962, **18**, 1288.
10. Bernard, K. H., *Amer. Dyestuff Repr.*, 1955, **44**, 220.
11. Ward, G. R., *Amer. Dyestuff Repr.*, 1955, **44**, 220.
12. Woodland, P. C. and Ziegler, E. E., *Mod. Plastics*, 1951, **28**, 95.
13. Concise Encyclopedia of Chemical Technology (Kirk-Othmer), Wiley Interscience Publications, *John Wiley & Sons*, New York, p 130 and references cited therein.
14. Kalininchenko, O. V., *USSR. Patent 995851, Soviet Invent III*, 1984, **84**, (No 45), GpG 2.

# Leather finishing\*

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## Abstract

This article describes the manufacture of leather followed by discussion on leather finishing.

It must be sheer conjecture to estimate when man first thought of protecting himself from the natural hazards of climate and terrain by the fabrication of some form of covering for the body and feet from the skin of his kill. Some of the earliest caveman drawings (30,000 BC) show that the feet were covered by something like a shoe.

Certainly there is evidence that 4,000 years BC in the Nile Delta the upper classes, at least, wore leather sandals to protect the soles of the feet from the hot desert sand. Some of these sandals including a fine pair of calf leather ones recovered from the tomb of Tutankhamen are physical proof and can be seen in the Cairo Museum.

In Great Britain the earliest known leather article appears to be a roughly fashioned leather cup dug out from considerable depth at Smithfield in London in 1867, perfectly preserved and which the experts have dated as from the 'Neolithic' period. Generally the climate of this island is not conducive to the preservation of an organic material like leather. However, in recent years, leather pieces and evidence of a tannery have been discovered in York and attributed to the Vikings.

What is Leather? By definition, leather is the skin of animals, birds, reptiles or fish converted chemically into a non-putrescible material. The first tanning materials used were of vegetable origin and discovered quite accidentally by skin falling into water containing the bark, fruit, roots or leaves of certain trees which preserved them. Alum tanning, the first type of mineral tannage was probably found in the same way. This mineral readily occurs on the North Yorkshire Moors discolouring pools and streams with its slightly milky colour.

To give a brief explanation of the leather making process that is usual today one must begin with the raw hide or skin. These are usually bought from the abattoir by weight (at present £1.10 per kilo). They are lightly salted to prevent bacterial damage. The first operation is to soak the hides and wash out this salt and any dirt adhering to the hair. This

operation takes place in a wooden drum which revolves at slow speed. Cement mixers are also used for this purpose. Next the hair is removed by immersing in a strong alkaline bath comprising calcium hydroxide, sodium hydroxide and sodium sulphide. This takes place in the same drum as the soaking process and pulps the hair by dissolving the hair root. The strong alkaline liquid swells the hide into a translucent turgid sheet. This is then passed through a machine rather like a large cylinder lawn mower which removes surplus fat and adipose tissue from the inside of the hide. These "fleshings" as they are called are chemically purified and turned into table jellies and gelatine.

The next chemical process is to remove certain protein materials called elastins which glue the leather fibres together and prevent them from slipping. This is done by the use of pancreatic enzymes which are very selective in digesting elastin at pH of 8-8.4 and at blood temperature. The hides are delimed by the addition of ammonium sulphate to reach this pH before the enzyme is added. After one hour the enzyme is killed by acidification. Sulphuric acid is added in a saline bath (to prevent acid swelling) and to prepare for the tannage. By this time the pH will be around 2.0. There are two main types of tannage used today, vegetable which makes sole leather, saddlery and harness leather and leathersgoods, and chrome tannage for shoe upper leather, clothing and some upholstery leathers.

Vegetable tannage is carried out with the tannins present in the bark or fruits of trees such as Mimosa, Chestnut, Oak, Quebracho, Myrobalams and gives the characteristic smell of leather and a pale brown appearance.

Chrome tannage is made with basic chromium sulphate and is a mineral tannage, green in colour and very resistant to high temperature and chemical attack.

After tannage the leather is removed from the tanning drums, excess water removed by squeezing between felts under high pressure and the leather is then divided or cut into two horizontally. This splitting machine consists of an endless band knife and governs the thickness of leather. For example, men's unlined shoes are split at 1.8-2 mm. Ladies' shoes 1.4-1.6 mm, high length fashion boots 1.3 mm and clothing leather 0.7 mm, sole leather will be up to 10 mm. After splitting, the leather is examined and graded for

\* Presented at the West Riding Section OCCA Meeting, 21 October 1986.



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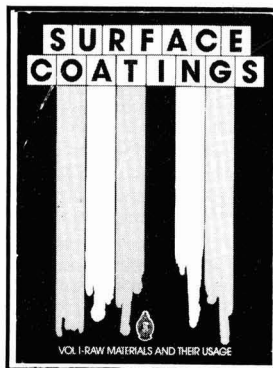
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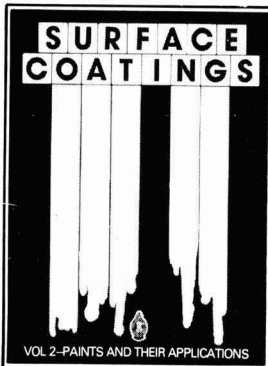


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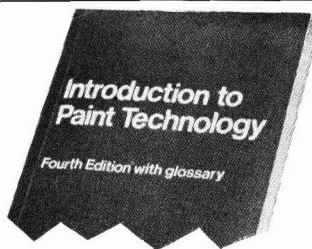
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various purposes. It then returns to the drums for neutralisation of the acidity, followed by dyeing which is normally carried out with acid dyestuffs. The final operation is to replace the natural oils and fats which have been removed during the earlier parts of the process with emulsified oils such as fish, castor, neatsfoot and, until recently, whale oil (the industry now uses synthetic replacements). Now the leather is stretched out and smoothed by a setting machine before being dried on a heated plate under a vacuum hood. The dried leather is rather hard at this stage and has to be softened by mechanical means. A slight damping with water is given and the leather passed between a series of interlocking stubby fingers which massage the fibres, loosening and softening.

The leather is now ready for finishing.

The basic requirements of a leather finish today are covered by three main criteria:

1. Adhesion of finish to the leather – governed partly by oils used to soften leather and partly by the choice of a suitable resin binder.
2. Flexibility of the finish on the leather – governed also by the resin.
3. Wet and dry rub fastness of the finish – governed mainly by the top coat.

Adhesion is measured by sticking the leather surface to a steel plate and measuring the force necessary to pull the finish from the leather. A minimum of 250g per cm width for dry adhesion and 200g for wet adhesion is recommended by Shoe and Allied Trades Research Association.

Flexibility is assessed by simulating the flexing which occurs during the walking operation when the shoe vamp bends. Again Shoe and Allied Trades Research Association recommend one million flexes without more than fine cracking of the finish.

Rub fastness is measured by a rotating white felt pad which is applied under a weight of 4.75lbs. A recommendation of 1,024 revolutions for dry rub fastness and 512 wet rub fastness is necessary without marking of the white felt or marring of the finished surface.

The finishing of leather goes back a long way. In the British Museum there is part of the Egyptian book of the Dead which contains a list of names painted on leather dating from c1500 BC. It was soon realised that unfinished leather which looked drab could be improved by the application of colouring and protein materials to improve its appearance. In the times of the Pharaohs a simple mixture of cow's milk was used with egg white to give a bright surface coating. The milk contained about 3% of casein which acts as a binder and glazing material and 3-4% fat which acts as a lubricant. For black leather fresh bull's blood was often used, the albumen it contained proved to give excellent gloss if a somewhat brittle film. The use of fresh blood has only recently ceased in leather finishing. It was a rather messy process and needed to be brought daily from the slaughterhouse. Egg albumen however still continues to be used and is available as a dried powder mainly produced in China.

The earliest types of finishes therefore were protein materials and would have been coloured by natural dyes obtained from berries, bark or nuts – or crushed beetles. Pigments were also available – iron oxides, malachite, lapis lazuli, lampblack, gypsum. This type of finishing continued

albeit in modified forms and with greater sophistication and mechanical assistance until the arrival of acrylic resin emulsions in the 20th century brought about a significant change in finishing. Casein and albumen finishes though still continue to be used especially for high quality shoes in calf and goatskin. Italian shoe makers prefer to use protein finished leather as do the very best of British shoe makers. However this type of finishing has several disadvantages. Poor flexibility, poor resistance to wet rubbing and water spotting but above all it is labour intensive and requires highly skilled operatives. With the introduction of synthetic resin emulsions around the end of World War II and the shortage of skilled manpower, the large scale use of glazed protein finishes began a rapid decline, thus leading to the beginning of a more scientific approach in an industry largely based on craft workers with an artistic flair.

Introduced originally as an undercoat in cellulose finishing with the aim of minimising plasticiser migration into the leather, emulsions of synthetic resins and in particular poly acrylates rapidly established themselves as binders in the application of water based finishes. Some of the advantages of acrylics over the protein binders were important ones and helped leather manufacturers to overcome problems which up to this time had not been possible. Light fastness, adhesion of the finish to leather, flexibility of the finish, resistance to water spotting and wet rub fastness were all significantly better with acrylics. In the late 1940's hides and skins were in short supply and of low quality due to poor animal husbandry. During the war one important factor was the ability of acrylic resins to bind large amounts of pigment. Whereas a casein finish consisted of 50-100g of pigment dispersion to 250g casein binder in a litre of liquid finish, acrylics would bind twice the amount of pigment in a litre. This enabled the leather finisher to use lower quality hides and by the application of several coats of high covering power pigments turn them into good leather.

Other types of synthetic resin emulsions, PVA, styrene, acrylonitrile and butadiene copolymers became available either as individual polymers or copolymerised with acrylic. They also give flexible films but only butadienes have established and retained a place in modern leather finishing, primarily for low quality leathers which require a thick coating of finish to hide the defects. Some of the disadvantages of a butadiene binder system include a rubbery feel, a tendency to yellow and therefore preventing their use for white or pastel shades. Another is premature ageing of the finish when butadienes are pigmented with organic toning pigments containing manganese. This premature ageing causes embrittlement of the whole finish and large cracks appear on the surface and sometimes well into the leather itself.

The acrylics and to a lesser extent butadienes were the principal binders used in leather finishing through the 50's and 60's. The main constituents of leather finishing during this period were pigment dispersions, to colour the leather, synthetic resins to bind the pigment to the leather, paraffin wax emulsion to avoid sticking of the resins and water as the diluent.

Pigment dispersions for leather are usually supplied as thick pastes ground in casein as a protective colloid and dispersing media. Casein also acts as a thickener and prevents the pigment from settling. The requirements of pigment dispersions used in leather finishing can be placed



into two groups. Properties required by the leather finisher and properties required by the leather user may not be compatible.

For example, the leather man will want to have high covering properties so that lower selection hides caused by damage to the living animal as well as the hide can be used and that as few applications as possible can be given and so higher productivity with cheaper costs. However the shoe manufacturer may not want highly covered leather. These days this is synonymous with cheap plastic looking shoes whereas the fashion today is for natural, leather looking items soft to touch and comfortable to wear. Modern shoe making demands high heat resistance and pigments which do not bleed into PVC or polyurethane soling materials. Tanners prefer to economise with cheaper pigments which do not have this property. Good resistance to hot humid conditions is also required. Stitched upper leather is often placed in steam for several minutes to relax the leather before lasting therefore the finish should be able to withstand this treatment. The lasted upper is then force dried so that it retains its shape better after slipping from the last.

Car upholstery leather requires good abrasion resistance, flexibility and adhesion of finish to leather. A light fastness to blue wool scale of at least 6 is demanded by Volvo and Saab insist on grade 7. Pigments must not bleed into PVC which is often used in side panels combined with leather.

Clothing leather also demands excellent light fastness and resistance to steam ironing. Resistance to discolouration by certain adhesives used in folded seams is also required. As well as the physical properties, aesthetic properties of the leather have to be considered, soft to touch and a drape like cloth, leather like, not plasticity, bright fashion shades etc.

What then are the types of pigment used. Generally all available pigments can be used for leather but inorganics are preferred because of their high covering, light fastness and heat resistance. Organics are used for brightness and life either in combination with inorganics or alone.

*White* Titanium dioxide in both anatase and rutile forms. Rutile is preferred for extra covering properties and for shading purposes whereas the anatase gives cleaner purer whites. Titanium dioxide because of its inert character, good light fastness and good covering power has virtually no opposition in the production of white leather. Commercial dispersions of 50-60% TiO<sub>2</sub> are used by the leather industry and several applications are necessary to achieve obliteration of the leather substrate which is often of a greenish colour due to chromium sulphate tannage which is used for most shoe leathers. Titanium dioxide in powder form is often used in the tanning process to obtain a better coloured leather finish. The TiO<sub>2</sub> is physically absorbed into the surface of the leather, but unfortunately is preferentially absorbed by the flesh side (or animals inside) because of the more open fibre structure. The grain (or hair side) being a finer and densely packed structure.

*Black* colours are mainly produced with carbon black dispersions. They are fast to light and heat and give a dense black colour. Because carbon is difficult to disperse in aqueous media commercial dispersions of 14% carbon are rarely exceeded. Black iron oxides are sometimes used with carbon. Their high solid content give good filling properties but they give poor colour and cannot be used alone. Aniline

black produced by oxidation of aniline with chromic acid gives a very rich tone and is used to improve the colour of black suede, without impairing the 'nap' or fluffy fibre. Ever since the withdrawal of benzidine black dyes on health and safety grounds the production of intense black suede has been extremely difficult without recourse to 'pigmenting' the surface.

*Brown* shades are largely produced with highly concentrated iron oxides with added carbon black for the dark browns. Iron oxides have high covering power, are fast to light and heat and do not bleed into lacquers and after white and black constitute the largest selling 'colours' for leather manufacture.

*Yellow* pigments in this group are giving both pigment producer and pigment user many problems these days. Lead chrome and cadmium yellows are the principal pigments used but are of concern to the health and safety directorate and several water authorities. Lead chromes are used for most yellow brown colours and have high covering properties. At one time only soluble lead salts were considered to be dangerous but now all lead whether soluble or not is under suspicion. In factories it is necessary to monitor lead levels in the blood of workers who handle these pigments. Cadmium chemicals too are considered toxic and have been banned altogether in Scandinavia whether as pigment dispersions or cadmium coated leathers. Only this month it has been rumoured that the EEC may ban the use of cadmium altogether in 1987. The alternatives one must look to are the organic yellows but these have much lower covering power and poor heat resistance and in order to produce light fastness the price is much higher than chromes.

*Reds* are most usually organic types sometimes mixed with orange chromes to give better covering properties. The red shades cause the most complaints in leather finishing. Light fastness, heat resistance, bleeding into lacquers, PVC or polyurethane soling materials used in shoe manufacturer are all important properties that pigments for leather must have these days and in order to obtain red colours with these properties one will have to pay in the range £60 per kilo for the powder pigment.

*Green and Blue* shades are mainly produced with copper phthalocyanines but because of their poor covering power are often used with titanium dioxide and carbon black to give better cover of grain defects.

Besides the resin emulsion, pigments and water, certain auxiliary products are added to these mixtures to confer special properties or to facilitate the mechanical procedures which leather has to go through during the finishing process.

Wax emulsions based on paraffins are commonly used to prevent leather from sticking one piece to another or to the heated platen during hydraulic pressing. Hydraulic pressing with either a chrome plated super smooth surface to give a smooth glossy finish or embossing plates to reproduce different patterns is carried out hot between 70-100°C. Paraffin wax emulsions melt at this temperature and migrate to the leather surface therefore stopping the thermoplastic resins from sticking to the hot plate. Quantities required are quite small, around 10-15% based on the quantity of resin used. Casein binders can also prevent this sticking as they are non thermoplastic, but larger quantities

are required and they are not fast to light. They also harden up a finish as they are not as flexible as the synthetic resins. Matting agents are used and these are often based on fine silica dispersions. They also give excellent filling properties especially useful when using organic pigment e.g. red colours which have low filling and covering power. Silicone slip agents are used but their use is largely confined to the top coats as they are extremely effective materials and overuse can cause intercoat adhesion and cratering problems.

It is very rare for the finishing of leather to be accomplished by the use of a single coating, more commonly three are used. The first, impregnation, consists of a fine particle sized acrylic or PU Emulsion aided by a suitable penetrator – applied as a primer to obtain good adhesion and also to tighten the grain fibres (this prevents unsightly wrinkles in your shoes). The leather is then pressed smooth and buffed with a very fine sandpaper to promote adhesion of the mixture comprising the pigment/resin products. Several applications of this mix may be necessary to achieve the build-up of the finish before the final coat is applied.

This final coat is designed to give water resistance, abrasion resistance plus a degree of gloss or matting as required. These top coats are usually of nitrocellulose or polyurethane but due to the high costs of solvents and the dangers in their use, more and more attention is being turned to aqueous top coats, e.g. nitrocellulose emulsions which can be diluted with water are commonly used. They are convenient and easy to use for topcoating. Films formed from these emulsions give good wet and dry rub fastness properties. They are usually fairly bright but can easily be made matt by additions of products which interrupt the film's smoothness. Similarly, polyurethane dispersions can serve the same function as nitrocellulose. Polyurethane has greater dry rub and abrasion resistance than N/C but lower wet rub. Aliphatic urethane dispersions are fast to light but nitrocellulose has a tendency to yellow on ageing and this can be pronounced on white or pastelshades when used in shoes with polyurethane soles. Amine groups, present in the soles, discolour nitrocellulose quite rapidly and to avoid this cellulose acetate butyrate top coats are used. These have an added advantage in that the dried residue is nonflammable unlike the cellulose nitrate which is highly flammable and burns rapidly.

Hard polyacrylates are also available. They are light fast, completely solvent free and give good wet and dry rub resistance. They have one significant failing in that they are thermoplastic and can soften with heat causing sticking or marring of the leather surface. Copolymers of urethane and acrylates however show promise in being able to resolve the shortcomings of both types of products when used independently.

The use of solvent based lacquers, though decreasing because of hazards in transport and application, are still used where maximum properties such as gloss and rub resistance are needed. This includes shoe and upholstery leather but I suppose the extreme example is patent leather where a very thick layer of two component polyurethane is applied to give a virtually indestructible finish.

In order to produce two-tone or semi-aniline effects on leather the use of pre-metallised dyes are frequently used in the top coats. These dyes help to confer much brighter colours and look more attractive than plain colours.

Having discussed the materials, the machinery used in leather finishing will now be considered.

Originally application was by hand, quite literally in fact. The lampblack/glue/gelatine/casein mixture was applied by the forearm and was considered to give a smoother finish than a brush. The men used to shave their arms every morning to avoid hair marks. Present day equipment includes automatic padding machines where endless belt plush pads apply the finish as the leather passes underneath on a conveyor system. Curtain coating is also used for heavy applications of 20-30 gms sq. ft. The finish mixture falls in a curtain over a weir onto the leather. A more recently introduced method of applying finish is the reverse roll coater. This machine is based on a 'thousand' point roller which picks up the liquid retained by the doctor blade and passes it to the leather which is moving in the opposite direction to the applying roller – hence reverse roll coater. This is a very economical machine in its use of finishing materials as the liquid is only transferred when the leather is passing under the roller.

Automatic rotary spray machines are still very popular because of their high through put but they are expensive to buy and wasteful of materials despite sophisticated electronics. Trials have shown that up to 50% of the liquid sprayed through the guns goes up the extraction chimney and not onto the leather. Rates of finish application vary widely according to machine type and finish film desired but in total 30-40g. sq. ft. of the pigment/resin coat is applied followed by 15g. sq. ft. of a lacquer. A padding machine applies about 7-10g., a spray machine 7-20g., curtain coater up to 3-30g. and reverse roll coaters the same.

Hydraulic presses are used with either chrome plated smooth platens to flatten and increase the gloss of leather or with engraved platens to reproduce a variety of patterns including other animals e.g. crocodiles, lizard and elephant.

The different types of leather produced today will now be considered. Like all natural products, leather is a variable material in size, shape, texture and thickness. Therefore certain skins are suitable for one article and others for something different. There are three large groups of animal skins used commercially: bovine, ovine and caprine. Cattle and sheep exist in large numbers in this country but there are few goats and thus there is no domestic goatskin production. Goats will eat anything and can exist in areas where the vegetation is limited such as parts of Africa and Asia but contribute to erosion.

A goatskin will yield around 6 square feet of leather, is fairly thin, but has a very tough resistant grain layer with a characteristic hair follicle pattern. Leather made from goatskin is used for high quality shoes and for leathergoods articles like diaries, books, wallets, billfolds, etc. As this country has no domestic supply of goatskin obviously they have to be imported and this means prices are high and given today's economic situation there are difficulties in obtaining supplies. This is the main reason why goatskin shoes are less common and why there is only one tannery devoted to goatskin processing in Britain.

Sheepskins on the other hand are plentiful here, and there are two types of sheep. First, the long woolled British and New Zealand animals which are reared mainly for wool

and meat. Second the "hair" sheep produced in semi desert areas in the Middle East and Africa for meat. Because of the climate in which it lives the wool is short and fine more like the hair of goatskin and contains much less grease.

This difference is important for leather making. The cold climate skins tanned with the wool on, form the major part of the traditional sheepskin coat business. That is with the wool side on the inside and the flesh or suede side on the outside. Suede, by the way, is the inside part of the skin and is specially fluffed to a fine nap by buffing with sandpaper wheels. The hot climate skins are tanned without the hair on and produce very fine grained high quality leather for clothing purposes and for gloves.

An increasing proportion of the British sheepskin industry now de-wool the skins and turn them into grain clothing. This is a very difficult thing to do because of the very high grease content. This grease has to be removed during tanning and the resultant voids yield a delicate material which can easily tear or delaminate. Domestic sheep are about 8 square feet in size. Chamois leather is made from sheepskin. In this process the skin is divided into two parts by passing it through a horizontal endless bandknife. The top part, the grain, will measure 0.3mm and is called a skiver. The lower part about 1.00mm thick is processed for Chamois by tanning with cod oil and then oxidised in hot ovens to complete the tannage. The skivers are used for desk tops, coffee tables, etc. often gold blocked with decorative designs.

Cattle hides are large yielding 45 square feet in area with a thickness of 4-5mm. They are tough and strong being used traditionally for shoe leathers, both sole and uppers, and also for upholstery. Modern methods and machinery have enabled cowhides as opposed to ox to be split to 0.7mm thus providing another source for the production of clothing leather.

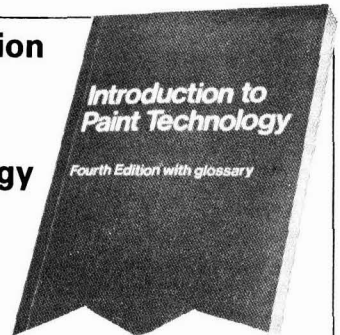
Pigskin is rarely produced in this country. Pork with its skin is bought from the butcher, cooked and its skin (crackling) is eaten. One of the dangers facing the leather trade today is that hides and skins are a byproduct of other industries, either meat or wool. Provided it is more economical to sell it as part of "the meat" there will always be a larger demand for leather than supply. The plastic shoe must exist and continues to be made for no other reason than necessity. The world's needs will continue to increase and therefore the search for other types of animal skin for leather making becomes more urgent. The Chinese, Japanese, Poles and Hungarians have traditionally skinned their pigs and made leather from them. The Americans are now beginning to do the same. Incidentally pigskin is one of the rare leathers where the hair shaft passes right through the skin into the subcutaneous tissue. If one holds it to the light one can see through the holes. Fish skins have never been considered before as leather making possibilities but tanneries now exist which tan cod and salmon. Mr Mathews' "bootiful" turkeys are being skinned. After all they are similar to baby ostrich. Frogs from Indonesia, South America and the Far East are large enough to produce an interesting leather suitable for leather goods articles. Horse hides too produce soft clothing type leather or gloves and are very hard wearing.

On the other hand conservation and protection of wild life has resulted in decreased supplies of other skins – snakes, crocodiles, seal, bear, zebra, tigers and leopards.

Unless produced by "farming" methods they are not allowed to be killed or exported from their countries of origin – indeed they are prohibited goods into European and North American countries. Leather after a period of intense competition from synthetic imitations has like all other natural materials weathered this storm and is much in demand by the fashion market. New types of leathers are being developed with softer and more natural appearance, combined with fancy effects such as natural pearl made from fish scales, metallic effects either as a foil laminated onto leather or as a sprayed finish, iridescent effects which give interesting double tones and the latest is a pigment which changes colour with temperature. This leather is finished with thermochromic crystals which are sensitive in the blood temperature range. The crystals are colourless below 27°C and above 33°C but between these temperatures they pass through the colour spectrum. The colour changes most easily noticed are red-green-blue.

Despite the fact that many uses for leather have passed into history e.g. collar boxes, binocular and camera cases, helmets, horse boots, leggings (remember the RAC motor cyclists?), leather industrial belting, razor strops, top hat cases, suitcases, coach springs, gas meter washers, leather buckets, hosepipes, etc, leather due to its versatility continues to be developed for a variety of uses. Upholstery, clothing, books, saddles, gloves, billiard cues, buttons, dog collars, gun holsters, cricket balls, strap hangings on buses, footballs, boxing gloves, golf bags, belts of all types, shoes, slippers, ties, shirts, brief cases, the list seems endless – watch straps. Currently new outlets for leather or rather re-establishment are in motor car and aeroplane upholstery. Fires which occur as a result of accidents cause more damage than the accident itself due to the molten plastic fascia and fittings sticking to the human face and poisonous fumes emission. Leather when ignited tends to char and is self-extinguishing. The future for leather thus seems assured. Assured that is provided people continue to eat meat!

## Introduction to Paint Technology



The Introduction to Paint Technology, of which over 30,000 copies have been sold, forms an excellent introduction to the whole field of surface coatings and related technologies.

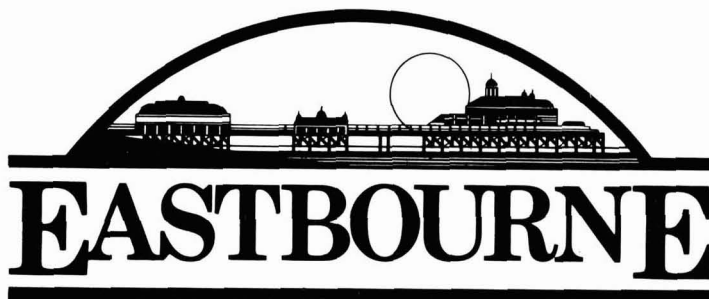
To: OCCA, 967 Harrow Road, Wembley,  
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Please send ..... copy/ies of Introduction to Paint  
Technology at £10.00 each (inc. p&p) to the following  
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I enclose remittance (payable to OCCA) for £ .....



This year the Association's biennial Conference is being held at the Grand Hotel, Eastbourne (17-20 June 1987). The technical sessions are shown opposite.

### Conference preprints

Preprints of the papers are now being prepared and it is expected that these, together with details of accommodation at the Grand Hotel, badges, social programmes etc, will be sent to those who have registered for the Conference early in June 1987. It is a feature of the Association's Conferences that preprints are sent well in advance of the function in order to enable delegates to read them before the Conference, at which the lecturers illustrate their topics but do not read the papers in their entirety. This allows for a much longer discussion period than at many other conferences and has proved to be of immense value to those attending previous Association Conferences.

### Accommodation

Although the closing date for registering for accommodation at the Grand Hotel was given as 1 April 1987 (so as to enable the hotel management to let any accommodation not taken by delegates by that date) there is no restriction as to the date for those delegates making their own arrangements for accommodation. It may well be possible to arrange a few rooms at the Grand Hotel but delegates wishing to stay at the headquarters hotel should submit their registration forms to Priory House as quickly as possible. EXPOTEL, as mentioned in the Conference Brochure—further copies of which are available from Priory House—are willing to assist delegates (both members and non-members) with a wide range of accommodation. However, since June is a busy month for hotels at Eastbourne early application is advised.

Daily registrations, if required, can be arranged through Priory House. Non-members wishing to avail themselves of the preferential Conference fee for members should request application forms from Priory House and—when completed—these should accompany the registration form.

Members attached to the Bristol, London and Thames Valley Sections have been offered a special concession (limited to one daily visit per member) and details are given in the Bulletin enclosed with members' copies of the *Journal*.

### Summaries of papers

Summaries of papers to be presented and biographies of the lecturers have appeared in the earlier issues of the *Journal* published in 1987.

### Social Events

Following the very great success of the entertainment provided on the first evening of the Edinburgh Conference by the Scottish Section to celebrate their 50th Anniversary, this year the London Section (which will likewise be celebrating its 50th Anniversary) will be arranging an entertainment on the evening of Wednesday, 17 June, after dinner. This will be provided by the Players' Theatre and the London Section will welcome all delegates and spouses to this function. No charge will be made as the Section has kindly provided this entertainment.

The remainder of the Social Programme includes an Overseas Visitors' Reception and a Presidential Reception (both by invitation only), four coach tours to places of outstanding interest, a golf tournament (for which two trophies will be awarded—the Sam Shary OCCA Conference Trophy and the Pearson Panke Trophy), an evening visit to Drusillas for a Wine Tour and a traditional Sussex Meal and the Dinner and Dance on the Friday evening. Full details are given in the Conference Brochure.

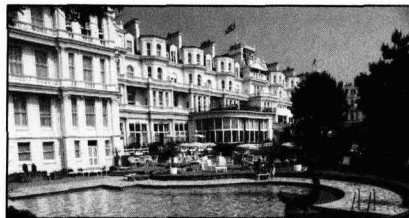
### Travel

British Rail offer concessionary fares for those staying overnight and details can be obtained when registration forms are sent to Priory House. The journey from London by rail from Victoria Station takes approximately 84 minutes and is 65 miles by road via the A22. Gatwick Airport is 40 miles by road or 40 minutes by Railair Link. The newly opened M25 orbital motorway links the A22 with the M1, M40, M4 etc, and allows those travelling by road to avoid the London area.

# OCCA Conference 1987 Eastbourne

## GRAND HOTEL

17 - 20 JUNE, 1987



## “ADVANCES AND APPLICATION OF SCIENCE AND TECHNOLOGY IN SURFACE COATINGS”

### Lecture Programme

The Technical Sessions will take place in the Devonshire Suite at the Grand Hotel on Thursday and Friday, 18 and 19 June. The Honorary Research and Development Officer (Mr J. R. Taylor) has arranged the following lectures for the Conference:

#### THURSDAY, 18 JUNE

##### Session I (9.00 a.m. — 12.15 p.m.)

Chairman: Mr J. R. Taylor (Honorary Research and Development Officer, OCCA)

Speakers: Address of Welcome by the President, F. B. Redman  
Keynote Address by Ing. Arja Saloranta (President, SLF)  
Dr A. Wilson and Dr J. W. Nicholson (Laboratory of the Government Chemist) — “Preparation of Ionomers for Coatings from Water Soluble Polymers”  
Mr R. H. E. Munn (Cray Valley Products) — “Novel Polyamide Type Epoxy Curing Agents”  
Mr Thor Fjeldberg (Dyno Industrier AS Norway) — “Alkyd Emulsions, Properties and Applications”  
Dr H. Warson (Solihull Chemical Services) — “Recent Advances in Crosslinking and Curing Applications to Surface Coatings”

##### Session II (2.00 p.m. — 4.30 p.m.)

Chairman: Mr G. W. Fowkes (Vice-President, OCCA)

Speakers: Ilkka Sarvimaki (Tikkurila OY) — “A Novel Water-Based Coating System for Wet Areas” (*Paper presented on behalf of SLF*)  
Mr J. Spauwen (Dow Chemical Co Ltd) — “New Propylene Glycol Ethers for Water Borne Coatings”  
Mr D. S. W. Dargan and Mr J. Hemmings (Kirklees Chemicals) — “High Binders in Decorative Emulsion Paints”  
Mr L. Cutrone and Mr D. V. Moulton (Tioxide Ltd) — “The Reliability of Durability Testing”  
Mr A. C. D. Cowley (ICI Organics Division) — “Improving Dispersion of Pigments with Hyperdispersants”  
Mrs N. Usman (Paint Research Association) — “Development of Novel Driers for Paint”

#### FRIDAY, 19 JUNE

##### Session III (9.00 a.m. — 12.15 p.m.)

Chairman: Mr J. Bernie (Director, Paint Research Association)

Speakers: Keynote Address by Mr G. Phillips (Managing Director, Ault and Wiborg PLC)  
Dr W. G. Erskine (Domino Amjet Ltd) — “Advances in Ink Jet Printing and Ink Jet Inks”  
Mr P. C. Stievater (NL Chemicals Inc) — “Advances in Environmentally Acceptable Polyurethanes”  
Professor Mengies (Loughborough University) — “Rapid Electrodeposition Systems for Metallic Coatings”  
Mr P. Fallon (Johnson and Bloy Ltd) — “Advances and Changes of Ink Technology in Cold Seal Packages”

##### Session IV (2.00 p.m. — 4.15 p.m.)

Chairman: Mr G. J. Gough (President, Birmingham Paint, Varnish and Lacquer Club)

Speakers: Dr H. Robinson (Taylor Woodrow Engineering Ltd) — “Durability of Anti-Carbonation Coatings”  
Mr M. Leclercq (Societe des Mines et Fonderies de Zinc de la Vieille Montagne) — “Production of Zinc and Zinc Alloyed Dusts by Fine Atomisation”  
Dr B. L. Kaul (Sandoz Huningue SA, France) — “Advances in the Science and Technology of Pigments”  
Dr N. Henwood (Dow Chemical Co Ltd) — “Membrane Separation for the Production of Nitrogen Enriched Inert Gas”  
Mr I. Tonini (Walter Maeder AG) — “Technical Progress of New Ecologically Safe Paint Systems and Application Technologies” (*Paper presented on behalf of FATIPEC*)

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## next month's issue

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The Honorary Editor has accepted the following papers for publication in the May issue:

**Water disbondment and wet adhesion of organic coatings on metals: A review and interpretation** by H. Leidheiser, Jr, of the Centre for Surface Coatings Research, Lehigh University, Bethlehem, Pennsylvania, U.S.A. and W. Funke, Department of Chemistry, Stuttgart University, West Germany.

**An evaluation of South African micaceous iron oxide pigment** by E. R. Timm, Paints and Sealants Division, South African Bureau of Standards, Pretoria, South Africa.

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## occa meetings

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### London Section

#### Organophilic clays

The third meeting of the 1986/87 session was held on 15 January, at the 'Pearly King', Bromley High Street, E3, when, despite the very inclement weather conditions there was a good turnout to listen to an excellent talk on Organophilic Clays given by John Tatum, Development Chemist of Perchem Ltd.

Mr Tatum described how Organophilic Clays are regarded as specialities with a world-wide production of around 40,000 tonnes. The process of mining the clays and subsequent drying, grinding etc, was explained and the need for further additives in order to modify the properties.

The structure of various types of clays was illustrated in some depth, and the ways in which organic complexes could be formed to give different properties explained. The gelling properties of the clays in various application fields including paint, ink, oil and drilling industries were described.

Finally a vote of thanks to the speaker and particularly to Perchem who sponsored the meeting was given by Barry Canterford.

*D. Bannington*

### Manchester Section

#### Flocculation gradient monitor

Seventy members and visitors attended the meeting held on 2 February, at the St James' Club, Manchester. A paper entitled "The Flocculation Gradient Monitor" was presented by Luigi Cutrone, Section Manager of the Applications Development Section of Tioxide UK Ltd.

The instrument can be used for Research, Development and Quality Control, and is designed to measure the degree of dispersion of Titanium Dioxide in paint.

When pigment is dispersed in the absence of stabilisers, flocculation may occur, and this degree of flocculation is difficult to quantify. The instrument is based on the principal of light scattering, using light in the IR region, where this is at a maximum. The original work was carried out on a spectrophotometer, however, an instrument was then developed, specifically for this purpose, using the

fixed wavelength of 2.5  $\mu\text{m}$ .

Examples of the types of results obtained, and reasons for them were described. Because results in emulsion paints, appeared anomalous, the factors affected flocculation gradient (Polymer Dispersion, Extender, Rheology Modifier, Surfactants and Air Voids) were outlined in detail, and their effects on the results described and explained.

The lecturer completed his talk by outlining how the Flocculation Gradient Monitor could be used for Quality Control using measurements in the wet state.

After a short question and answer period, a vote of thanks was proposed by Jeff Kelly, and the evening's proceedings concluded with an exhibition of equipment by "Pearson Panke" and a buffet sponsored by Tioxide UK Ltd.

#### Cobden Chadwick Ltd

On Monday, 16 February 1987, 43 members and guests, mostly from the Printing Ink Industry, visited Cobden Chadwick, manufacturers of printing presses for the flexible packaging market.

Cobden Chadwick were founded in 1907, and have expanded through the years. The company is still family owned, and now occupies a modern 70,000 sq ft site, where the company's 1,000th printing press was recently produced.

Machinery for making gear wheels, cylinder cores, and anilox rollers were on view, as well as a six colour CI Linoflex partially assembled, and a completed, smaller, six colour polythene press for export to Japan.

Videos of various machines in action were shown, and the print quality from these presses demonstrated to be first class.

Our thanks are given to Mr McHugh, Mr Behan and other staff members for their time and efforts in showing us around.

#### Organophilic clays

A meeting of the Manchester Section was held on 2 March, at the St James' Club, Manchester, when Mr John Tatum, Development Chemist, from Perchem Ltd, presented a

paper entitled "Organophilic Clays as Thixotropic Agents", the meeting being attended by 63 members and guests.

Organophilic clays are buff coloured, free flowing powders and there is an annual world production of the order of 30,000 to 40,000 tonnes.

The clay is normally open cast mined, and selectively mined for quality, dried and ground. The powder is slurried in hot water at about 60°C, and additives added. The clay slurry is then centrifuged to separate the clay from impurities. Quaternary ammonium salt is added, then the clay is filtered, dried and milled to give an organoclay powder.

The clays consist of tetrahedral silica layers, and octohedral alumina layers, condensed together in such a way that the alumina layer is sandwiched between two silica layers. If substitution of atoms of similar size but lower valency occurs, a charged structure results. Montmorillonite is the basis for most organoclays, and in this case the substitution is of magnesium for aluminium.

The two most commonly used quaternary ammonium compounds are dimethyldioctadecyl-ammonium salts, and dimethylbenzyl octadecyl ammonium salts.

To produce a useful organoclay which will swell in an organic liquid, a minimum level of organic material must be reacted with the clay. This minimum level corresponds to just over 50% of the available surface area of the clay.

Organophilic clays will easily disperse in most organic liquids using high shear mixing, however, gellation will only occur if the organic liquid contains a mixture of polarities. The concentration of the polar additive has a very profound effect on gel strength, which increases with polar additive concentration up to a maximum, after which further additives give a reduction in gel strength.

Mr Tatum concluded his lecture by outlining the different applications for organoclays such as greases, inks, oil well drilling muds, and surface coatings. There was a lively and extensive question time, and the vote of thanks was proposed by David Love.

At the conclusion of the meeting, those present were able to partake of a buffet sponsored by Perchem Ltd.

*M. G. Langdon*

## Midlands Section

### Alkyd resins

Members and guests heard Mr J. Cornish of Croda Resins Ltd, give a talk entitled "Alkyd Resins—Raw material Substitution", on 19 February, at the Clarendon Suite, Stirling Road, Edgbaston, Birmingham. Mr Cornish said that for successful substitution the resins must match exactly. An imperfect match would only be acceptable if there was a cost saving. The two main reasons for considering substitution are:

1. Raw material availability
2. Raw material cost

The speaker went on to discuss three examples of substitution giving reasons for the change and the end result.

### Case 1

Due to the rapid increase in price of glycerol and its high cost it is possible to replace it on a molar basis with a mixture of pentaerythritol and ethylene glycol. The resulting resin had very similar properties but when mixed with a DCO alkyd this formed cloudy solutions and films.

### Case 2

With another alkyd resin the properties and compatibility were satisfactory but the dilution characteristics were very different. The new resin giving a much lower viscosity when reduced with solvent.

### Case 3

Here vinyltoluene was partially replaced by styrene to reduce raw material cost. It was also replaced by a styrene/acrylic combination. Both substitutions were satisfactory up to level of 25-30% styrene, but in those resins containing acrylic much better gloss retention was achieved on durability trials.

After a lively question time the meeting closed with a vote of thanks given by Mr D. Penrice. Thanks were also expressed to Croda Paints Ltd, who provided a buffet after the meeting.

*B. E. Myatt*

## Midlands Section Trent Valley Branch

### Titanium Dioxide

A meeting was held on 26 February, at the British Rail School of Engineering, Derby, and was generously sponsored by SCM Chemicals Ltd.

The very topical subject of the technical paper, presented by Mr Geoff M. Deighton, European Sales Manager of SCM Chemicals Ltd, was on "Titanium Dioxide, world supply and demand in the 1980s".

Mr Deighton estimated that the world consumption of pigments in 1985 was 3.45 million tonnes, 96 per cent of which were inorganic, and of this 2.45 million tonnes was Titanium Dioxide.

Titanium Dioxide supply and demand are currently in balance, and some producers have instituted product allocation programmes to protect customer's supplies. The projected yearly growth in the total world demand for TiO<sub>2</sub> is generally considered to be in the range of 2 to 2.5%.

Titanium Dioxide producers world-wide have been scrambling to meet increased demands for the past 18-24 months. Over-capacity, depressed prices, and environmental pressures during the late 1970s and early 1980s resulted in many plant closures, a moratorium on new plant construction, and significant industry consolidation as many companies chose to leave the industry. Supply and demand are just about in balance today and this, coupled with significant increases in titaniferous raw material costs, the need to generate capital for future investment and give a realistic value to the product, has resulted in increased prices in the market place.

New plants have been put into operation and others have been planned or are in the course of construction so that the continuing increase in demand for Titanium Dioxide can be met. If the projected statistics prove to be valid, in 1991 there will still be an excess of produced tonnages over demand.

After a series of questions, the vote of thanks was proposed to the speaker by OCCA President Designate, John R. Bourne, and to the sponsors, SCM and colleagues of Mr Deighton who assisted at the meeting, by J. C. Ellis.

*J. C. Ellis*

## Newcastle Section

### Design/Protection of Thames Barrier

Thirty-six members attended the fifth meeting of the 1986/87 session on 3 February, at St Mary's College, Durham University, to hear a lecture by Mr D. Bayliss, ITI Anticorrosion Ltd, entitled "Design and Protection of the Thames Barrier".

He began by reviewing the reasons for having the barrier, namely the prevention of serious flooding, of East London in particular, resulting from chance coincidences of very high winds reinforcing abnormally high tides, causing sea water to bunch in the North Sea and flood into the Thames. He cited Samuel Pepys diary record of Westminster flooding in 1663 and the disaster in 1953 when more than 300 people died in East London.

Next, he reviewed the basic requirements for the barrier given to the design consultants, i.e. it must normally be open, not impede river traffic nor interfere with the flow of water to those installations along the river which rely on this, and should be able to shut off within one hour. It should also be on a straight stretch of river to reduce the odds of ship collisions with it and to be strong enough to resist such a collision. He gave an amusing account of how Charles Draper stumbled across his idea on how the barrier gates should be designed and showed slides illustrating the working principles of the 10 gates finally installed.

Coating specifications were developed over two years by Keith Julian Day and Mr Bayliss paid tribute to Keith's resourcefulness in putting together ideas and test methods which resulted in selection of the best systems. In retrospect, some of the methods proved inadequate for predicting coating performance, being either too aggressive

or subject to panel preparation/application variables. Thus a coal tar epoxy actually used on part of the barrier is in excellent condition after 14 years, whereas raft panels at Woolwich showed some blistering after two years testing. Moreover, none of a series of painted weld test panels showed any failure, because paint suppliers had prepared the panels of their own systems and had been very diligent in treating the welds. Sulphate-reducing bacteria tests were ineffective because the conditions were insufficiently anaerobic to support the bacteria. In the event, Thames water is now so clean that SRB are not considered a threat anyway.

Outstanding abrasion resistance was a requirement of the gate coatings to prevent wear by suspended mineral matter in water flowing between closed gates and the concrete base. A successful test method was developed after much work and hot-applied solventless epoxies proved the best of the various types examined. Surprisingly, poor results were obtained with glass flake-filled polyesters, neoprene and coal tar epoxy coatings.

Adhesion tests proved difficult with very thick coatings, results with the Sayberg apparatus being most inconclusive. Similarly, the MOD Impact Test on 750  $\mu\text{m}$  films would not truly reflect performance with excessively thick (2,000  $\mu\text{m}$ ) films as may be found in parts of the completed barrier today.

Mr Bayliss described application trials with hot-applied systems and the elimination of all but three solventless epoxies for the gates. From performance in other tests, allied to supporting field evidence elsewhere, the coating to be used was finally chosen. When the contract for the gates started, continual problems arose with inaccurate metering of the two parts of the hot-applied coating and an attempt was made to change the specification to a solvent-thinned cold-applied coating. This attempt failed when the much superior film properties of the specified coating were demonstrated. Eventually the paint supplier took over the application contract and the job was completed successfully. After eight years, the gate coatings are in excellent condition.

Mr Bayliss felt that the only weak area of coating specification was the decision to aluminium metal spray the gate arms and to protect this with coal tar epoxy. With large steel structures attached, the immersed gate arms are, in effect, large coated anodes, and any damage sustained will lead to rapid breakdown at that point. Fortunately, only the exterior surfaces are concerned because practical problems prevented metal spraying of the interior sections, which were coated with hot-applied solventless epoxy.

Areas of the barrier not subject to immersion were coated with a zinc silicate/high-build chlorinated rubber system. Despite some criticism of this at the time of specification, all areas are in excellent condition after eight to 10 years.

Summing up, Mr Bayliss felt that the coating systems used on the Thames Barrier had been very successful to date, but he did see some problems in the future when repairs would become necessary. Before that time arrived



## occa meetings

he hoped that someone in the Paint Industry would provide an answer to the potential adhesion weakness between old and new coatings.

He concluded with an invitation for anyone visiting London, and with time to spare, to visit the Thames Barrier. He strongly suggested that any paint technologists doing this should keep their penknives firmly in their pockets!

After a short question time, the vote of thanks was given by Mr E. A. Watson for a very entertaining and absorbing lecture.

*J. Bravey*

## Ontario Section

### Tour of the Ontario Research Foundation

On 21 January, the Ontario Section met for a tour of the facilities of the Ontario Research Foundation. Located in Mississauga, to the west of Toronto, ORF conducts applied research, usually in conjunction with Canadian industrial organizations.

Members were treated to a comprehensive trip through the vast research facilities, and had the opportunity to examine the wide variety of instruments and equipment which are used in virtually every area of scientific and technological research.

After thanking our hosts, the Ontario Section reconvened for dinner at the Cambridge Motor Hotel.

### Water pick up in perspective

On 18 February, the Ontario Section met at the Cambridge Motor Hotel. Thirty-two members and guests gathered to hear Mr David Daffern of Hostmann-Steinberg speak on water pick up.

Mr Daffern recounted in an amusing manner the many moments of frustration and the few of success in dealing with such a complex topic. He took the members through several examples of specific situations, and described each of the factors that had to be taken into account in order to rationalize each of the observations.

Following the conclusion of Mr Daffern's talk, the Chairman, Mr Purnell, expressed his thanks on behalf of the members for a lively and entertaining presentation.

*P. Marr*

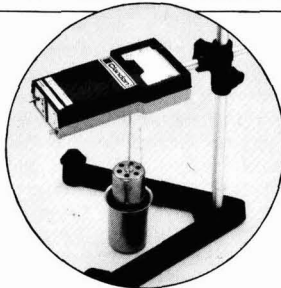
## Scottish Section

### Coatings formulation

On the evening of 11 December, 1986, at the Hospitality Inn, Glasgow, members and guests gathered to hear Mr Luigi Cutrone of Tioxide give a talk on "Coatings Formulation Using Three Components Contour Plotting".

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#### LITERATURE

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# Eastbourne



## OCCA CONFERENCE 1987

Details of the lecture and social programme appear on page 111. Further copies of the registration brochure are available from Priory House.

Mr Cutrone explained that in studying multi-components systems, such as coatings, a problem that confronts the formulator is the difficulty in assessing the effects of the mixture variables. This task is facilitated by applying three component contour plotting and, with the help of a computer, obtaining response surfaces which help the formulator in assessing the influence of each of the variables evaluated.

The experimental design software allows the formulator to maximise results and minimise experimentation by preparing seven computer generated formulations, measuring the desired properties and generating contours. Optimization can be achieved by making use of the built-in superimposition feature which allows the user to superimpose up to five properties.

A vote of thanks was proposed by the chairman Mr R. L. Barrett who also thanked Tioxide UK Ltd, for sponsoring the buffet that preceded the meeting.

*R. A. Hunter*

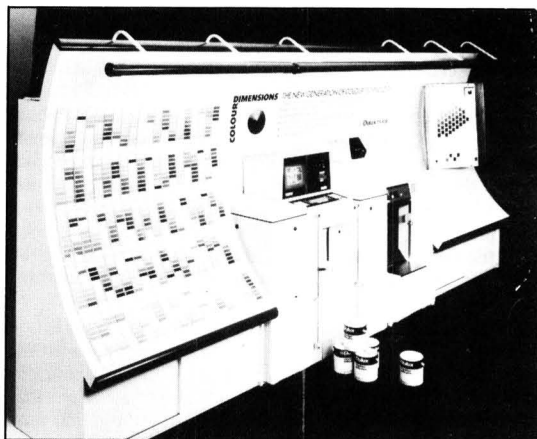
### ICI Dulux

#### New "Dulux Colour Dimensions" tinting system

ICI Dulux Trade Group has introduced a new computer controlled tinting system to the UK market to enable their main stockists to provide a range of 1,669 colours in all four major finishes—gloss, eggshell, matt and silk emulsion. The accuracy and consistency of colour matching is far superior to that of previous tinting systems, being equal to ready mixed paints.

The colour range is based on the Natural Colour System (NCS) developed over the last 30 years by the Scandinavian Colour Institute. (The Swedish Standards Institute has nominated the system as the ISO International Colour Standard). The colour range can be represented in a three dimensional model, subdividing all the colours perceived by the human eye to give descriptive notations. We perceive six basic colours—yellow, red, blue, green, black and white—and this enables a model to be made in which white to black is the axis and the colours from yellow to red to blue to green progress in a spectrum around the axis. In this model the colour space can be divided equally in simple percentage steps, and the colour notation is derived from this model. Thus Y10R represents a hue of yellow with 10% red; 1080 represents 10% blackness with 80% chromaticity, and in the Dulux Colour Dimensions system the complete notation "1080-Y10R" represents a strong, clean, reddish yellow. A Colour Atlas is provided to show the colours, containing 41 pages with colour chips displayed in a triangular diagram; for example page 14 displays R30B hues (red with 30% blue) with a range of blackness and chromatic intensities. The 1539 NCS colours, the complete BS 4800 range and the Dulux Trade colour range have been given their Dulux Colour Dimensions notation and are shown on the appropriate pages of the atlas.

A computer controlled colour tinting machine is an essential part of the system. The colour notation selected from the atlas is keyed into the machine and displayed on a screen together with its name and its BS 4800 reference where appropriate—this enables the details to be checked before proceeding further. Alternatively the name of the colour or its BS 4800 reference may be keyed in, when the same display is obtained. The type of finish (gloss, eggshell, matt or silk emulsion) and the size of can (11., 2.5l or 5l.) required are also keyed in and a tin of the appropriate base



The new "Dulux Colour Dimensions" tinting machine.

placed under the tinter delivery nozzles. Touching the operating button causes the can to be raised to near the nozzles and the required tinters delivered, after which the can is lowered to permit removal from the machine. The lid is replaced and the can transferred to a mixer compartment where it is clamped then shaken vigorously for 45 seconds. Meanwhile the machine prints out a label showing the colour notation, name, can size and, where appropriate, the recommended undercoat. The machine uses 16 high strength tinters; there are four bases of varying strength for each type of finish, plus a yellow gloss base, making 17 bases in all. The small amounts required of the strong tinters enable the volume of finished paint supplied to be correct or no more than 1% over. The machine is sophisticated and has been made as far as possible "idiot-proof"; thus it will not operate if the wrong size can is placed in it, or if it does not contain sufficient of the required tinters.

The size and cost of the Dulux Colour Dimensions tinting equipment limits its use to main stockists, but smaller merchants will offer the range through an ICI operated tinting service. ICI are confident that their new system will take colour notation, selection and tinting technology into a new era.

T. A. Banfield

## bri news

### New BS 5750 Scheme for Paintmakers

On 28 January 1987, the British Standards Institution's Registered Firms Scheme for the Paintmakers Association was launched at the BSI Conference Centre. The scheme was developed by the building and construction section of BSI's Quality Assurance Services at the request of the PA, and covers the development, manufacture and supply of the whole range of paint finishes. Participating firms are required to offer a technical advice service to customers and must operate a quality system to the national quality

standard BS 5750 to Quality Assessment Schedule 2551/202.

In his introduction Dr Ivan Dunstan, BSI's Director General, said the scheme arose from joint initiatives by the British Standards Institution, Paintmakers Association, Ministry of Defence, British Rail and the Property Services Agency. It is a tough scheme, not just window dressing, and is likely to become one of BSI's major schemes with increasing application. An International Standard, ISO 9000, based on BS 5750, is being prepared and in due

course will be issued in the UK as a revision of BS 5750.

Mr Knight, President of the Paintmakers Association, said the scheme is intended to improve the quality of British industry, introducing disciplined practices to ensure getting things right first time. Suppliers to the paint industry—resins, solvents, pigments, etc—are gaining approvals under BS 5750, and it is expected that the British scheme will become international. He hoped that MoD, BR and PSA will use the scheme for many of their purchases and will then need to make less use of their own existing quality assurance schemes.

Mr B. Miller, Director General, Procurement Executive, Ministry of Defence, said that in the past there had been a tendency to take for granted the paints used on equipment purchased, but its importance is now recognised. This is particularly so because items purchased for MoD may remain in store for long periods before being required for

service and must then be “as new”.

The proceedings concluded with Mr J. E. Ware, Director, Quality Assurance Services, BSI, presenting framed certificates to the first 23 firms to be registered under the new scheme, as follows:

Berger Decorative Paints, Berger Industrial Coatings, Craig & Rose PLC, Croda Paints Ltd, Cuprinol Ltd, Firwood Paints & Varnish Co Ltd, Hempel's Marine Paints Ltd, ICI Paints Division (Slough), ICI Paints Division (Stowmarket), International Paints PLC, Johnstones Paints PLC, Joseph Mason PLC, Macpherson & Co Ltd, Manders Paints Ltd, Permoglaze Paints Ltd, Postans Ltd, R. J. Stokes Co Ltd, Sigma Coatings Ltd, Sonneborn & Rieck Ltd (Chesterfield), Sonneborn & Rieck Ltd (Ilford), Trimate Ltd, Valspar Paints Ltd, W & J Leigh & Co.

*T. A. Banfield*

## news

### Cementone Beaver's large export order

The Buckingham-based company has won an export order to paint an entire new Egyptian city—2.3 million litres of Cementone-Beaver white emulsion and gloss paint will be used to paint the interior of the new military city of Hammad.

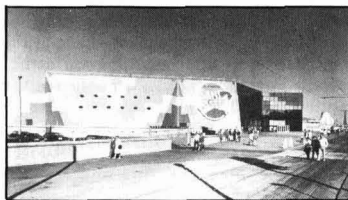
### SIV increases French powder paint capacity

Société Industrielle de Voisins (SIV), the operating company of the Resins Division of DSM, has increased its powder paints production in France. A new fully automated production line at Dourdan (France) has increased its production capacity from 5,000 to 7,000 tons per year, strengthening SIV's leading position in the French powder paints sector.

### Crown decorates Europe's biggest leisure centre

The decoration of Europe's newest and biggest leisure centre on Blackpool's world famous seafront required more than 4,000 litres of problem solving, high technology Crown paints. The huge £16m complex appropriately named “Sandcastle Centre” stands almost on the beach of the resort's South Promenade and is expected to attract over one million visitors during 1987, its first full year of operation.

The interior was a huge decorating task. For example the pool areas, where humidity is a problem, required Crown's Chlorinated Rubber system. The piazza needed a different approach with six different colours on one wall and seven on another. The solution was the Crown Colour Plan range with a choice of 960 different shades.



Sandcastle Leisure Centre, Blackpool

Crown's Ferox Urethane moisture curing system was used on the exterior of the building. The paint is designed to give long-lasting protection against damp and aggressive weather conditions. This was ideal for Blackpool's seafront where hot sunshine, heavy sea mists and even gales can be experienced all on the same day.

### John Godrich on the move

John Godrich, supplier of surface coatings testing equipment is moving to Pellow House, Old Street, Ludlow, Shropshire.

### Meeting the requirements of BS 5750

In ensuring that their operations meet the requirements of BS 5750, many companies are finding a need to check and calibrate flow cups and viscometers. Certified Standard Viscosity Oils covering the range 0.5 to 200 poise together with three special oils for calibrating ISO 2431-1980 (BS 3900: Part A6: 1983) flow cups are available from the Paint Research Association. These are all based upon high quality mineral oils (no silicones) and the calibrations are traceable to NPL standards. For further information contact: Mr Alan Sherwood, Group Leader,

Protective Coatings, Paint Research Association, Waldegrave Road, Teddington, Middlesex TW11 8LD.

### Berger Britain first in quality

Berger Britain's commitment to quality was enhanced when three of its companies each received Certificates of Quality Assurance to BS 5750 Part 1 from the British Standards Institute. Berger Decorative Paints, Berger Industrial Coatings and Cuprinol were all recipients of the Certificates at a special presentation which took place at the institute's headquarters in London. The BSI Registered Firm Scheme is discussed above in BSI news.



From left to right: Mr R. Williams, Managing Director at Berger Decorative Paints, Mr A. Hilditch (centre), Technical Director at Cuprinol and Mr J Cain, Quality Manager at Berger Industrial Coatings.

OCCA ties at £4.25 each are now available from the Association's offices, with a single Association Insignia on either a blue or maroon background.

## products

**BASF Polyester Steel Coating**

*BASF Coatings & Inks Ltd* of Slinford, UK, has available a two coat polyester coil coating. This coating has been used by British Steel to improve durability of its pre-coated steel. The coating consists of a high opacity base coat to which a textured clear lacquer is applied. The abrasion resistant crystalline finish can be used for both industrial and metal shelving. *Reader Enquiry Service No. 20*

**Minolta Chroma Meter CR-200**

*Minolta* of Milton Keynes, UK, has introduced the *Chroma Meter CR-200* to its range of tristimulus colorimeters. With the CR-200 colorimeter, absolute colour or colour difference can be measured based

**Minolta Chroma Meter CR-200.**

on any of four colour systems; Xy, L\*a\*b\*, L\*C\*H° or Munsell. Either CIE Illuminant C or D65 may be selected and reflection density can also be measured. The meter has a data processor to increase versatility. Its memory provides space for 20 calibration standards, 20 target colours for colour-difference measurements and 300 sets of colour-measurement values. The measuring head of this colorimeter contains a pulsed Xenon light source. The CR-200 is a general purpose model, with an 8 mm diameter measuring area and a diffused illumination, 0° viewing angle geometry. *Reader Enquiry Service No. 21*

## meetings

**Viscometry**

The Department of Trade and Industry's Warren Spring Laboratory is to hold a two day training course on viscometry on 3-4 June 1987. Intended for technicians and research workers who use viscometers in their everyday work, the course will include lectures and hands-on experience on a range of instruments available at the laboratory in Stevenage. For further details contact: Ms P. Madhvi, Warren Spring Laboratory, Gunnels Wood Road, Stevenage, Herts SG1 2BX.

**SSPC's Annual Meeting and Symposium**

The Steel Structures Painting Council's

38th Annual Meeting and Technical Symposium will be held at the Sheraton World in Orlando, Florida, on 2-5 November 1987. The topic of the Technical Symposium is "Improving Field Reliability of Protective Coating Systems". For further information contact: Steel Structures Painting Council, 4400 Fifth Avenue, Pittsburgh, PA 15213-2683, USA.

## literature

**Brass Lacquer Brochure**

W. Canning Materials Ltd, has published a new brochure describing their range of lacquer coatings for polished and electroplated brass surfaces. The brochure recommends suitable air drying and stoving lacquers for brass surfaces and deals with their preparation and application techniques. Copies of the brochure are obtainable from: B. Green, W. Canning Materials Ltd, Great Hampton Street, Birmingham B18 6AS.

## people

**Trevor Mayer** has been appointed Managing Director of Ferro (Great Britain) Ltd of Wombourne, Wolverhampton.

**Terry Mackriël** has been appointed Managing Director of Ferro (Holland BV).

## OCCA news

## Report of council meeting

A meeting of the Council took place at 1.30 pm on Wednesday, 18 February 1987, at the Great Northern Hotel, King's Cross, London N1 9AN. The President (Mr F. B. Redman) was in the chair and there were 27 members present.

The President informed the meeting with regret of the death on 4 January, of Thurston Entwistle (the Representative of the three South African Divisions). The condolences of the Council had been extended to his widow and, in accordance with her wishes, a donation had been sent to the British Heart Foundation. The Council then stood in silent tribute to the memory of their late colleague.

The draft Annual Report of the Council for 1986 was tabled and adopted. The Agenda for the Association's AGM, to take place on 19 June, after the conclusion of the fourth technical session of the Eastbourne Conference was agreed.

Council noted with pleasure that an item on the AGM Agenda would be to confer the Jordan Award.

Discussion took place on the format of the Council's Reunion Dinner to which all Past Presidents, Past Honorary Officers and Honorary Members are invited. It was agreed, as had been the case formerly in years alternating with the Conference, to arrange the Reunion with another function and the AGM. The next Reunion Dinner will be held at the SURFEX Exhibition at Harrogate on the first day (Wednesday, 15 June 1988), when a special table would be set aside for these distinguished guests at the SURFEX Dinner. The AGM would also be arranged to follow immediately after the close of the Exhibition on that day.

In accordance with the articles, it was resolved that any members in arrears with their 1987 subscriptions would not be sent

copies of the Journal after 1 April. The Honorary Treasurer reported that the Finance Committee would be meeting before the next Council meeting in order to present the accounts for 1986 to that meeting.

The Honorary Editor reported on papers for the Journal.

It was reported that papers to be presented on behalf of the Association were being sought for the following conferences of sister organisations and any members willing to offer contributions were asked to write to the Director & Secretary giving details of the papers offered:

FSCT Convention, Dallas, Texas, 5-7 October 1987, under the title "People and Technology: The cornerstone of progress".

SLF Congress, Helsinki, 9-11 May

1988—original contribution on any important aspect of paint technology.

FATIPEC Congress, Aachen, 18-24 September 1988, under the title "Present and Future of the Science and Technology of Coatings and their Compounds".

It was reported that the Jordan Award committee had met earlier in the day and had conferred the Award on Ms Ilona Davies for her paper on "Instrumental analysis in the coatings industry" which was published in the May 1985 issue of *JOCCA* and on Dr J. Nicholson for his paper on "Heat-cured Ionomers prepared from poly (acrylic acid): A new class of waterborne coating material" which had been accepted for later publication in *JOCCA*.

The Council made the following appointments to the Association's representation on BSI Committees:

PVC/14—Colour Schedules—Mr D. Owen in place of Mr R. Woodbridge who had resigned from the Committee.

PVC/11—Glossary of Paint Terms—Mr B. A. Canterford in place of Mr G. V. Hill who had resigned from the Committee.

Details of the recent joint symposium with the Society of Dyers & Colourists and other societies were tabled and it was agreed to continue active participation in these biennial symposia.

Council was pleased to note that a good response had been received from members and non-members wishing to participate in the Eastbourne Conference. The London Section Chairman was able to report that arrangements had been made for the celebration of that Section's 50th Anniversary on the first evening of the Conference.

The attention of the Chairmen of the Bristol, London and Thames Valley Sections was drawn to the special provision, limited to one day per member attached to those Sections, of a special daily rate. The preliminary arrangements for the Conference at Chester in 1989 were also in hand.

It was reported that, at the request of the South African Division, consideration was being given to the best way to encourage students to qualify for Ordinary membership.

Council learnt that at the meeting of the Professional Grade Committee held earlier, two Fellows, two Associates and one Licentiate had been admitted to the Register.

The Chairman of the Exhibition

Committee reported that the bookings for SURFEX 88 were well up to expectations and that the Committee hoped that all the additional space arranged for the 1988 Exhibition would be reserved in the next few months.

Council was pleased to accept the recommendation by the Scottish Section that a Commendation Award should be made to Mr A. McLean.

Under Section Reports it was noted that Mr D. J. Morris would represent the South African Divisions.

The dates for forthcoming Council meetings were approved.

The President reported on the work of the Group which had originally been set up to consider the modernization of equipment at Priory House, but which had been enlarged to consider the appointment of a General Secretary Designate. Following advertisements in national newspapers and specialist journals, a short list of candidates had been prepared and two interviews had been conducted.

The council were informed of the progress made in setting up an autonomous Association in New Zealand which came into effect on 1 January 1987. The best wishes of the Council were extended to the new Association, which will have the same aims as the parent body.

The Director & Secretary reported that in December he had attended a meeting called to explain the workings of the newly formed National Council for Vocational Qualifications and he gave a brief summary of the proceedings. He was anxious that the Association should continue to be represented at future meetings and this was noted.

There being no other business, the President thanked members for their attendance and declared the meeting closed at 3.50 pm.

## News of members

**Eric Carter** has been appointed Product Development Manager of MPLC Laboratories Ltd. Mr Carter has been engaged in the paint and pigments industries for nearly 40 years specialising in anti-corrosion coatings' technology and has published several technical papers on this subject. MPLC Laboratories are engaged in research and development in the field of inorganic chemical processes including novel synthetic metallic oxides for use as pigments in protective coatings for steelwork.

## professional grade

At the meeting of the Professional Grade Committee held on 18 February 1987, the following admissions were made:

### Transferred from Associate to Fellowship

Churchman, Anthony Edward (*London*)

### Admitted to Fellowship

Hopgood, Arthur Thomas Robb (*London*)

### Admitted to Associateship

Howarth, Graham Alistair (*Manchester*)

### Admitted to Associateship through approved affiliated body

Thorburn, Alan McGregor

### Admitted to Licentiate

Langham, Christopher (*London*)

## new members

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

### Ordinary members

Cliffe, J. B. (*Manchester*)  
Coetzer, P. B. (*Transvaal*)  
Dunlop, J. K. C., BSc (*Transvaal*)  
Farnocchi, C. F. (*Manchester*)  
Fletcher, T. E., BSc (*Thames Valley*)  
Hutchinson, B. A., BSc (*Manchester*)  
Lawlor, D. P., MSc (*Manchester*)  
Lee, T. C. P., BSc, PhD (*Midland*)  
Stamper, G., BSc (*London*)

### Associate members

Buchanan, R. W. (*Transvaal*)  
Curtis, M. G. (*Ireland*)  
McDermott, J. (*Manchester*)  
Muhlenbeck, V. (*Transvaal*)  
Rozel, M. D. (*Ontario*)  
Van Deventer, D. J. (*Transvaal*)

### Registered students

Golder, W. (*Scottish*)  
Moore, P. J. (*Irish*)

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# Technical Service

## Wood Finishes

Croda Paints Ltd, a leading manufacturer of Industrial Surface Coatings require a Technical Service Chemist to support their expanding Wood Finishes Market. The successful candidate would be based at Sheffield and would already have some experience in Surface Coating products. Salary is negotiable and a contributory pension and life assurance scheme is in operation.

Company car will be provided.

Please apply with full CV to:

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**Metana House, Priestley Way,**  
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  - Plant and Process Oil Inks Chemist**, 30-35, for New Technologies for News Ink and Web Off. Inks. AMERICA **\$32-35,000 p.a. +**
- These appointments (2 and 3) offer career progression towards Laboratory Service and Plant Management.
- Oil Inks Laboratory Manager** (c.30) to lead small Formulation Customer Development and Intended T/S Team for Litho Inks. SOUTH **£12,800 p.a.**
  - Oil Inks Development Chemist**, Graduate (c.30) to initiate Innovative Technology primarily for Litho Inks. SOUTH **£12,800 p.a. +**
  - Resin Chemist** (25-30) for Formulation Short Term Development and Plant and Process Development primarily for Alkyds. SOUTH **Up to £12,000 p.a.**
  - Resin and Resin Media Evaluation Technologist** (25-30) for Short Term Alkyd Development for Oil Inks, for Customer Development Work and Process Developments. SOUTH **c.£10,000 p.a.**
  - Assistant Production Manager** for Wood Finishes to Control Production through a Team of 50—Materials Handling and Storage, Scheduling, Progressing. I.R. Maintenance, Despatch. SOUTH **£13,000 p.a.**

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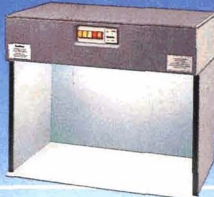
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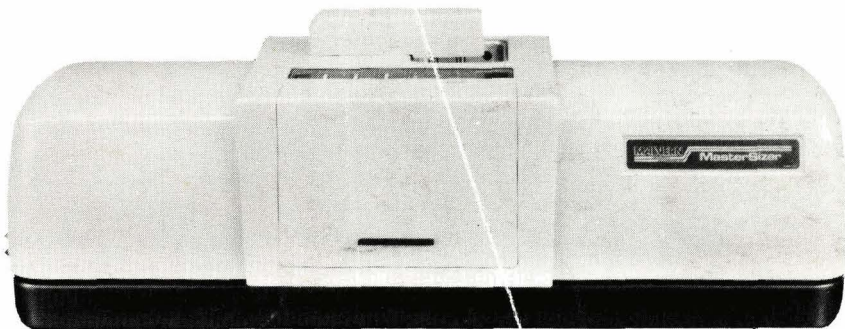
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