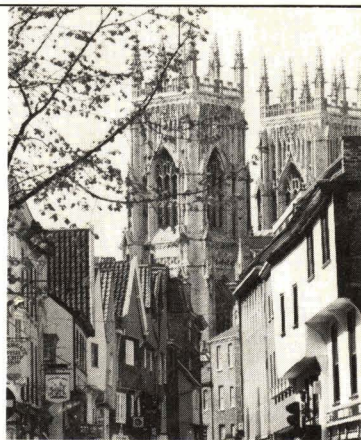


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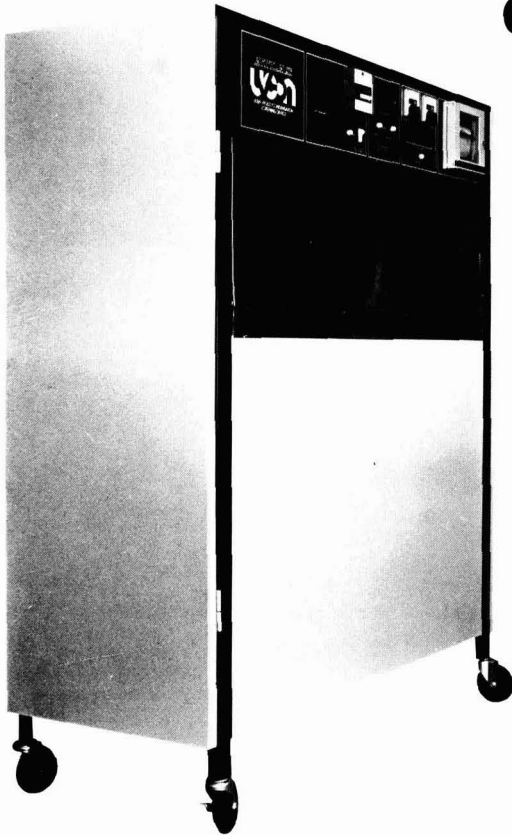
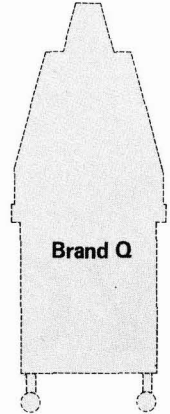
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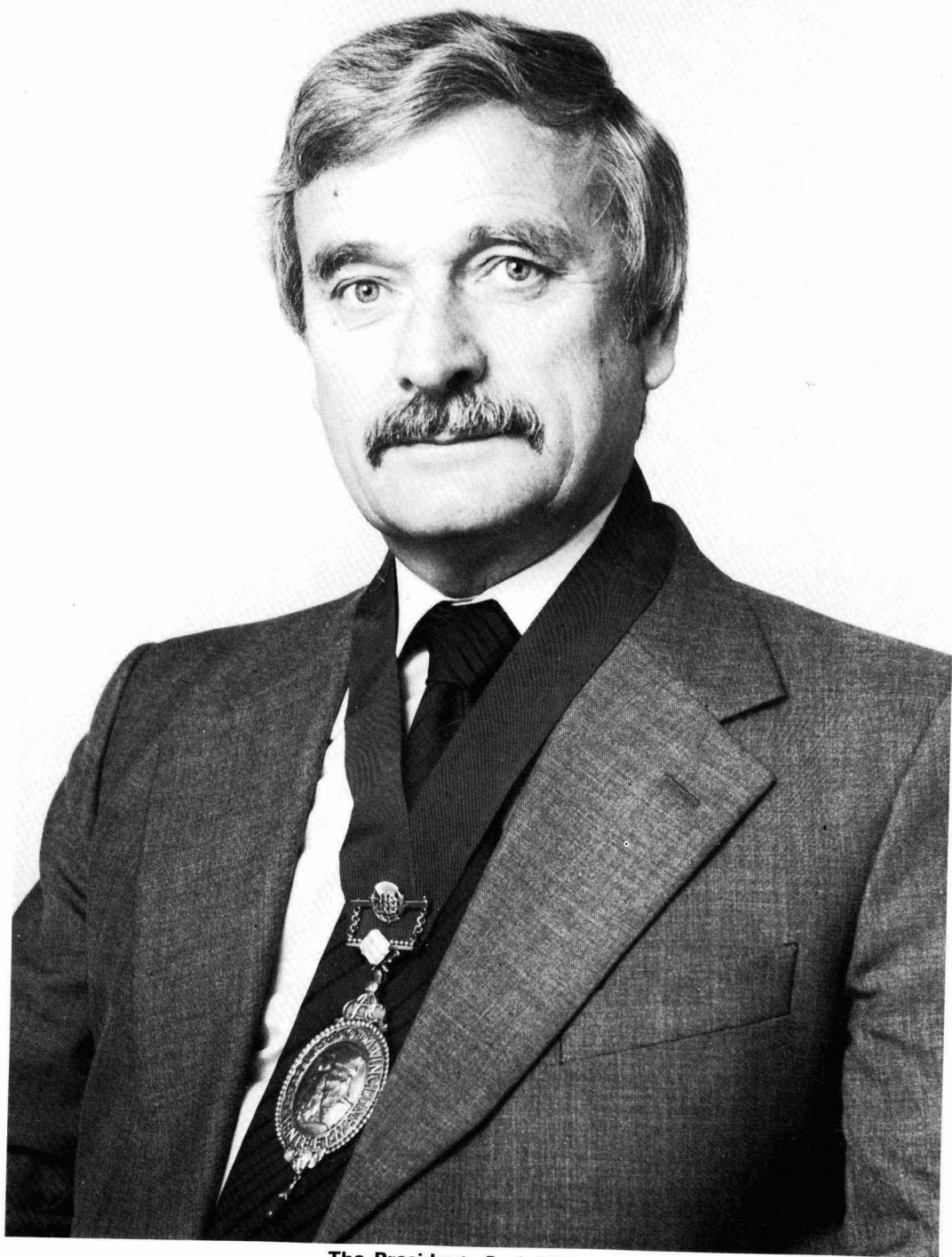
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Electrochemical impedance on coated metal electrodes.

Part 4: The effect of overpotential

By **L. M. Callow** and **J. D. Scantlebury**

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Summary

A vinyl acrylic lacquer on abraded mild steel in sea water has been used for impedance measurements after 5 and 35 days immersion. The effects of holding the specimen at various overpotentials away from the natural corrosion potential has been

studied. At short immersion times where no corrosion was observed, the effects of overpotential were negligible. At the longer times, significant changes occurred in the low frequency impedance responses with changing overpotential.

Keywords

Properties, characteristics and conditions primarily associated with

dried or cured films

film defect

Processes and methods primarily associated with analysis, measurement or testing

electrical impedance

L'impédance électrochimique des revêtements appliqués aux électrodes métalliques. 4. L'influence de surtension

Résumé

On a utilisé des panneaux d'essai en acier doux dépoli et revêtus d'un vernis clair vinyl-acrylique pour effectuer des mesures de l'impédance après des périodes d'immersion de cinq et de trente-cinq jours en eau de mer. On a étudié les effets mis en évidence lorsque le panneau d'essai est maintenu à de divers potentiels au dessus du potentiel naturel de corrosion. En ce qui concerne les

brèves périodes d'immersion, on n'a noté aucune corrosion, les effets de surtension étaient négligeables. Dans le cas de la plus longue période d'immersion, des changements importants se produisaient à l'égard des réponses de l'impédance aux basses fréquences au fur et à mesure des variations de la surtension.

Die elektrochemische Impedanz der auf Metallelektroden aufgetragenen Beschichtungsmittel

Zusammenfassung

Probeplatten aus geschliffenem niedriggekohlten Stahl, der mit einem Vinylacrylklarlack aufgetragen wurden, wurden nach Eintauchzeiten von fünf und fünf und dreissig Tagen in Seewasser für Impedanzmessungen verwendet. Die Wirkung, die entfaltet war, als die Probeplatte bei verschiedenen über dem Naturkorrosionspotential stehenden Potentialen gehalten

wurden, wurden untersucht. Bei kürzlichen Eintauchzeiten wo keine Korrosion beobachtet wurde, waren die Überpotentialeinflüsse unbedeutend. Bei der längeren Eintauchzeit, vorkommen wichtige Änderungen an Niedrigfrequenzreaktionen als das Überpotential sich verändert.

Introduction

Refs. 1-3

Previously,¹⁻³ it was shown that the type of impedance curves obtained on coated mild steel electrodes depended strongly on the potential at which the data was obtained. The potential of such a specimen has been shown to be difficult to measure accurately during the initial stages of immersion. Furthermore, the potential during this period has been shown to vary over a range of several hundred millivolts and that when this variation is followed and

impedance data obtained simultaneously, there is a corresponding marked variation in the type of curve obtained.

After the coated specimen has been immersed long enough for corrosion spots to be observable, the Warburg type impedance response reported previously was invariably observed, however, deviations from the ideal of linearity at 45° were observed as the rest potential apparently varied. An investigation into these variations in the impedance curves with potential, forms the basis of this paper.

Experiment

Refs. 1-3

The materials used and the techniques employed have been described in the earlier papers¹⁻³ in this series.

Results and discussion

Ref. 4

The specimen used in the investigation described herein was substantially more intact than those used previously, inasmuch as the impedance data was essentially capacitive (in the order of 30pF cm^{-2}) over the first 118 hours of immersion when the potential was held at -610mV (SCE). After this first 118 hours, the rest potential was measured and found to be stable at -850mV . This potential is not thought to be a result of a corrosion process and is an example of the difficulties, for the unwary, in measuring potentials on substantially intact paint films. The potential on the potentiostat was moved in a positive direction in 50mV steps from -850mV . After each increase of 50mV frequency, scan was initiated. Data points below 1Hz were obtained using the minimum integration time available on the frequency response analyser, in order that the amount of time that the specimen was away from a "reasonable" potential should be minimised. A complete frequency scan down to 30MHz consequently took in the order of 20 minutes. On completion of each scan, the potential was increased. Figure 1 shows the shape of the

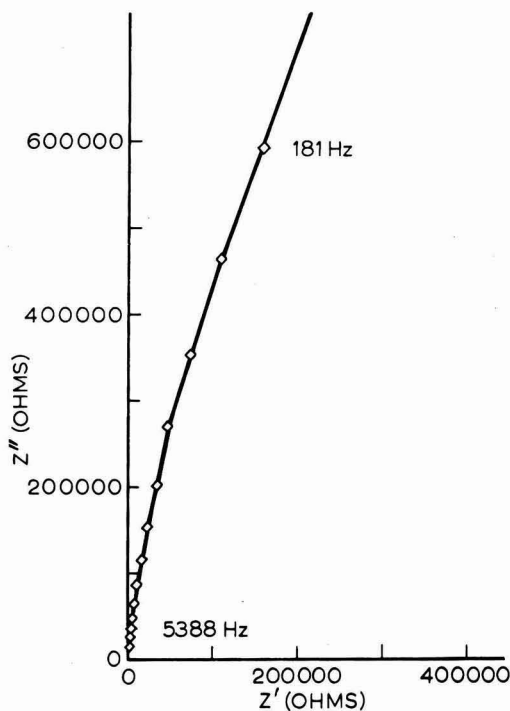


Figure 1. Impedance diagram for $50\ \mu\text{m}$ vinyl acrylic lacquer on abraded mild steel in sea water after 5 days at -800mV SCE

Table 1
Capacitance, potential data at 5 days

Potential (mV SCE)	Capacitance (pF cm^{-2})
-850	31.70
-800	32.00
-750	32.04
-700	32.06
-650	32.22
-600	32.25
-550	32.34
-500	31.93

curve typically observed throughout the range of potential investigated, namely -850mV to -500mV .

The variation of capacitance with potential is set out in Table 1. The values obtained at all potentials are constant, to within experimental accuracy, and are of the order expected of a paint film. As no corrosion was observed, the hypothesis of Kittelberger and Elm concerning electro-osmotic water movement⁴ was not thought to be applicable. The value obtained, being the minimum for a paint film of this thickness, was indicative of the absence of corrosion.

The specimen was then left under immersed conditions with no external polarization for a further 30 days. During this time, the corrosion process developed in the same manner as observed on previous specimens of this type that had not been subjected to any substantial external polarization. The rest potential was measured and was now found to be -530mV (a much more reasonable potential to expect from a partially corroded specimen). The impedance curve obtained at the rest potential, Figure 2, shows the remainder of a high frequency (paint film) semicircle followed by a classical Warburg impedance response, i.e. a straight line at 45° to the real axis. Changing the set potential in a positive direction by only 30mV resulted in pronounced curvature in the low frequency points, Figure 3. Every extra 50mV positive polarization resulted in further curvature, Figure 4, curves A, B and C. Curves B and C resemble semicircles with increasing depression in the low frequency region.

After the positive potential excursion, the specimen was returned to -530mV and left to settle for a further 30 minutes.

Polarization to -600mV (SCE) resulted in the curve of Figure 5. Comparison with Figure 2 shows that once again, significant curvature has been produced by a small overpotential. Figure 6, curves A, B, C and D, shows how the amount of curvature initially increases and then becomes relatively constant. The overall dimensions of the low frequency component become reduced with increasing negative overpotential. The low frequency region eventually becomes relatively horizontal and the extreme low frequency points become progressively elevated. This is not the case with positive overpotentials (Figure 4) where the extreme low frequency data tends towards the real axis and the origin. The data from figures 3, 4 and 5 were replotted as angular frequency vs. the imaginary part of the admittance; this enabled the high and low frequency capacitances to be obtained from the gradient of a least squares fit to the resulting straight lines. Figures 7 and 8 were obtained from the data at -450mV , Figure 4

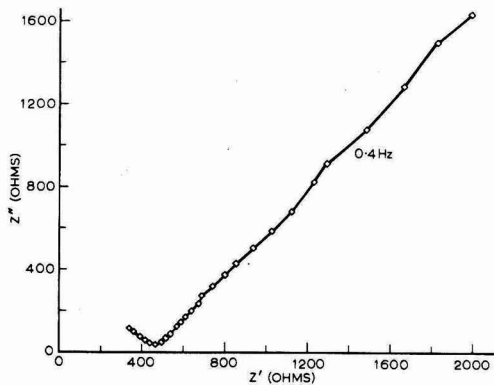


Figure 2. As Figure 1 after 35 days at -530 mV SCE

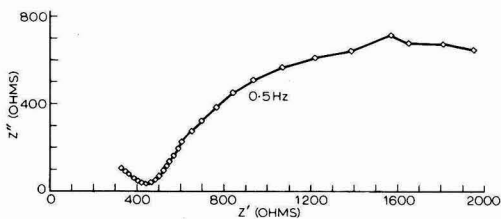


Figure 3. As Figure 1 after 35 days polarized to -500 mV SCE

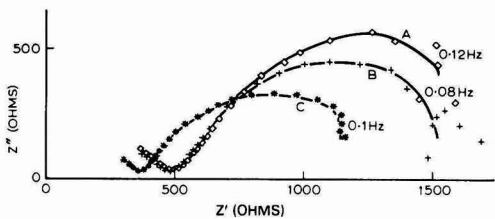


Figure 4. As Figure 3, positive overpotentials, curve A -450 mV SCE, curve B -400 mV SCE and curve C -350 mV SCE

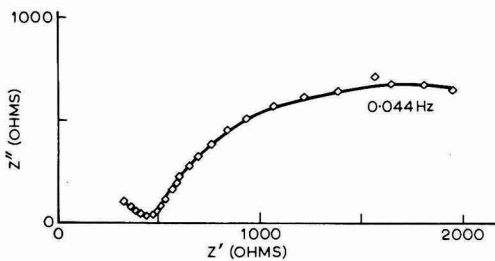


Figure 5. As Figure 3 after 35 days polarized to -600 mV SCE

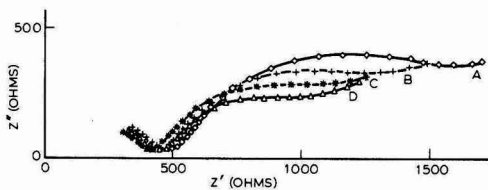


Figure 6. As Figure 3, negative overpotentials curve A -650 mV SCE, curve B -700 mV SCE, curve C -750 mV SCE and curve D -800 mV SCE

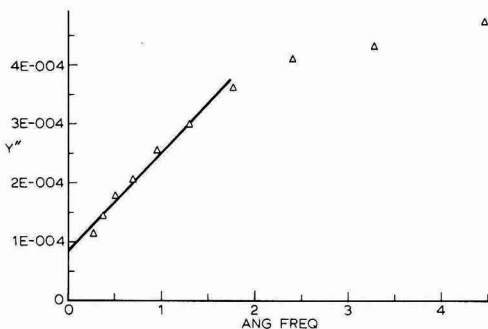


Figure 7. Imaginary part of admittance versus angular frequency corresponding to Figure 4 curve A, high frequency portion

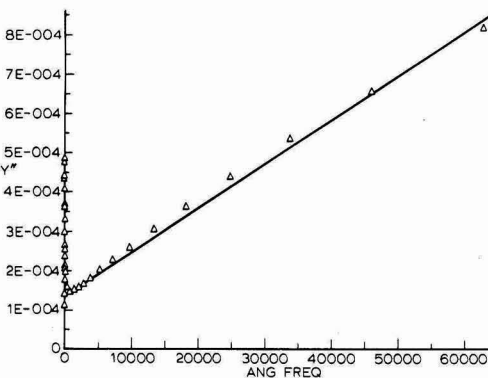


Figure 8. As Figure 7, low frequency portion

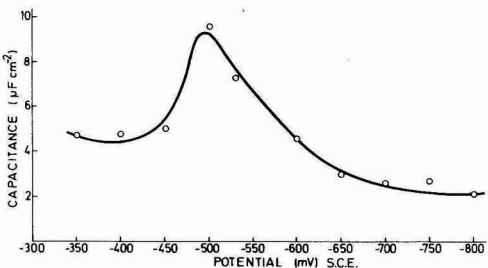


Figure 9. Low frequency capacitance data extracted from figures 2 to 6 plotted as a function of polarizing potential

Table 2
Capacitance, potential data at 35 days at
high and low frequencies

Potential (mV SCE)	High frequency capacitance (pF cm ⁻²)	Low frequency capacitance (μF cm ⁻²)
-350	356	4.7
-400	267	4.75
-450	312	5.00
-500	374	9.6
-530	356	7.3
-600	354	4.6
-650	358	3.0
-700	363	2.6
-750	371	2.7
-800	380	2.1

curve A. These capacitances are shown as a function of potential in Table 2. The capacitance associated with the high frequency semicircle has increased by an order of magnitude over those values given in Table 1. The low frequency capacitance or pseudo-capacitance is in the μF range and shows a pronounced maximum in the region of the rest potential, Figure 8. In view of the ease with which erroneous rest potentials may be measured on coated metals, the location of a maximum of the capacitance at this point should be a distinguishing feature.

Conclusions

1. The capacitance of the intact paint film did not vary with overpotential. The capacitance associated with the paint film when corrosion was observed was an order of magnitude greater. This might be related to some parallel contribution from the double layer capacitance.
2. At the rest potential of a corroded coated metal

electrode, the impedance response is governed purely by Warburg diffusion.

3. The capacitance associated with the corrosion process was found to be a maximum at the rest potential. At positive overpotentials, this capacitance was approximately double that at the extreme negative overpotential examined.
4. The impedance response at all potentials away from the rest potential tended towards a semicircular shape.
5. The extreme low frequency data points tended towards the origin with positive overpotential and away from it with negative overpotential.
6. Conventional corrosion theory suggests that negative overpotential would promote the cathodic reaction, this could be under mass transfer control by oxygen diffusion and would tend to give Warburg type behaviour. This is usually associated with an increase in pseudo-capacitance. However, in this case a decrease in capacitance was observed.

Acknowledgement

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References

1. Callow, L. M. and Scantlebury, J. D., *JOCCA*, 1981, **64** (2), 83.
2. Callow, L. M. and Scantlebury, J. D., *JOCCA*, 1981, **64** (3), 119.
3. Callow, L. M. and Scantlebury, J. D., *JOCCA*, 1981, **64** (4), 143.
4. Kittelberger, W. W. and Elm, A. C., *Ind. Eng. Chem.*, 1947, **39**, 876.

The truth about water-dispersed epoxy coatings*

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Keywords

Properties, characteristics and conditions primarily associated with

bulk coatings and allied products

water dispersible

dried or cured films

performance

Types and classes of coatings and allied products

epoxy coating

Introduction

Water-dispersed epoxy-based surface coatings (WDE) are by no means new. A number of international paint groups and at least two South African concerns have been actively marketing such systems for the past five to ten years. When considering the wide application potential of epoxy-based coatings and the tremendous advantages offered by water-reducible systems in general, the question arises: "why are WDEs only now beginning to gain momentum in the South African market?"

Undoubtedly, the acute alertness to the problems of environmental pollution in many European countries, and the associated legislation, has prompted interest and greatly accelerated the evaluation and acceptance by these countries of coating systems which are water-borne or solvent-free.

The fact that the Republic has unfortunately lagged behind the Western World, somewhat, in its concern for the environment is often used as an excuse for the limited interest that has, in the past, been shown in water-dispersed epoxy systems.

Whilst, undoubtedly, environmental legislation may be considered as a catalyst which will greatly accelerate the acceptance of such systems, the author suggests that local factors inhibited real market growth of water-dispersed epoxy-based coatings during the past decade. These were: incorrect, ill-defined and exaggerated marketing claims for a product which had not yet been fully developed technically.

It was perhaps to be expected that people in marketing, on being presented with a new water-dispersed system, would immediately latch onto, for their promotions, the concept of a "wonder" coating. A coating which, whilst possessing all the attributes of a normal epoxy-based material, i.e. high chemical resistance, good gloss, mar resistance etc., would exhibit none of the normal drawbacks - thus the following sweeping statements (some true, some dubious and some outright false) appear in the early literature:

Easy handling and application
May be applied to damp surfaces
Solvent-free
Chemical resistant
Non-toxic - no health hazard to applicators
Resistant to ultraviolet light

Strangely enough, the real advantages of the new system were often omitted from technical data sheets - perhaps because the manufacturers were still unaware of the real product potential, or they had simply not done their technical "homework" prior to product launching.

To appreciate the effects of marketing claims on the product's acceptance, some of the problems that were experienced with water-dispersed coatings will be examined.

Easy handling and application

It is unfortunately a fact of life that two-component coating systems are not as simple to handle as their single-pack counterparts. Merely rendering the product water-dispersible in no way reduces the problems of ensuring that the two components of an epoxy system are blended together in the correct ratio and are adequately mixed prior to use. In the same way, the presence of water in the paint does not eliminate the problem of limited pot life of the activated product.

On the contrary, the introduction of water into epoxy paints increased the difficulties of handling with "phase I" type coatings, which usually consisted of a base component containing a liquid grade of epoxy resin, non-ionic emulsifying agents, pigments etc., and an activator component made up from a polyamide resin which was usually supplied as a solution of 50 per cent in a hydrophilic solvent such as Methyl Cellosolve, isopropanol, etc.

The base and activator components of the phase I type coatings had first to be mixed together and then diluted on-site with water. The process of dilution itself presented two difficulties.

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Firstly, the addition of water to these coatings necessitated the sudden passing, during dilution, from a thick water in oil emulsion stage to a very low viscosity oil in water emulsion – a phenomenon which proved very confusing to unenlightened applicators and often resulted in over thinning.

Secondly, the availability of suitable dilution vessels on-site often presented a problem. The concept of supplying a small amount of base in a container which provided sufficient ullage to allow in-can dilution, whilst offering a decided economic advantage against competitors, was not readily accepted by the assize authorities.

The ease of handling of water-dispersed epoxy coatings was further complicated by the fact that the pot life was extremely short, when compared with a conventional solvent-borne coating, and the end point could not readily be "seen" in a container of activated diluted paint.

It is all very well to advise an applicator that he must apply paint within half an hour of mixing, but if the product is still brushable after four hours there is a good chance that it will be applied.

Many of the phase I products, whilst exhibiting a 1-2 hour pot life, suffered a severe drop off in gloss when applied thirty minutes after mixing. It was thus possible on one surface, using one can of paint, to obtain a finish which at the commencement of coating produced a reasonably high gloss and at the conclusion a good semi-matt! Many manufacturers overcame this particular problem by confining phase I coatings to the role of primers where an initial low gloss was designed into the product.

Although the pot lives of the phase I type coatings were short, they were not accompanied by the normal curing expected from epoxy coatings. The time taken to achieve a tack-free state was often long, and full-cure protracted.

Application to damp surfaces

Someone once said "make a new mousetrap and customers will come flocking to your door". Experience has shown that this saying could readily be translated thus for the paint industry. "Formulate a coating that will go over rust or onto a damp surface and customers will come flocking to your factory." The problem of course is to define a damp surface. Water-dispersed epoxy coatings, including the phase I types, may be applied to surfaces which are damp from, for example, acid etching or even correctly designed green screeds, but they will not be successful where there is excessive moisture or the surface is damp as a result of rising dampness. More than one flooring contractor has learnt this to his cost.

Stressing suitability for application to damp surfaces without restriction proved to be as costly as suggesting that a product may tolerate substandard surface preparation. It is interesting to note that one of South Africa's largest paint manufacturers in a recent two page journal advertisement outlining the advantages of water-dispersed epoxy coatings, made no mention of application to damp surfaces.

Solvent-free and chemical resistant

Many of the phase I coatings were not solvent-free as stated since they contained hydrophilic coupling solvents. In gloss finishes, n-butanol was sometimes used to replace

some of the water, thus increasing binder solids and improving gloss and flow.

The chemical resistance of these coatings was also somewhat below that of conventional epoxy/polyamide solvent-borne systems. This was largely due to the residual effect of the emulsifier used to induce water dispersibility, and thus varied considerably from manufacturer to manufacturer.

Non-toxic – no health hazard to applicators

Undoubtedly, the elimination of solvents from a coating reduces considerably the hazards both of toxicity and from fire. What is, however, often overlooked is the dermatitic hazard to applicators. The corrosive nature of amines and operator sensitising to these compounds is well known and well documented. Less well known, however, is the strong sensitising action of some reactive diluents used in certain liquid grades of epoxy resin. It is interesting to note that some diluents are only mild irritants (i.e. mildly corrosive to the skin) but exhibit a strong sensitising action. Sensitisation is an allergic reaction which may develop rapidly or only after years of repeated contact. Once sensitisation of an operator has occurred, even slight contact with the offending material can bring about a violent reaction.

Many water-dispersed epoxy coatings, especially the phase I types, are based on liquid grade epoxy resins containing sensitising reactive diluents and polyamide resins which can also exhibit this phenomenon. The presence of emulsifiers, which reduce surface tension, increases the danger of skin contact with sensitising agents.

It is not surprising, therefore, that severe cases of dermatitis have been reported in operators using water-dispersed epoxy coatings. In each case, investigations showed that the low toxicity of material being used lulled operators into a false sense of security, and that normal hygiene and protective clothing procedures had been discarded, resulting in excessive and prolonged skin contact with the coating material.

Ultraviolet light resistance

Tests that have been conducted on the phase I type of water-dispersed coatings have, as would be expected from the paint composition, shown performance to be similar to that of solvent-borne epoxy coatings, i.e. early onset of chalking and tendency of whites to yellow on exposure.

In the light of all this information, the paint chemist was faced with the question "was there really any future in water-dispersed epoxy coatings?" The answer was, and still is, a resounding "yes!" Continued interest in them was ensured due to increasing solvent prices and environmental concern, together with the fact that in spite of their many shortcomings, the phase I WDE coatings exhibited some very promising properties (see below). Further technical development was, however, required.

In an effort to overcome the shortcomings of the phase I WDE coatings a phase II formula was developed, the success of this project was due very largely to the appearance on the market of a water-dispersible polyamide curing agent which was entirely solvent-free and which was supplied as a 50 per cent solution in water.

At last it was possible to produce truly solvent-free water-dispersible epoxy coatings.

Comparison of the properties of phase I WDE coatings and solvent-borne epoxy coatings

	Water-dispersed epoxy	Solvent-borne epoxy
Ease of application by brush or roller	excellent	good
Dry film thickness per coat	low	low
Clean-up	simple – use water	toxic solvent
Adhesion to controlled damp surface	excellent	poor
Intercoat adhesion	good	fair
Long term recoating	good	poor
Thinner	water	aromatic/ketonic
Chemical resistance to: dil. mineral acid	limited resistance	good resistance
dil. alkali	good resistance	good resistance
aliphatic hydrocarbons	good resistance	good resistance
Application to bituminous surfaces	yes	no

The form in which the phase II WDE paints were presented to the customer was changed. The epoxy resin was pre-emulsified, pigmented and diluted with water to produce the base component. The activator consisted of an aqueous solution of polyamide. This represented a major deviation from the former technique of diluting the paint with water on-site after the base and activator had been mixed together.

Whilst representing a considerable improvement over the phase I products, phase II WDE coatings still suffered from some drawbacks. In particular, short pot life and protracted tack free times remained troublesome, whilst the technique of emulsification of the epoxy base needed improvement.

Phase III WDE coatings have gone a long way in overcoming these problems. Further developments in the field of polyamide resins have given rise to WDE coatings crosslinked with them which exhibit improved chemical, corrosion and weather resistance (US patent 3,956,208, May 1976).

The use of alkylene oxide block copolymers in conjunction with the epoxy resin component has extended the pot life of the product, whilst at the same time reducing the time taken to achieve a tack free film (US patent 3,945,964, March 1976). Modifications of the epoxy resin component with materials other than the conventional reactive diluents have enabled WDE coatings of high flexibility and low sensitising action to be produced.

This does not mean that good hygiene and safety precautions can be abandoned. Excessive contact with even mild sensitisers can give rise to long term sensitisation. Barrier creams and gloves should always be used. The fact that solvent vapours are not produced by these products does not mean that good ventilation of work areas is not necessary.

With the early types of WDE coatings it was necessary to utilise high levels of non-ionic emulsifier to obtain emulsions of the epoxy resin/pigment component which exhibited long term stability. Investigations have shown that salts present in the pigments tend to reduce the action of the emulsifier on storage, necessitating the use of high

initial levels. The careful selection of pigments and extenders, and the use of chelating compounds such as citric acid has enabled emulsifier levels to be greatly reduced. Thus, phase III WDE coatings exhibit greatly improved levels of chemical resistance, in some instances superior to those of their solvent-borne counterparts.

Phase I and II coatings found very little application in the anticorrosive field. This was, to a certain extent, due to the resistance by engineers to the application of water-based coatings to steel surfaces which, in the past, they had been cautioned by corrosion experts to "protect from moisture at all costs". Little could be done, however, to break down this continued resistance as the products could not be suitably pigmented with anticorrosive pigments because of in-can instability, this resulted in severe flash rusting on application to ferrous surfaces.

Once again, in phase III type WDE materials, the judicious use of chelating agents has enabled primers to be pigmented with anticorrosive compounds such as zinc phosphate and strontium chromate, providing a very high degree of corrosion inhibition and eliminating flash rusting.

The emulsifier level has been found to play an important role in the blistering of films in both salt spray and humidity cabinets. Special manufacturing techniques have been adopted to further reduce the emulsifier level in primers.

Flow and levelling have been improved by incorporating acrylic and urea formaldehyde resins, thus eliminating the n-butanol used previously.

With the successful development of the phase III type coatings, the stage was set for the introduction of a product onto the market which could fill a gap in the existing range of coatings available, and at the same time perform in itself without the need of marketing gimmicks.

The product was set for launching – but where was it to be used?

During the preparation of this paper a large number of sites, both local and in Europe, where water-dispersed epoxy coatings of the phase III type had been used were inspected. The results of these inspections were most encouraging. Not only was the performance of the coatings outstanding, but also the reason for their initial selection was sound. Gone are the days when WDE coatings were specified on jobs which could quite satisfactorily have been coated with acrylic or even p.v.a. emulsion paints.

WDE coatings must never be considered as substitutes for conventional emulsion paints. They have a set of their own particular outstanding characteristics, the use of which should be optimised at the time of specification.

To appreciate the properties of these coatings which may be produced in matt, semi-gloss and high gloss grades, some of the applications in which they have been successfully applied will be examined.

1. Nuclear installations

Nuclear decontamination studies have been conducted by a number of independent atomic research institutions on a wide range of WDE coatings. Results, in general, have

been excellent. In particular, a coating of the phase III type was subjected to irradiation from an isotopic mixture of ^{137}Cs , ^{45}Ca , ^{106}Ru and ^{60}Co . Decontamination tests were conducted by washing as follows:

- 30 seconds with distilled water
- 60 seconds with distilled water
- 120 seconds with distilled water
- 60 seconds with 1N hydrochloric acid

A further test was conducted by brushing the film for one minute with No-Dermine C/R.

In each case the decontamination results obtained were within the limits required, and the German Research Institute who conducted the tests gave the coating a "very good" class rating.

The same institute simultaneously conducted chemical resistance tests on the coating. The chemicals checked were those likely to be encountered in nuclear installations. The results obtained showed that the particular coating tested was resistant to 1N sodium hydroxide and 1N hydrochloric acid. It was also found to resist limited contact with ethylene, acetone and benzene. As a result of a wider range of chemical resistance tests conducted in the author's laboratories, it has been concluded that, in general, these coatings are resistant to alkali and mild mineral acid solutions. In most cases the chemical performance is a little better than that of conventional solvent-borne epoxy/polyamide coatings but inferior to that of good solvent-free systems.

The WDE coating described above has been successfully used in many European nuclear installations over the past five years. Typical of such applications were:

Goesgen - CH	40,000 m ² of floor coating
Leibstatt - CH	30,000 m ² of floor coating
Dodewaard - NL	5,000 m ² covering walls and ceilings in warehouse for radio-active waste materials

2. Flooring in new structures

Of particular interest has been the use of WDE coatings in flooring applications in new constructions. The protection of new screeds from oil and dirt contamination during the final construction and plant erection phase of operations (which may take up to two years in large installations such as power plants) has always proved difficult, expensive and not very efficient. Experience has shown that new screeds may be coated, soon after laying, with a WDE coating. This coating will serve as a protective layer whilst there is a danger of floor contamination, and when plant assembly is complete it will, after wiping down to remove dirt and grease, serve as an excellent primer for subsequent WDE, solvent-borne or solvent-free flooring systems. (The adhesion of all these materials, if correctly formulated, to well aged WDE films has proved to be excellent.)

One of the big advantages of WDE coatings is that they may be applied to "correctly designed", green screeds. Thus they will not only protect the screed, soon after laying, from contamination but will also perform the role of a curing membrane. Normally it is preferable, if possible, to allow at least seven days curing of the screed before applying the WDE coating. In Switzerland, where it is possible to control the screed mixture accurately in so far as the water/cement ratio and admixture content is

concerned, thus minimising bleeding and laitance formation, it has been found practical to coat flooring screeds 24 hours after laying. In one such application on an area of 30,000 square metres, less than 1 per cent of the coating showed signs of distress after the eighteen month fabrication period. It proved a simple matter to patch these areas prior to laying the final floor coating. One per cent of such a large area may appear to some to constitute excessive patching, but if one considers the difficulties which could have arisen from contamination during the first seven days, such practice is, in fact, viable.

In South Africa the control of screed composition is difficult and so it is normally necessary to undertake surface preparation prior to coating.

Since a WDE system can tolerate some dampness of the surface to which it is being applied, there are three methods of preparation that may be adopted.

(a) Acid etching

This method may be used, although it is not to be recommended as the preferred system. The use of phosphoric acid instead of hydrochloric acid (which produces unpleasant fumes) has been successfully tried. It is important to remove all the reaction products of etching by flushing with copious quantities of fresh water before coating.

(b) Wet blasting

This is undoubtedly the preferred method of surface preparation.

(c) Retardation of laitance formation by chemical means

Tests which have been conducted have shown that if a controlled layer of retarding chemical (e.g. sugar) is applied to the surface of a new screed, laitance formation is prevented. The surface is simply flushed with water prior to coating. Great care must be exercised with the application of the retarder however, for, if this is too liberal, a very rough surface texture will result. Work is currently in progress to evaluate the use of "retarding paper" on new screeds.

Where it is desired to produce a non-slip surface, a suitable graded aggregate may be either incorporated into the coating or scattered onto an intermediate coat whilst this is still tacky. A typical example of the latter method is the concrete pavement area outside the domestic departure terminal of an International Airport which was coated some six years ago. WDE coating was applied, aggregate was broadcast over the surface, excess aggregate was swept away and a wear coat applied over the surface.

3. Wall and ceiling coatings

As has already been mentioned, because of their ease of decontamination, WDE coatings find ready application as wall coatings in nuclear installations. Their application is by no means restricted to this area of service however.

WDE coatings have been approved by a number of European countries for use in food processing plants. More specifically, as a result of tests conducted by the Federal Research Laboratory for the Milk Industry, the Swiss Board of Health has issued clearance for the use of approved WDE coatings on walls, ceilings and floors of Swiss dairies.

The hot water, detergent and mild chemical resistance of these coatings renders them suitable for the regular cleaning-down required in food processing plants. The very smooth nature of the film surface (unlike conventional emulsion paints) makes the sterilisation of walls in sensitive areas possible by washing down with bactericidal solutions. With correct formulation and judicious incorporation of fungicides, it is possible to produce WDE coatings with a high degree of resistance to fungal growth.

A number of traffic tunnels in Europe have been coated with WDE systems. To obtain official sanction for their use in Switzerland, the following tests, which serve to demonstrate some of the physical properties of WDE coatings, were conducted by an independent Swiss laboratory. The test methods, which are somewhat unusual, are those specified by the authorities concerned.

Test specimens

Two coats of WDE coating were applied at 250 g/m² per coat to:

- (i) Concrete panels 200 × 300 × 50mm
- (ii) Asbestos cement panels 200 × 300 × 50mm

Drying time between coats – 12 hours

Drying time before testing – 7 days

Drying conditions – 20°C and 60 per cent RH

Tests

The coated concrete panels were used for impact, water/freeze and sulfated water testing. The coated asbestos cement panels were used for detergent resistance, cross hatch, steam blast and exhaust gas resistance tests.

Results

- (1) Appearance: white, smooth, semi-gloss finish.
- (2) Grate test: (cross hatch) (SNV 137,111 width of cut = 2mm) gratecutting class 0, i.e. the edges of the grates are absolutely sharp – no squares disbonded.
- (3) Impact test: (a steel ball, mass 1kg, dropped onto the panel from a height of 2 metres). After five impacts on the same section of coating there was no distress.
- (4) Water/freeze test: 1 cycle = 6 hours at –20°C, 3 hours immersion in water 18°C, 12 hours recovery at 20°C and 65 per cent RH. Coating unaffected after 20 cycles.
- (5) Detergent resistance: using a scrubability apparatus fitted with a brush of contact area 2,500mm² and mass 1.5kg, the coating was subjected to 39,000 double strokes, using a 2.5 per cent synthetic detergent solution in water. The test took a total of nine hours to complete and at the conclusion the coating showed no defects.
- (6) Steam blast: a steam blast of 30 seconds duration was applied directly to the coating. No change of the surface could be detected.
- (7) Influence of diesel engine exhaust fumes: the sample was positioned vertically, at a distance of 50cm, in front of the exhaust of a diesel engine. The sample was allowed to remain in this position for 2 minutes during which period the engine was brought 5 times to maximum power. The panel was conditioned for

five days at 20°C and then washed for one minute in a 2.5 per cent detergent solution.

At the conclusion of the test the panel showed no discolouration.

- (8) Influence of sulfate containing water: the coated panel was immersed in a 1 per cent solution of sodium sulfate in water at 20°C for 21 days. At the conclusion of this period no film defects were observed.

4. Breweries

One particularly interesting application of WDE coatings is in breweries. Research has shown that traces of mesityl oxide have a devastating effect on the fermentation process involved in beer manufacture. Mesityl oxide is produced as a side reaction in, amongst other things, the production of ketonic solvents. Before any coatings can be used in the fermentation area of a brewery they must be laboratory tested for mesityl oxide. Even the presence of traces of this substance will result in the coating being rejected. Many of the conventional epoxy and polyurethane coatings submitted to the breweries have been found to contain traces of mesityl oxide (including coatings which do not contain ketonic solvents as such).

WDE coatings have been extensively tested and to date no signs of mesityl oxide have been detected in these materials, rendering them ideally suitable for coating in sensitive brewery areas.

5. Asphaltic surfaces

Being solvent-free, WDE coatings will not give rise to bleeding when applied to asphaltic surfaces. Vast areas of industrial flooring, car parks etc. in South Africa are topped with bituminous based compounds. Bitumen remains liable to solvent and oil attack and must be protected against spillage. To date this has largely been achieved by using tar based coatings which are ideal if a black surface is acceptable. Where some form of decorative appearance is required, it is normal to use solvent-free or spirit-soluble resin-based materials. Unfortunately, due to the thermoplastic nature of the bitumen, cracking of the coating and the resultant ingress of oil invariably occur. Field trials conducted over the past five years have shown that a suitably flexibilised WDE coating will give good service on bitumen-based flooring compounds.

The floor of a shopping complex in a Zurich suburb was made of a mastic asphalt type. This was coated in 1975 with a flexibilised WDE system. An inspection in September 1980 revealed that the coating was standing up extremely well to intense foot traffic and regular daily cleaning.

Of particular interest, however, was an area used as a pavement café. Here, the feet of metal chairs and tables had dented the asphaltic flooring, but a close inspection revealed that the coating in the dented section was still entirely intact.

WDE coatings have been extensively used around machines in factory areas to protect asphaltic floors from oil spillage. Recently, entire factory floors have been coated to provide a decorative effect and, at the same time, to give protection from oil spillages resulting from fork lift truck activities.

Protection against oil leaks from vehicles parked on bituminous surfaced roof-top parking areas has been achieved using WDE coatings.

6. Protection against corrosion

Anticorrosive systems utilising WDE primers based on barium chromate and more recently zinc phosphate have been found to give good salt spray results. Field scale trials in marine environments have proved these materials in practice.

Coal tar modified WDE coatings have begun to receive acceptance in the marine field, although not as rapidly as might have been expected when one considers their performance record.

Conclusion

Undoubtedly, stricter legislation, increasing solvent prices and greater public concern about the environment will

intensify interest in the water-dispersed range of epoxy coatings which, as a result of their excellent track record over the past five years, can be seen to have passed from the "gimmick" to the proven stage.

Properties such as ease of application, ease of clean-up and reduced fire risk which were, in the early days, the attributes upon which the marketing people launched their WDE campaigns, may today be seen simply as the "cherry on the top" of an assortment of outstanding basic product advantages.

Water-dispersed epoxy coatings are undoubtedly specialised products with a specific performance role to play. If they are to achieve their full potential in the 80s, however, manufacturers must guard against the ever present temptation to debase quality in the interests of price cutting.

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Next month's issue

The Honorary Editor has accepted the following papers for publication. They are expected to appear in the February issue of the *Journal*:

A review of the relationship between visual and instrumental assessment of colour difference, part 1 by *R. McDonald*

Factors affecting the development of amino resins for use in surface coatings by *J. E. Sreeves*

Indigenous raw materials from coal for coatings for the eighties by *P. J. Strassburg*

Powder coatings – 10 years experience of application technology by *A. van de Werff and B. V. Zwolle*

Foam control in the surface coatings industry*

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Summary

The structure and causes of foam in aqueous systems are covered and reasons for efficient foam control in industrial systems outlined.

The reasons for foam collapse and how defoamers speed up the

process are described, together with the functions of various defoamer components and how these can be affected by the chemical make-up of surface coatings.

Keywords

*Raw materials for coatings
miscellaneous paint additives*

defoamer

*Processes and methods primarily associated with
manufacturing or synthesis*

foam control

Le contrôle de la formation de mousse à l'industrie de peintures

Résumé

On décrit la structure et les causes des mousses qui se produisent en systèmes aqueux et l'on considère, brièvement les raisons pour lesquelles un système de contrôle efficace de mousse est nécessaire à l'industrie de peintures.

On décrit les raisons pour l'effondrement des mousses et la

manière par laquelle les agents anti-mousses favorisent ce processus, ainsi que les fonctions mettent en évidence par les divers constituants des agents anti-mousses et la manière par laquelle celles-ci peuvent être influencées par la nature chimique des peintures.

Die Schaumkontrolle bei der Lackindustrie

Zusammenfassung

Die Schaumstruktur und deren Entstehung in wässrigen Systemen werden besprochen und die Ursachen weshalb ein leistungsfähigen Schaumkontrollensystem bei der Lackindustrie notwendig ist, werden überlegt.

Die Ursachen für den Schaumzusammenbruch und die Weise

wodurch die Entschäumer dieses Verfahren beschleunigen, und dazu die Funktionen der verschiedenen Entschäumerbestandteile und wie diejenige von der chemischen Struktur der Beschichtungen beeinflusst werden, werden beschrieben.

Introduction

The presence of foam in surface coatings can cause untold problems to the user. Not only will pinholes or craters occur in the film, but also loss of adhesion, reduction in gloss or sheen and poor flow-out properties may be experienced.

Although the title of this paper suggests a general description of the theories of defoaming, perhaps there should be an introduction to the theories of foaming first. This may help explain how the theories for defoaming have been developed.

What is a foam?

Foam is, by definition, an agglomeration of gas bubbles separated from each other by thin liquid films. But what causes the foam in the first place?

The presence of a gas and a pure liquid alone is not sufficient to produce a stable foam. Another substance is

required in the liquid phase to produce a stable gas-in-liquid dispersion. This third component produces a surface layer which is different in composition to the bulk of the liquid phase.

In a liquid system there is no such thing as a stable foam. It is more correct to think of it as being metastable. It is possible to classify foams into two categories:

1. The persistent type
2. The transient type

Foams, in one way or another, are frequently encountered in industrial situations. Sometimes they are beneficial, but more often than not their presence interferes deleteriously with process and equipment operations. As a result, the great bulk of foam study has been devoted to either preventing foam formation or destroying it once formed.

However, interest is increasing in the more useful aspects of foam, one of the best examples being in the

*Paper presented at the South African Division's 8th National OCCA Symposium

production of foamed plastics. Also, foaming agents used for the generation of fire-fighting foams from aqueous systems have long been of major interest. Yet another application is the use of foam separation processes: froth flotation for the separation of minerals is familiar to many people.

Perhaps because they occur so commonly in chemical systems, foams and their control have been given little close attention and familiarity has promoted indifference. As a result, there have been few theoretical studies on the subject, but fortunately the little work which has been done, has provided technologists with an adequate theoretical chemical background on which the examination of technological problems can be based.

Methods of foam collapse

Going back to the two types of foam – the persistent and the transient types – two examples can be given.

Everyone is familiar with the head on a glass of beer. This is composed of uniform bubbles and may be classed as a persistent foam.

Others, like sea foam, are transient. This is produced by the breaking surf and is composed of a wide range of bubble sizes which are very short lived.

As stated before, in general, a pure liquid does not foam. (In fact, the purity of drinking water can be measured by studying the level of foam during aeration. Contaminated water will foam much more persistently than distilled water.)

However, this is not a hard and fast rule. For instance, if a pure liquid which is extremely viscous is used, then when the bubbles are formed they cannot collapse quickly because of the slow rate of drainage. In other words, the bubble films are unable to thin down to such a degree that collapse occurs.

In contrast, most true foaming systems contain materials known as surface active materials (surfactants) and there appears to be a connection between the amount of surfactant present and the quantity and quality of foam generated.

It is probably advantageous to define surface activity at this point to clarify the situation.

The surface activity of a solute is defined as its ability to lower the surface or interfacial tension of the solvent. This can be done only if the solute is positively absorbed at the surface or the interface, or in other words work must be done to transfer the material from the surface back into the bulk phase.

As stated previously, foams are generally unstable systems and in a foam mass three main processes occur:

1. Re-distribution of bubble sizes
2. Film thinning
3. Film rupture

The first effect, the re-distribution of bubble sizes, is caused by the dependence of the gas pressure in a bubble on the curvature of its walls.

Consider two bubbles, one with a radius R_1 which is

large and one with a radius R_2 which is small. The gas will, surprisingly, diffuse from the smaller bubble into the larger bubble giving a re-distribution of sizes. The reason is simply that bubbles of a lower radius have a higher internal pressure. Thus, gas diffusion takes place in foams on ageing.

Film thinning, the second process, occurs due to drainage. For instance, it can easily be seen that if a vessel is filled solely with foam and left to stand, after a time a layer of liquid drains to the bottom of the vessel and continues to grow until the foam disappears. Film thinning is due, in general, to gravitational forces. As can be well understood, for a vertical film, gravity causes drainage of liquid downwards and film thinning occurs.

There is also another reason for film thinning, this time caused by suction. Without going into great detail, at a bubble interface the walls are approximately parallel. When contact is made with a third bubble, the interface becomes distorted and a capillary pressure difference exists which drives liquid from between the bubble walls into this deformed area, and this again causes drainage.

The third process, foam rupture or collapse, occurs because of energy considerations. The area of the resulting drop or drops of liquid is smaller than that of the initial system. The energy difference between such systems is so large that when a bubble bursts, energy is rapidly dissipated and the liquid droplets released may acquire speeds of 10-20 metres/sec.

Foam persistence

Despite all of the above considerations foam can persist for measurable times.

One reason is often due to surface viscosity. For example, proteins tend to form skin, similar to that on hot milk. In other words the skin, which has a greater viscosity than the bulk, inhibits drainage and this is the main cause of foam stability.

But when surface viscosity is absent, foam stability is apparently caused by a phenomenon known as the Marangoni effect. This effect may be understood by imagining a freshly formed foam film, the film is ruptured and the underlying liquid is then exposed. This exposed liquid tends to have a greater surface tension than the original surface of the bubble and consequently it tends to close the gap and inhibit drainage from the bubble walls above it.

Another cause of foam stability is the presence of electrolytes such as soaps in the bubble films. These films consist of two layers of long chain ions between which a solution containing an excess of counter ions completes the sandwich. Repulsion therefore exists between the two equally charged walls, preventing their mutual approach or thinning which is the first step to bursting.

The action of a defoamer

It has been shown many times that the surface tension of a foaming system is lowered by the addition of a defoamer. Further, that the greater this decrease in surface tension, the greater the efficiency of the defoamer. However, there are many compounds capable of reducing surface tension which do not act as defoamers when added to a system. For instance, normal surfactants, wetting agents etc.

Hence, other factors would appear to be important in addition to the decrease in the surface tension:

1. The insolubility of the defoamer in the foaming systems
2. The ability of the defoamer to spread over the surface

Thus, the basic principle of defoaming is the rapid spreading of a low tension insoluble oil over the surface of a system, providing a weakness where the collapse of bubbles can take place.

With regard to defoamer construction, in the Bevaloid range there are hundreds of different defoamers which have been developed over the past 15 years or so. All of these are obviously of very varied chemical types.

In respect of the requirements for a simple defoamer, as stated previously, the first is that it should be an insoluble material, so a carrier is used, for example a mineral oil. Synthetic oils and surfactants are becoming more and more attractive for use as carriers because of current oil prices.

However, if an insoluble oil is added to a paint system it will just remain on the surface in droplets and cause fish eyes or cissing, unless there is sufficient surfactant within the paint system to disperse it.

Mineral oil, kerosene or whatever oil is chosen are not, in themselves, particularly good defoamers and hence they need to be modified. The second specification was that the defoamer should spread over the surface, so to the mineral oil surface active agents are added which will then emulsify the oil and cause it to spread over the interface. Such systems do work in certain instances. A mineral oil plus a surface active agent, for instance, could be quite an effective defoamer in a paper machine system. It depends greatly on the choice of mineral oil and also on the types of surfactants used, but basically they are relatively simple defoamers.

Defoamer construction

Most surface coating applications are not as simple as the above example. Consider all the materials incorporated into a paint or any surface coating, which would be liable to cause foam. There are binders, thickening agents, surfactants, coalescing agents and all have separate foam problems. So a defoamer for use in surface coatings is usually more complex than is required in other industrial processes.

At one time it could have been said that the construction of defoamers was more an art-form than a science, being more allied to cookery than chemistry. However, the scope of the art has developed over the last few years far beyond this stage, as more understanding of the mechanisms of foam control in complex systems has been gained. An ever increasing number of different chemicals are now available to the defoamer chemist to incorporate in such formulations. It nevertheless becomes very much a blend of feel and experience, as to the best combination of ingredients. A summary of the types of ingredients and their actions are listed below. A defoamer will be composed of many or all of these:

1. The base oil to provide the insoluble component.
2. Very high molecular weight compounds which provide rapid breakdown of foam in thin films, i.e. relating to bubble break on roll out of paint films.

3. An emulsification system that provides a dual purpose:

- (a) To ensure that none of the insoluble components of the defoamer cause surface defects in the coating film such as fish eyes, cissing etc.
- (b) To ensure stability of the defoamer itself. Inevitably a complex mixture, a stable defoamer often demands a higher level of emulsifiers than is consistent with the highest efficiency. A delicate balance exists between efficiency, defoamer mobility and product stability, which is why many of the earlier generation of defoamers exhibited gross separation and required stirring before use. The development of more sophisticated and, inevitably, more expensive emulsifiers has provided the more stable products currently on the market.

4. Certain additives, some polymeric in nature, are carried by the mineral oil/emulsifier systems to the bubble sites. The additives enter the bubble film causing drainage, or at least an increase in the level of drainage, leading to bubble break.

5. "Entering agents" is a term used for certain materials that promote the absorption of components of the defoamer into the film or the interface between bubbles.

6. Spreading agents are used which, although not contributing to the emulsification of the system, increase the spreading ability of the oil. It can often happen that the spreading rate of the active ingredients of the defoamer will cause more rapid knock-down. A very high spreading rate can create shear forces at the surface which lead to a mechanical breakdown of the foam. This is a transient effect but can add greatly to the overall effect of the defoamer.

Factors affecting defoamer action

After describing generally the components of defoamer construction, the factors affecting defoamer action will be discussed.

As mentioned earlier, the basic principle is the rapid spreading of a low surface tension insoluble oil over the surface of the system, to provide weaknesses where collapse of bubbles will occur. On the face of it, it may appear that a universal defoamer might exist which would work in all systems.

A universal defoamer, however, does not exist as all systems differ chemically as well as in their physical properties. Some of these are listed below:

1. The solubilising property of a system. This is of great importance as one of the major factors, stated earlier, is the insolubility of the defoamer in the system. The most difficult systems to defoam are those containing high levels of surfactants or wetting agents. Here the problem of defoaming is connected with using a compound so insoluble that it does not dissolve, i.e. it is not solubilised by the wetting agents. If a defoamer is solubilised it is never able to form the insoluble surface layer necessary to break the foam.

Also, a defoamer for a surface coating must not be solubilised in time. In other words, the defoamer must remain active in the paint during months of storage.

2. Again to do with solubility, the presence of organic solvents in the system would tend to dissolve essentially organic defoamers. Most systems are, however, aqueous based, but inclusion of substantial quantities of solvents

into an emulsion system can destroy the action of a normally effective defoamer, e.g. coalescing agents.

3. The ability of the defoamer to spread through the surface layers, i.e. on a paint roll-out or during manufacture, will be found to determine the degree of quick knock-down of the foam. Hence, the viscosity of the system plays a major part in the performance of defoamers or the rate of breakdown of foam.

4. If the system consists of a suspension of pigment particles, then the defoamer may be preferentially adsorbed onto the surface of certain pigments rather than appearing at the foam sites. The type of pigments will determine, to a degree, which type of defoamer is going to work well.

5. The pH of a system must always be considered. If the pH is strongly acid or strongly alkaline then the defoamer may undergo chemical reaction. For example, esters in the formulation may hydrolyse. If these esters act as emulsifiers then this will promote surface defects such as cissing.

6. Certain defoamers contain volatile components and at an elevated temperature the activity of a defoamer may be impaired.

Thus, from the factors above, it is clear why defoamers will work in one system and not another. For example, it would be foolish to recommend a defoamer for a paint system when it has been found to perform well only on the latex binder employed. In such a case, the effects of coalescents, pH, pigment particles and surfactants have been ignored. As described above, each of these factors influences defoaming action greatly. This is why in the evaluation of a paint, manufacturers are often asked for a sample of finished paint containing no defoamer. Although it is appreciated that producing such a sample is often difficult, it is the only method of accurately evaluating the effect of various components on defoaming action. The ideal situation would be to produce paints from the basic raw materials in the laboratory, but most manufacturers are naturally unwilling to disclose their formulations and raw materials.

The above factors also illustrate why in certain paints one type of defoamer is used at the grind stage and another type employed during let-down. Often the paint will exhibit quite different foaming characteristics during these two stages of manufacture.

Defoamer evaluation

Many tests can be carried out in the laboratory to assess defoamer action. Shaking tests, either mechanically or by hand, are often useful for initial screening tests. High speed stirring tests assess performance under a Cowles type dispersator during manufacture.

Timing of the breakdown of static foams in thick films relates to bubble break on roll-out and draw downs on Moorst cards. Other substrates are used to assess the effects of defoamer on film continuity, colour etc.

Storage tests are also carried out to assess defoamer performance on ageing. These can be accelerated by storage at higher temperatures than ambient.

The choice of which defoamers to test depends on the coating system to be evaluated. As a guide for laboratory workers, the foam control agents are grouped into a series

of "families" derived from a balance between chemical types and past performance. As an initial test the first member of each of six family groups is evaluated. These results point the way to the assessment of related defoamers.

A separate seventh family group exists for non-aqueous systems. Solvent systems generally dissolve many defoamers and render them ineffective and a completely different chemical class must be used. Testing of these non-aqueous types is often difficult because foam volumes are generally small. Assessment of performance is usually by way of observation of bubble break or simple observation of surface foam on a bulk sample after prolonged agitation.

In some cases defoamers that are performing well are solvated by the system and yet, paradoxically, foam collapse is still observed. Perhaps in these cases, foam break is associated with factors other than those described above. Some products are thought to promote flow or reduce surface viscosity, causing increased bubble drainage and subsequent breakdown.

New developments

The ever increasing price of mineral oil has led to the development of many mineral oil-free systems. These are generally more expensive than the conventional type of defoamer, but efficiency is often far superior and in some cases these products can be offered as lower-cost, lower-activity emulsion types. These products have been developed mainly for industrial processes where defoamer off-take is large and mineral oil prices have contributed significantly to the cost of processing, e.g. in the paper industry. However, these chemical types will be tailored in the future to meet the needs of the paint industry in general.

The technology involved in the production of acrylic and vinyl polymer defoamers, as supplied to the textile industry, is being utilised to prepare polymeric materials for possible use as antifoams. Defoamers are also being produced in dry form for incorporation into powder systems such as powdered vinyl polymers, starches, cement systems, powder paints, etc.

In short, research and development work is in progress to develop new materials to meet the rapidly changing needs of the surface coatings industry, and to provide efficient foam collapse in systems incorporating the great variety of technically complex additives which are present in today's surface coatings.

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References

1. Ross, S., Mechanisms of Foam Stabilisation and Antifoaming Action, *Chem. Eng. Proj.*
2. Keszthelyi, S. E., Foams, *J. Paint Tech.*, 1974, **46** (598), 31.
3. Jurish, M. J., Why and How of Industrial Foam Problems, *Paper Trade Jour.*, 1957, 15 July, 52.
4. Harkins, W. D., *J. Chem. Phys.*, 1941, July, **9**, 552.
5. Kitchener, Cooper, Current Concepts in the Theory of Foaming.
6. Gaden and Kevorkian, *Chem. Eng.*, 1956, October, 173.
7. Kouloheris, *Chem. Eng.*, 1970, July, 143.

Masonry paints and cleaning methods for walls affected by organic growth

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Summary

As prior treatments for painting external walls bearing organic growths, biocidal washes applied after wire brushing were less effective than vigorous cleaning alone; water jet with or without abrasives being preferred. The difference in effectiveness

between the manual and jet cleaning methods was large for a brittle, solvent-thinned masonry paint not containing any fungicide, but marginal for two emulsion masonry paints which contained fungicides.

Keywords

Processes and methods primarily associated with surface preparation before coating

surface treatment

Miscellaneous terms

biodeterioration

Types and classes of coatings and allied products

masonry finish

Raw materials for coatings

biologically active agents

biologically active agent

Peintures pour façades et les méthodes de nettoyage des murs touchés par des moisissures

Résumé

On a trouvé qu'en tant que pré-traitements des façades touchées par des moisissures, l'application, après des coups de brosse métallique, des solutions biocides était moins efficace que le simple nettoyage au fond; la méthode de préférence comprend un jet d'eau avec ou sans abrasifs. La différence entre l'efficacité

des méthodes de nettoyage par main et par jet d'eau était grande dans le cas d'une peinture oléorésineuse pour façades exempte de fongicide et qui était devenue friable, mais petite dans le cas de deux peintures-émulsion pour façades contenant des fongicides.

Reinigungsmethoden und Wandfarben für von destruktiven Organismen betroffenen Fassaden

Zusammenfassung

Es wurde gefunden dass als Vorbehandlungsmitteln für die von destruktiven Organismen betroffenen Fassaden die nach Drahtbürsten angestrichenen biociden Lösungen waren wenig wirksam als kräftige Reinigung allein, worin man einen Wasserstrahl mit oder ohne Schleifmittel vorzieht. Der Wirksamkeits-

unterschied zwischen der Hand- und Strahlungsmethode war wichtig im Falle einer spröde auf organischen Lösungsmittel gegründeten Wandfarbe, die kein Fungicid enthielt, aber wenig im Falle zweier Fungicid enthaltenden Dispersionswandfarben.

Introduction

Rehabilitation of old buildings is the concern of many local authorities and private owners. It is often accompanied by the painting or repainting of external rendered walls, for which a variety of masonry paints and coatings are available. As well as the difficulties in selecting suitable paints, preferably having a long life or the best cost-in-use, there is usually the question of how to deal with accumulations of organic growths such as algae, lichens and mosses, particularly in the wetter areas of the country. There is also a lesser requirement for removing such growths with a lasting treatment when painting is not contemplated. A recent trial at the BRE Garston exposure site has provided useful guidance, and some results were contrary to what might have been expected.

Experimental procedure

A very old concrete retaining wall, 14 m long \times 2.3 m

high, with a slope of 9.5°, bearing 30 years of growth, was utilised. It represented a damp situation and was partly shadowed by a slightly higher wall only 3.5 m to the south.

The wall was divided into four areas:

1. No manual or mechanical treatment
2. Very thorough wire brushing
3. Water jet cleaning
4. Water jet/grit cleaning

Eight biocidal solutions were applied (in vertical strips down to ground level) to the first three areas and three to the last, with an untreated control section in each.

Biocidal washes

(Proprietary materials diluted according to manufacturers recommendations to give working concentrations as shown below.)

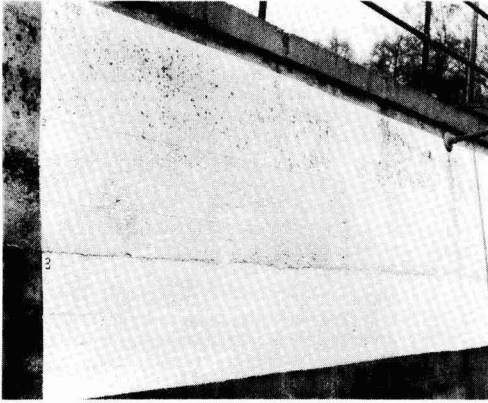


Figure 1. Wire brushed area, solvent thinned masonry paint at top

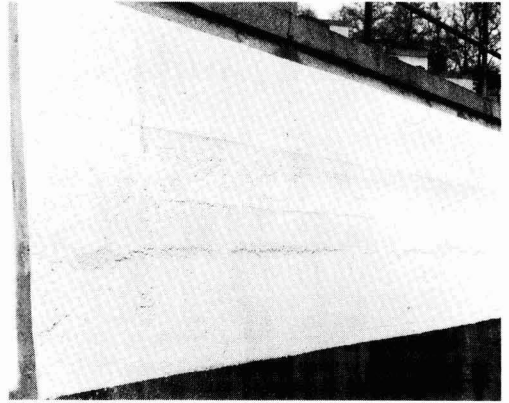


Figure 2. Water jet cleaned area

Household bleach (diluted 1:4 by vol)	1 per cent v/v
Boric acid	5 per cent w/v
Proprietary quaternary ammonium compound	1 per cent v/v
Proprietary quaternary ammonium compound/tributyltin oxide	5 per cent v/v
Proprietary quaternary ammonium compound/pentachlorophenol laurate	10 per cent v/v
Proprietary dichlorinated phenolic compound	undiluted
Proprietary sodium pentachlorophenol laurate	2 per cent w/v
Proprietary amino compound	5 per cent v/v

Across areas 2, 3 and 4 were applied horizontal bands of three commercial paints: two fine textured emulsion-based paints and one matt solution polymer masonry paint. The last paint had been observed to fail in practice by re-growth of algae or lichens in less than a year, followed by detachment of small flakes. Whereas the emulsion paints were stated to contain fungicides, this paint did not, and it had been shown by tensile testing to have a fairly inextensible film at normal temperatures. The lowest paint band was 0.5 m above ground level.

A second comparison was made on a vertical rendered wall, 2.2 m high \times 1.3 m wide, again with many years growth of algae and lichens. This was wire brushed only and then treated with eight biocidal washes leaving untreated strips between each area to avoid a run-down overlapping the treatment below (Figure 3). Two paints, the solvent-thinned masonry paint and an untextured matt exterior emulsion paint (claimed to be resistant to mould and algal growth) were applied in adjacent vertical strips.

Results

The biocidal washes on area 1 were slow to take effect and variable in performance. None proved able, without manual or mechanical treatment, to produce a clean surface of acceptable appearance, when no coating was to follow, or a surface suitable for painting. Detailed results,

of more value as microbiological studies than as practical guidance, will be reported elsewhere.

On the painted areas there was little difference, of practical value, between the biocides. The most striking results were in the comparisons of the manual and water jet cleaning methods and of the paints (figures 1 and 2).

On the wire brushed area, none of the biocides prevented the early re-growth of lichens from disrupting the solvent paint which also flaked progressively. This flaking was especially apparent over aggregates covered by only a thin layer of cement paste which was pulled off by the paint. Only two biocides, a dichlorinated phenol and a quaternary ammonium compound, had any distinguishable effect (of no practical value) after 3 years.

Re-growth was just visible in one emulsion paint after 3 years, together with some surface growth of mould and algae. Again, there was no useful distinction between the biocides. The third paint was almost free from growth. All paints were stained yellow by the chlorinated phenolics at the start, but this gradually became less noticeable. One emulsion paint blistered over a quaternary ammonium compound but also over the control section; flaking of the blisters occurred later.

On the water jet cleaned section, the failure of the solvent paint was similar but delayed, except for a few flakes, to between 1 and 2 years, and was less severe even at 3 years. There were only traces of re-growth in the emulsion paint. The water jet with abrasive produced the best results for the solvent masonry paint, with only slight flaking at 3 years, but no useful improvement in the emulsion paints.

On the vertical wall, the differences between biocides were again far less than between the paints (Figure 4). Only one biocide, a quaternary ammonium compound, was noticeably better than the rest, and not to an acceptable degree commensurate with the extra cost its use would entail. Growth through the solvent paint appeared in a few months and resulted in a patchy grey appearance visible at a considerable distance. The emulsion paint was much less affected but growth became visible after 2 years and unsightly after 3.

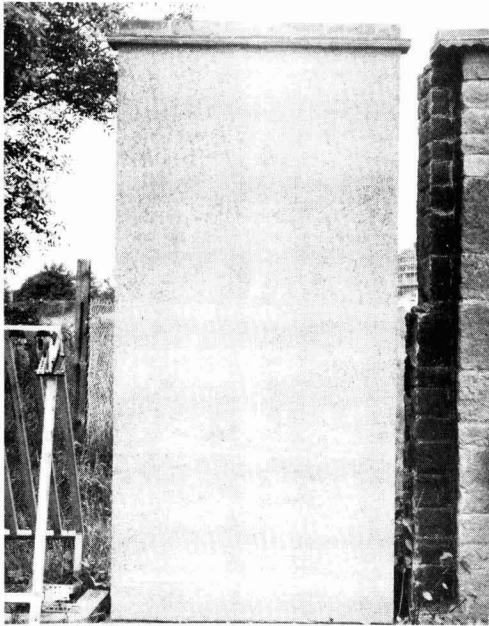


Figure 3. Rendered wall after biocidal treatments

Many other comparisons are in progress on this site, and other areas both of old and new rendering have confirmed the specific behaviour of the unsatisfactory paint. They have also, over many years, illustrated the very large differences in the mode of behaviour of masonry paints and in their resistance to biological growths.

Conclusions

Four important lessons are apparent:

1. Despite all existing recommendations, it seems that biocidal washes cannot be relied on to prevent re-growth of algae and lichens under and on paint films. It is not suggested that their use be abandoned and many will wish to continue to use them as a possible safeguard, particularly where water jet treatment is not possible.
2. The evidence supports the use of thorough cleaning methods, although up to 3 years the benefit was marginal for two typical emulsion paints. On large areas and heavily textured surfaces (e.g. roughcast), there would be benefits in both effectiveness and costs. Water jet cleaning is suggested as the minimum, with abrasives for the best possible results.
3. If the comparison of paints had not been included, the early results would have appeared to support a diagnosis

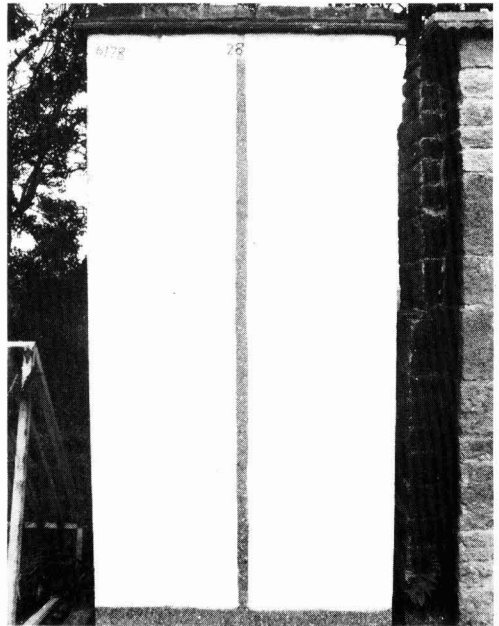


Figure 4. Eight biocidal treatments on an old rendered wall. First and third vertical strips are emulsion paint, second and fourth solvent masonry paint (3 years weathering)

of inadequate cleaning as the cause of failure of the solvent masonry paint, as could have been assumed for failures in use. The choice of paint is clearly critical to the user, yet little or no guidance is available. Recommendations based solely on paint type are inadequate because there are large differences in proprietary brands of each type, as seen elsewhere in BRE trials.

4. Masonry paint formulations need to be resistant to algae and lichens over a long period, and to show tolerance to what may be less stable surfaces than are assumed. This requires – in addition to such factors as alkali resistance, adhesion and correct level of vapour permeability – an extensibility of possibly 10 per cent or more at average temperatures. This should not decrease strongly at lower temperatures and must be maintained by the use of stable polymers and plasticisers for many years.

Acknowledgement

The work described herein has been carried out as part of the research programme of the Building Research Establishment of the Department of the Environment and this paper is published by permission of the Director. The assistance of Mr G. W. Rothwell is gratefully acknowledged.

[Received 14 October 1981]

letters

All correspondence should be addressed to: Mr D. S. Newton, Honorary Editor, OCCA, Priory House, 967 Harrow Road, Wembley, Middlesex, HA0 2SF, England.

JOCCA readers with R & D experience wanted

Sir - I would like to ask any *JOCCA* readers who have experience of R & D work in the colour making and using industries, if they would be willing to assist me in my PhD research by being interviewed or by answering a questionnaire, regarding certain aspects of their work experiences. I am sponsored by the Science and Engineering Research Council with the broad brief: "Investigation of problems associated with the management of scientific and technical projects". This topic lies in the border area between the social sciences (i.e. management studies) and technology (i.e. technical aspects of carrying out industrial research and development).

The particular area that I am interested in concerns how R & D scientists handle the high levels of task uncertainty inherent in their jobs. This topic, which grew indirectly out of my own ten years experience in R & D as a pigment chemist, is particularly relevant at present when the recessionary climate is putting great pressures on R & D departments and their scientists, to produce successful new products that will aid company survival and profitability.

My own experience, a relevant literature search and pilot interviews with a number of R & D scientists, has illustrated several different general strategies by which scientists take a new project specification through to the final (hopefully successful) product. The varying fortunes of companies carrying out R & D, and the similar variations in the salaries and promotion patterns of scientists in those companies, illustrate that some approaches are more successful than others.

In order to confirm my preliminary findings and literature search, I now wish to interview a substantial number of R & D scientists/technologists (or people who have worked in R & D in the past). Alternatively, postal questionnaires can be used if this is more convenient to those willing to contribute. Such interviews or questionnaires will hopefully discover, for example, if there are any general approaches to R & D project work that are reasonably successful, regardless of the particular industry, company or the position on the research to development spectrum of the individual's work. The long term aim of my work is to contribute to making the task of industrial R & D less difficult by learning from the mistakes and successes of others.

The interviews and questionnaires will be entirely confidential and any conclusions, either published or fed back to contributors, will be of a general but hopefully practical nature. The questions or topics of discussion will be based upon a background of technical project work but will be concerned with ways of solving problems etc, and will not, of course, cover any detailed aspects of the work that employers might consider confidential. The perspective being taken is from the point of view of the individual scientist/technologist, although results are also likely to be

useful in the training of new R & D staff within a company.

I am particularly keen to obtain responses from *JOCCA* readers rather than any other group of scientists because they are most likely to have a similar technical background to myself. This will aid communication substantially and produce findings that are at least relevant to our own group of industries. Would anyone willing to contribute to this topic please contact me either by telephone or by letter at the address below.

Yours faithfully,
Anthony Booth

48 Station Road,
Quorn,
Loughborough,
Leicestershire
LE12 8BS
Tel: Quorn (0509) 43048

27 November 1981

Glycerol from sugar

Sir - For the past forty years or so the price of glycerol has depended on the cost of propylene - which was fine until 1973. Since then, all users of glycerol must have been feeling rather nervous, and must have been wishing for an alternative source (other than the limited amount obtained from fat splitting).

During the 1914-18 War the Central Powers, desperately short of glyceride oils, manufactured around 12,000 t/y of glycerol by the Connstein-Lüdecke process, whereby the course of ordinary alcoholic fermentation is diverted to yield glycerol. After the war the process became uneconomic and it has not been operated for over 60 years, although it received a little attention at the end of the 1939-45 War. I recently thought it might be worth looking at the process again in the light of present-day costs and techniques; it proved a fascinating exercise.

No complete description of the process in operation exists, but it has been possible to reconstruct it - with the surprising finding that there are really two separate processes which can be worked together or apart. It would appear quite possible to convert sugar into glycerol with a weight yield of 40-45 per cent in quite simple plant. At the present price of sugar the economics are quite attractive.

Yours faithfully,
M. H. M. Arnold

Arnold Services,
106 Runcorn Road,
Moore,
Warrington
WA4 6UB

18 November 1981

Intercoat adhesion

Sir - I read with interest a recent article in *JOCCA* by Mr R. G. Humphries, volume 64, pages 224 to 230. In this he describes work carried out on the improvement of intercoat adhesion of epoxy formulations by the introduction of Alloprene R10.

Experiments were carried out with coal tar epoxy coatings containing no Alloprene which gave total failures, classification 5, using the BS 3900, Part E6, crosshatch/sellotape test.

Work within the Technical Department of British Steel Corporation (Chemicals) Limited, has shown that the intercoat adhesion between aged and fresh epoxy coatings may be improved by careful selection of various components.

This is illustrated by the following example.

Laboratory coating formulation number 2608A was applied onto a pitch epoxy paint, number 2716A, which had been previously exposed to one year of exterior weathering in an industrial area of Sheffield. Details of the formulations are given below. After allowing one week to fully cure, the intercoat adhesion was measured to the above BS 3900 standard as classification 2, with 5-15 per cent of the cross cut edges giving evidence of flaking.

Formulations 2608A	Parts by weight
Special Pitch Number 5 (British Steel Corporation (Chemicals))	46.5
Epikote 828 (Shell)	29.0
Talc ATI (Norwegian Talc Co.)	23.0
Aerosil 200 (Degussa)	0.4
DZ 093 (CIBA)	1.1
Euredur 43 (Schering)	17.5
2716A	
Grilonit G x 2401.80 (Grilon UK Ltd)	23.8
Special Pitch No. 3 (British Steel Corporation (Chemicals))	35.7
China Clay (ECC)	29.6
DZ 093	1.0
Aerosil 200	1.0
Mixed solvents*	8.9
Grilon Hardener H84007	33.3

*The mixed solvents were of xylene, 60 parts by weight, methyl isobutyl ketone, 25 parts, and oxitol acetate, 15 parts.

The evidence quoted above may be further supported by a number of other examples which show that the

Further information on any of the publications reviewed may be obtained by circling the appropriate *Reader Enquiry Service* number on the form at the back of the *Journal*. Enquiries will be forwarded to the publisher.

Particle size measurement

T. Allen

Chapman & Hall, third edition, 1981

pp. XXII + 678, price £24.50

This is the third edition of a comprehensive text, much rewritten and enlarged. The layout and chapter headings are as in the second edition, with chapters on sampling of powders (with a new section on theory), of dusty gases and of the atmosphere, methods of determining particle size, shape and distribution (a detailed survey, comprising the bulk of the book) and with a new chapter on on-line

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letters

intercoat adhesion of aged and fresh pitch epoxy coatings is superior to the total failure measured using BS 3900 crosshatch test, quoted by Mr Humphries.

Yours faithfully,

D. Bedford

British Steel Co. (Chemicals) Ltd,
Central Research Dept.,
Orgreave,
Sheffield
S13 9NJ

29 October 1981

Intercoat adhesion of coal tar epoxy formulations

Sir - In reply to Mr Bedford's letter (shown above), our project was confined to studying CR/epoxy blends from the point of view of compatibility, intercoat adhesion and durability and did not extend into changes in hardener, solvent blend and pigment volume concentration. It is good for the paintmakers to be able to effect even further improvements in the adhesion of two-pack systems.

Yours faithfully,

R. G. Humphries/A. J. Burgess

Imperial Chemical Industries PLC,
Mond Division,
PO Box No. 13,
The Heath,
Runcorn,
Cheshire
WAF 4QF

24 December 1981

reviews

particle size analysis. It is perhaps not unfair to say that the size ranges dealt with refer mostly to dust and minerals (and mineral slurries) with pigments considered only incidentally - in chapters on gas adsorption and sedimentation analysis for example. However, the book is impressive for the number and systematic treatment of methods and techniques and can be recommended as a reference work.

Reader Enquiry Service No. 21

J. L. Prosser

29

OCCA meetings

For information on membership of OCCA, enquiries should be sent to the Association's offices, see front cover for address.

Scottish

Factors which affect gloss

The first lecture of the new session was delivered by Dr L. A. Simpson of BTP Tioxide Ltd on Thursday 8 October 1981 at the Albany Hotel, Glasgow. Dr Les Simpson is a Newcastle Section member and the Scottish Section are most grateful to him for stepping in at a few weeks notice following a cancellation.

His lecture covered the factors which affect gloss, and Dr Simpson explained that this surface phenomenon is related to:

1. The angle at which the surface under study is illuminated.
2. The refractive index of the reflecting medium.
3. The surface roughness of the reflecting medium.

Incorporating TiO_2 into a paint produces an increase in both refractive index and surface roughness. The effect of increasing refractive index is advantageous from the point of view of gloss, whereas increasing surface roughness produces a decrease in gloss.

Factors relating to TiO_2 that produce an increase in paint film surface roughness were discussed in some detail.

Of the three factors that affect gloss, surface texture is the parameter that can be significantly controlled by the paint and ink manufacturer.

Defects on the surface of a paint film that are of the order of $0.1 \mu m$ in height are responsible for a decrease in gloss, and since this is comparable in size to that of a pigment particle, pigment can play an important role in influencing the gloss of paint and ink systems. The properties associated with pigment that can affect the gloss of the coating are concentration, pigment flocculation and the degree to which the pigment is wetted out and dispersed.

A question period followed and the evening was concluded by a vote of thanks proposed by Hugh Munro.

J. Toovey

Manchester

The potential of sugar as a feedstock

The first meeting of the 1981-82 lecture programme was held on 9 October 1981 at the All Saints Building of the Manchester Polytechnic. A total of 44 Section members and their guests were present to hear Dr K. J. Parker, chief scientist of Tate and Lyle Ltd, deliver his lecture.

Dr Parker's opening remarks were on the main topic of his lecture, sucrose – the reason, he stated, was the role of carbohydrates compared to the availability, at a price, of fossil fuels. These include petroleum, tar sands, shale oil, natural gas, coal and lignite, whose rate of recovery often depends on cost factors.

He then described the role of various carbohydrates, the only renewable energy source via Photosynthesis, by estimating the total available biomass as 120,000,000 tonnes, composed of cellulose, starch and sugar in descending order. Detailed descriptions of the above compounds were as follows:

Cellulose

100 million tonnes p.a. – difficult chemical process
Acid hydrolysis → glucose – very difficult } used in
Enzyme hydrolysis → glucose – very difficult } USSR only

Starch

Source – cereal crops – rice, maize etc.

Amylose: acid or enzymic → glucose – ferment maize – alcohol – gasohol – no tetraethyllead – popular in Brazil due to prevailing financial conditions (high inflation rates).

Sugar (sucrose)

Octahedral alcohol – largest production of an organic chemical in the Third World. There was a conflict between calories versus protein, the former being more readily available than the latter.

Sucrose production figures were quoted as 10m tonnes in 1880 rising to a predicted total of 110m tonnes in 1990.

The various properties of centrifugal grade sugar were quoted as follows:

1. Chemically active
2. Sucro-chemistry developed
3. Present production of 80m tonnes p.a. rising to 90m tonnes
4. Traded/stored/transported worldwide
5. Cost is less than 30 US\$/tonne
6. Renewable source
7. Non-toxic

With regard to toxicity, Dr Parker quoted the Colombian Indians dietary consumption of sugar as being 90 per cent of their total food intake, with no significant cariogenic effects. He also made the point that whilst world prices of sugar are capable of violent fluctuations which affected its viability, sugar cane was the most efficient natural method of converting solar energy into chemical energy. Relative performance figures quoted were as follows:

Sugar	2 on 0-10 scale
Timber	0.1 on 0-10 scale

Comparative world prices in dollars per ton of various products at April 1981 values were given as follows:

Methanol	– 230
Sucrose	– 230
Benzene	– 630
Glycerol	– 1200
Sorbitol	– 1400

In the 30-40 year history of sucrose, ten alternative

degradative production methods have been evaluated, without economical success. Direct high pressure hydrogenation of sucrose to propylene and propylene glycol is possible.

Some products of the fermentation of sugar can be listed as:

Solvents	Polysaccharides	Antibiotics	Gases
Acids	Amino acids	Vitamins	

The feedstock is a 14 per cent juice obtainable from a cane or beet source.

Alternative routes available for the production of ethylene from ethanol depend on choice relative to feedstock background. Hence, a petroleum plant has a 700,000 tonne p.a. break-even point whereas countries such as Pakistan and Brazil can rely on the fermentation process as being more efficient in relation to feedstock supply.

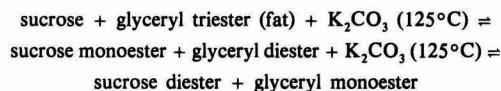
Characteristics of sucrose

1. Polyhydric alcohol – polyfunctional
2. Water soluble – polar – hydrophillic
3. Forms polydentate complexes
4. Readily metabolised – biodegradeable
5. Non-toxic – environmentally acceptable

Development methods possible are:

1. Esterification
2. Etherification
3. Acetals
4. Urethanes
5. Xanthates

The Tate and Lyle sucroglyceride reaction was described as follows:



This is the TAL sucrose surfactant product. The Knowsley site produces sucrose ester/surfactant, xanthan, gum and polysaccharides. Additional products include sucrose glycerides, mixed glycerides, calcium soaps and untreated sucroses. Dr Parker listed the respective end-uses which included washing machine powders, anti-static agents in records, PVC, plasticisers, plastic extrusion lubricants etc. A novel use was a 10 per cent sucrose ester solution as a fruit dip for apples and bananas to enable non-refrigerated transport of the latter from West Indies to UK, and to prevent skin wrinkling in the former by a process of modifying skin respiration.

With regard to sweeteners, Dr Parker gave some very interesting comparisons which can be summarised thus:

Sucrose → relative sweetness of chlorodeoxysucrose = 1

Galactosucrose – not sweet
6-chloro-6-deoxysucrose – bitter
1,4,6-Trichloro-1,4,6-trideoxygalactosucrose (TGS) relative sweetness = 1000

TGS is twice as sweet as saccharine and 650 times as sweet as sucrose, but is non-calorific and non-toxic.

Dr Parker concluded his 80 minute lecture with a 30

occa meetings

minute question period in which subjects discussed included:

1. TAL liaison with PRA
2. Role of L-glucose – non-metabolised sugar – unfortunately capable of inducing osmotic diarrhoea in humans
3. Degradation products of sucrose – trace of acid – hydrolysis – fructose – colour poor
4. TAL product – surfactant
5. TGS – acceptable to diabetics
6. Biocidal properties – none
7. Anticariogenic – interference with *streptococcus* bacteria on teeth resulting in pH increase and ammonia production
8. Feedstocks, beet or cane – temperate or tropical

The vote of thanks, proposed by Norman Piper, was received with a level of enthusiasm relative to the excellent detail contained in Dr Parker's lecture.

F. B. Windsor

Trent Valley

The paint inspector

The second technical meeting of the Trent Valley Branch on 12 November turned out to be somewhat of a surprise to members since Mr G. Dunkerley, a founder member of the Branch in 1963 and past Chairman, kindly deputised at very short notice for Mr John Fowles-Smith, who was taken ill, and talked on the role of the paint inspector, the advertised topic.

Mr Dunkerley is an expert in this field and could easily have extended the meeting into the early hours. However, he confined his topics to encompass the requirements of a paint inspector, the specifications, the pre-treatment, factory coating and transport of steelwork, and methods of testing the coating.

Briefly summarising the above points, it was learnt that a paint inspector must be able to practise what he preaches, have a thorough knowledge of the coatings specified, be able to interpret specifications accurately and know what to be looking for, and be able to submit a full technical report on the contract.

Before the advent of the paint inspector no such records were available and, therefore, either failure or success was difficult to attribute to a particular source.

The specifications are the key to the whole situation and the inspector must follow them very carefully. A technical control specification will define them very carefully. A technical control specification will define the surface preparation, method of coating application, paint composition, film thickness and method of measurement.

occa meetings

The preferred method of pretreatment of metal is wet-blasting followed by dry-blasting. The wet-blast will remove the maximum amount of water soluble iron salts and the limited amount remaining, which may initiate small rust deposits, will largely be removed by dry-blasting, with the appropriate selection of grit sizes.

Blast cleaning creates a sensitive steel surface such that efficient on-site coating can no longer be practised, and fabricated steelwork must be painted before leaving the factory. Much longer life-spans can now be expected from coatings, using epoxy resin based coatings on a blasted surface. This process calls for more careful handling of the structures during loading, transport, unloading and erection, and various methods of overcoming these problems have been employed.

Temperature, humidity and wet film thickness are important criteria in coating to the specification and most paint manufacturers supply the required information on their data sheets.

Relevant questions and discussions took place throughout the talk and a vote of thanks was given by Mr J. C. Ellis, particularly as Mr Dunkerley was willing to deputise at such short notice.

J. C. Ellis

London

The use of computers in the paint industry

The second technical meeting of the 1981-82 session was held on Thursday 22 October 1981 at the Great Eastern Hotel, Liverpool Street, under the chairmanship of Mr B. Gilliam.

Mr D. Lilley, services manager McPherson Industrial Coatings Ltd, presented a paper entitled "Use of computers in the paint industry". Outlining the development

and history, Mr Lilley described the various types of computers and their functions.

Analogue - fast interface, difficult to program

Digital - very flexible and easy to program

Hybrids

Computers turn data into information. It is the use of this information by its "biochemical" counterparts that causes problems. The part played in computer development by Pascal, Leibnitz, Jacquard, Boole, Babbage, Von Neumann, Hollerith and Power, and the concept of Boolean Algebra were discussed.

Mr Lilley then described the computer's development over the last two decades and the milestones that have speeded development. In the 1960s the input was by cards, storage was on tapes, output on tables, and a large number of personnel were required to punch information onto cards which was costly. Two events speeded the input and retrieval of information. The first being the replacement of magnetic tapes by discs. These electromechanical devices but retrieval time from minutes to milliseconds. The second was the cathode ray tube that provided a window into the machine. In the 1970s the central batch system was replaced by on-line systems. The minicomputer speeded process control. Advances in program development and data base terminals have speeded retrieval times.

The large computers used at the moment run fast and hot and may be water cooled, gate speeds of 1 nanosecond being normal. Microcomputers run slow and cool with gate speeds of 25 nanoseconds.

Such is the development rate of computers that in 1940 a computer with the capacity of a human brain would have been 1 mile square. In 1960, the size of St. Pauls Cathedral, 1970, the size of a desk, and in 1980 on the desk.

In the final part of his lecture, Mr Lilley discussed the use of computer systems in laboratories and offices.

Administration and order processes can be computerised. The use of computers for controlling manufacturing processes is already underway. Data retrieval for laboratories still needs development.

Concluding the lecture, Mr Lilley looked to the future and the IBM Cryogenic cooled laser disc system.

A vote of thanks was proposed by Mr G. Hughes and the audience responded in the usual manner.

B. A. Canterford

Further information on any items mentioned below may be obtained by circling the appropriate Reader Enquiry Service number on the form at the back of the *Journal*. Enquiries will be forwarded to the organisation concerned.

of St Louis, Missouri to manufacture under licence and market methylated melamine coating resins.

These resins will be produced by BIP Chemicals Division at its factory in Oldbury, West Midlands.

Resins of this type have found wide acceptance in the industrial coatings field and have been marketed for some years by Monsanto under the Resimene brand name. BIP expects to commence production of these resins in early 1982 and will

market them under its own Beetle trade name.

Reader Enquiry Service No. 31

New tanker service

Solrec Ltd, the recovery and formulation specialist, has introduced a new tanker collection service for their customers.

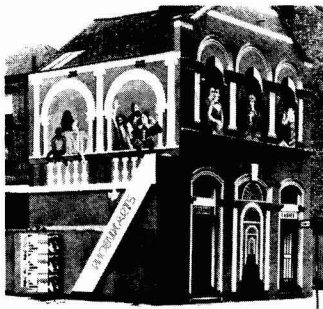
The new tanker will collect contaminated solvents in bulk and transport them to Solrec for solvent recovery.

Reader Enquiry Service No. 32

news

BIP to produce Monsanto resins in UK

British Industrial Plastics Ltd has signed an agreement with Monsanto Company



House of laughter!

Festival colour

Michael S. Abbott, decorative coatings distributor and consultant, describes the building shown in the photograph above as the best decorated "house of laughter" in the Midlands.

This period public lavatory was decorated in various shades of Alphatex IQ matt emulsion, chosen from more than 600 colours in the Sikkens Colour Collection 2021, as part of the Leicester Festival.

Reader Enquiry Service No. 33

On-site nitrogen generation

On-site generation of nitrogen in self-contained compact gas making plant has been traditional in the metallurgical industries and now its use is becoming for more widespread in other process industries.

The cost of on-site nitrogen generation is claimed to be much lower than delivered supplies, since distribution overheads are eliminated and there is no need to use energy to liquefy the nitrogen. An example from Wellman Gas Systems Department of the savings that are possible is as follows: the cost of producing, compressing and storing one hundred cubic metres (HCM) of commercial nitrogen from an on-site plant would be in the order of £2.30. This compares with a liquid supply price, excluding the on-site storage cost, of something in excess of £6.50 per HCM. In addition to the economic advantages there is also the advantage of security of supply.

Reader Enquiry Service No. 34

BP Chemicals to double HEC capacity

BP Chemicals plans to double Cellobond hydroxyethyl cellulose (HEC) capacity at its factory in Antwerp, Belgium. The expansion, which incorporates the latest advances in technology, will raise capacity to 8,000 tonnes a year and will come on-stream in mid-1983.

Cellobond HEC is a versatile, non-ionic, water soluble polymer produced in 19 standard grades covering a wide

viscosity range. Basic raw materials are ethylene oxide and cellulose.

Reader Enquiry Service No. 35

Evode acquires Postans

Evode Holdings plc has acquired Postans Ltd, the Birmingham based manufacturer of powder coatings, industrial paints and pigment dispersions, including Syntho Pulvin electrostatic spray powder protective coating for aluminium architectural components.

Postans' powder coatings activities are said to have been a particularly successful business area in recent years and are believed to offer important growth potential.

The Evode Group, based in Stafford, is well known for its range of Evo-Stik consumer adhesives but has for some years been pursuing a growth and diversification policy. There is within the Evode Group a specialist coatings company, Allweather Evode Paints Ltd, which manufactures and markets high performance chlorinated rubber and epoxy coatings for anticorrosion applications in a wide range of markets.

The manufacturing and marketing activities of Postans and Allweather Evode Paints are regarded as wholly complementary, a factor which attracted the Evode Group to acquire Postans. Combined sales of the two companies will approach £6 million.

Reader Enquiry Service No. 36

Anglo-Dutch award for enterprise

Sikkens UK Ltd is one of four sponsors of a new concept in industrial awards, the Anglo-Dutch Award for Enterprise.

Four silver and gold-plated trophies valued at £3,500 each will be awarded each year to a small and a large business in each country. The organisers, the Netherlands-British Chamber of Commerce, say they will be searching for evidence of initiative and enterprise, for that "something extra" in grasping new opportunities in any area of Anglo-Dutch trade.

The award was launched, symbolically, in the middle of the North Sea on board North Sea Ferries' mv *Norstar* sailing from Hull to Rotterdam. The unveiling ceremony was carried out by the Netherlands Ambassador to the Court of St James, Mr Robert Fack, and the British Ambassador to the Netherlands, Mr Philip Mansfield, CMG.

According to the Chamber's director general, Jim van de Worp, two-way trade between the two countries is now running at the record rate of more than £7 billion a year. Holland is Britain's third largest export market, after West Germany and the USA. For the Dutch, Britain is their fourth largest customer worldwide.

Reader Enquiry Service No. 37

news

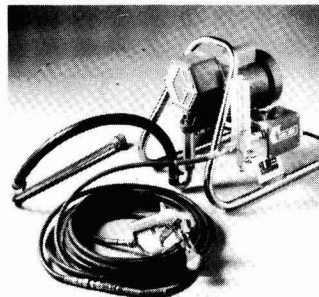
Energy conservation

A scheme jointly sponsored by the departments of Energy and Industry and managed on their behalf by the Energy Technology Support Unit and the National Engineering Laboratory, has been set up to encourage the more efficient use of energy by demonstrating new methods and techniques.

Leaflets relevant to particular industries and areas where energy conservation can be effected are available from the Department of Energy or by completing the reader enquiry service form at the back of the *Journal*.

Reader Enquiry Service No. 38

new products



The EM-380

Small airless unit

Graco's new EM-380 electric airless spray unit is designed specifically to aid the professional painter on the smaller painting jobs.

The new unit's piston pump design provides plenty of power for one man to finish a room, hallway or basement quickly and professionally. It makes short work of blinds, doors, shutters and radiators.

With its delivery of up to 1.25 litres a minute, at pressures up to 172 bar, the EM-380 will continuously spray stains, lacquers, oil paints, latexes, vinyls and acrylics.

The unit is small enough to be picked up easily and transported in the boot or back of a car.

Reader Enquiry Service No. 39

news

New controller for reciprocators

Tycoate International has announced production of a programmable control unit for its range of one dimensional powder coating reciprocators. It ensures the uniform coating of most complex workpieces, eliminates human error and provides a new degree of versatility on the shop floor.

Up to four separate programs can be stored in the controller's memory. Programs are repeatable, easily changed and the user can key-in programs to suit his own production requirements without the need for special programming skills. The reciprocator speed can be optimally varied at different points of the stroke to suit widely differing workpieces and, as a result, a fine degree of coating control is obtained.

Reader Enquiry Service No. 40

Drum cleaning machine range

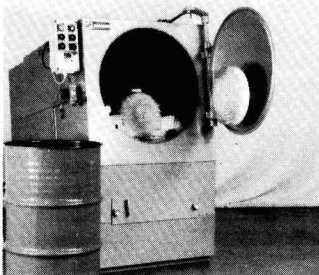
A comprehensive range of machinery for cleaning drums and other vessels has just been introduced onto the UK market.

The escalating costs of metal and plastic containers, coupled with increasing international regulations on safety and environment on the shop floor, are forceful incentives to streamline and improve cleaning procedures.

The Klieverik range of water or solvent aided drum washing equipment fulfils these requirements.

There are four basic machines in production said to cater for virtually all likely user requirements. All systems utilise durable nylon brushes to aid the cleaning process.

Reader Enquiry Service No. 41



The VVO-200, nylon brushes are designed to clean inside and outside drums

New PTFE coating

Loyne (Manchester) Ltd is currently offering what it describes as a new PTFE supercoat system. Although the new system involves an additional coat, it is being offered at no extra cost. The new three coat system is the same price as the original two coat system. This improved PTFE coating treatment is said to extend the working life expectancy of nickel chrome hardbase and soft coatings by up to twelve months.

Reader Enquiry Service No. 42

Automatic density measuring

A new, improved, completely automated helium pycnometer is now available from Coulter Electronics Ltd. This instrument, the Micromeritics AutoPycnometer 1320, can automatically determine the absolute density of a wide variety of solid materials in less than 20 minutes with minimal operator attention.

The 1320 is said to be extremely easy to use, employing microcomputer technology to measure volumes to better than 0.02cm³. The accuracy of the actual density measured depends upon sample density and volume.

To operate, a sample is loaded into the AutoPycnometer's sample chamber, the sample mass in grams is entered into the microcomputer memory, evacuation time is set and the "run" switch is pressed. At the conclusion of the interactive measurement cycle, sample density in g/cm³ is displayed on a digital read-out and retained, while the instrument automatically resets for the next analysis.

Reader Enquiry Service No. 43

Warning labels

Matley-Corran Ltd has started production of warning labels, that comply with the necessary regulations, as stock items for the paint and chemical industries.

For the paint and allied industries, three classes of labels have been designed. For the broader market - including the chemical, oil and paint industries or anyone who packs dangerous substances - composite labels have been designed in four regulation sizes.

Matley-Corran has devised a system whereby individual customer information can be quickly overprinted onto stocks of standard preprinted blanks. This effects a saving for the customer and, it is claimed, ensures swift deliveries.

Reader Enquiry Service No. 44

Mauser drum handling

Norris Systems Ltd has developed a pallet truck specially adapted to handle vertically stored Mauser drums.

Reader Enquiry Service No. 45

Process computer system

The new K90S process computer system

from Kent Process Control is equipped as standard with sufficient applications software to cater for the majority of industrial process control applications. By virtually eliminating the need for highly specialised system software for each application, the company expects that K90S will usually cost about 25 per cent less than an equivalent traditionally engineered process control systems. Commissioning times will be correspondingly lower, and the standardised system will considerably reduce the involvement of customers' engineers in specifying their particular requirements at the outset.

K90S is a centralised system designed for any batch or continuous process in the chemical, petrochemical, pharmaceutical and other industries. It has been developed so that the plant process engineer can call up and modify a supervisory control system without needing software expertise. Using conversational techniques at a terminal, he can call up inputs and outputs, control schemes, sequence programs, calculation programs and operator display.

Each standard K90S system has all the necessary software facilities to enable data acquisition, digital control, sequencing, historic data and event recording, logging and database schemes to be implemented. It also incorporates diagnostic aids and housekeeping facilities.

Full colour mimic displays can be built and modified on-line by the user to show a schematic diagram of the plant with an overlay of data from measured values, loop status, setpoints and digital status.

Other displays which can be used include bargraphs, sequence status and trends.

Reader Enquiry Service No. 46

New Fire escape

A simple, effective and unobtrusive fire escape system has just been developed by Hydrascope Ltd. It is meant principally for premises where existing systems are inadequate or for buildings completely unsuited to conventional fire escapes.

The Hydrascope system comprises a hose which is installed outside the building above a convenient window providing a means of escape to a lower level, and inside the building a wall cabinet containing one, two, three or more sets of safety harnesses and hose constrictor clamps.

In the event of fire the hose drops to ground level and fills with water. An escapee can then slip on a safety harness, complete with constrictor, attached to the hose and make a controlled descent to safety. Control of descent is achieved automatically through the rollers of the constrictor which compress the sealed hose and allow water below the constrictor to pass slowly above it.

Reader Enquiry Service No. 47

literature

Formulating and packing services

Beta Chemicals Ltd, who specialise in mixing and blending compounds and the packing of liquid or dry products, have produced a simple guide to their confidential services.

Beta, an associate of Ellis & Everard chemical distributors, can manufacture according to customers' own formulations or can provide a full formulation service.

Reader Enquiry Service No. 48

Aqueous powder coatings

R. H. Chandler has put together a bibliography of the few articles which have been published – together with in-depth reports on the more extensive patent literature – on "Aqueous powder coatings and powder electropainting".

Reader Enquiry Service No. 49

Resin index

The British Resin Manufacturers' Association has published a new edition of the "Surface coating resin index". Nearly 1500 products are listed, together with detailed specifications. The index also includes a comprehensive list of trade names.

Reader Enquiry Service No. 50

Changes in the chemical industry

The Institution of Chemical Engineers has published a document entitled "Future changes in the chemical industry". The committee responsible for the report had as its terms of reference: "To comment on developments taking place in the world of raw materials and energy situations, and the ways in which the basic organic chemical industry engaged in manufacture in Western Europe might prepare to adapt to such changes from the year 2000".

Reader Enquiry Service No. 51

Company finance

The Industrial and Commercial Finance Corporation and Heinemann have recently combined to publish a new practical guide to financial management entitled "Manging your company's finances".

Reader Enquiry Service No. 52

meetings, etc.

10th SLF congress in Copenhagen

The Federation of Scandinavian Paint and Varnish Technologists will hold its 10th congress in the hotel Scandinavia in Copenhagen from 11-13 October 1982.

15 papers will be presented, 9 in English and 6 in Scandinavian languages

For information on membership of OCCA, enquiries should be sent to the Association's offices, see front cover for address.

OCCA Conference 1983 – call for papers

The Association's Technical Committee has now drawn up preliminary plans for the Association's Biennial Conference which will take place at the Viking Hotel, York, England from 15-18 June 1983.

The theme of the Conference will be:

"The efficient use of surface coatings".

There will be four technical sessions under the headings:

- (i) Formulation including manufacturing etc.
- (ii) The efficient use of coatings application
- (iii) The use of computers in surface coatings
- (iv) Maintenance of quality and prediction of performance

Following the innovation at the 1981 Conference, there will be a discourse session included in the fourth technical session.

Offers of papers with a short summary of 200 words are now invited for consideration. These should be sent to the Director & Secretary of the Association at the address on the contents page.

Jordan Award

The Jordan Award Committee now invites applications for the seventh award of £100. The rules of the Award are:

1. The Award will be made for the best contribution to the science or technology of surface coatings by a member of the Association of any nationality working in either the academic or industrial field who is under the age of 35 at the date of application.

2. The final date for submission of applications will on this occasion be 31 December 1982 and it is hoped to present the award at the Association's Conference in the following year.

3. The selection of the recipient of the Award will be made by the Jordan Award Committee under the chairmanship of the Association's Hon. Research and Development Officer.

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with simultaneous translations into English. A special section will be devoted to printing ink papers.

For further information and application forms please contact: 10th SLF Congress, Gladsaxevej 300, DK-2860 Soborg, Denmark.

Printing ink courses

The London College of Printing at the Elephant and Castle has set up five short courses for the 1982 spring term. The titles of the courses are as follows: "Printing inks – an insight for the non-specialist", "Chemical hazards in the printing industry", "Health and safety practices for users of screen process printing", "Health and safety measures for operatives of small offset litho equipment" and "The management of quality in printing and allied industries".

For further information write to: Dr R. C. Thompson, London College of Printing, Elephant and Castle, London SE1 6SB, Tel: 01-735 8484/9100.

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4. There will be two methods of application. First, by the submission of a paper describing original work by the candidate which is offered for publication in the *Journal* or has been so published during application. The alternative method will be by recommendation by a superior for work which for reasons of commercial secrecy cannot be published; in this case the candidate will be expected to submit a dissertation on a topic relating to his work and demonstrating his superior knowledge of the principles thereof. The Award is for individual merit and clear evidence of the candidate's own contribution will be required if a paper is offered under joint authorship.

5. Applications should be addressed to the Director & Secretary at the Association's offices.

See page 38, "London Section", for details of the Award for the period 1979-80.

OCCA news

News of members

Mr P. Whitley retires from BRE

Peter Whitley has retired from the Building Research Establishment after 24 years service. He started as a Tropical Paint Research Fellow becoming

Principal Scientific Officer and finally Head of the Surface Coatings Section. He spent the first part of his career, nearly 20 years, in R & D in the paint industry.

Mr Whitley has served on the London Section Committee and has lectured at three OCCA Conferences, he has also given numerous lectures to section meetings.

President visits South Africa, USA and Canada

The President, Mr D. J. Morris, accompanied by Mrs Morris, visited the South Africa Division in August 1981 and received a warm welcome from members of the section committees. Four photographs taken in the Cape Section are shown below.

At the end of October 1981, the President attended the Annual Meeting and Paint Show at Detroit of the Federation of Societies for Coatings Technology, when an informal luncheon of the International Co-ordinating Committee was held.

Following the President's visit to the FSCT Convention he visited Canada where he met Mr Peter Birrell (Vice-President) and discussed the affairs of the Ontario Section.



Shown from left to right: Prof A. Toussaint (President of FATIPEC), Mr N. Harkness (OCCA Australia), Mr D. J. Morris (President of OCCA), and Mr L. H. Ellis (President of FSCT)



Members of Cape Section at a social evening to welcome the President and Mrs Morris



Shown from left to right: Mr H. J. Schöne (Hon. Treasurer), Mrs C. J. de Villiers (Hon. Secretary), Mr D. J. Morris (President), Mr W. A. Cherry (Committee Member), Mrs Morris, Mr A. R. Byrns (Committee Member) and Mr D. F. Smith (Chairman)



Mr D. F. Smith (Chairman) (left) presenting a book, a memento of Cape Town, to the President (right) at the social evening



Shown from left to right: Mrs Morris, Mr D. J. Morris (President), Mr D. F. Smith (Chairman) and Mrs Smith

News of members

Mr S. A. Ray retires from Tioxide

Mr S. A. Ray will retire in January 1982 after more than 33 years service with the Tioxide Group. During the formative years of the Midlands Section of OCCA he played an active part in its development, having served successively as Hon. Treasurer, Hon. Secretary and Chairman, during which time he also served on the Council of the Association. A keen supporter of the Birmingham Paint, Varnish and Lacquer Club, he was made an Honorary Member in 1963 and President two years later. In his capacity as a professional chemist, he has served on the Council of the former Royal Institute of Chemistry, and as Hon. Secretary and Chairman of the local section. Currently he is the Regional Representative of the Benevolent Fund of The Royal Society of Chemistry and Chairman of the local section of the Society of Chemical Industry. He hopes to continue his work on the BSI and ISO committees dealing with pigments and with multilingual terminology in relation to the paint and allied industries. As a result of his work in the latter field, he collaborated with Dr H. Clausen in the compilation of the trilingual "Wörterbuch der Lacktechnologie" which was published in 1980. In retirement he plans to undertake technical and general translations from and into French and German and from certain other European languages. After 14 January he can be contacted on 021-777 3000.

Mr J. Bax becomes President of Pacific Scott Bader Inc.

John Bax was named as president of Pacific Scott Bader Inc., the Richmond, California company owned jointly by PVO International Inc. of San Francisco and Scott Bader Co. of Wollaston, England. Mr Bax was previously technical services manager for Pacific Scott Bader Inc., a position he held since being transferred from Scott Bader Co. in 1979.

In announcing this appointment, Ralph



Mr J. Bax

Woolf, chairman of Pacific Scott Bader said: "this appointment emphasises our commitment to the supply of speciality, high technology polymers to the paint, adhesives and paper industries".

Prior to his move to the USA, Mr Bax was with Scott Bader Co. for 17 years in the Technical Development Department.

Mr M. H. Gamon joins Pearson Panke Equipment Ltd

Michael H. Gamon has joined Pearson Panke Equipment Ltd in the Technical Sales Department to handle marketing and sales of the range of Erichsen equipment for paint and lacquer testing.

He joins the new post from Laporte Industries where he has been associated with the paint and plastics industry for over 20 years.



Mr M. H. Gamon

Roon Award goes to non-USA company for first time in 24 years

Dr Leslie Simpson, a member attached to the Newcastle Section and a section manager in the Technical Service Department of BTP Tioxide Ltd, has won the prestigious Roon Award Competition for the paper which he presented at the Annual International Paint Technology Convention in Detroit, USA on behalf of the Association on "Factors affecting metal marking".

The Roon Foundation Awards are made annually for the best technical papers concerned with the organic coatings industry submitted to the Federation of Societies for Coatings Technology. Papers must reflect a real contribution to the advancement of coatings technology and describe original scientific work.

This is the first time in the 24 years the awards have been made that the premier award has been gained by a company from outside the USA.

Dr Simpson's paper concerned the metal marking of paint films and described original work which elucidated the mechanism and described ways of minimising metal marking.



New appointment for Mr J. Ashley

John Ashley, an Ordinary Member of OCCA, Manchester Section, has been appointed sales manager for fatty acids and related products sold by Akzo Chemie UK Ltd. This new appointment will strengthen the sales team and give better service to the wide variety of customers in the surface coatings and other fields.

Mr Ashley graduated in 1954 at London University and then spent some years with the BXL Plastics Group developing thermosetting resins and providing technical service support. He then moved to BOC Chemicals Group Ltd and was responsible for the technical service and sales development of tall oil products and naval stores. In 1974 he joined Victor Wolf Ltd and has spent the last seven years in senior sales positions developing new business and markets for fatty acids and glycerine on a worldwide basis.



Mr J. Ashley

Mr E. B. Cowie, technical manager, Berger Paints SA

Mr E. B. Cowie was recently appointed technical manager of Berger Paints SA Pty Ltd which is based in Durban, South Africa.

Prior to taking up this appointment he was technical manager of Berger Paints Kenya Ltd from 1976-1981 and Berger Paints Tanzania from 1974-1976.

Before joining the Berger Group he was the technical manager of Federated Paints Ltd of Glasgow from 1970-1974.

OCCA news

Eastern Branch

Annual skittles match

The annual skittles match organised by the Eastern Branch was held at the Murrayfield Indoor Sports Centre, Edinburgh, on Friday 16 October 1981. 37 members and friends attended of whom 34 actually played. During the evening a hot snack was provided.

The Newton Cup, awarded to the best team, was won by the Scottish Section with an average score of 121.5 points. The Eastern Branch achieved an average score of 115.4 points. The Cup was received by Mr T. L. M. Humphrey, Scottish Section Chairman, on behalf of the Section.

Individual prize winners were as follows:

<i>Gentlemen</i>		<i>Points</i>
1st	John Toovey	185
2nd	Colin Jenkins	164
3rd	David Owen	155
4th	Gerry Merton	145
Booby	Tom Humphrey	91
<i>Ladies</i>		
1st	Lily Gough	142
2nd	L. Warrison	114
3rd	M. Owen	113
4th	L. Kirkwood	107
Booby	L. Veitch	74

The Chairman and Committee of the

Eastern Branch wish to express their thanks to the following persons and companies who helped by supplying prizes for the event:

Trevor Jackson,	Harbour Chemicals
Bob Morrow and	
John Toovey,	BTP Toixide
John Balding,	Meade, King,
	Robinson
Bob Gardiner,	Alexander G.
	Paterson
Bob Watson,	Ciba-Geigy P & A
	Company.

The continued success of this event from its initial inception as a competition for the student section is a tribute to the hard work of the office bearers and members of the Eastern Branch.

J.H.C.

London Section

Colour and railways

The first meeting of the 1981-82 session was held at the Great Eastern Hotel, Liverpool Street on Thursday 24 September 1981. The subject of the first meeting of a new Chairman's term of office is traditionally his personal choice. Mr B. Gilliam presented a paper entitled "Colour and railways".

Mr Gilliam is also the London and Southern Area Secretary of the Stephenson Locomotive Society and several members of the Society joined us.

Describing himself as a life-long railway enthusiast, Mr Gilliam used a combination of slides and modern colour panels to show locomotive colours before and after nationalisation.

The colours used can be broken down into green, blue, brown, yellow, black and red. The colour panels, prepared with the aid of specifications from the Railway Museum, York, showed how different

paint shops within the same company produced two standard colours. As some of these colours and specifications date back to 1880, there is no one to verify that the colours were as seen.

Mr Gilliam took various companies GWR, LNER and LMR and examined the various pigment types used to produce the colours. After nationalisation the colour schemes became the same but some fascinating slides showed prototype diesel stock in white and grey liveries. The personalised colour schemes of the local depot at Stratford were also shown. Some of these may be adopted nationally.

After an interesting discussion period a vote of thanks was proposed by Dr F. Zobell, head of Coating Research, British Rail, Derby.

Jordan Award

The Jordan Award was instituted in 1967 by Mrs Marjorie Jordan in memory of her late husband Dr L. A. Jordan who was President of the Association, 1947-49, and became an Honorary Member in 1955.

The award is made for the best contribution to the science or technology of surface coatings by a member under the age of 35 of any nationality working in either the academic or industrial field.

The award for the years 1979-80 was presented to Mr M. W. Leonard by Mr B. F. Gilliam, Chairman of London Section, at the Section meeting held on 24 September 1981. The award comprises a certificate and a cheque for £100. The Jordan Award Committee adjudged that Mr Leonard's paper, published in the December 1979 issue of the *Journal*, was the best contribution for the award.

It will be of interest to members to learn that this paper was originally submitted by Mr Leonard for his Licentiateship.

B.A.C.

Report of Council meeting

A meeting of the Council took place at 2.00 p.m. on Wednesday 2 December 1981 at the Great Northern Hotel, King's Cross, London N1 with the President (Mr D. J. Morris) in the chair. There were 23 members present.

Before the commencement of the business of the meeting, those present stood in silent tribute to the memory of Dr S. H. Bell, OBE (President, 1965-67 and an Honorary Member) who had died in August.

It was reported that the following changes in the composition of the Council had taken place since the last meeting:

Mr R. N. Rea had resigned as Chair-

man of the Irish Section on being transferred to Germany and Mr D. Pountain had been elected Chairman in his place.

Mr L. H. Silver had relinquished his appointment as the Representative of the Auckland Section and Mr C. Butler had been appointed to replace him.

Mr G. Willison had relinquished his appointment as the Representative of the Wellington Section and Dr F. M. Smith had been appointed to replace him.

Discussion took place on nominations for vacancies on BSI committees.

Reports were received on the arrange-

ments for the Reunion Dinner to be held later on the same day (and reported elsewhere in this issue) and for the Association's Savoy dinner dance to be held on 28 April 1982 (forms of application are in the Bulletin enclosed in the *Journal*).

The half year accounts and estimates were presented and adopted.

A report was submitted on the number of names of members removed from the register and it was noted that, despite the recession, there had been fewer removals than in 1980 and that applications for new members were being received in encouraging numbers.

The views of the Finance Committee, as endorsed by the President's Advisory Committee, on proposals for the future financial and administrative structure of the overseas divisions and sections were discussed. The future of the overseas divisions and sections in the structure of a proposal to form an OCCA International was outlined, and the intention to arrange a meeting with senior representatives from the two divisions and the Ontario Section at OCCA-34 when the scheme could be discussed with the President, Honorary Secretary and the Director & Secretary was welcomed.

The Honorary Editor reported that the papers from the Bath Conference were being printed in the *Journal* and the value of including discussions on publication was debated, it being felt that in future only written contributions received from those who took part in Conference discussions should be included, with a general paragraph by each lecturer bringing out salient points which arose but which were not covered by the written contributions.

On educational matters, the position regarding future training in the industries was discussed and a report made on the findings of the special Joint Working Group set up by the Technical Education Committee (with the Paintmakers' Association and the Society of British Printing Ink Manufacturers).

The President reported on his visits to the South African Division, the Annual Convention of the Federation of Societies

for Coatings Technology at Detroit and to Canada. At Detroit he had had conversations with Professor M. Toussaint (President of FATIPEC) regarding future FATIPEC Congresses and OCCA Exhibitions and Council felt that these talks should continue.

The Honorary Research and Development Officer reported that the Technical Committee had met in November and agreed upon a title for the 1983 Conference to be held at York on 15-18 June. This would be "The efficient use of surface coatings" and four main sessions (one containing a discourse) would be arranged. Fuller details appear elsewhere in this issue.

The Director & Secretary reported that the meeting of the Professional Grade Committee had authorised that three Associates be transferred to Fellowship, one Licentiate be transferred to Associateship, four new Associates be admitted and three applications for Associateship be deferred for further information.

The venue for the 1985 Conference (to coincide with the 50th anniversary celebrations of the formation of the Scottish Section) was agreed as the Dragonara Hotel, Edinburgh.

Section chairmen reported on the activities in the sections; three seminars had been held (by London, Midlands and Thames Valley sections). The *OCCA Bulletin* in the *Journal* containing section information which replaced individual circulars received favourable comments,



as it was appreciated that by this means all members in the UK and Irish sections had full information of all activities taking place in all the sections.

The Director & Secretary reported that all membership record cards had been re-typed during the summer and copies supplied to section and branch treasurers overseas; the opportunity was also taken of checking records with honorary secretaries overseas.

It was unanimously agreed to confer Honorary Membership upon Mr L. H. Silver (President 1973-75) not only in recognition of his outstanding service to the Association in many capacities, but also to record the unique distinction of his having been elected as President of three other organisations connected with the industry — the Paintmakers Association, the Paint Industries' Club and the Paint Research Association.

There being no other business, the President thanked members for their attendance and declared the meeting closed at 4.30 p.m.

Report of 1981 Council Reunion Dinner

The Reunion Dinner for past and present members of Council was held on Wednesday 2 December 1981 at the Great Northern Hotel, London N1. There were 32 members present, including three past Presidents (Dr H. W. Keenan, Mr A. T. S. Rudram and Dr F. M. Smith), Mr S. R. Finn (Honorary Member) and three past honorary officers. The Dinner followed a Council meeting held earlier in the afternoon, both of which had been postponed from the original date arranged in October owing to a threatened rail strike.

As on a previous occasion, the reception prior to the Dinner was extended in order to allow former members of Council an opportunity to meet the present members.

After the loyal toast, the President (Mr D. J. Morris) gave an address of welcome to the company and briefly reviewed the main Association events which had taken place since the last Reunion, which had been held in conjunction with the 1980 Annual General Meeting and Luncheon Lecture. He was sorry to have to report that since the last Reunion Dr Sydney Bell, OBE (President 1965-67 and an Honorary Member) had died and a

tribute to his work would appear in the December issue of the *Journal*.

He mentioned the visits which both he and his predecessor, Dr F. M. Smith, had paid overseas. Both had visited South Africa and there met OCCA officers and committee members. In addition, Dr Smith had attended the New Zealand Division Convention in 1980 and had contacted the officers of OCCA Australia on the same visit. Mr Morris had recently attended the FSCT Convention in Detroit and had afterwards visited Canada, where he had met Mr Peter Birrell (Vice-President). At Detroit, he had had interesting talks with Professor M. Toussaint (President FATIPEC) regarding the FATIPEC Congress and the OCCA Exhibitions.

He was pleased to report that the Conference held at Bath in June 1981 had been successful, an innovation on that occasion being a discourse session aimed at encouraging as many delegates as possible to take part in the discussion.

The *Journal* continued to play an important part in the Association's activities and finances and had achieved the rare distinction in November 1980 of

winning the prestigious ABC Reed International Award for the best Media Data Form submitted by a society or association.

Membership, which might have been expected to fall sharply in the recession, had not done so and there were encouraging signs in the new membership lists published each month in the *Journal*. Council had continued with the policy of increasing membership subscriptions gently and regularly rather than waiting until a larger increase would become inevitable. However, on the international scene this had meant that the sections and divisions abroad had now asked for permission to settle their own levels of subscriptions, which had led in turn to a new concept of the OCCA International scheme which it was hoped could be worked out more fully in the next year.

The President was pleased to report that, at the Council meeting held earlier in the day, it had been agreed to confer Honorary Membership upon Mr L. H. Silver (President 1973-75) in recognition not only of his work on behalf of the Association but also on achieving the unique distinction of having been elected as President of three other organisations

OCCA news

serving the industries: the Paintmakers' Association, the Paint Industries' Club

and the Paint Research Association. Unfortunately, Mr Silver was unable to be present at the Reunion Dinner and the scroll would be presented to him on another occasion.

In concluding his address, the President reminded the company that it had been the practice to mark the retirement of an Association Honorary Officer with a memento of his choice and it was with great pleasure that he presented Mr C. N. Finlay (Honorary Research & Development Officer 1975-81) with a set of six

hock glasses - one for each year of service!

Following the President's speech, Dr H. W. Keenan, the senior Past President present, replied on behalf of the guests in a charming speech in which he thanked the Association for its hospitality and warmly praised the *Journal*, which he read eagerly each month.

After the Dinner, the assembled company retired to a separate room to meet old and new friends.

Professional Grade

At the meeting of the Professional Grade Committee held on 2 December 1981 the Committee authorised the following:

Transfer from Associate to Fellow

Calder, Robert Malcolm (*Auckland*)
Munro, Hugh Anderson (*Scottish*)
Sharp, Peter Frank (*Auckland*)

Admitted as Associates

Barrie, James (*Midlands - Trent Valley*)
Eylers, Petrus Gerardus (*General Overseas - Zimbabwe*)
Gaynor, Helen MacDonald (*Transvaal*)
Marples, Peter (*Transvaal*)
Vorster, Olof Caruso (*Transvaal*)

Transfer from Licentiate to Associate

Saggar, Anoop Kumar (*General Overseas - Kenya*)

Courses for Licentiate

Several colleges of further education are willing to help Registered Students and Ordinary Members of the Association with courses and the preparation of dissertations in respect of Licentiate in the Technology of Surface Coatings (LTSC). Details of the courses including those within the TEC framework are available from:

Watford College, Hempstead Road, Watford, Herts WD1 3EZ.

new members

Ordinary Members

BLUNSTON, DAVID WILLIAM, 4 Grimshaw Road, Acocks Green, Birmingham B27 7SN (*Midlands*)

CARBERRY, THOMAS, Croda Inks Ltd, 170 Glasgow Road, Edinburgh (*Scottish - Eastern Branch*)

DARBAR, ASWINKUMAR UDESINGH, BSc, Rua Tamandare No. 300, Apt 11-F, Sao Paulo CEP 01525, Brazil (*General Overseas*)

Mr L. Young, Head of Department of Printing and Packaging.

London College of Printing, Elephant and Castle, London SE16.
Mr K. Bradshaw, Science and Printing Department.

Polytechnic of the South Bank, Borough Road, London SE1 0AA. Mr P. Barnes, Department of Chemistry and Polymer Technology.

Manchester Polytechnic, All Saints, Manchester M15 6BR. Mr G. Higginbotham, Department of Polymer Technology.

Manchester Polytechnic, Chester Street, Manchester M1 5GD. Mr R. Stott, Department of Polymer Technology.

College of Arts & Technology, Maple Terrace, Newcastle upon Tyne NE4 7SA. Mr P. Maycock, Head of Department of Science.

East Ham College of Technology, High Road South, London E6 4ER. Mr G. Wood, Department of Sciences.

The Polytechnic, Wolverhampton WV1 1LY. Dr B. W. Rockett.

Matthew Boulton Technical College, Sherlock Street, Birmingham 5. Mr C. J. Thompson.

Coventry Technical College, Butts, Coventry CV1 3GD. Dr M. J. Hall, Head of Department of Science.

Warley College of Technology, Crocketts Lane, Smethwick, Warley B66 3BU. Dr R. A. W. Longden, Head of Department of Chemistry, Computing and Applied Sciences.

Stow College - Glasgow, 43 Shamrock Street, Glasgow G4 9LD. Mr D. C. Dunn, Head of Department of Management Services.

The following elections to membership have been approved by Council. The Section to which each new Member is attached is given in italics.

EDWARDS, DAVID JOHN, Blundell-Permoglaze Ltd, Sculcoates Lane, Kingston on Hull (*Hull*)

GRABHAM, WILLIAM GEORGE, MRSC, CChem, R. A. Watts Ltd, 36/38 Woodcote Road, Wallington, Surrey SM6 0NN (*London*)

HOPGOOD, ARTHUR THOMAS, 17 Shevon Way, Brentwood, Essex CM14 4PJ (*London*)

LANGDON, MICHAEL, BA, PO Box 329, 62 Drakensberg Road, Rondebult 1423, Republic of South Africa (*Transvaal*)

LUDORF, BARRY KELVIN, c/o SA Cyanamid (Pty) Ltd, PO Box 7552, Johannesburg 2000, Republic of South Africa (*Transvaal*)

MASON, TREVOR THOMAS, 2 Nash Road, Langley, Slough, Berkshire SL3 8NQ
(Thames Valley)

MICHAELIS, ERNST EDVARD, MIMechE, 22 Garthland Drive, Arkley, Barnet, Hertfordshire
(London)

MURRAY, KEITH ALLEN, GRSC, 223 Bury Road, Radcliffe, Manchester M26 9XF
(Manchester)

NOGUEIRA, JOSE LUIS PINHEIRO SOUSA, MSc, Corporacao Industrial Do Norte Ltd, Apartado 8, 4471 Maia - Codex, Portugal
(General Overseas)

OBERHOLZER, CHARLES HENRY, Lewis & Everitt (Pty) Ltd, PO Box 9294, Johannesburg 2000, Republic of South Africa
(Transvaal)

OTTO, ROBERT P., BSc, c/o Union Carbide SA (Pty) Ltd, PO Box 8194, Johannesburg 2000, Republic of South Africa
(Transvaal)

PATEL, RATILAL, BSc, Unit 20, Erica Road, Stacey Bushes, Milton Keynes, Buckinghamshire
(London)

STEEN, KARL AKE BERTIL BSc, AB Volvo, Avd 6300 TGS, S-40508 Gothenburg, Sweden
(General Overseas)

WOLF, HANS, Dr, BASF Aktiengesellschaft, D-EDE/A, Ban H201, D6700 Ludwigshafen/RH, West Germany
(General Overseas)

Associate Members

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(General Overseas - Nigerian Branch)

new members

REID, PETER ALLAN, AM Reid Ltd, PO Box 78, Otaki, New Zealand
(Wellington)

Registered Students

CLARK, GARY JOHN, 12 Morrison Court, Henderson Road, Broadfield, Crawley, Sussex
(London)

EVANS, JESS, 39 Birkenshaw Road, Great Barr, Birmingham B44 8UL
(Midlands)

ROBERTSON, STEPHEN KENNETH, 78 Riverside Road, Albany Park, Sidcup, Kent DA14 4PU
(London)

SHAW, BARRY KEVIN, 115 Bournehall Avenue, Bushey, Hertfordshire
(West Riding)

SUTHERLAND, DENNIS DELVIN, 104 Masons Avenue, Wealdstone, Harrow, Middlesex HA3 5AR
(London)

WALKING, MARK WILLIAM, Coates Brothers & Co. Ltd, Cray Avenue, St Mary Cray, Orpington, Kent
(London)

Details are given of Association meetings in the United Kingdom and Ireland up to the end of the third month following publication.

January 1982

January

Midlands - Trent Valley Branch: Joint dinner lecture with Midlands Section. Details to be announced.

Thursday 7 January

Newcastle: "Occupational health & safety - corporate and personal commitment and accountability" by F. Riddell of Crown Decorative Products Ltd, to be held at the Students' Common Room, St Mary's College, Elvet Hill Road, Durham, commencing 6.30 p.m.

Monday 11 January

Hull: Third ordinary meeting. F. J. Morpeth of Foscolour Ltd will be talking on the subject of "The manufacture and uses of pigment chips", to be held at the Duke of Cumberland Hotel, Cottingham, Nr. Hull, commencing 6.45 p.m.

Manchester: Lecture "Radiation curing of polymers" by K. O'Hara or M. Holder, Cray Valley Products Ltd, to be held at the Lord Daresbury, Warrington, commencing 6.30 p.m.

Thursday 14 January

London: "Optimised TGIC levels in polyester powder" by D. Lawlor, Grilon (UK) Ltd, at the Great Eastern Hotel, Liverpool Street, EC2, commencing 6.30 p.m. Refreshments will be available from 6.00 p.m.

Friday 15 January

Scottish: Annual Dinner Dance, to be held at the St. Andrew Suite, Albany Hotel, Glasgow, commencing 6.45 p.m.

Tuesday 19 January

Bristol: "Colour instrumentation" by D. A. Plant, supported by BOC (Software Science) Ltd, to be held at the George and Dragon, High Street, Winterbourne, Nr. Bristol, North Avon, commencing 7.15 p.m.

Wednesday 20 January

Manchester: Student lecture "Cellulose esters for liquid inks" by K. Walker, Eastman Chemicals Ltd, to be held at the Manchester Polytechnic, New Administration Building, All Saints, commencing 4.30 p.m.

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Thursday 21 January

Midlands: M. Levete, Paintmakers Association. Details to be announced.

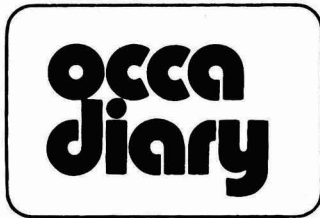
Irish: Technical and commercial business forum to be held at the Clarence Hotel, Wellington Quay, Dublin 2, commencing 8.00 p.m.

Thames Valley: "Electron beam curing in the 80s" by P. Cahill of Otto Durr Ltd to be held at Beaconsfield Crest Motel (White Hart), Aylesbury End, Beaconsfield, Bucks, commencing 6.30 p.m. for 7 p.m.

February

Monday 1 February

Hull Section: Fourth ordinary meeting. P. W. Munn, an independent speaker, will be discussing "Paints for concrete". To be held at the Duke of Cumberland Hotel, Cottingham, Nr. Hull, commencing 6.45 p.m.



Tuesday 2 February

West Riding Section: "The financing, organisation and work of the Paint Research Association" by G. de W. Anderson, managing director of the PRA. To be held at the Mansion Hotel, Roundhay Park, Leeds 8, commencing 7.30 p.m.

Thursday 4 February

Newcastle Section: "OCCA past, present and future" by R. H. Hamblin, Director & Secretary of the association. To be held at the Students' Common Room, St. Mary's College, Elvet Hill Road, Durham, commencing 6.30 p.m.

Thursday 11 February

Midlands Section - Trent Valley Branch: "Primers for difficult surfaces" by J. R. Bourne of Mebon Paints Ltd. To be held at the Sutton Centre, High Pavement, Sutton-in-Ashfield, Nottinghamshire, commencing 7.15 p.m.

Scottish Section: "Haloflex for water based paints". A speaker from ICI Ltd. To be held at the Albany Hotel, Glasgow, commencing 6 p.m.

Friday 12 February

Manchester Section: Lecture "Polymers without carbon" by B. R. Currell of Thames Polytechnic. To be held at ICI Ltd, Piccadilly Plaza, commencing 6.30 p.m.

Scottish Section - Eastern Branch: "Burns supper", to be held as usual in the Commodore Hotel, Marine Drive, Edinburgh, commencing 7.30 p.m.

Thames Valley Section: Annual dinner dance to be held at Great Fosters, Egham, Surrey.

Wednesday 17 February

Scottish Section - Eastern Branch: Joint Scottish Section/Eastern Branch meeting in the Maybury Roadhouse, Edinburgh, "Mossmorran in relation to the North Sea" by J.R. Alywin of Esso Chemical Ltd, commencing 7.30 p.m.

Manchester Section: Student lecture, "Carbon black for paint and printing

ink systems" by P. Gallagher, Cabot Carbon Ltd. To be held at Manchester Polytechnic, New Administration Buildings, All Saints, commencing 4.30 p.m.

Thursday 18 February

London Section: "Developments in artists' colours" by P. Staples, technical director of Winsor and Newton Ltd. To be held at the Great Eastern Hotel, Liverpool Street, EC2, commencing 6.30 p.m., refreshments available from 6.00 p.m.

Midlands Section: "Water thinnable epoxies" by A. Schnelle, Emser Werke AG. To be held at the Calthorpe Suite, County Cricket Ground, Edgbaston, Birmingham, commencing 6.30 p.m.

Thames Valley Section: Details to be announced.

Friday 19 February

Newcastle Section: Ladies' night at the Five Bridges Hotel, Gateshead. Details to be announced.

Friday 26 February

Bristol Section: "Pigments paint and protection" by D. Bishop, British Rail. To be held at the Post House, Cardiff.

Irish Section: Ladies' evening, to be held at the Clarence Hotel, Wellington Quay, Dublin 2, commencing 8.00 p.m.

March

Manchester Section: Informal buffet dance. Details to be announced.

Monday 1 March

Hull Section: Ladies' evening, a local speaker will discuss "Stained glass". Venue to be decided.

Tuesday 2 March

West Riding Section: "Paint containers present and future" by W. J. Walton, marketing executive of Metal Box Ltd. To be held at the Mansion Hotel, Roundhay Park, Leeds 8, commencing 7.30 p.m.

Thursday 4 March

Newcastle Section: "Decorative paints - market pressures on the formulator" by R. D. Mearns, Goodlass Wall & Co. Ltd. To be held at the Students' Common Room, St Mary's College, Elvet Hill Road, Durham, commencing 6.30 p.m.

Scottish Section - Eastern Branch: Joint Eastern Branch/Institute of Printing meeting in the Albany Rooms, Queen Street, Edinburgh. "Developments in printing inks" by Jeff

Hutchinson, Croda Inks, commencing 7.30 p.m.

Monday 8 March

Manchester Section: Lecture "New two-pack systems without isocyanate" by Dr Mondt, Hoechst. To be held in the New Administration Building, Manchester Polytechnic, All Saints, Manchester, commencing 6.30 p.m.

Thursday 11 March

Midlands Section - Trent Valley Branch: "Radiation cured coatings" by a speaker from Cray Valley Products Ltd. To be held at the Sutton Centre, High Pavement, Sutton-in-Ashfield, Nottinghamshire, commencing 7.15 p.m.

Scottish Section: Lecturer from Barr & Stroud, Glasgow, subject to be confirmed. To be held at the Albany Hotel, Glasgow, commencing 6 p.m.

Saturday 13 March

London Section: Spring buffet/disco. To be held at the Treetops Hotel, 25 Station Road, Epping, commencing 8.00 p.m.

Wednesday 17 March

London Section: "The human factor in management", one day symposium at Thames Polytechnic, Woolwich SE18, registration 9.30-10.00 a.m.

Scottish Section - Eastern Branch: "Alternative means of controlling paint viscosity/temperature phenomena" by N. Reeves, NL Chemicals, Livingston. To be held in the Murrayfield Hotel, Edinburgh, commencing 7.30 p.m.

Thursday 18 March

Midlands Section: Visit to Birmingham College of Food and Domestic Arts. Details to be announced.

Thames Valley Section: "Safety forum", three speakers and a question and answer session. To be held at the Beaconsfield Crest Motel (White Hart), Aylesbury End, Beaconsfield, Buckinghamshire, commencing 6.30 p.m. for 7 p.m.

Friday 19 March

Bristol Section: "Ultraviolet and electron beam - energy efficient methods of curing" by M. V. Holder, Cray Valley Products Ltd. To be held at the George and Dragon, High Street, Winterbourne, Nr. Bristol, North Avon, commencing 7.15 p.m.

Friday 26 March

Bristol Section: Ladies' night. To be held at the Unicorn Hotel, Bristol. Details to be announced.

Irish Section: "Powder coatings". Details to be announced.

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OIL & COLOUR CHEMISTS'



ASSOCIATION

Marine Finishes

Reprints are now available of the OCCA Monograph number 1 on Marine Finishes by Dr T. A. Banfield from the Association's offices. These bound copies reprinted from the February and March issues of the *Journal* cost £2 including post and packaging.

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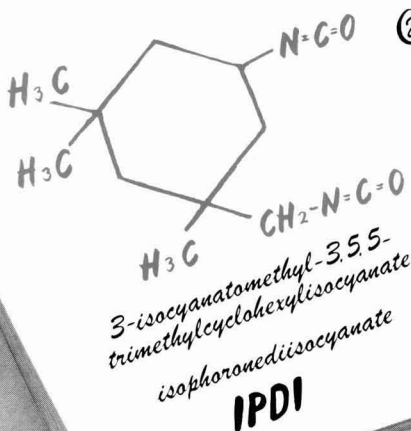
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③ IPDI-B 1065 IPDI-B 989 IPDI-B 1530 IPDI-BF 1540	Hydroxylated polyester Polyester 3353 Polyester 3356	Powder coatings Powder coatings Blocking-agent-free powder coatings	Coatings with good weather resistance, good flow and high gloss
④ IPDI-B 1370	Oxyester Z 1439 Hydroxylated polyesters, acrylates and alkyd resins	Stoving enamels	Low splitting temperature, one-component paints known for their good PU properties
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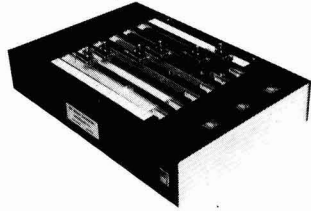


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