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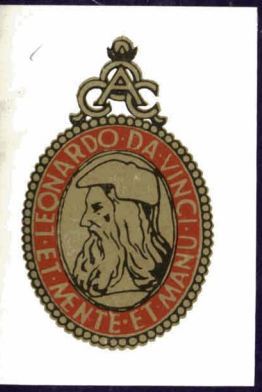

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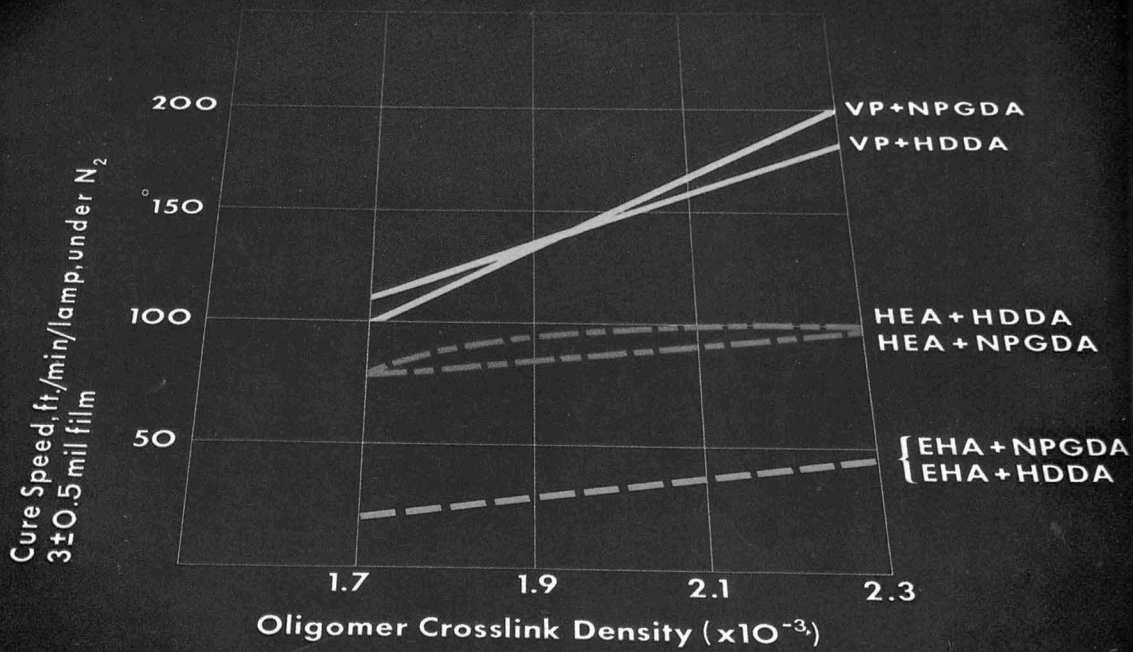

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SHEEN NEWS
No. 1

The New Look at Sheen

Alan Routs, Managing Director, reports

There have been so many new developments within our group recently that we thought this newsletter would interest our friends in the industry and bring you all up to date with our activities.

The expansion of our product range has firmly placed us in areas of higher technology as well as introducing us to paint users and inspectors with our range of film thickness measuring equipment.

As a group we have also expanded with the acquisition of Voss Instruments—well known for laboratory stirrers, mixers and shakers—and Startronic. With their expertise in electronic design and manufacture of specialised instrumentation, Startronic are now our research and development centre.

Alan Routs

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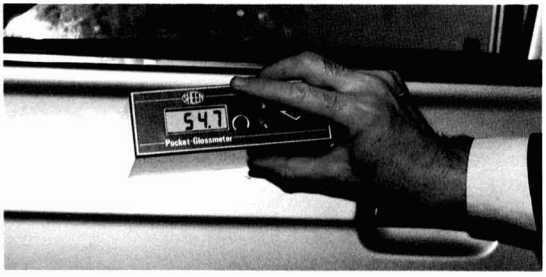
Easy to use, the instrument operates at any of six selected gradient temperature bands spanning air drying and stoving emulsions. Temperature is displayed to a resolution of 0.1°C with a ten way selector switch to monitor temperature in ten steps across the platten.

Circle No. 1

. . . and now the Pocket Gloss Meter

An important new addition to the Sheen range of gloss meters is the 100 Pocket Glossmeter, which measures only 150 × 100 × 50mm (shown below). Although small it is a precise instrument for the measurement of specular gloss of paints, plastics and similar materials in conformity with ISO 2813, BS 3900.D5, ASTM D523, DIN 67530. The Pocket Glossmeter is available with either 60° or 20° angles. Features include: auto control of lamp brightness to compensate for ageing lamps; robust construction and design give long term reliability; digital display reading to 0.1 gloss units; auto hold facility to minimise battery usage.

Circle No. 2



150 PORTABLE GLOSSMETER

These high performance portable glossmeters provide versatility and accuracy for use on the production line, as well as in the laboratory or on outside locations.
The solid state digital read-out meter is separate from the sensing heads which are interchangeable and available in the following optical geometries:
60° for general purposes; 20° for high gloss finishes; 85° for low gloss/matt finishes. Other geometries (45°/75°) also available for specialist applications.
This glossmeter also conforms to all international standards.

Circle No. 3

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. . . THINK OF SHEEN

Microprocessor Controlled Spraying Of Test Panels

One of our more recent developments is an automatic paint sprayer for test panels which is controlled by a microprocessor to give a high standard of repeatability. It is designed to spray test panels or groups of test panels up to 600mm × 600mm. It also has potential use as a production sprayer where the requirements are comparatively simple but highly repetitive.

For safety reasons the traversing mechanism is pneumatically controlled. The electronic control unit is a new form of the well proven Startronic PLLC, programmable linear and logic controller and can be located in a safe area well away from hazardous spraying areas.

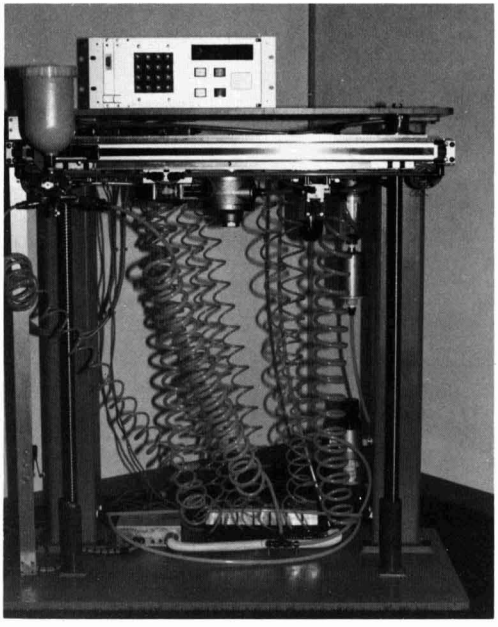
Many programmes are available within the computer memory, but only four are normally chosen for access by the operator, the other programmes being available by key access (holders of the key to the access switch). The PLLC features the use of EEPROM memory which can be completely reprogrammed on site if ever non-standard programmes are needed.

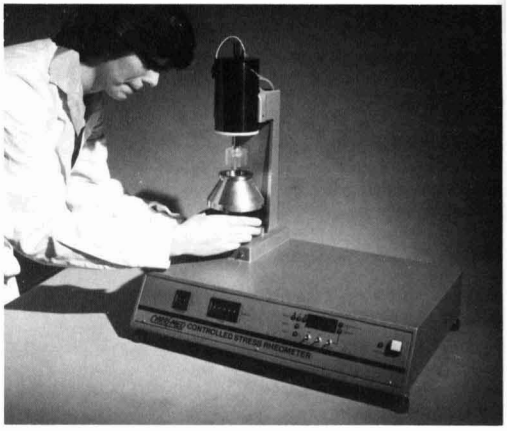
Standard programmes allow for variations in speed, lap distance, number of laps, number of successive coats, dwell time and spray cycle. Width can be chosen to suit the operation.

The unit is suitable for pressure or gravity feed automatic spray guns of many types; these are fitted with quick release connectors to permit a complete gun change to take place in minutes. Gun angle can be altered to suit the user.

Design has kept down the size and weight whilst retaining a robust construction. The complete unit weighs approximately 150 Kg but overall size excluding the projection of the gun is 900mm high × 850 wide × 400 deep, making it easy to transport and capable of going through a standard doorway.

Circle No. 4





Carri-Med CONTROLLED STRESS RHEOMETER

These new Carri-Med controlled stress (C.S.) rheometers are used to study deformation and flow properties of thixotropic and other liquids, semi-solids, emulsions, suspensions and polymeric systems. They greatly simplify the determination of yield value, plasticity, visco-elastic properties as well as conventional viscosity, both in research and in production.

The high precision C.S. rheometers also enable direct measurement to be obtained of the stress required to deform a system up to the yield point. Subsequent flow properties can then be measured with greater precision, e.g. with thixotropic paints.

Key features of the Carri-Med C.S. rheometers are sensitivity, robustness and ease of use. The ease of use results from the upper component of the measuring component of the measuring geometry being supported on an electronically stabilised air bearing which is virtually frictionless.

Circle No. 5

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Sheen's Celstar range of digital thermometers have an accuracy of 0.07°C and a resolution of 0.1°C. They provide fast, accurate temperature measurements or the difference between two temperatures.
Ideal for painting system inspection and control, they are used to determine dew point and steel temperature. Three main temperature ranges are offered: 0-100°C, −30+50°C, and −5+45°C.

Other features include:

*Differential or single input.

*Hold facility simplifies readings in difficult locations or stores a reading for later comparison.

*Range of static or mobile standard probes, with special probes available.

*Excellent long-term stability

Circle No. 6

SHEEN MOVES INTO CORROSION CONTROL

Dry film thickness

Of the many methods available for the measurement of coating thickness the two which best commend themselves for this application are the magnetic pull-off gauge (Positest) and the low frequency eddy current instrument, usually defined as the electromagnetic induction instrument (Sheen SS-1200).

High frequency eddy current instruments find favour for other applications in coating thickness measurement but the overwhelming advantages of the electro-magnetic induction type is that the nature of the substrate steel is comparatively unimportant and the coating formulation if not in itself magnetic plays no part in the measurement: only the thickness is indicated, as in the Sheen 'banana' gauge, bottom right.

The merits of the magnetic pull-off gauge are cheapness, modest accuracy, no power of any kind required—so may be used in a hazardous area, fully portable.

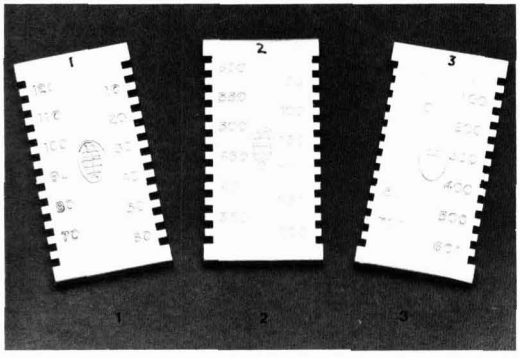
Wet film thickness

To measure the wet film thickness of an anti-corrosion coating, Sheen offer two methods of measurement. The first is the wet film comb, which is simple to use, reading in steps of 25 microns. It has a long base line which helps to overcome inaccuracies in use.

The wet film wheel is marked typically 0-200 micron but a range of scales are available. The instrument is placed on the wet film so that it makes good contact with the substrate with the high value area to the surface. The wheel is then rotated 180° in either direction and the point at which the wet paint touches the centre rail is noted.

The wet film wheel is of greatest importance when large areas must be coated to a precise value.

Circle No. 7



Sheen wet film combs

The ABC of corrosion control

THE SS1200 DIGITAL COATING THICKNESS GAUGE
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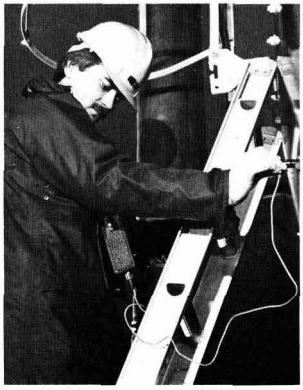

LOOK! No third hand needed with the SS1200!

Circle No. 8

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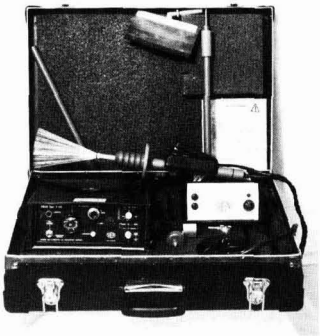
***Circular brushes for internal pipe testing**

***Needle probes for testing awkward recesses**



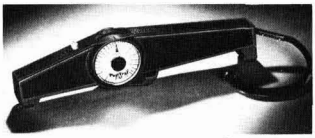
Circle No. 9

THE POSITEST 'BANANA' GAUGE

For measuring film thickness of paints, plastics, galvanising, *non-ferrous plated deposits*

***Cobalt rare earth permanent magnet, so no power is required**

***Weighs less than 200 gms—the lightest on the market**



Circle No. 10

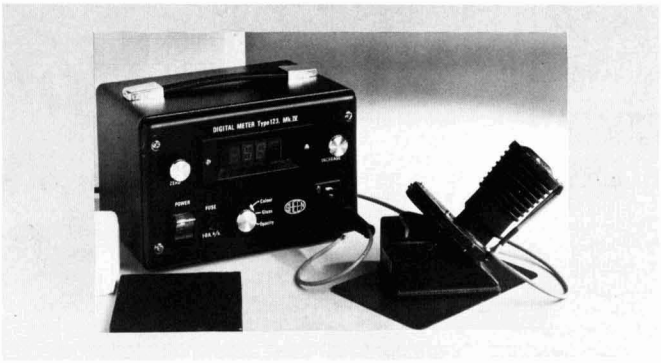
World's cheapest colorimeter for non-continuous use

For those companies who require a colorimeter for non-continuous use in process control, Sheen offer a miniature model for less than £1,000. This compares with a minimum of £3,000—and frequently much higher—for most other colorimeters currently available.

Originally designed for the colorimetric examination of paint and related surfaces, the Sheen colorimeter is used in other process industries where colour is a factor.

The search unit consists of a robust lightweight casting with a flat base (63mm × 90mm) having an aperture of 35mm × 35mm. This aperture is illuminated from the lamp housing at an angle of 45° with a gas filled tungsten filament lamp operating at approximately 2400K. Readings are displayed on our Ref. 123 Digital meter which can also be used for opacity readings (using opacity reflectometer, ref 305).

Circle No. 11



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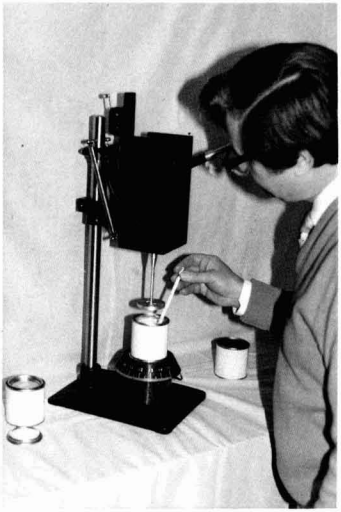
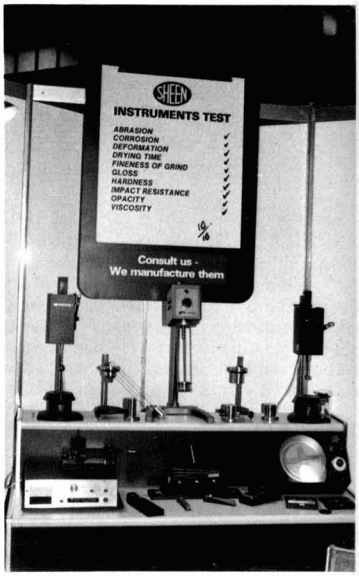


SHEEN ALSO PRODUCE . . .



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Contents **Vol. 66 No. 6** **June 1983**

Transactions and Communications

OIL AND COLOUR CHEMISTS' ASSOCIATION
Priory House, 967 Harrow Road, Wembley, Middlesex, HA0 2SF England

Alternative driers to cobalt and lead

G. de W. Anderson and N. A. R. Falla

Paint Research Association, Waldegrave Road, Teddington, Middlesex TW11 8LD, United Kingdom

Summary

This paper describes an investigation into possible alternatives to the conventional cobalt/lead drier systems used in oil-based paints.

Background

In December 1978 the Paint Research Association was invited by the Paintmakers Association to identify possible alternative paint driers to those based on cobalt and lead. At that time cobalt supplies were seriously threatened by disorders in Central Africa and the use of lead was under attack by environmentalists especially in the United States.

A first phase programme consisting of a literature and information survey, followed by a short screening programme on candidate materials resulting from the survey, was agreed in July 1979. This was followed in March 1980 by a second phase programme which involved a more detailed study of promising materials from phase 1.

Experimental work

A survey of the literature over the last 40 years yielded a number of possible leads.

An investigation by Stewart[1] showed that when single metal soaps were used as catalysts for air drying alkyd enamels, cobalt was the most effective of the 35 metals tested. Managanese and vanadium showed some activity but this was markedly less than that of cobalt.

Zettlemoyer and Myers[2] have shown that di-functional heterocyclic amines can accelerate the catalytic power of manganese up to a point where it is more effective than cobalt.

McAuliffe[3] has reported the synthesis of a group of manganese complexes which can duplicate the mechanism whereby haemoglobin transports oxygen around the body.

In a review of oxidative coupling[4], Lewis has drawn attention to the work of Resnik *et al.*[5] on the use of copper salts as oxidation promoters as well as the use by Henbest and Stratford[6] of an activated form of manganese dioxide. Lewis also quotes a number of publications which describe the successful use of enzymatically induced coupling reactions.

This literature search was supplemented by contacting 100 firms manufacturing driers in Europe, United States and Japan. This survey revealed that few drier manufacturers were trying to develop alternative driers. Very little advice was offered in the way of total cobalt replacement, the most common suggestions being manganese and vanadium. It was suggested that partial replacement of cobalt could be achieved by the addition of calcium, zirconium, vanadium and manganese as well as certain organic compounds. A number of suppliers, particularly those from the United States, believed that there was no problem in replacing lead by zirconium in any cobalt-lead-calcium drier system.

One result of this survey was that a number of commercial cobalt- and lead-free drier systems were submitted for evaluation.

After considering the results of the literature and information surveys, it was decided to carry out a short screening programme on four classes of material, i.e. manganese-amine complexes, oxygen carriers, oxidative coupling reagents, and cobalt- and lead-free commercial drier systems.

The testing work was carried out using Synolac 29W[7], a long oil soya alkyd. This was used as a clear medium and also as a 20 per cent PVC gloss paint. The materials under test were incorporated into the paint or varnish, which were then applied so as to give a dry film thickness of 25 microns. The applied films were allowed to dry at 25°C and 60 per cent relative humidity on a Beck Koller drying recorder. Films were also tested after six hours to the British Standard Method BS 3900 Part C2: 1971: Surface-drying test (Ballotini Method). The control for these tests was a mixture of conventional cobalt and lead driers added to the paint or varnish to give a concentration of 0.05 per cent cobalt and 0.5 per cent lead. These figures express the weight of the element as a percentage of the weight of the resin non-volatiles.

Materials which gave drying times comparable with or better than the control were tested to British Standard Method BS 3900 Part C3: 1971: Hard-drying time (Mechanical Thumb). This test was carried out 24 hours after the films were applied.

Materials which passed both drying tests were re-tested after drying at 5°C.

When this testing programme was carried out, it was apparent that although only two of the 42 amines tested proved to be manganese drier accelerators of any practical significance, the materials in question, 2,2′-dipyridyl and 1,10-phenanthroline, both gave very encouraging results. When used with manganese at the 0.05 per cent level, both amines accelerated the 25°C and 5°C drying times to such a degree that they were comparable with the cobalt/lead control.

Seven manganese complexes[3] were supplied by Dr McAuliffe and at 25°C none of these proved to be comparable in drying power to the cobalt/lead control. However, at 5°C they dried as well and in some cases slightly better than the control.

The oxidative coupling reagents evaluated included active hydrated manganese dioxide, chelated copper naphthenate, sodium iodate, ferric chloride, N-bromosuccinimide, benzoyl peroxide, tetrachloro-*o*-benzoquinone and miscellaneous enzymes. Of these only one system showed drier activity. This was copper naphthenate complexed with 2,9-dimethyl-1,10-phenanthroline. Both materials were inactive when used separately, but together at 25°C they were comparable in drying power to the cobalt/lead control. However, at 5°C the drying performance was inferior to that of the control.

Five cobalt- and lead-free commercial drier systems were tested but only one of these, a vanadium-based drier, gave a performance comparable with the cobalt/lead control. Unfortunately this drier produced unacceptable discoloration of the white test paint.

The most promising compounds identified by the phase 1 screening programme were judged to be complexes of manganese with 2,2′-dipyridyl and 1,10-phenanthroline, the novel manganese complexes supplied by Dr McAuliffe, and copper naphthenate complexed with 2,9-dimethyl-1,10-phenanthroline.

These materials were subjected to further evaluation using a specially prepared gloss paint and undercoat, both of which were based on the long oil soya/pentaerythritol alkyd, Synolac 60W. The tests were carried out on films prepared and stoved as for phase 1. The testing programme involved:

A manual touch dry test at half hour intervals.

A hard dry test to BS 3900: Part C3, 1971 (mechanical thumb).

A recoatability test carried out 24 hours after spreading. This involved 20 seconds vigorous rubbing with a white spirit soaked tissue.

A colorimetric determination of whiteness (expressed according to the whiteness scale in ASTM E313-73).

Three commercial gloss paints and the test gloss paint with conventional cobalt/lead driers were used as controls.

Materials performing well were re-tested in paints containing methyl ethyl ketoxime antiskinning agent.

The addition of 2,2′-dipyridyl or 1,10-phenanthroline to paints containing manganese driers (in a 1:2 to 1:4 molar ratio of manganese/amine) was found to accelerate drying to a level comparable with the effect of cobalt/lead driers. At a manganese level of 0.05 per cent the manganese amine driers caused some discoloration, but at 0.02 per cent manganese the effect was negligible. Optimum concentrations were found to be 0.02 per cent manganese with a 1:3 molar ratio of 2,2′-dipyridyl or a 1:4 molar ratio of 1,10-phenanthroline. These concentrations in the test paints gave short touch dry times, good hard drying, recoatability after 24 hours (even at low temperatures) and acceptable colour.

The cost of the optimum manganese/2,2′-dipyridyl system was calculated to be only marginally higher than that of the conventional 0.05 per cent cobalt/0.5 per cent lead drier combination. Costs calculated from quotations for manganese/1,10-phenanthroline systems were about four times higher.

Final evaluation of the manganese complexes supplied by Dr McAuliffe proved disappointing. Only three of the seven compounds showed acceptable drier properties at 25°C, and all failed to give satisfactory drying at 5°C.

The copper naphthenate/2,9-dimethyl-1,10-phenanthroline system only gave acceptable drying properties at concentrations which produced unacceptable discoloration of the paint films. This problem was also noted when copper naphthenate was complexed with 2,2′-dipyridyl, 1,10-phenanthroline and triethylene diamine.

In view of these results it was decided to limit further work to systems containing 0.02 per cent manganese with a 1:3 ratio (atoms/molecules) of 2,2′-dipyridyl.

The final tests were carried out using six commercial brand leader gloss paints supplied without driers by the manufacturers, together with the corresponding "finished" paints containing driers and antiskinning agents. No attempt was made to optimise drier concentrations in these six paints, but at the standard concentration the manganese/2,2′-dipyridyl gave faster drying than the manufacturers normal combination in one case and equalled it in two others. Only for a white lead gloss paint was drying unsatisfactory with the novel combination. Film colour of the six paints was found to be at least equal to that produced by the paints as normally sold.

Conclusion

It is considered that this investigation indicates that a combination of manganese driers with 2,2′-dipyridyl could be an effective and economically acceptable alternative to the usual cobalt/lead driers in air drying alkyd paints.

In order to further assess the scope and any limitations of the new drier, and, if justified, to encourage its commercial exploitation, it is hoped to carry out a comprehensive evaluation in a full range of commercial paints supplied by members of the Paint Research Association.

The authors are indebted to the Paintmakers Association of Great Britain for permission to publish, and to Mrs N. Usman and Ms B. L. Rouse for conducting the experimental work.

[Received 5 March 1983

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Fractional precipitation of lac. Part 3: heat and water resistances

A. Kumar

Indian Lac Research Institute, Namkum, Ranchi, 834010, Bihar, India

Summary

In this paper, the heat and water resistances of the fractions of lac are discussed. Remarkably it was found that the fractions possess excellent water resistance, and there is also an improvement in their thermo-hardening compared with seed lac.

Introduction

The thermo-hardening property of lac has many practical applications, but no satisfactory results have been obtained in the case of heat-resistant mouldings[1]. Also, the indiscriminate addition of plasticizer to lac has failed to bring about any improvement in water resistance[2]. Since the present work on fractionation was aimed at curing such defects, it was thought necessary to examine the heat and water resistances of the fractions.

Experimental

As described earlier[3,4], fractions of lac were prepared in bulk by the successive addition of a non-solvent. The experimental data are shown in Table 1.

Determination of fluidity

Fluidity was determined by the Victor method[5]. The apparatus consisted of a metal cylinder (having steam inlet at the bottom and a small steam outlet at the top) with provisions for holding the cylinder vertical or turning it to an angle of 110°. During the test, a gentle current of steam was circulated through the apparatus until it attained a temperature of 100°C. Two grams of each sample, ground to 30 mesh size, were placed in pyrex test tubes (8″ × 1″), which were then tightly corked. After clamping down the test tubes in the orifices, the cylinder was kept in the vertical position for three minutes and then turned into the sloping position and held there for 12 minutes. Afterwards, the tubes were withdrawn and in each case the length of flow was measured in millimetres from the bottom level of the molten lac to its furthest position. The fluidity data are shown in Table 1.

Determination of water resistance

Twenty-five per cent solutions of the fractionated samples were prepared in methylated spirit (b.p.76°C) and thin films were spread on glass slides in the usual manner. The films were dried for one week and then subjected to the water immersion test. The results are recorded in Table 1.

Results and discussion

From Table 1 it is evident that the yields were in good agreement with the reported values.

The linear plot of V/W_x against V is shown in Figure 1.

Distribution of fluidity

As with other physical parameters, the fluidity indices showed alternation. Hence the experimental data were analysed for accuracy.

The cumulative polygon for fluidity is shown in Figure 2 and the plot of weight average fluidity (Table 2) against

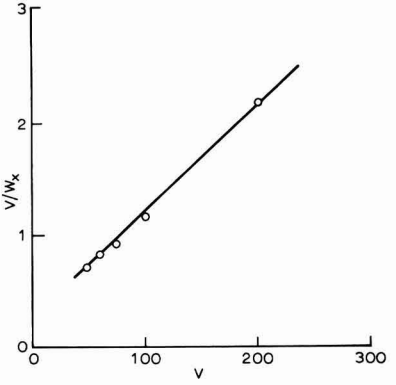

Figure 1.

Table 1
Fluidity and water resistance data

Solution/ non-solvent	Yield (%)	Fluidity (mm)	Water resistance	Polymerisation time (minutes)
500:250	67.50	18	films did not blush, even after one week's immersion in water	10.75
500:300	72.42	19		
500:375	80.73	13		14.8
500:500	86.06	15		
500:1000	92.85	18		18.2
Seed lac			film blushed within 24 hours	33.4

*Parts 1 and 2 appeared in *JOCCA*, 1983, **66**(4), 111; and *ibid* **66**(5), 132.

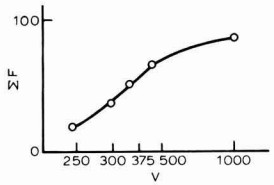

Figure 2. Cumulative polygon for fluidity

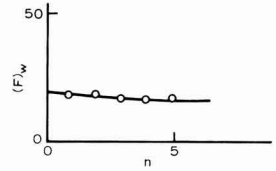

Figure 3.

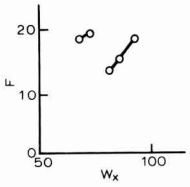

Figure 4.

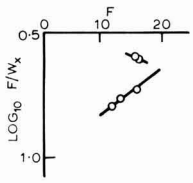

Figure 5.

the number of the fraction used is shown in Figure 3. These graphs demonstrate the accuracy of the experimental data.

The plots of F against W_x and of $\log_{10} F/W_x$ against F are shown in figures 4 and 5.

It is important to mention that the fluidity depends on the moisture content of lac[6]. Due to the presence of impurities, this test is not suitable for seed lac.

Water resistance

The data concerning the water immersion test show that the films prepared from these fractions did not blush even after one week, whereas the control blushed within 24 hours. This shows a marked improvement in water resistance compared with seed lac. The poor water resistance of lac has been attributed to the presence of soft lac resin[2], but the present findings are not in agreement with this view.

Before drawing any conclusions, it is important to mention that film properties in general depend on two factors: (i) cohesion between the film forming substances, and (ii) adhesion between the film and the substrate. Film formation takes place only when the cohesive and adhesive forces balance each other[7].

It should be also pointed out that there are two types of adhesion: (i) mechanical adhesion involving a physical interlocking of film and substrate through irregularities of the substrate or through penetration into the substrate, and (ii) specific adhesion involving chemical or molecular reaction between substrate and coating. Poor adhesion reveals itself in flaking or peeling of the film[8].

Further, the drying of surface coating films[9] is accomplished by either oxidation or polymerisation. Oxidation takes place at room temperature whereas polymerisation prevails at elevated temperatures.

From the foregoing discussion it is clear that the oxidation of films during the process of drying is possible.

However, the blushing of film of the original substance (seed lac) within 24 hours clearly indicates that drying has nothing to do with water resistance. Evidently there must be other reasons for the poor water resistance.

Table 2
Analysis of fluidity data

Test I		Test II	
V	ΣF	n	$(F)_w$
250	18	1	18.00
300	37	2	18.52
375	50	3	16.50
500	65	4	16.08
1000	83	5	16.52

It has been noted that the presence of carboxyl, hydroxyl and acetyl groups makes the films water sensitive[10]. On the basis of previous results, it cannot be stressed on that these functional groups are responsible for the poor water resistance of lac. In addition, it would not be wrong to conclude that during fractionation the water-soluble portion (presumably the source of poor water resistance) is leached out and as a consequence good water resistance is imparted to the product.

The fractionation process also shortens the polymerisation time. The polymerisaton time for ordinary seed lac is about 33 minutes whereas the polymerisation time for the completely precipitated lac was 18 minutes.

The fractionation process thus imparts outstanding water resistance and better thermo-hardening properties to the product.

Further, the process seems to hold commercial promise as it hints at a method for the manufacture of the water resistant lac on an industrial scale.

Acknowledgements

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Studies on adhesion of water-soluble alkyd-based paints: role of pigments

N. Premkumar, M. N. Sathyanarayana, R. S. Balakrishna, M. M. Shirsalkar and M. A. Sivasamban

Surface Coatings Division, Regional Research Laboratory, Hyderabad 500-009, India

Summary

A recent development in the field of surface coatings is the production of alkyd resins capable of being solubilized in water. The present trend is to "get the solvent out", due to the increased price of petroleum solvents and their toxicity, which leads to health hazards and atmospheric pollution. Little work has been done on the factors affecting the adhesion of water-soluble alkyd-based coatings to metal substrates, although adhesion is an important property of surface coatings. In the present work, the effect of the pigments titanium dioxide (anatase), iron oxide (natural) and lead chromate (middle chrome) and their pigment volume concentrations (PVCs) on the adhesion of water-soluble alkyd paints to mild steel is discussed. Other paint film properties such as gloss, impact resistance, scratch hardness, flexibility, and chemical and solvent resistance have also been evaluated and reported.

Introduction

The present trend of replacing solvent-based coatings with water-thinnable coatings and the importance of the latter are increasing tremendously day by day[1-4]. For a proper evaluation of the performance of such systems, physico-chemical analysis and examination of properties are necessary. Adhesion studies play a vital part in this regard[5-12]. Numerous factors are known to contribute to the adhesion of paint but correlation between many of these factors and adhesion has not yet been fully established, especially in the field of water-soluble paint systems. As part of an earlier study[13] on the adhesion of water-soluble paints, it was noticed that water-soluble alkyd resin with 5 per cent melamine modification for crosslinking purposes produced films of high bond strength, high scratch hardness values, good flexibility and better resistance to chemicals when compared with the films obtained from alkyds without modification or with 10 and 15 per cent melamine modification.

In the present study, work has been carried out to determine the effect of three commonly used pigments at different pigmentation levels on the adhesion of paints formulated with them using water-soluble alkyd resin with 5 per cent melamine modification, as this binder system proved to be satisfactory.

Experimental

Materials

Medium

Forty-five per cent oil length linseed glycerol phthalate alkyd modified with rosin maleic anhydride adduct, acid value 68.4, was thinned with butyl Cellosolve as co-solvent and neutralised with suitable amine. This was blended to the extent of 5 per cent with water-soluble melamine resin (50 per cent solids), based on the weight of alkyd resin.

Pigments

Titanium dioxide

Pigment grade titanium dioxide, anatase (Travancore Titanium Products, India), specific gravity 3.84, oil absorption 25.1, identified as titanium dioxide (anatase) tetragonal from x-ray diffraction pattern.

Lead chromate

Pigment grade lead chromate, specific gravity 6.28, oil absorption 20.

Iron oxide

Pigment grade natural iron oxide, specific gravity 49, oil absorption 13.8.

Solvents

Methyl ethyl ketone, extra pure (E. Merck), b.p. 79.5°C.

Xylene (BDH) b.p. 138°C.

White spirit (Burmah Shell) b.p. range 150-200°C.

Butyl Cellosolve (Sisco Chem. Industries, Bombay) b.p. 170°C.

Distilled water.

Melamine resin (Synthetic & Polymer Industries, Ahmedabad) 50 per cent soluble in water.

Driers

Cobalt naphthenate (6 per cent cobalt content) in butyl Cellosolve.

Lead naphthenate (24 per cent lead content) in butyl Cellosolve.

Mild steel discs and panels

Mild steel discs of diameter 32 mm were punched out of plate of gauge 20 (0.9 mm), abraded with emery paper of increasing order of fineness in white spirit medium, swabbed successively with xylene and butyl Cellosolve, and finally degreased with methyl ethyl ketone for two hours. The residual solvent from the degreased specimen was removed in a vacuum desiccator.

Mild steel panels of size 150 × 100 mm were cut from plate of gauge 20 (0.9 mm), abraded with emery paper of increasing order of fineness in white spirits medium, and swabbed successively with xylene and butyl Cellosolve.

Tin panels

Panels of size 150 × 100 mm were cut from electrolytically tinned mild steel (0.315 mm). The tin panels were lightly abraded with a fine emery paper and swabbed with xylene and finally with butyl Cellosolve.

Emery paper

Emery paper of grade numbers 180, 220, 320 and 400 (in

Table 1

Typical formulation for the preparation of melamine modified water-soluble alkyd paints with different pigment volume concentrations

	Pigments used		
	Titanium dioxide	Iron oxide	Lead chromate
Density (g/cc)	3.84	4.90	6.28
PVC (%)	20	35	25
Pigment amount (g)	$20 \times 3.84 = 76.8$	$35 \times 4.90 = 171.5$	$25 \times 6.28 = 157$
Alkyd (g)	$80 \times 1 = 80$	$65 \times 1 = 65$	$75 \times 1 = 75$
Total weight of pigment (g)	$\frac{100 \times 76.8}{156.80} = 48.97$	$\frac{100 \times 171.5}{236.50} = 72.51$	$\frac{100 \times 157}{232} = 67.67$
Total weight of alkyd* (g)	$\frac{100 \times 80}{156.80} = 51.02$	$\frac{100 \times 65}{236.5} = 27.48$	$\frac{100 \times 75}{232} = 32.32$
Total weight of pigment (g)	99.99	99.99	99.99

Note: calculations were carried out along similar lines for preparing paints at other PVCs.

*Total weight of alkyd includes 5% melamine resin

increasing order of fineness), silicon carbide waterproof paper (Carborundum Universal Ltd, India).

Paints

A series of paints with PVCs varying between 0-50 per cent were prepared using water-soluble alkyd resin pigmented with anatase titanium dioxide, natural iron oxide or lead chromate; the paints were ground to 7-8 on the Hegmann gauge scale in a laboratory ball mill. The calculations involved in formulating paints to the desired PVCs and the pigment and resin quantities used are shown in Table 1. After grinding, the paints were strained through a fine muslin cloth and thinned to a brushable or spin coating consistency as required by diluting with a suitable quantity of distilled water. Sufficient amounts of driers were added to the paint formulations.

The paints were matured by storing in closed bottles for 24 hours. They were then applied to mild steel and tin panels by brushing to uniform thickness. The discs were coated by spin coating.

Methods

To minimise the effects of uncontrolled variables on adhesion, the following steps were taken. The same solvent system was used for all the paints. The discs and panels were from the same mild steel plate and were cleaned by identical procedures. All paint films were cured by stoving at 120 ± °C for 30 ± 5 minutes. Discs coated to the same dry film thickness were used for adhesion testing.

In the present study the direct pull off technique based on the use of a Hounsfield Tensometer was used for the reasons put forward by Bullet and Prosser[8]. Apart from adhesion, impact resistance and resistance to solvents and chemicals were also determined.

Determination of adhesion by sandwich pull off technique

Bond strengths (practical adhesion values) were determined by the sandwich pull off technique using a Hounsfield Tensometer[14,15].

Test specimens were prepared by applying paints to the mild steel discs with an ICI Spin Coater to a dry film thickness of about 1-1.5 mils (25-37.5 microns) and stoving at 120 ± 5°C for 30 ± 5 minutes. Test doublets were prepared by gluing a painted disc between two stainless steel cylindrical test pieces 2 inches (50.8 mm) long and 1 inch (25.4 mm) in diameter. The test piece that was stuck to the painted face was turned down to 3/4 inch (18 mm) in diameter so that higher forces could be applied while at the same time obviating the possibility of a break occurring between the coupling test piece and the unpainted side of the disc. For bonding, an adhesive of suitably high bond strength (to the substrate and to the paint surface) was chosen so that failure occurred only at the paint/substrate interface or in the body of the paint film. The adhesive system used for bonding was Araldite AW 106 and Hardner HV 953 U (Ciba Geigy Corporation). The bond strength of this adhesive system to mild steel was found to be approximately 4000 psi (280 kg/cm^2).

During the curing of the adhesive the doublets were kept aligned on parallel rod jigs of the same diameter as the cylinders, enough pressure being applied to squeeze out the excess adhesive without starving the joints. Great care was exercised in laying the doublets securely on the alignment block for proper alignment of the test specimens. The test doublets were kept under pressure for 48 hours to allow the adhesive to cure, the bowing effect of the doublets in the assembly being corrected by suitable clamping arrangements. When curing of the adhesive was complete, the doublets were taken out of the alignment blocks and kept in a vertical position for a further period of 12 hours. The doublets were then pulled apart by subjecting them to progressively increasing stress at a constant rate until failure took place. Sagging of the doublet in the Tensometer was prevented by suitable holders. Based on the area of bonded paint surface and the load indicated by the Tensometer at the time of failure, adhesion was expressed as practical adhesion[16].

Cohesive failure refers to any break in the body of the paint film and adhesive failure describes the break between the paint and the substrate. Classification of the nature and extent of failure was carried out by applying copper sulphate solution to the painted surface of the disc after test, then superimposing a transparent plastic sheet on

Table 2

Practical adhesion values of water-soluble alkyd paints (modified with 5% melamine resin) with different pigments

Sample No.	PVC (%)	Titanium dioxide		Lead chromate		Iron oxide	
		Practical adhesion	Type of failure	Practical adhesion	Type of failure	Practical adhesion	Type of failure
1	0	146.47	55% CF	146.47	55% CF	146.47	55% CF
2	10	226.36	84% CF	141.47	80% CF	151.84	100% CF
3	15	250.68	90% CF	148.51	80% CF		
4	20	274.75*	80% CF	151.14	90% CF	188.61	100% CF
5	25	213.24	90% CF	173.99*	100% CF		
6	30	198.94	98% CF	146.75	100% CF	212.06	100% CF
7	35	186.85	100% CF	104.57	60% CF	228.47*	100% CF
8	40					181.58	100% CF
9	45					125.83	100% CF
10	50					86.67	100% CF

CF = cohesive failure, *CPVC of particular systems

which squares were engraved and counting the number of squares of brown deposit. The average practical adhesion value was calculated from the results of 15-20 test specimens.

Determination of gloss

Gloss was measured at 45°, as prescribed in IS:101-1964, using a Gardner Multiangle Glossmeter.

Determination of scratch hardness

Scratch hardness was measured according to IS:101-1964 using a REL automatic power operated scratch hardness tester.

Determination of impact resistance

This was measured by a falling weight type instrument using a 2 lbs weight at a fixed height of 25 inches (DEF 1053 specification).

Determination of resistance to chemicals/solvents

Chemical/solvent resistance was measured according to IS:101-1964 using distilled water, H_2SO_4 (2 per cent), Na_2CO_3(5 per cent), xylene, white spirit and butanol.

The practical adhesion values of the water-soluble alkyd paints containing different pigments – viz. titanium dioxide, iron oxide and lead chromate – together with details of failure are given in Table 2 and are illustrated in Figure 1. Table 3 lists the PVC of each paint system at which the highest practical adhesion value was obtained, along with details of failure. Table 4 shows the gloss,

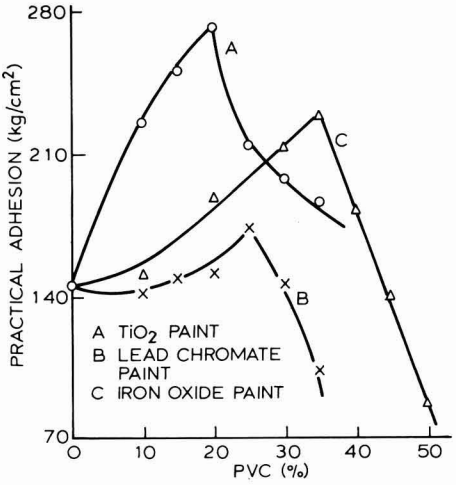

Figure 1. Effect of pigmentation on adhesion

Table 3

Practical adhesion values of pigmented systems at their critical pigment volume concentrations

Sample No.	Pigment	PVC (%)	Practical adhesion	Type of failure
1	Titanium dioxide (anatase)	20	274.75	80% CF
2	Iron oxide (natural)	35	228.47	100% CF
3	Lead chromate (middle chrome)	25	173.99	100% CF

CF = cohesive failure

Table 4

Gloss, scratch hardness, flexibility and impact resistance of water-soluble alkyd paints

Sample No.	PVC %	Titanium dioxide				Lead chromate				Iron oxide			
		Gloss (45°, Std.56)	Scratch hardness (g)	Flexibility	Impact resistance	Gloss (45°, Std.56)	Scratch hardness (g)	Flexibility	Impact resistance	Gloss (45°, Std.56)	Scratch hardness (g)	Flexibility	Impact resistance
1	0	56	2000	P	P	56	2000	P	P	56	2000	P	P
2	10	55	2400	P	P	52	1700	P	P	26	1800	P	P
3	15	54	2500	P	P	44	1800	P	P				
4	20	52*	2400*	P	P	35	1800	P	F	10	1500	P	P
5	25	35	2300	P	P	35*	1900*	P	F				
6	30	2	2300	P	P	20	1700	F	F	4	1600	P	P
7	35	2	2300	P	P	20	1300	F	F	4*	1700*	P	P
8	40									2	1600	P	P
9	45									2	1000	P	P
10	50									2	900	P	P

*Values at CPVC of particular systems, P = pass, F = fail

Table 5

Resistance of water-soluble alkyd paints to various chemicals/solvents

Sample No.	PVC (%)	Paint No.	Resistance to					
			Distilled water (48 h)	2% H_2SO_4 (18 h)	5% Na_2CO_3 (4 h)	Xylene (4 h)	White spirit (4 h)	Butanol (4 h)
1	0		NE	NE	NE	NE	NE	NE
2	10	A	NE	NE	NE	NE	NE	NE
		B	NE	SB	SB	SB	NE	NE
		C	NE	NE	SB	NE	NE	NE
3	15	A	NE	NE	NE	NE	NE	NE
		B	NE	SB	SB	SB	NE	NE
		C						
4	20	A	NE	NE	SB	NE	NE	NE
		B	NE	SB	SB	SB	NE	NE
		C	NE	NE	SB	SB	NE	NE
5	25	A	NE	NE	NE	NE	NE	NE
		B	SB	SB	SB	SB	NE	NE
		C						
6	30	A	NE	NE	NE	NE	NE	NE
		B	SB	HB	HB	SB	NE	NE
		C	NE	NE	SB	SB	NE	NE
7	35	A	NE	NE	NE	NE	NE	NE
		B	SB	HB	HB	HB	NE	NE
		C	NE	SB	HB	SB	NE	NE
8	40	A						
		B						
		C	NE	NE	SB	SB	NE	NE
9	45	A						
		B						
		C	SB	NE	SB	SB	NE	NE
10	50	A						
		B						
		C	SB	NE	SB	SB	NE	NE

A = titanium dioxide paint, B = lead chromate paint, C = iron oxide paint,
NE = no effect,
SB = slight blistering, HB = heavy blistering

scratch hardness and impact resistances of the paints. The resistance of the paints to solvents, acids and alkalies are given in Table 5.

Discussion

It is seen from Table 2 that as PVC increases the practical adhesion value increases, up to a certain level of pigmentation, and then decreases. This was observed with all three pigments studied, even though the optimum PVC values were different in each case. The pigmentation level corresponding to the highest practical adhesion value can be considered to be the critical pigment volume concentration (CPVC) of that pigment/binder system[10]. The practical adhesion value at the CPVC (Table 3) was highest for titanium dioxide paint, 274.75 kg/cm^2 (20 per

cent PVC), followed by iron oxide, 228.47 kg/cm^2 (35 per cent PVC), and lead chromate, 178.99 kg/cm^2 (25 per cent PVC). The type of failure at all PVC levels was found to be predominantly cohesive irrespective of the pigment used in the paint.

The scratch hardness data (Table 4) indicate that the titanium dioxide paint system had the best scratch hardness followed by lead chromate and iron oxide. This could be an indication that titanium dioxide does not interfere with the curing of the medium, whereas the other two pigments affect the crosslinking of the medium to some extent. Lead chromate and iron oxide may possibly react with the acid groups formed at the stoving temperature of the paint.

The flexibility and impact resistance data of these paints show that titanium dioxide and iron oxide paints passed the test whereas lead chromate paints failed. This would indicate that lead chromate paints form films that are more brittle compared with the other paints.

As far as gloss (Table 4) is concerned, the titanium dioxide paint had the highest gloss followed by lead chromate and iron oxide paints.

The resistances to various solvents and chemicals as listed in Table 5 indicate that the titanium dioxide paints performed by far the best with respect to water, solvents and chemical resistance properties. Next in order were the iron oxide paints and then the lead chromate paints.

Thus, comparing the overall performance of the paints studied, it is seen that titanium dioxide pigmented paints performed best followed by iron oxide and lead chromate pigmented systems.

Conclusion

In the present study the effect of three pigments and variations in PVC on the practical adhesion of water-soluble alkyd paints to mild steel substrates has been investigated. This study yielded useful and interesting data on paint properties such as practical adhesion, scratch hardness, impact resistance, flexibility, gloss, and resistances to solvents and chemicals. The results show that the practical adhesion value is highest at the CPVC of each paint system. Taking into consideration the overall properties of the paints, it is seen that the performance was best with titanium dioxide-based paints followed by iron oxide paints and lead chromate paints.

It is hoped that the results of this study will be of help to paint technologists in the formulation of water-soluble paints with different pigments.

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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 July issue:

Car finishing in Europe – the technological challenge in the 1980s *by J. L. Inshaw*

Hydrolysed lac-based polyurethane coating *by P. M. Patil, K. Mohan and B. B. Khanna*

Organo-silanes as adhesion promotors for organic coatings. Part 3: silanes on cadmium, copper and zinc *by P. Walker*

Paint film adhesion *by U. Zorll*

Micaceous iron oxide in protective coatings

S. Wiktorek and J. John

Surface & Corrosion Research, Australian Iron & Steel Pty Ltd, Port Kembla, New South Wales, Australia

Summary

Micaceous iron oxide (MIO) is essentially a type of haematite (Fe_2O_3) similar in crystal structure to mica, hence the term "micaceous" is used. Its distinguishing feature is the unusual tabular crystal structure, which can be easily fractured to give very thin platelets or lamellar fragments.

When used as a pigment in paint, these thin platelets orientate themselves in overlapping layers with their thinnest cross sections parallel to the coated substrate. This orientation produces an increase in resistance to water permeation through the paint film, reduces the ultraviolet degradation of the vehicle and provides mechanical reinforcement to the paint film. Several alternatives are commercially available with obvious differences in physical properties, some of which may result in inferior corrosion protection when used in paints. For this reason it was advisable to compare and evaluate the differences in performance of applied coatings.

A sample of South Australian material claimed to be micaceous iron oxide (SA MIO) was supplied for evaluation. This material was similar in visual appearance to MIO but was found to be basically a mixture of granular pigments and fines when compared with an Austrian micaceous iron oxide (MIOX) which has a fully lamellar structure. Laboratory tests included salt droplet, salt spray and UV radiation exposure. Physical properties were examined using both optical and scanning electron microscopes. Natural weathering tests involved exposure of test panels at a marine industrial environment for 40, 60 and 80 days.

All test results clearly illustrate that so-called "MIOs" which possess a granular particle shape have inferior protective properties and are unsuitable for use as pigments for corrosion preventive coatings.

Introduction

Micaceous iron oxide (MIO) pigmented paints have been successfully used worldwide for many years to provide long term corrosion protection for structural steelwork exposed to various types of industrial environments[1-4].

As polymer technology has advanced, new and improved vehicles have led to a more widespread use of MIO paints, based on alkyd, phenolic, acrylic, vinyl, chlorinated rubber, polyurethane and catalysed epoxy resins. This allows for more specialised selection and improved performance, particularly for marine and severe industrial environments. Today, some of the most important civil engineering structures in the world are protected with MIO pigmented coatings.

When a paint pigmented with MIO is applied to a substrate or primed steel, a tough impermeable barrier coating is formed. During application, drying and curing of the paint film, the lamellar shaped MIO platelets orientate themselves into overlapping and interleaving layers which are roughly parallel to the substrate (Figure 1). This decreases the permeability of the paint film since the length of the path along which moisture and gases must travel to reach the substrate is much greater than for an equally thick coating containing an amorphous pigment. In addition, MIO flakes provide mechanical reinforcement to the paint film and shield the medium from the degradation effects of UV radiation and attack from outside corrosive components. On the other hand, granular shaped pigments may create direct paths for penetration of moisture and pollutants to the substrate[1-4] (Figure 2). This is especially important for coatings which are exposed to aggressive industrial environments such as those experienced at the Port Kembla Works of Australian Iron & Steel Pty Ltd, where MIO pigmented coatings have been successfully used for the long term protection of various types of steel structures and miscellaneous equipment. In most applications, MIO pigmented coatings are applied over a suitable primer or directly to the substrate as a barrier coating.

Micaceous iron oxide pigment

Micaceous iron oxide is a natural mineral which, after suitable refining, consists of at least 85 per cent Fe_2O_3. It is also known as specular or flaky haematite and has distinguishing features which set it apart from the conventional amorphous types of iron oxides (Fe_2O_3) which are used for red, brown and yellow pigmentation. Micaceous iron oxide possesses a characteristic metallic grey sparkling appearance and when viewed under the optical microscope has flake-like particles with a crystalline structure closely related to mica. This gives rise to the term "micaceous" when describing the particle shape. In fact it does not contain any mica although it possesses similar characteristics. Its unusual tabular crystal structure can be fractured to very thin platelets or lamellar fragments, which, when used as a pigment in paints, orientate themselves parallel to the substrate[1-4].

According to current theory, MIO was formed during the Carboniferous geological period about the same time the black coal deposits of Europe were laid down. One theory states that during this period, intense geological faulting movements created high metamorphic pressures which changed α Fe_2O_3 (amorphous variety) to the metastable micaceous form, γ Fe_2O_3 (lamellar structure)[1,2].

Although MIO is found in various parts of the world, the true micaceous structure may be doubtful. Depending on the location of ore deposits, MIO pigments can differ considerably in size, shape and purity (figures 3-6), but the ore used in paint must contain at least 85 per cent Fe_2O_3, be extremely low in water-soluble salts and have a fully developed lamellar structure[3,4].

The largest and most well-known deposits are found in Austria (Waldenstein), where both the quality and quantity of the as-mined ore are unique. In addition, the Austrian variety is much more friable and consequently presents no difficulty in the grinding and sizing operations. A fairly good quality MIO was also produced in South Devon, England until the mine was closed for economic reasons in 1969 and the pigment became unavailable[1,3,4].

In the last few years several alternatives have become commercially available but with obvious differences in their physical properties, consequently early coating failures have occurred.

To ensure a high level of corrosion protection is maintained, it is necessary to characterise the physical properties of the alternative pigments and to evaluate their effect on the corrosion protection of steel surfaces.

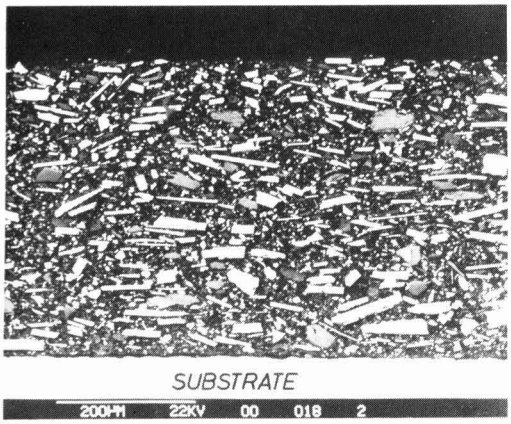

Figure 1. Austrian MIOX

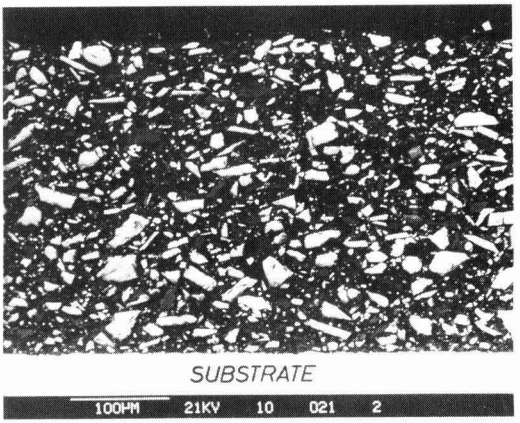

Figure 2. South Australian MIO

Scanning electron micrographs showing cross-sections of epoxy resin-based MIO pigmented coatings on steel substrates, comparing the distribution and orientation of lamellar shaped Fe_2O_3 (Figure 1) with the random orientation of granular shaped Fe_2O_3 particles (Figure 2)

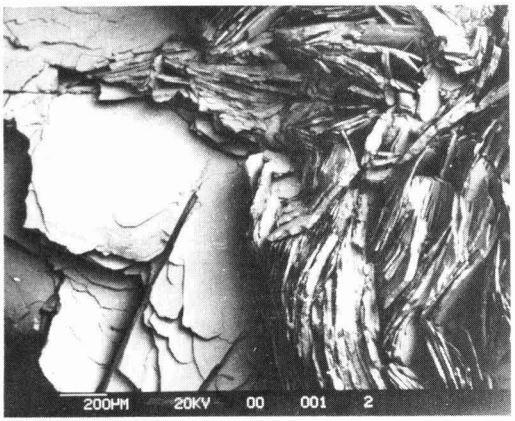

Figure 3. Scanning electron micrograph of Austrian crude iron oxide ore showing very thin platelets which appear free of gangue material

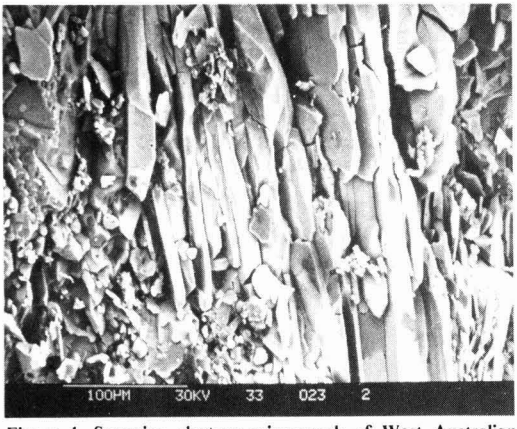

Figure 4. Scanning electron micrograph of West Australian crude iron oxide ore which is comprised of thick MIO platelets and some gangue material

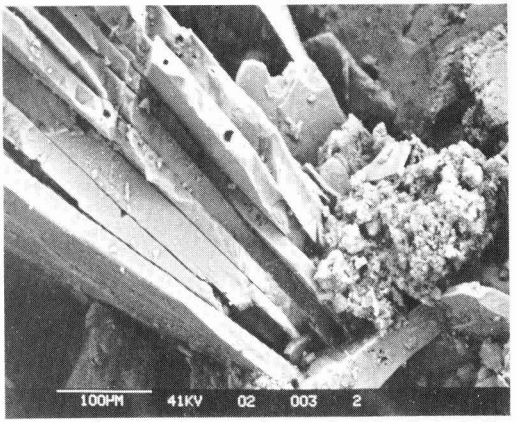

Figure 5. Scanning electron micrograph of South Australian crude ore, which basically includes quartz, non-lamellar Fe_2O_3 and a small amount of lamellar structured MIO

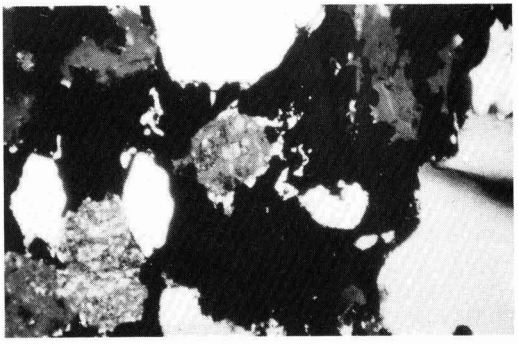

Figure 6. Optical photomicrograph of South Australian crude ore sample as in Figure 5. Cross-section under transmitted light showing basically opaque haematite (black areas) filling voids, and quartz clasts (white and grey areas)

Table 1
Test results

	Paint	Density (kg/l)	Volume solids content (%)	Specific gravity of MIO pigment at 20°C
(a)	Alkyd resin-based paints containing:			
	(i) SA MIO pigment	2.0	54.8	5.16
	(ii) Austrian MIOX pigment	1.9	58.6	4.62
(b)	Epoxy resin-based paints containing:			
	(i) SA MIO pigment	1.7	56.1	
	(ii) Austrian MIOX pigment	1.7	60.0	

Experimental procedure

Preparation of test panels

Mild steel panels were used for the laboratory and weathering tests. The panels were prepared by sanding in accordance with the procedure laid down in Australian Standard 1580 Method 105.2, Pretreatment of Metal Test Panels – Sanding.

Types of paint and associated MIO pigment used for tests

Two different generic types of paint were used for both laboratory and natural weathering tests, namely alkyd resin-based MIO and epoxy resin-based MIO. The paint samples were made by a paint manufacturer using standard formulations for both generic types of MIO pigmented paint. Alkyd resin was selected as the most permeable vehicle and catalysed epoxy resin as the most impermeable.

The type of pigments included in the tests were Austrian MIOX standard grade, commonly used by paint manufacturers, and South Australian (SA) MIO sample, supplied for evaluation by a marketing company (figures 7, 8).

The proportion of MIO pigment to medium or vehicle solids on a w/w basis was 61 per cent for the alkyd resin-based paint and 51 per cent for the epoxy resin-based paint. The laboratory test results are given in Table 1.

Application of coatings

A digital balance which continuously measures the change in weight of a paint film during spray application was used to achieve the nominated dry film thickness (DFT) of 100 μm on both the laboratory and weathering test panels. The paint was applied directly to the substrate in all cases by conventional spray, which is a practical laboratory method for the application and monitoring of a pre-determined amount of paint to a test panel. The mass of paint to be applied was calculated in advance using the density of the paint and the area to be sprayed with the formula:

$$\text{wt paint} = \frac{\text{area} \times \text{DFT} \times \text{density} \times 10^{-2}}{\text{volume solids content}}$$

After allowing full curing time, the coated test panels (size 150 × 100 mm) were exposed both to salt droplet (using the salt solution described by the Australian Standard 1580, Method 432.2 "Resistance to Corrosion – Salt Droplet Test") and salt spray (fog testing).

Test panels were examined at 240, 480 and 720 hourly intervals and the results recorded. After the final assessment of each test panel the paint coatings were stripped from their substrates, taking care not to remove any rust deposits on the steel surface. Typical examples of test results are shown in figures 9-12.

Test panels exposed to both salt droplet and salt spray tests clearly illustrate the superiority of lamellar shaped MIO pigment in protective coatings.

Ultraviolet radiation test

Coated test panels (1/3 masked) were placed horizontally in a UV radiation cabinet where three 300 watt Philips type MLU UV lamps were used on a continuous exposure basis for 1,600 hours. The distance from the surface of the panels to the lamps was 250 mm and the surface temperature of the test panels was approximately 100°C. The paint which deteriorated by UV radiation was removed from the exposed surfaces by rinsing with tap water.

Finally, the test panels were examined with a scanning electron microscope in order to determine the degree of paint film deterioration caused by the UV radiation.

The results are illustrated by figures 13-16. Figures 13 and 15 illustrate the surface appearance of epoxy resin-based MIO pigmented coatings prior to UV radiation exposure, while figures 14 and 16 illustrate the surface condition after 1600 hours UV radiation exposure. The lamellar shaped MIO pigment in the protective paint film (Figure 14) shields the medium from further degradation while the granular shaped pigment leaves the medium exposed to further degradation from actinic radiation (Figure 16).

Permeability test

Moisture permeability determinations were carried out on pre-stripped paint films with a test area of 21.24 cm^2 using similar cups to Payne or ASTM varieties, as described in a paint testing manual by Gardner/Sward. Here, the paint film forms a lid to the apparatus. A measured amount of water is put in the cup and the apparatus stored at 30°C in a desiccator. The water attempts to evaporate through the paint film into the surrounding desiccated atmosphere

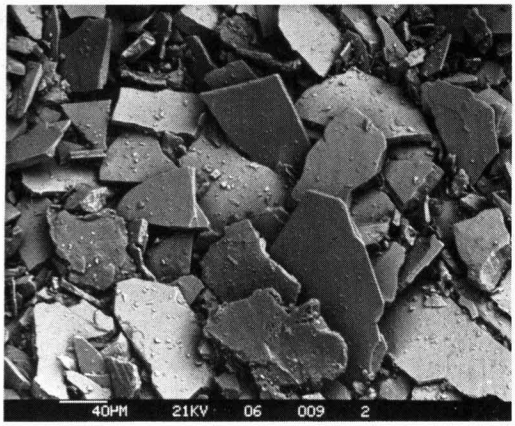

Figure 7. Scanning electron micrograph of Austrian MIO pigment standard grade. The particles (except for a very small proportion of fines) possess the lamellar structure

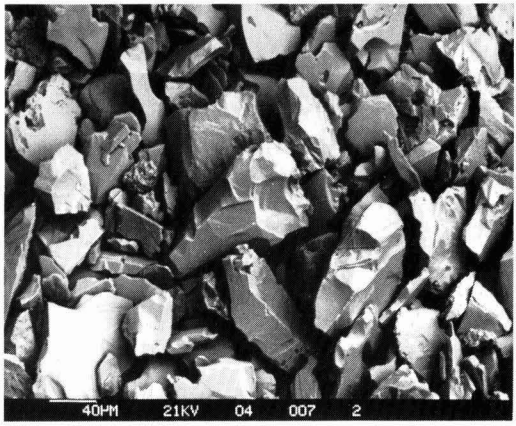

Figure 8. Scanning electron micrograph of South Australian iron oxide pigment of specular grey colour but granular shaped particles

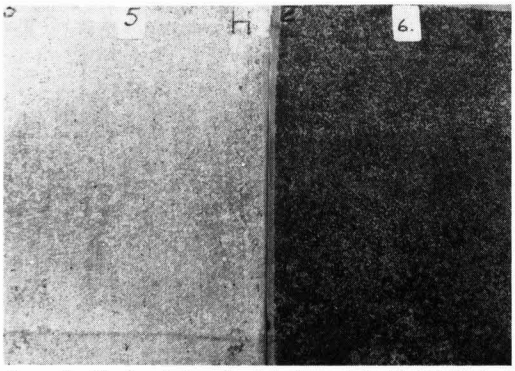

Figure 9. Alkyd resin-based paint pigmented with MIOX (test panel No. 5), alkyd resin-based paint pigmented with SA MIO (test panel No. 6)

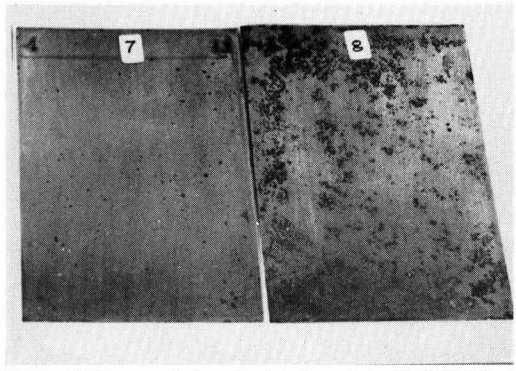

Figure 10. Epoxy resin-based paint pigmented with MIOX (test panel No. 7), epoxy resin-based paint pigmented with SA MIO (test panel No. 8)

Surface condition of steel test panels after 720 hours salt droplet test

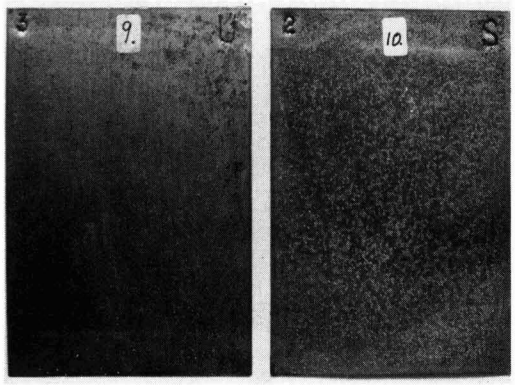

Figure 11. Alkyd resin-based paint pigmented with MIOX (test panel No. 9), alkyd resin-based paint pigmented with SA MIO (test panel No. 10)

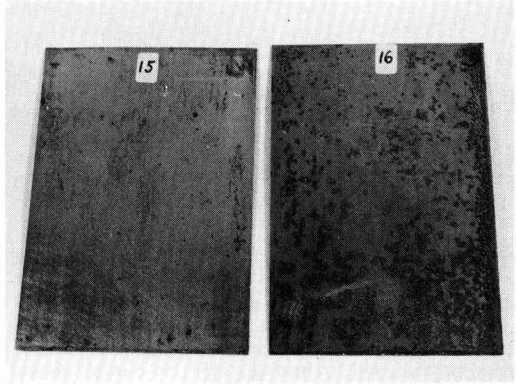

Figure 12. Epoxy resin-based paint pigmented with MIOX (test panel No. 15), epoxy resin-based paint pigmented with SA MIO (test panel No. 16)

Surface condition of steel test panels after salt spray testing for 480 and 720 hours respectively

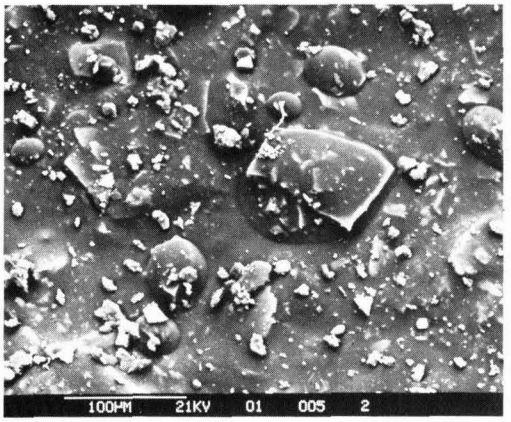

Figure 13. MIOX pigmented epoxy before exposure

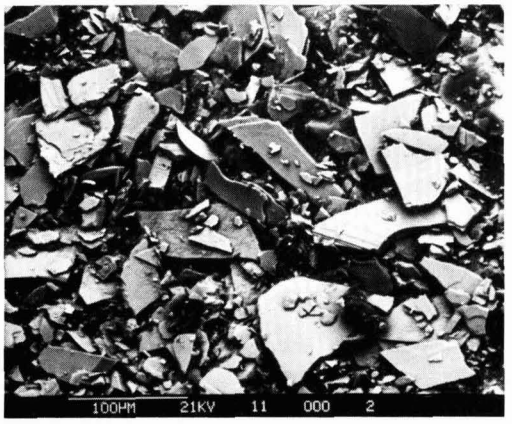

Figure 14. MIOX pigmented epoxy after exposure

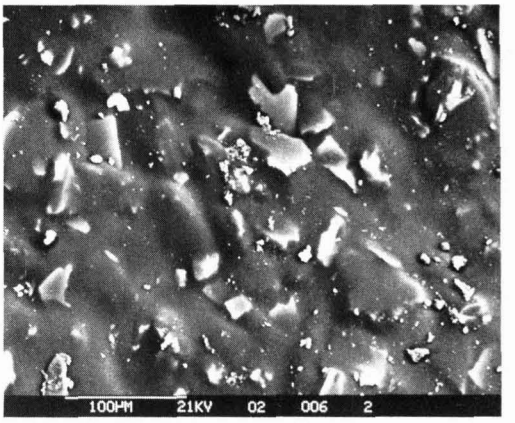

Figure 15. SA MIO pigmented epoxy before exposure

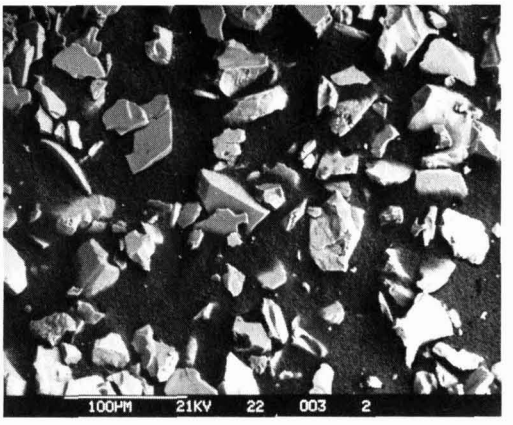

Figure 16. SA MIO pigmented epoxy after exposure

Surface appearance of epoxy-based coatings before and after 1600 hours of UV radiation exposure

and the permeability rate is determined by weighing the cups at 24 hour intervals.

Different paint film thicknesses were applied to simulate one and two coat applications.

The specific moisture permeability of a paint film is defined as the number of milligrams of water that permeate 1 cm^2 of film of 1 mm thickness each 24 hours after a constant rate has been attained under the preferred conditions of 30°C (figures 17 and 18).

Microscopic examination

Micaceous pigment

The Austrian micaceous iron oxide pigment particles, when viewed under transmitted light beneath an optical microscope at a magnification of ×100-200, appear as extremely thin flat translucent ruby-red colour platelets. This examination exclusively defined MIO pigment as angular ruby-red crystals with the fracture planes clearly visible (Figure 19).

Non-micaceous pigment

The South Australian sample contained smaller pigment particles than the Austrian and showed an almost complete absence of any ruby red crystals typical of the lamellar micaceous structure (Figure 20).

Weathering test

Test panels were exposed to a marine atmosphere in Port Kembla Harbour for periods of 40, 60 and 80 days. Test panels were visually examined, the films stripped away and the underlying steel substrate surface photographed. These test results also confirm the superiority of true micaceous iron oxide over non-micaceous pigment (Figures 21 and 22).

Conclusion

This work has clearly proved that the outstanding durability afforded by micaceous iron oxide pigment is due to the thin flake-like particle shape.

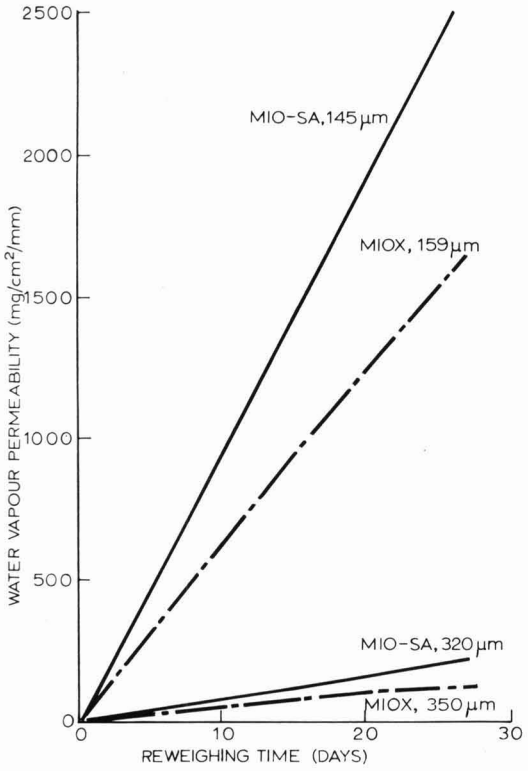

Figure 17. Alkyd resin

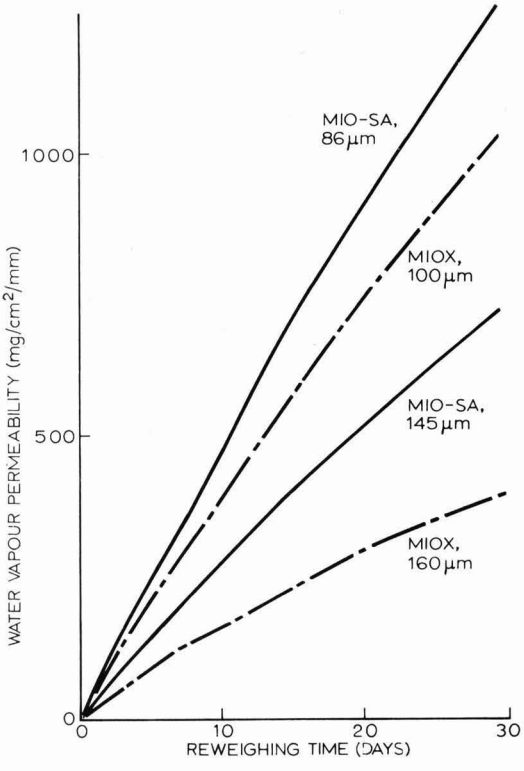

Figure 18. Epoxy resin

Moisture permeability graphs of Austrian MIOX and South Australian SA MIO indicate a reduction in permeability occurs when lamellar structured MIOX is used as the pigment

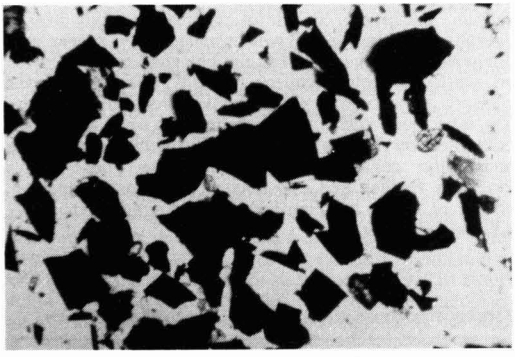

Figure 19. Austrian MIO

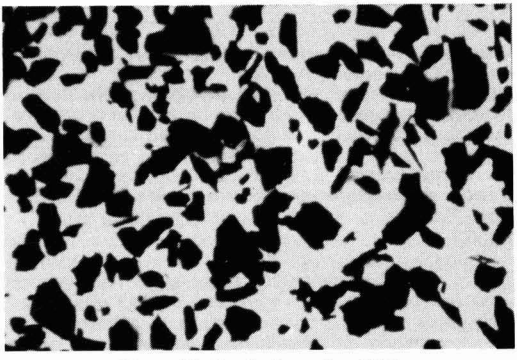

Figure 20. South Australian MIO

Optical photomicrography of pigments viewed under transmitted light

So-called micaceous iron oxides which possess granular shaped particles and/or fines should not be used in protective coatings, simply because they will cause more harm than benefit.

Without lamellar shape, orientation and foliation of pigment within the paint film, it is impossible for such coatings to function in the same way as genuine MIO pigmented paints.

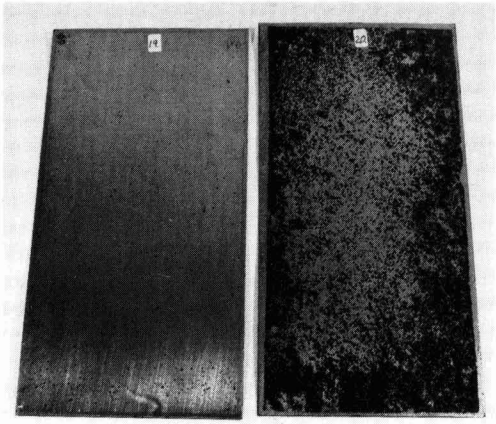

Figure 21. Surface condition of steel panels after 60 days weathering test. Both test panels (19 and 20) were coated with alkyd resin-based paint pigmented with either MIOX (test panel No. 19) or SA MIO (test panel No. 20)

Figure 22. Surface condition of steel panels after 80 days of weathering tests. Both test panels (23 and 24) were coated with epoxy resin-based paint pigmented with either MIOX (test panel No. 23) or SA MIO (test panel No. 24)

In addition, the particle size successfully used in protective coatings must conform to ISO, 1248:1974 and an equivalent national standard.

Acknowledgements

Acknowledgement is made to the management of Australian Iron & Steel Pty Ltd for their permission to publish this paper. Thanks are also due to the staff of the various service departments of AIS for their assistance with the experimental work.

[Received 25 October 1982

References

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2. Wiktorek, S., "MIO Pigment in Protective Coatings". Presented to the Australasian Corrosion Association, March 1980.
3. Bishop, D. M., *JOCCA*, 1981, **64**(2), 57.
4. Carter, E., *Polymers Paint Colour Journal*, 1981, August 5/19, 506.

reviews

Further information from the publishers of the titles reviewed can be obtained by completing the *Reader Enquiry Service* form at the back of the *Journal*.

Glossaire des Termes de Peintures, Vernis & Encres. Français – Anglais
Glossary of Paint, Varnish & Printing Ink Terms. French – English

M. Voituriez and G. Pierson
Centre de Préparation Documentaire à la Traduction, Paris
pp. 63

This is a slender volume containing some 1,500 expressions in French together with their English equivalents. Only those who, like this reviewer, have collaborated in the compilation of multilingual glossaries can really appreciate the pitfalls and the near-impossibility of avoiding every misleading rendering. Consequently, it is a matter of regret that the usefulness of this glossary has been needlessly diminished by the number of errors – some 100 – ranging from purely typographical that could have been eliminated by more careful proof reading, to others of a more serious nature. Some stem from that widely-held Gallic belief that the English language is so supple that any liberty is permissible, two examples will suffice to illustrate this point: the entry "encres pour illustrés et bandes dessinées" i.e. inks for picture-papers and strip cartoons, for which this reviewer believes there is no generally-accepted English expression, is rendered as "comic ink"; the delightful expression "jus-musée" (literally "museum juice") which, presumably, covers such things as mastic varnish and the like that are used in the art world, becomes "gallery varnish". Nevertheless the glossary does contain many useful expressions which are not to be found easily elsewhere and it is to be hoped that in the not too distant future the authors will embark on a revision in collaboration with someone whose native tongue is English and also correct the errors in spelling, not all of which are confined to the English text.

Reader Enquiry Service No. 21

S. A. Ray

Photopolymerisation of surface coatings

C. G. Roffey
John Wiley & Sons, 1982, pp. 353, illus., £22

Correction

A review of the above publication was published in the May 1983 issue of *JOCCA* but unfortunately the price was mistakenly quoted as being £45.75 instead of its true price of only £22.

Reader Enquiry Service No. 22

Developments in Polymer Stabilisation – 5

Gerald Scott, editor
Applied Science Publishers Ltd
London, New Jersey, 1982
pp. x + 240, £29

Of the six chapters in this volume the first three are by Russian authors, dealing with critical antioxidant concentrations, the role of alkyl radicals in polymer oxidation and stabilisation, and the antioxidant action of sterically hindered amines, respectively. The next, of which the editor, a world leader on the subject, is part-author, is concerned with photodegradable plastics: the major types are compared and the development of a new product for agricultural use described. The final two chapters consider

reviews

flame retardancy: one considers the specific roles of the six main flame retarding elements – chlorine, bromine, phosphorus, antimony, boron and aluminium; the other, the use of electron spin resonance to study radical mechanisms of flame retardancy.

Reader Enquiry Service No. 23

L. A. O'Neill

Information regarding membership of OCCA is obtainable from the Association's offices, see contents page for address.

occa meetings

Newcastle Section

53rd flight of the corrosion vulture

Now that the 1982-83 season is over, it is intended over the "out of season" months to review the papers presented to the Newcastle Section.

The first meeting was held on Thursday 2 September 1982 at the normal St. Mary's College venue in Durham City. Numerically the attendance of 20 (18 members and 2 visitors) was disappointing, but "Corrosion the vulture of metallurgy" presented by Dr M. Clarke of the London Polytechnic proved to be the most popular and entertaining technical lecture ever presented to the Section.

Indeed, Dr Clarke's humorous yet technically enlightening lecture was so enthusiastically received by the audience that he was immediately booked to present the second of his trilogy of vulture lectures during the 1983-84 season.

The lecture was followed by the usual excellent free buffet to make the evening an occasion to be remembered.

With regard to the lecture itself, Dr Clarke began by reporting that he had first presented it in March 1969, and since then he had given it all over the UK, in Australia, and in the USA. The presentation to the Newcastle Section of OCCA was in fact the "53rd flight of the vulture".

The vulture was described as nature's dustbin, hovering in the sky and swooping on the animal world to pick clean animal carcases leaving behind only the bones. The "corrosion vulture" was depicted as clouds hovering in the sky ready to rain down on the mechanical world to leave behind only the rusted shells of cars etc. The corrosion vulture's nest was shown to be council supplied metal bins left by the roadside filled with salt and sand for use in winter conditions. A picture was shown of the vulture lying in wait, and in fact eating its way out of the bottom of one such nest.

The corrosion vulture was shown to be much more voracious than the actual bird, for it attacks living, working machines, not waiting for them to die the way the bird waits for the death of its prey. Moreover, the corrosion vultures appetite is such that it defies mans attempts with grinders, sandpaper, stopping compounds, fillers, inhibitors, primers, paints and such like to prevent its attack. Some councils had introduced plastic bins to prevent the nesting of the vulture, but it still found them ideal nesting sites with the sand assisting the breakdown of vehicles paintwork, and the chloride assisting the corrosion attack. The inferior mechanical strength of the plastic bins coupled with the UV degradation of the plastic meant that these nests did not have a working life any longer than those of the previous metal nests.

Slides were shown of metal bridges with 1.25/1.5 inch girders eaten through by the vulture in about 100 years, and with the "cocoa" like rust stains around bolts, joints and edges, evidence on both old and new bridges of the vultures healthy appetite. Again man's ingenuity in building concrete bridges with internal steel reinforcement had failed to fool the vulture, and the telltale cocoa stains, showing it had wetted its appetitie, were abundantly apparent on such structures particularly around areas of concrete failure and degradation.

Pictures were shown of New York's West Side Highway, which in a couple of decades had been built and then abandoned because of the voracious attacks of the vulture. Design faults were highlighted, but better design would only have delayed, not halted, the inevitable.

The use of plastics, aluminium and stainless steel to outwit the vulture were all reviewed, but drawbacks were presented of them all, i.e. UV degradation of plastics, corrosion of aluminium in both acid and alkaline atmospheres, the need to wash down every three weeks British Petroleum's stainless steel building in London because of the telltale cocoa stains.

Dr Clarke indicated that painted zinc galvanized steel was probably the best defence against the vulture, but inevitably mechanical damage to the surface allowed the vulture in. He then pointed out that where unprotected metal was used the effective working life was just as long as where protected metal was used. Examples were shown of railway lines (cocoa evident on chair/line interface) and of a recent London building which was made of

unprotected mild steel and was now an overall cocoa colour. Thus the message was clear, save all the time, cost and technology and ignore the vulture.

Dr Clarke pointed out that the Delhi pillar in India, an iron tower that has stood uncorroded for centuries, has defied both the vulture and the corrosion experts. Furthermore, iron Roman coins dug up from bogs in this country had remained immune from the vulture until corrosion technologists had examined them.

From these facts Dr Clarke drew the following final conclusions:

1. In the presence of enough corrosion experts, corrosion will occur.

2. Disbelief in corrosion will prevent it, and in the extreme will reduce it to zero.

Dr Clarke's lecture was so comprehensively covered and so well presented that the questions were minimal but the applause long and loud.

Book your seats now for the return of the vulture next season to the Newcastle Section at St. Mary's College in Durham City.

I. Mim

Eastern Branch

Visit to Abbey Chemicals

A visit to Abbey Chemicals Limited, manufacturer of organo-clay rheological additives, took place on the evening of Wednesday 19 January 1983.

The evening began with Abbey Chemicals staff briefly describing the plant and the equipment that would be seen on the tour to follow. This talk included a short resumé of the mode of action of organo-clays and the reasons for choosing a particular grade of organo-clay for a particular end-use.

Their highly complex manufacturing process was further explained on the guided tour. Visitors were impressed by the amount of work involved in producing these types of products, and from this could well understand the relatively high price for this type of raw material.

The evening was rounded off by visitors enjoying some food and wine generously provided by Abbey Chemicals. Visitors wish to thank Abbey Chemicals for their excellent hospitality.

This was a joint meeting with Scottish Section organised by Eastern Branch.

E. P. Sinclair

Bristol

Chain stopped alkyds

There were three lectures in the first period of the 1982-83 session, under the chairmanship of Mr G. Fowkes.

The first lecture was on the subject of "Chain stopped alkyds" given by Mr J. Wilson of SOAB Ltd. It was held in Cardiff but unfortunately was very poorly attended. The lecturer gave an excellent talk on the modern concepts of the structure and manufacture of these rapid drying alkyds and the difference in properties when compared with the styrenated and acrylic modified types.

The polymer architecture necessary to give reasonable weathering properties was discussed. Details of formulation to give a satisfactory paint were outlined.

The Brunel Society

The second lecture in the series was given at the ladies evening held at the George and Dragon, High Street, Winterborne when Mr K. Hickman, Assistant Secretary of the Brunel Society, delivered a most interesting talk on the aims and work of this Society. The members of the Section and their wives were well represented and the evening was a success.

Solvent-soluble dyes for inks and paints

The third lecture was on "Solvent-soluble dyes for inks and paints" given by Mr P. Ecker of Ciba Geigy Ltd. The lecture was extremely well attended by some 30-40 members and their friends, many representing the printing ink industry. It is hoped that the large attendance was not due to the excellent buffet provided by Ciba-Geigy Ltd, for which the Bristol Section wish to thank the company for its kindness.

The lecturer gave an excellent talk on oil-, solvent- and water-soluble dye-stuffs and their use in printing inks. The difficulty in obtaining accurate values for the solubility of dye-stuffs was discussed, and details of methods which give adequately accurate values were given. An example of a dye-stuff of which 2 kg could be dissolved in 1 litre of solvent was described and in this case it was difficult to decide which of the two substances was the *solvent*.

The use of the solubility parameter concept had been found to be useful in this respect, and solubility diagrams giving the solubility areas where a mixture of hydrocarbons, alcohols and ketones had been used with a dye-stuff were shown.

Lightfastness of films containing metal complex dye-stuffs were stated to be usually fair to very good and often equal to a good pigment. The basic and oil-soluble dye-stuffs gave fair to poor light stability in general.

Yellow and orange colours usually had better lightfastness than blues, greens and blacks.

Resistance to bleeding when used for packaging food stuffs was discussed. The advantages of the use of dye-stuffs over pigments in inks was stated to be: 1. no gloss problems, 2. no flow problems, and 3. good transparency and penetration on paper etc.

An interesting use of a dye-stuff was stated to be its

addition to an automotive enamel by a paint company in the USA.

The question time was well supported. The vote of thanks was given by Mr Les Brookes.

J. R. Taylor

Manchester

Chlorinated rubber – the versatile paint resin

The initial student lecture of 1983 was held at the All Saints Lecture Theatre, Manchester Polytechnic on Wednesday 19 January 1983. Forty eight members and their guests heard Gordon Humphries, technical service manager, ICI Mond Division, commence his lecture by referring to the age of chlorinated rubber as a surprising 49 years and then progressing to detailing the Alloprene manufacturing process.

In addition to the general properties of the resin, the various grades based on viscosity were outlined along with their plasticiser requirements.

The subject of formulating chlorinated rubber finishes was discussed very fully and covered many types of potential applications based on substrate, type of environment, method(s) of application.

Gordon then continued his lecture with reference to chlorinated rubber coatings based on case histories from worldwide sources.

The discussion period that followed the lecture was comprehensive and it was noted that the use of modifying resins, alkyds for primers, acrylics for finishes, was a continuing trend. For those readers who require more comprehensive details of this lecture I can recommend the preprint obtainable from the lecturer: R. G. Humphries, Technical Service Manager, Chlorinated Product Business Group, ICI PLC, Mond Division, PO Box 13, The Heath, Runcorn, Cheshire WA7 4QG.

R. Stott brought this very interesting meeting to a successful conclusion by his vote of thanks which was warmly applauded.

The use of the electron microscope in technical service

This senior lecture was presented to 31 members and guests at the Crest Hotel, Bolton on Friday 11 February 1983 by H. H. McEwan of The Technical and Analytical Services, Tioxide Group PLC.

Harry McEwan opened his lecture by relating the history of use of the electron microscope at Tioxide. Some of the details of the instrument were summarised thus:

Small and compact relative to ultra high resolution

Very efficient vacuum system – fast throughput

Beam optics – electron beam – tungsten filament – copper column

Surface of sample is bombarded by electrons through a variable aperture – Tioxide uses a 200 micron diameter aperture

occa meetings

Voltage variation – 2 kV, 15 kV and 30 kV

Too high a voltage can damage sample

No voltage fluctuation acceptable

Duplicate cathode ray tube used

Photography – initially polaroid but though fast it is expensive and subject to poor definition. Therefore conventional 35 mm camera used.

After a full description of the instrument, preparation of specimens/techniques were described and can be summarised as follows:

1. Surface treatment of sample with gold, platinum or carbon to conduct unwanted electrons to earth.
2. Vacuum metalliser – argon atmosphere – high voltage can deposit gold film 100/200 Å thick.
3. Initially, surface treatments have to be removed from the pigment. Tioxide have tried freeze fracturing with liquid nitrogen but this is too problematical. They have developed a "home made" system based on ten years experience that relies on the following procedures:

   (a) Vacuum
   (b) Oxygen injection
   (c) Microwaves injected
   (d) Fluorescent discharge (breaks down organic treatment to carbon dioxide and oxygen – removed)

As the lecture proceeded, with the aid of slides/graphs, the following were amongst the subjects discussed.

Depth of etch
Etching rate of different systems
Paint degradation tests – accelerated weathering
Comparison between carbon arc and fluorescent tube systems
Comparison between Accelerated results and those obtained from Carlton and Allunga
Effect of TiO_2 grade on durability

The discussion period that followed Harry McEwan's lecture included reference to:

Stability of TiO_2 to electron bombardment
TiO_2 durability in relation to photocatalytic properties
SEM – 50,000× is the maximum.

It was most obvious at the end of this very interesting lecture that the lecturer certainly knew his subject and that his company is cognisant of the need to provide high quality technical service. This was demonstrated by lecture content and the relationship between the various facilities including Carlton Weathering Station.

John Calderbank's vote of thanks on behalf of the Manchester Section was warmly applauded.

F. B. Windsor

news

Further information on any items mentioned below is obtainable by completing the *Reader Enquiry Service* form at the back of the *Journal*.

New paint company

A new paint company has recently been set up in the north-east of England. The company is known as Derwentside Paints & Specialities Ltd and is sited at Unit 10A, No. 1 Industrial Estate, Medomsley Road, Consett, Co. Durham DH8 5HU. The premises comprise 5,200 square feet of new factory space. DPS is intending to produce high quality decorative paints, varnishes and speciality coatings.

The directors are John White (sales), formerly with Cementone-Beaver Ltd, and Jack Howarth (technical), formerly with Tor Coatings Ltd and a member of the Newcastle Section of OCCA.

It is hoped to create 12 new jobs within three years.
Reader Enquiry Service No. 31

Non-paint wood finishes for UK market

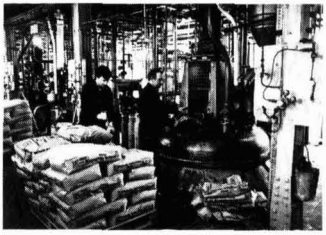
One of Europe's best known protective stain manufacturers is now aiming at a major foothold in the UK's rapidly expanding market for non-paint wood finishes. To spearhead their attack, the Dutch-based Farbaline company has linked with Alternative Wood Finishes of Harrogate to supply customers via regional Colour Centres throughout Britain.

Protective stains now claim nearly one-seventh of the annual £23 million market for wood finishes. This is a 60-fold increase on ten years ago, says AWF.
Reader Enquiry Service No. 32

Flame retardants

Anzon Ltd has signed an exclusive agreement with the Cros Group of Spain to market its range of ammonium polyphosphates. The most important product in the range is FR-Cros 480, an ammonium polyphosphate with a high degree of polymerization. Because of its low water-solubility and low particle size it is claimed to be ideal as a major component of intumescent flame retardant paints and to impart flame retardant properties to a range of polymers.

Other products in the range include ammonium hexametaphosphates with varying degrees of polymerization suitable for incorporation into flame retardant solutions for the impregnation of timber, fibre-based board, particle board and textiles.
Reader Enquiry Service No. 33



The new reactor at CVP Machen, Gwent gives an additional manufacturing capacity of 2,000 tonnes p.a.

New CVP plant

Cray Valley Products Ltd has added new plant to its Stallingborough (South Humberside) site. It is envisaged that the new plant, which includes blenders, mixers and distillation columns, will increase polyester manufacture capacity by a further 4,000 tonnes per annum.

In addition to Stallingborough, CVP is installing a new reactor at its Machen (Gwent) site. The new reactor will be used exclusively for manufacturing polyester-based powder resins and has been commissioned to increase the manufacturing capacity by a further 2,000 tonnes per annum. These increases in manufacturing capacities are to meet growing demand from both home and export markets.
Reader Enquiry Service No. 34

Croda sells Kelrez to develop liquid resin activities

Kelrez, previously Croda Resins' range of hard resins, has been sold to Lawter Chemicals Ltd. This move is said by Croda to have been carried out to release production and research resources for the development of its activities in liquid resins for the paint and ink markets. Croda's existing range of resins has been strengthened by the addition of speciality resins for high solids, low cure and powder coatings.
Reader Enquiry Service No. 35

Touchin Technical Labs' new principal

Following the sudden death in November 1982 of Mr H. R. Touchin, arrangements have now been made for Touchin Technical Laboratories and Corrosion Engineering Consultancy to be taken over by Dr John Ashworth, APRI as principal.

The objects of the practices, established in 1962, will remain unchanged, namely to offer consultancy services in the protection of metals and other materials covering all aspects from specification, preparation, paint selection and application, and inspection of work in progress as well as investigation of services and performance. Facilities available include general chemical investigations and analysis, and specialised facilities for the evaluation of paints, surface coatings, resins and other systems, polymers and rubbers.

The existing comprehensive laboratory facilities for evaluation, testing and analysis of paints and coatings will continue to be immediately available.
Reader Enquiry Service No. 36

new products

The new Graco AA 2000 Air Assisted Airless spray gun uses a combination of air spray and airless atomisation

Air assisted airless finishing

Graco has announced a new finishing system as an addition to its wide range of spray painting equipment, the AA 2000 Air Assisted Airless System. According to Graco, the addition of the AA 2000 means that it is now able to offer the finishing industry the widest choice of spray painting equipment available on the market.

Graco says the new system uses a combination of air spray and airless atomisation, which achieves the flexibility and control of air spray systems whilst retaining the benefits of reduced spray fogging, as with airless sytems.

The AA 2000 gun has an airless spray tip to create a flat fan pattern at relatively low fluid pressure, average 1,000 psi (70 bar), supplied from 15:1 pump. The atomising air is admitted from an air cap at an average pressure of 30 psi (2 bar) and has the facility to enable the operator to adjust the spray fan size.

Graco's new system is designed to handle virtually any finishing and corrosion resistant paint.
Reader Enquiry Service No. 37

New acrylic resins

Degussa has enlarged the range of isocyanate crosslinking acrylic resins it supplies as paint binders to include three new developments. These are designated VP-LS 50, VP-LS 73 and VP-LS 102, and are pure acrylate resins free from styrol. The numbers 50, 73 and 102 correspond to the hydroxyl numbers of the resins, related to 100 per cent solids. All three resins are supplied as 60 per cent solutions in xylol/butyl acetate.

As a result of their specific chemical compositions, these resins are claimed to possess distinctly better resistance to solvents and chemicals than conventional acrylate resins for isocyanate crosslinking with the same hydroxyl numbers.

VP-LS 50 serves as a base resin for formulating isocyanate crosslinked two-component paints, as used on both metals and wood. The best resistance to yellowing and weathering is obtained if aliphatic polyisocyanates are used. VP-LS 50 can also be crosslinked with aromatic polyisocyanates and is thoroughly compatible with cellulose acetobutyrates, nitrocellulose and PVC/PVA copolymers.

Despite their relatively low crosslinking agent requirements, paint films based on VP-LS 73 are said to possess good resistance to solvents and chemicals. Suitable crosslinking agents are either aliphatic or aromatic polyisocyanates. The paints are used on metals and wood. VP-LS 73 is also highly compatible with cellulose acetobutyrates, nitrocellulose and PVC/PVA copolymers.

The most stringent standards of resistance to chemicals and solvents in relation to the hydroxyl number are satisfied by VP-LS 102. This resin is particularly recommended in combination with aliphatic polyisocyanates for the production of automobile body repair paints.

Reader Enquiry Service No. 38

Colour matching system

Pacific Scientific has introduced what it claims to be a complete colour matching system, with formulation, batch correction and quality control capabilities.

Advances in colour technology have been implemented in the Spectrogard Automatch™ System, including a highly efficient colour matching model and high speed automatic colour match mode with no colorant pre-selection.

The Spectrogard Automatch™ System is claimed to be the first colour matching system designed to communicate with the colourist in his own language. There is no need to learn a new vocabulary. Being fully menu-driven, first-time users are said to be able to operate the system in less than 30 minutes.

Reader Enquiry Service No. 39

Low volume dispensing and colour control software

Applied Color Systems has announced the release of a new computer controlled low volume dispensing system (LVDS). Designed for laboratory sample preparation and low volume production applications, the system dispenses colorants, clears and additives according to computer generated formulas.

Typical quantities dispensed range from 100 cm^3 up to 3.75 litres. Individual fluids in the formulation can be dispensed simultaneously in increments as low as 0.1 cm^3.

Accuracy and repeatability are assured, says the manufacturer, through microprocessor control of a DC variable drive motor, peristaltic pump and three-way dispensing valves. The system's microprocessor, in turn, is controlled by the colour computer, which rapidly performs calculations and transmits detailed instructions to the mechanical components of the system via the microprocessor.

Applied Color says the system is capable of accurately dispensing quick drying fluids such as inks, high solids paints and textile print pastes. It also handles volatile or corrosive solvents.

Also recently announced by Applied Color Systems Inc. is the international release of a new and updated version of CHROMA-PAC™ V colour control software for paint and coatings manufacturers. The software package is designed for use with ACS Computer Color Control Systems and is available with computerized "teacher files" in English, German, French, Spanish and Portuguese as well as in Scandinavian and Slavic languages.

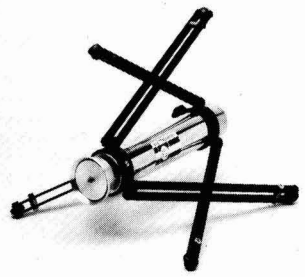
Functions performed by the programs include colour matching and formulation, colour correction, work-off of waste colorants, formula scaling and costing, and colour difference measurement.

The new package is said to provide greatly increased speed, accuracy and efficiency in a wide range of colour related functions. Least cost/most accurate formulations can be generated in just a few seconds through the programs and the ACS colour system's spectrophotometer, the SPECTRO-SENSOR® II. Corrections to laboratory or production formulas can be generated just as quickly. In addition, a large volume of colour standard matching can be performed by the system without operator attendance.

Among the many unique features of CHROMA-PAC™ V are its pigment load calculation options. A user may perform colour matching within a specified pigment load parameter or request a match with minimum load. Where hide characteristics of the final product are of paramount importance, the user may select a specified film thickness and have each formula printed with a predicted contract ratio. He may also specify a contrast ratio and film thickness and have each formula adjusted with a high solids white to meet the contrast ratio.

Reader Enquiry Service No. 40

news



Ravarini Castoldi's internal pipe coater

Internal pipe coater

The Centrifugal Paint Atomizing Unit from Ravarini Castoldi & C spa is a painting device for coating the inner surfaces of pipes of wide diameter, long length and various materials. The unit is suitable for both field and shop use to apply the numerous finishes required by the oil, chemical and energy industries.

Paint is pumped through a flexible hose to the units nozzle inside a rotating bell. The high speed bell is driven by a pneumatic motor within the unit body. The paint is finely atomised by the centrifugal force and is projected radially from the bell edge.

The unit is placed in the pipe to be coated and subsequently moved through it. The paint is sprayed on the return of the machine through the pipe. A six wheel adjustable centring device is provided to align the bell with its axis along the pipe axis.

Reader Enquiry Service No. 41

Goodyear and metal protection

Goodyear's European Chemical Division, well-known to the European paint industry as the supplier of Pliolite for high performance masonry coatings, is now offering Pliolite resins and paint formulas for similarly high quality anticorrosion paints.

Goodyear, banking on more than 25 years experience of manufacture and use of Pliolite resins, charged its paint technical group at its Orsay, France, Technical Centre to develop anticorro-

news

sion applications. The results were new and improved resins, and new formulas for paints that are claimed to have demonstrated excellent results in applications on metallic structures such as bridges, large storage tanks, containers and railway wagons.

Goodyear claims the following advantages for its Pliolite systems over other currently used materials: a higher solids content, non-toxic or very low toxicity solvents, excellent fluidity, and better resistance to many corrosive atmospheres.

Reader Enquiry Service No. 42

Coo-Var's new paint range

Specialist paints for DIY

To meet the demand from the do-it-yourself market for products to match an increased level of public skills, Coo-Var Ltd, the Hull-based paint manufacturer, is launching its successful range of Specialist finishes into DIY outlets.

The extensive range of finishes are available in a wide variety of small attractive pack sizes. Among the range are anti-vandal paint, blackboard black, road line paint, greenhouse paint and yatch varnish.

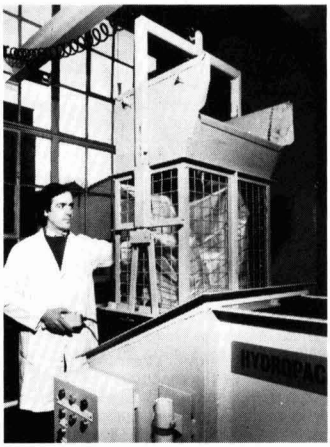
Reader Enquiry Service No. 43

New salt spray cabinet

John Godrich's range of salt spray cabinets has increased with the new Liebisch chest-type cabinets which have capacities of 400 and 1,000 litres. According to John Godrich these cabinets, comforming to the ASTM B117 specification and all known salt spray tests, have all the technology of standard upright front-opening cabinets built into them but are very economically priced.

Standard features include robust internal and external cabinet casings and a salt evacuation system to allow for demisting before the cabinet is opened thus preserving other items of laboratory equipment.

Reader Enquiry Service No. 44



Porous plastic bag of waste paint solids is removed from a Hydropac unit during evaluation trials at Haden Drysys' research and development facility

Waste paint collection system

Economies in capital and installation costs, space and water volume are claimed for a new system for removing waste paint solids from spraybooth wash water. The system, called Hydropac, is based on a flotation cell and was developed by Haden Drysys Ltd.

Hydropac was originally intended to replace the huge, costly and inefficient settling tanks and sludge removal equipment used to remove overspray paint solids from spraybooth wash water in large installations such as car plants.

The new plant is said to be very compact and to have paint solids removal efficiencies as high as 95 per cent, yielding wastes with a 70 per cent solids content, over twice as high as settling tanks.

During operation, wash water is admitted to the base of the Hydropac unit where, under the influence of entrained air from the booth's washer section and from chemical additives, the paint particles agglomerate and float, forming a "raft" on the water surface.

The essentially solids-free water in the Hydropac's sump is continuously recirculated to the booth.

Once sufficient paint waste has accumulated, the water level in the Hydropac is raised and the raft weirs over into a collection bin lined with a porous plastic bag. Once excess water has drained from this, the bag of essentially solid paint may be quickly and cleanly disposed of.

Haden Drysys says Hydropacs could be used to concentrate and collect any water-borne solids which float or can be made to float through aeration or additives.

Reader Enquiry Service No. 45

Insulator/protector of conductive inks

Advanced Coatings & Chemicals of Temple City, California recently introduced a new high solids silk screenable or sprayable polyurethane coating that can be used over silver, nickel or graphite conductive coatings to insulate and protect them. The product is now in use on membrane switches, printed circuit boards etc.

Reader Enquiry Service No. 46

literature

Fine particle technology

A new leaflet entitled "A short course in fine particle technology" is now available from Coulter Electronics Ltd.

The booklet, produced by Micromeritics of Georgia, USA, outlines methods for the characterisation of powders and solid materials, including particle size, surface area, chemisorption, pore size/volume, and density. Also included are certain applications of these methods.

The booklet has been written in an easily understandable, non-technical fashion and is intended as an introduction to the methods and applications of particle technology.

Free copies of the leaflet are available by completing the reader enquiry service form at the back of the *Journal*.

Reader Enquiry Service No. 47

meetings, etc.

OCCA at XVII FATIPEC Congress

Mr A. C. D. Cowley of ICI Organics Division will be presenting a paper entitled "Controlling lead chromes in the workplace" on behalf of OCCA at the XVII FATIPEC Congress. The Congress takes place on 23-28 September 1984 at Lugano in Switzerland.

Further information is available from Hans Kraicinger, Redaktor SVLFC, Lerchenweg 357, CH-5649 Stetten, Switzerland.

people

Mr Mahmood Usman, formerly finance director, has been appointed UK chief executive of Dussek Campbell – part of the Coatings Division of Burmah Speciality Chemicals Limited.

Mr Usman, who is 44, joined the Group in 1960 and is married with two children.

OCCA-35 EXHIBITION 1-3 May 1984

Cunard International Hotel, London

IE INTERNATIONAL FORUM FOR THE SURFACE COATINGS INDUSTRIES

A new concept

Following the successful innovation of the extension of exhibition facilities by the presentation of lectures by exhibitors at the 1982 exhibition, the Exhibition Committee of the Oil & Colour Chemists' Association will welcome suggestions, not only for lectures but also for the showing of films and possibly videos, from exhibitors at OCCA-35 which will take place at the Cunard International Hotel, Hammersmith, London W6, 1-3 May 1984. The Exhibition Committee also encourages exhibitors to organise competitions and other attractions wherever possible.

Theme of the Exhibition

The aim of the Exhibition is the presentation of commercial and technical information relating to raw materials, plant and equipment used in the paint, polymer, printing ink, colour, adhesive and allied industries, both in their manufacture, processing and application.

The Exhibition Committee will be particularly pleased to welcome exhibits from companies relating to the new energy efficient, low-polluting technologies, including powder coatings, high solids coatings, radiation curing, water-based coatings and other developments.

The Committee stresses that it does not require new products only to be shown at the exhibition as there are many developments between exhibitions on existing products and their uses which are of importance and interest to visitors.

International forum – the crowd puller

An analysis of the registration cards completed at the entrance to the 1982 Exhibition showed that visitors to the Exhibition were drawn from the following countries:

Argentina, Australia, Austria, Belgium, Canada, Cyprus, Denmark, Egypt, Eire, Finland, France, East and West

The Cunard International Hotel, Hammersmith, London, venue for OCCA-35, 1-3 May 1984

Germany, Hungary, Iceland, India, Israel, Italy, Japan, Kenya, Libya, Netherlands, New Zealand, Nigeria, Norway, Poland, Portugal, South Africa, Spain, Saudi-Arabia, Sweden, Switzerland, Turkey, United Arab Emirates, Uruguay, USA, Zimbabwe.

Over 13 per cent of visitors completing cards came from overseas and an analysis of cards (both from the UK and overseas) by job function confirmed that the OCCA Exhibition has not only a wide appeal, but is also able to attract the top level of the industries, as follows:

Description	*Percentage*
Director/Owner	16.33
Management	17.82
Section head/group leader	5.10
Chemist/physicist/technologist	19.63
Lab assistant/technician	9.34
Sales and marketing	16.01
Buyers	2.43
Administration/secretarial	4.08
Lecturer/Student	1.33
Other	2.04
Item not completed	5.89
	100.00

It is stressed that the attendance at OCCA exhibitions is an **audited** attendance since the Association completes an Audit Bureau of Circulations Exhibition Data Form, which allows for checks on completed registration cards by independant auditors. Exhibitors at OCCA-34, who were drawn from 11 overseas countries, commented on the very high level of personnel attracted to the exhibition. The percentage analysis of visitors by products manufactured was:

	Percentage
Paints	25.03
Covering and coatings	6.99
Resins	9.89
Pigments and dyes	8.56
Dispersions and solvents	2.83
Inks and graphic materials	6.59
Plastics	1.57
General chemicals	12.95
Other	16.33
Item not completed	9.26
	100.00

One of the great successes of OCCA-34 was the introduction of a lecture series. Exhibitors were offered the facility of talking, showing films, etc. on any topic of their choice – commercial, technical or otherwise. The series proved to be very popular with visitors and exhibitors alike with 16 lectures drawing as many as 70 visitors on occasions

A number of competitions were organised at the last OCCA Exhibition including the one shown above where the percentage of cobalt in a drier solution had to be estimated

The innovation of lectures at OCCA-34 was widely welcomed by both exhibitors and visitors since it allowed exhibitors to give talks on commercial or technical themes in a separate room which could then be discussed further on the stand. Sixteen talks were given at OCCA-34 and some of these attracted attendances as high as 70 visitors. Admission to the lectures is free of charge, but those wishing to attend register for tickets at the Information Centre and this list is made available to the relevant exhibitor. Exhibitors have commented that this was a most useful extension of exhibition facilities in that it allowed them to draw attention by visual aids to particular aspects of research and development which could then be discussed in greater detail on the stand.

It is pointed out that this series of lectures is completely different in concept from the idea of an exhibition organised

in conjunction with a conference on a defined topic and is thus a new concept at the OCCA Exhibition.

Dates and venue

The Cunard Hotel is able to offer exhibitors and visitors a selecton of restaurants, bars, shop facilities and other services. As well as the traditional type of stands, several suites will be available for companies who wish to use that type of facility to exhibit. The main part of the Exhibition will once again be sited in the exhibition hall of the hotel, **which will be carpeted throughout**, and the suites are on the mezzazine floor connecting to the exhibition hall by a short staircase. The lectures will be presented in one of the rooms on the mezzazine floor. In the hall it has been the custom for OCCA Exhibitions to be arranged in a shell scheme which affords an easy method for exhibitors to display their products, but it may be possible for certain areas on this occasion to be made available at a lower charge to some exhibitors for stand space only. There is of course no shell scheme in the suites on the mezzazine floor.

Travel facilities

The Cunard International Hotel is situated near Hammersmith Station on the Piccadilly Underground Line between Heathrow and the centre of London. Visitors from overseas may board the Piccadilly Line at Heathrow Central station in the Airport complex, which will take them direct to Hammersmith Station or to central London where they may be staying. Car parking space at the Hotel will be limited but there is a large NCP Car Park close by in Kings Mall. However, those travelling to the Exhibition by car are advised to leave their vehicles outside central London and to travel to the Hotel by the Underground system.

An example of a very attractive and imaginative layout in one of the mezzanine rooms at the last OCCA Exhibition by Hoechst/RCL/Harco, which was designed with a draw for the Oktoberfest in Munich and, presumably, the parent company's country of origin in mind. This creative approach to exhibiting is often enthusiastically engaged in by exhibitors, always much enjoyed by visitors and a recognised feature of OCCA Exhibitions

Official Guide to the Exhibition

In previous years it has been the practice to issue a separate *Official Guide* to the Exhibition as well as a preview of the Exhibition in the April issue of the Associations' *Journal (JOCCA)*. At OCCA-35 it is intended to extend the preview in the April issue of *JOCCA* to include all the information which had previously been given in the *Official Guide*; exhibitors will be offered special advertising facilities in this issue. Exhibitors will be allowed space in the April issue for a free editorial entry describing their exhibits in exactly the same way as has previously been available in the *Official Guide.*

General

The Association will provide seating areas which in the past have been in constant use for those wishing to talk to acquaintances and to make notes. Visitors to OCCA-34 found these areas of great value. They also commented that the arrangements to discuss technical and commercial problems and to raise points at lectures and to meet colleagues in the supply industries for informal talks were of great value.

Invitations to Exhibit

Invitations to exhibit giving details of the various types of exhibition facilities at OCCA-35 together with an application form will shortly be sent to companies who have shown at previous OCCA Exhibitions. Any organisation which has not previously done so and would like to receive details should write to the Director & Secretary at the address on the contents page.

The standards listed below are available from: The Sales Department, British Standards Institution, Linford Wood, Milton Keynes MK14 6LE, Tel: Milton Keynes (0908) 320033, Tlx: 825777.

bsi news

British Standards

The publications listed below are new and revised British Standards. An existing BSI publication bearing a number identical to one announced below is automatically withdrawn. In all other cases of supersession, details are given in the appropriate announcement and a corresponding entry appears in the "Standards withdrawn" section.

2000:
Methods of test for petroleum and its products
2000: Part 34: 1983 Flash point by Pensky. Martens closed tester 12 page A4 size Gr 6
Identical with IP 34/82 with explanatory notes. Supersedes BS 2839: 1979. ≠ISO 2710. (ISBN 0 580 11916 5)
2000: Part 195: 1983 Distillation range of volatile organic liquids 12 page A4 size Gr 6
Identical with method IP 195/81 with explanatory notes. Supersedes BS 4700: 1971. (ISBN 0 580 11913 0)

3900:
Methods of test for paints
3900: Part H1: 1983 Designation of intensity, quantity and size of common types of defect: general principles and rating schemes [= ISO 4628/1] 4 page A4 size Gr 3
Describes general schemes for assessing the degree of breakdown of a painted surface. Together with Parts H2 and H3 supersedes BS 3900: Part H1: 1980. (ISBN 0 580 13092 4)
3900: Part H2: 1983 Designation of degree of blistering [= ISO 4628/2] 8 page A4 size Gr 5
Presents pictorial standards and reference scales for assessing blistering of paint films. Together with Parts H1 and H3 supersedes BS 3900: Part H1: 1980. (ISBN 0 580 13093 2)
3900: Part H3: 1983 Designation of degree of rusting [= ISO 4628/3] 10 page A4 size Gr 6
Presents pictorial standards and reference scales for assessing rusting of painted

bsi news

steel surfaces. Together with Parts H1 and H2 supersedes BS 3900: Part H1: 1980. (ISBN 0 580 13094 0)
3900: Part H4: 1983 Designation of degree of cracking [= ISO 4628/4] 6 page A4 size Gr 5
Presents pictorial standards and reference scales for assessing cracking of paint films. No current standard is superseded. (ISBN 0 580 13095 9)
3900: Part H5: 1983 Designation of degree of flaking [= ISO 4628/5] 6 page A4 size Gr 5
Presents pictorial standards and reference scales for assessing flaking of paint films. No current standard is superseded. (ISBN 0 580 13096 7)

Draft for Development

DD88: 1983
Method for the assessment of pot life of non-flowing resin compositions for use in civil engineering 4 page A4 size Gr 3
Describes a method for the assessment of the pot life of a filled resin composition in order to determine the effective working life of the product. No current standard is superseded. (ISBN 0 580 11936 X)

Proposed for confirmation

3900:
Methods of test for paints
3900: Part C2: 1971 Surface drying test (Ballotini method)
3900: Part E4: 1976 Cupping test
3900: Part E10: 1979 Pull-off test for adhesion

AU 148:
Methods of test for motor vehicle paints
AU 148: Part 2: 1969 Resistance to continuous salt spray
AU 148: Part 3: 1969 Flexibility and adhesion
AU 148: Part 4: 1969 Resistance to abrasion
AU 148: Part 5: 1969 Gloss measurement
AU 148: Part 6: 1969 Hardness
AU 148: Part 9: 1969 Resistance to dry heat
AU 148: Part 10: 1969 Resistance to heat and corrosion
AU 148: Part 11: 1969 Resistance to blistering
AU 148: Part 12: 1969 Resistance to accelerated weathering
AU 148: Part 13: 1969 Resistance to deterioration by contact with other materials
AU 148: Part 14: 1969 Resistance to outdoor exposure
AU 148: Part 15: 1969 Resistance to chipping

Standards withdrawn

3900:
Methods of test for paints
3900: Part H1: 1980 Designation of quantity and size of common types of defect: general principles and pictorial scales for blistering and rusting
Superseded by BS 3900: Parts H1, H2 and H3: 1983

Proposed for withdrawal

3900:
Methods of test for paints
3900: Part E9: 1976 Buchholz indentation test. Obsolete
Framework for colour co-ordination for building purposes: Colour matching fan
Will amend BS 5252 F

Draft British Standards for public comment

83/51583 DC Laboratory glassware – Test tubes (ISO/DIS 4142.2)
Borates and crude sodium borates for industrial use. Part 29 Determination of total and alkali-soluble calcium and magnesium contents of crude sodium borates, titrimetric method (ISO/DIS 6920)

83/51659 DC Specification for ethanol for industrial use (Revision of BS 507: 1966)

83/51660 DC Specification for industrial methylated spirits (Revision of BS 3591: 1963)

83/51903 DC Methods for sampling raw materials for paint and varnishes (Revision of BS 4726: 1971) (ISO/DIS 842)

83/52141 DC Methods of test for boric acid, boric oxide, disodium tetraborates, sodium perborates and crude sodium borates for industrial use. Part 28. Determinations of total and alkali-soluble calcium and magnesium contents, flame atomic absorption spectrometric method (ISO/DIS 6918)

Revised ISO Standards

ISO 787: 1983
General methods of test for pigments and extenders
ISO 787/18: 1983 Determination of residue on sieve – Mechanical flushing procedure 4 page C
To be implemented as Part B4 of BS 3483

occa news

Information regarding membership of OCCA is obtainable from the Association's offices, see contents page for address.

West Riding Section

Annual general meeting

The AGM of the West Riding Section was held on 12 April 1983 at the Mansion Hotel, Leeds.

During the formal part of the meeting, the retiring Chairman, Mr R. A. C. Chappell, gave his review of the past session. He went on to thank the members for their support both at lecture meetings and social functions.

The formalities over, Mr Phil Proudley, a Section committee member, gave a fascinating talk and slide show on his experiences whilst in Angola.

The evening was rounded off with an excellent buffet supper.

D. V. Maltman

Midlands Section

Rocks, minerals, fossils and gemstones

The annual Newton Friend lecture of the Midlands Section was held this year at the Clarendon Suite, Stirling Road, Edgbaston, Birmingham on Thursday 24 March. After a very pleasant meal, members, guests and their ladies heard Mr B. W. Gamston of the West Midlands Mineral and Mining Society give a talk entitled "Rocks, minerals, fossils and gemstones".

The speaker said that the collecting of rocks and minerals was one of today's fastest growing hobbies. Rocks can be broadly divided into three groups:

1. Sedimentary rocks

These are rocks that are built up in layers, such as sandstone, coal, limestone and rock salt.

2. Metamorphic rock

Here the rocks are formed from other rocks by a change in state usually caused by heat or pressure or both. Examples of these are limestone changing to marble, coal to graphite, and sandstone to quartzite.

3. Igneous rocks

These rocks are formed by crystallisation, many are very fine crystal forms of calcite.

Mr Gamston passed round many examples of these rocks for the audience to examine. Regarding gemstones he said that many of these were derived from

quartz and, as found, were not very valuable; it is the art of cutting, polishing and finding flawless specimens that makes them valuable.

To conclude the talk the speaker showed that when rocks containing certain crystals are viewed under UV light they become fluorescent. Other rocks emit radiation which can be detected by a Geiger counter.

A lively question time followed Mr Gamston's talk, and the meeting finally closed with a vote of thanks proposed by Mrs B. Kimber, which was warmly endorsed by the audience.

B. E. Myatt

news of members

Dr F. M. Smith retires

Dr Francis Smith, technical director for many years of the Pigments Division of Ciba Geigy Plastics and Additives Company, retired at the end of 1982 after 34 years with the company.

Dr Smith joined James Anderson and Co. (Colours) Ltd in Glasgow in 1948 as a research chemist and in 1953 moved to the Geigy Company in Rhodes, North Manchester as a technical liaison officer assisting the sales manager.

This was at the beginning of a phenomenal ten year growth period, and in the early 1960s he was heavily involved, in conjunction with colleagues from Basle, in securing significant sales of new technology dispersible pigments in export markets.

Dr Smith was President of the Paint Research Association (1975-78), President of OCCA (1979-81) and is a Fellow of the Royal Society of Chemistry, the Society of Dyers and Colourists and a Fellow in the Technology of Surface Coatings (OCCA).

Dr Smith remains very active in retirement. He is involved in lecturing and politics and is also working with a new ventures management company.

★ ★ ★

C. J. Williamson

As part of a planned programme of expansion and development, Foscolor Ltd, the north-west-based manufacturer of dispersions and colorants, has announced the appointment of Colin J. Williamson to the post of sales director.

This is a new appointment created to further strengthen and improve customer service, which coincides with the implementation of expansion planned for production.

Colin was brought up in Worsley, not far from Foscolor, and studied at Manchester University. His early working life involved the study of natural polymers in the brewing industry but he has spent the last 14 years in colorants and additives for plastics. Most recently he has been export sales manager for a major masterbatch producer and is currently chairman of the colorants sector and council member of the British Plastics Federation, as well as being a member of OCCA.

★ ★ ★

occa news

Ontario Section

Dinner dance a resounding success

Members and friends enjoyed an exceptionally fine evening on 19 February on the occasion of the seventh annual dinner dance.

The event was held in the traditional Humber Room of the Old Mill Inn in Toronto. The excellent arrangements were made by Bob Purnell, assisted by Iris and a small committee. Mr Purnell also performed most ably as master of ceremonies.

Dance music was provided by Dan Clarke from a seemingly limitless repertoire of new and old favourites.

The Section is indebted to the more than 30 firms whose generous contributions provided an impressive selection of prizes for the draws and spot dances.

J. F. Ambury

Participants surrender to boogie fever at the Ontario Section dinner dance held at the Old Mill Inn

Members of the executive and committee of the Ontario Section at the annual dinner dance

Obituary

J. D. W. Davidson

Jack Davidson died on 4 December 1982 – his 67th birthday. With him went more than one era of paintmaking in Scotland and further afield.

He was born in Burnside, on the outskirts of Glasgow, and had his early schooling at nearby Rutherglen Academy. Latterly, he transferred to Allan Glen's School in Glasgow, an establishment noted for its strong leaning towards the teaching of science. His association with "Glen's" was a lasting one. In due course he joined the Old Boys Club and, with some sense of inevitability, served as president of the club. His further education was pursued at the Royal Technical College, now Strathclyde University.

It was natural that on leaving school he should join Williamson, Morton & Co Ltd, the long established Glasgow paint manufacturing company, where his father was eventually to become managing director. To all intents and purposes he remained with the company throughout his working life, seeing first the merger which produced Federated Paints Ltd, and the further one with P & W MacLellan Ltd. Throughout all of these changes his loyalty was absolute. He was a director of the various companies for many years and was deputy managing director when he retired. Even at this level, however, it is probably true to say that he was happiest in a set of overalls coaxing co-operation from a piece of

occa news

recalcitrant paint machinery. His knowledge of the paintmaking process was extensive and this he carried through into his retirement when he acted in Scotland on behalf of Mastermix Engineering Ltd.

His interest in the professional aspects of the industry extended well beyond the company itself. The Institute of Works Managers, the Institute of Corrosion Technology and the Institute of Plant Engineers all came within his orbit, and he was a Fellow of each of them. He had long-standing ties with the Paintmakers Association and served for a number of years on both the Packaging Committee and the Statistical Committee. But, in this area, there is no doubt that OCCA was his first love. He was a founding member of the Scottish Section and served it loyally throughout his life – as a member of committee on several occasions, as Auditor and, eventually, as Chairman in 1976-78. He had been working on the history of the section, in view of its jubilee in 1985, and it is a sad turn of fate that he did not live to join in the celebration of an event to which he looked forward to so much. He served on Council as a representative member from 1974 to 1978 and as an elective member from 1978 to 1980, and was a valued member of the Professional Grade Committee from 1976 till 1982. He was one of the all too few FTSCs in Scotland, and when Council presented him with the Commendation Award in 1980, it was a fitting tribute from a body which he had served quietly and unassumingly for well nigh 50 years and one of which he was intensely proud.

Outside the coatings industry, and after his family, his church undoubtedly came first. He was a member of Burnside Church of Scotland, where he had been a ruling elder for 30 years: he was also a member of the Congregational Board and Property Convener, where his business and industrial experience proved invaluable. He was deeply interested in the Youth Fellowship and, in association with one of his oldest friends, spent many happy years assisting with the annual "show". Here it was that one of his more unexpected talents came to light: he was an accomplished drummer with his own complete set of equipment and quite apart from the Youth Fellowship, played with a number of different groups, some of them semi-professional. Even an occasional Scottish Section social evening had reason to be grateful to him.

The Boy Scout movement was another of his abiding interests. He was a member, in a variety of capacities, for the best part of 50 years serving, eventually, as District Commissioner and as President of the local Association. His distinguished service to the movement earned him the coveted Silver Acorn Award in 1982. He was a member of Glasgow Rotary, attending meetings regularly, and also served on the committee of the Burn's Homes in Mauchline. Jack's industrial activities were interrupted by war-time service. His initial efforts were, perhaps, somewhat abortive – he volunteered at a very early stage only to find himself suddenly back home in a reserved occupation! Undeterred, he spent his time serving with the Clyde River Patrol. He joined the RAF in 1943 and served with them till 1946 as signals and communications officer. His intimate knowledge of radio was not jettisoned when he returned to civilian life: indeed, it produced yet another of his unlikely accomplishments – he was a fully accredited radio "ham" with a loft full of sophisticated equipment.

Jack did, eventually, retire – sort of! But this was less a cessation of work than a reorientation of interests. His association with Mastermix enabled him to maintain a contact with the industry to which he had contributed so much. An active member of the British Legion for many years, he now took a special interest in its local Sheltered Housing and spent a lot of his time overseeing its finance and maintenance. Even in retirement, he seemed to have this special dispensation which stretched a 24 hour day to half as long again.

Such was the breadth of Jack's interests that a brief appreciation of him cannot escape the danger of looking perilously like a mere catalogue of activities and of doing less than adequate justice to a very real person who was warm, kindly and, above all, unassuming. Jack never just joined anything: membership of an organisation meant working for it – wholeheartedly. More than that, it meant working for others. He did everything effectively; but it was so much his nature to do things quietly and unobtrusively that it is doubtful if even his closest associates knew half of what was going on. His loyalty was absolute and never more so than to his family, which was the centre of everything for him.

It is given to some that they seem to touch and enrich life at one or two specific points. Jack Davidson touched life full-circle and everything he touched was the better for it.

A. McL

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professional grade

At the meeting of the Professional Grade Committee held on 20 April 1983, the Committee authorised the following (sections shown in italics):

Transfer from Associate to Fellow

Martin, Christian Pierre *(General Overseas – France)*
Stretton, Elizabeth *(Manchester)*

Admitted as Fellows

Goyal, Ramkumar Bhanwarlal *(General Overseas – India)*
Robson, Gordon Reginald *(Manchester)*
Tate, Donald Howarth *(Newcastle)*

Admitted as Associate

Calderbank, John Thomas *(Manchester)*

new members

The section to which each new member is attached is shown below in italics.

Ordinary Members

Benton, C. J., BSc *(Midlands)*
Billington, I. C. *(Auckland)*
Catherall, P. W., BSc *(Manchester)*
Coyle, A. M., BSc, PhD *(Manchester)*
Crook, F., BSc *(Wellington)*
Daffern, D., BSc *(Ontario)*
Esguerra, T., BSc *(Ontario)*
Göthe, S., PhD *(General Overseas – Sweden)*
Green, P., BSc *(Natal)*
Howson, K., LRSC *(Manchester)*
Hurst, J. T., LRSC *(London)*
Jecks, B. W., BSc *(Auckland)*
Kapetanidi, N. *(General Overseas – Greece)*
Karunaratne, T., BSc *(General Overseas – Sri Lanka)*
Lomax, R. C., BSc *(Cape)*
Marlow, B. *(Wellington)*
Masefield, A. J., BSc *(Natal)*
Millar, D. E., MS, MSc *(Wellington)*
Mogensen, H., BSc *(General Overseas – Denmark)*
Osten, K., BSc *(Wellington)*
Patel, M. C. B., BSc *(General Overseas – Kenya)*
Pratt, D. E. *(Ontario)*
Rapp, A. I., BSc *(General Overseas – USA)*
Stock, D. *(Ontario)*
Zapfe, H. *(Ontario)*

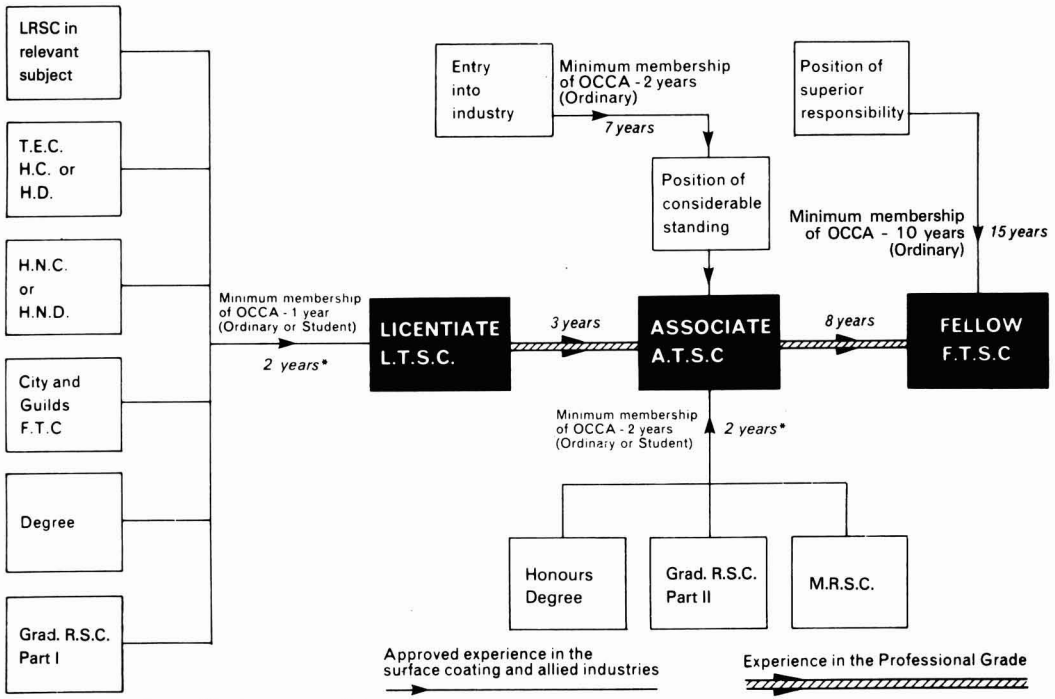
Associate Members

Anastassopoulos, G. *(Transvaal)*
Becker, M. *(Auckland)*
Brown, F. G. *(Midlands)*
Campbell, I. G. *(Wellington)*
Farry, J. J., BA *(Wellington)*
Ferrier, D. *(Wellington)*
Hall, M. F. *(Auckland)*
Hope, A. J., BA *(Wellington)*
Johnson, F. M. N. *(Natal)*
Nightingale, B. W. *(Wellington)*
Rees, A. E. *(Wellington)*
Roberts, D. E. *(Wellington)*
Taylor, H. R. *(Natal)*

Optional Professional Grade for Ordinary Members

Routes to the Professional Grades

The innovation of the Professional Grade has proved to be most successful, as evidenced by the impressive list of names in the December issue of the *Journal*. For the convenience of potential applicants, a chart indicating different routes to the various grades is shown below.



*Not necessarily after qualification – see regulations.
Note: At present there is no restriction on Students up to 21; between 21 and 25 a certificate from the employer or college confirming the course being taken is required.

Regulations for admission to the Professional Grade – Amended February 1981

A. Licentiate

1. Shall be an Ordinary Member of the Association and have been an Ordinary Member or Registered Student of the Association for not less than one year.

2. Shall have attained the age of 22.

3. (a) Shall be a Licentiate of the Royal Society of Chemistry in Coatings Technology or another relevant subject, such as advanced analytical chemistry, colour chemistry or polymer science.

OR (b) Shall have passed the Higher Certificate or Higher Diploma of the Technician Education Council in Coatings Technology or other relevant subjects (or equivalent SCOTEC qualification).

OR (c) Shall have passed Higher National Certificate or Higher National Diploma in a relevant subject (or equivalent SCOTEC qualification).

OR (d) Shall hold the Full Technological Certificate of the City and Guilds of London Institute in a relevant subject.

OR (e) Shall be a graduate in a relevant subject.

OR (f) Shall have passed Part I of the examination for the Graduateship of the Royal Society of Chemistry or Council of Physics.

OR (g) Shall have passed such other qualifications as approved by the Professional Grade Commitee from time to time.

4. Shall have attained approved experience in the science or technology of coatings. It is not expected that sufficient experience would be gained in a period of less than two years in the industry. Approved experience may be gained before, during or after the qualifications in paragraph (3) above have been attained.

5. Shall be required to satisfy the Professional Grade Committee, or some other body approved by the professional Grade Committee in a *viva voce* examination and submit written evidence on a subject directly associated with the science and technology of Surface Coatings or allied materials previously approved by the Professional Grade Committee.

6. Shall normally be sponsored by three Ordinary Members of the Association in the Professional Grade (either Associate or Fellow at least one of whom is a Fellow). A sponsor will usually be a person who has knowledge of the career of the applicant. The candidate shall be in a position to furnish the name of a referee acceptable to the Committee, who can be contacted in confidence, if required. The referee will have a full knowledge of the candidate's technical and scientific achievements to date and could be the applicants employer.

7. Shall have paid the fee stipulated by the Council and have paid the current subscription payable by an Ordinary Member.

B. Associate, being already a Licentiate

1. Shall, since his election to the Licentiateship, have practised the science or technology of coatings for not less than three years.

Note: For the sake of simplicity, reference is made only to UK examinations etc., but equivalent qualifications overseas will naturally be accepted.

2. Shall provide evidence acceptable to the Professional Grade Committee of his increased professional skill and maturity since his election as a Licentiate.

3. Shall have published work which, in the opinion of the Professional Grade Committee, is of a sufficiently high standard OR may be required to submit a thesis or dissertation on a topic previously approved by the Professional Grade Committee OR shall hold the City & Guilds of London Institute Insignia Award.

4. MAY be required to satisfy the Professional Grade Committee or some other body as approved by the Professional Grade Committee in a *viva voce* examination.

   The nomination of a referee for a *viva voce* examination will normally be for those whose work could be of a highly confidential nature or for overseas candidates.

5. Shall normally be sponsored by three Ordinary Members of the Association in the professional grade (either Associate or Fellow) at least one of whom must be a Fellow.

   A sponsor will usually be a person who has knowledge of the career of the candidate. The candidate should be in a position to furnish the name of a referee acceptable to the Committee, who can be contacted in confidence if required. The referee will have a full knowledge of the candidate's technical and scientific achievements to date and could be the applicant's employer.

6. Shall have paid the fee stipulated by Council and have paid the current subscription payable by an Ordinary Member.

C. Associate, not already a Licentiate

EITHER

1. Shall be not less than 24 years of age.

2. Shall be an Ordinary Member of the Association and have been an Ordinary Member or Registered Student of the Association for not less than two years.

3. Shall hold the Graduateship of the Royal Society of Chemistry or Council of Physics or a University or Council of National Academic Awards degree recognised by the Royal Society of Chemistry or Institute of Physics as giving full exemption from the Graduateship examination.

4. Shall have attained approved experience in the science or technology of coatings. It is not expected that sufficient experience would be gained in a period of less than two years in the industry. Approved experience may be gained before, during or after the qualifications in paragraph (3) above have been attained.

5. Shall normally be required to satisfy the Professional Grade Committee or some other body approved by the Professional Grade Committee in a *viva voce* examination.

   The nomination of a referee for the *viva voce* examination will normally be for those whose work may be of a highly confidential nature or for overseas candidates.

6. Shall normally be sponsored by three Ordinary Members of the Association in the Professional Grade (either Associate or Fellow) at least one of whom must be a Fellow.

   A sponsor will usually be a person who has knowledge of the career of the candidate. The candidate must be in a position to furnish the name of a referee acceptable to the Committee, who can be contacted in confidence if required. The referee will have full knowledge of the candidates technical and scientific achievements and could be the applicant's employer.

7. Shall have paid the fee stipulated by Council and have paid the current subscription payable by an Ordinary Member.

OR

8. Shall be not less than 30 years of age.

9. Shall be an Ordinary Member of the Association and have been an Ordinary Member of the Association for not less than two years.

10. Shall have been engaged in practising the science or technology of coatings for not less than seven years and shall have attained a position of considerable standing in the industry, with appropriate responsibility for technical and scientific matters within the company.

    It would be helpful if he had contributed to the knowledge and understanding of surface coatings technology by lecturing or by the publication of articles. He will also have shown himself to take a keen interest in the work of the Association by being an active member of his Section and by attendance at lectures etc., whenever and wherever possible.

11. Shall normally be required to satisfy the Professional Grade Committee in *viva voce* examination of his professional competence and also be required to submit a dissertation on a subject agreed by the Committee. In cases where the subject is of a highly confidential nature the use of a referee agreeable to the Committee may be asked to examine the dissertation.

12. Shall normally be sponsored by three Ordinary Members of the Association in the Professional Grade (either Associate or Fellow) at least one of whom must be a Fellow.

    A sponsor will usually be a person who has knowledge of the career of the candidate. The candidate must also be in a position to furnish the name of a referee acceptable to the Committee who can be contacted in confidence, if required. The referee will have a full knowledge of the candidate's technical and scientific achievement and could be the candidate's employer.

13. Shall have paid the fee stipulated by the Council and have paid the current subscription payable by an Ordinary Member.

D. Fellow

Note: This is the senior award of the professional grade. The Professional Grade Committee will require substantial evidence of professional maturity in the science or technology of coatings although commercial experience will be taken into account in assessing the merits of candidates.

1. Shall be not less than 33 years of age.

2. Shall have been an Ordinary Member of the Association for not less than ten years.

3. Shall have made outstanding contributions to the science and technology of coatings or reached a position of eminence in the industry **through the practice thereof**.

4. EITHER (a) shall have been an Associate of the Professional Grade for at least eight years and shown continued development.

   OR (b) shall have not less than fifteen years' experience in the science and technology of coatings in a position of superior responsibility.

5. Shall submit, with the application, an account of experience, with due reference to scientific and technological interests, achievements and publications.

6. Shall normally be sponsored by three Ordinary Members of the Association in the professional grade, all of whom must be Fellows, (who should submit a supporting commentary to the Professional Grade Committee).

7. It would be helpful if he had contributed to the knowledge and understanding of surface coatings technology by lecturing or by the publication of articles. He will also have shown himself to take a keen interest in the work of the Association by being an active member of his Section and by attendance at lectures etc., whenever and wherever possible.

8. Shall have paid the fee stipulated by the Council and have paid the current subscription payable by an Ordinary Member.

The fees payable with the application are as follows:

Fellow–£10.00 Associate–£6.00
Licentiate–£3.00
(Plus VAT at standard rate).

Application

Completed application forms should be returned, together with the appropriate remittance, to the Director & Secretary at the Association's offices (except in the case of those Members attached to the Cape, Natal, Transvaal, Wellington, Auckland and Ontario Sections, who should address their forms to their Section Hon. Secretaries).

The Committee wishes it to be known that members rejoining the Association after a period in other industries may include length of service as an Ordinary Member before their resignation as part of the qualifying periods for entry into the Grade.

Students wishing to apply for entry into the Professional Grade must first make application in writing for upgrading to Ordinary Membership, giving the reasons for their eligibility for such regrading. Applications, together with the appropriate remittance, should be addressed as for application for admission to the Professional Grade.

Potential applicants are recommended to give the fullest possible details of their appointments, including the number and type of staff under their control, and indicating to whom the applicant is responsible, as this aids the committee considerably in its deliberations.

INDEX TO ADVERTISERS

Further information on any of the products advertised in this Journal may be obtained by completing the Reader Enquiry Service form. The Reader Enquiry Service numbers are shown in brackets below.

CLASSIFIED ADVERTISEMENTS

RECONDITIONED EQUIPMENT

APPEALS

CLASSIFIED ADVERTISEMENTS

Classified advertisement rates: £6 per single column cm, £70 per quarter page, £125 per half page, £230 per full page. Cost of a box number is £2. Copy date: copy is normally accepted until the 15th of the month preceding publication, though it is usually possible to extend this deadline. *JOCCA* is published EVERY month. Orders and enquiries should be directed to Derrick Buddles, Assistant Editor, OCCA, Priory House, 967 Harrow Road, Wembley, Middlesex HA0 2SF. Tel: 01-908 1086, Telex: 922670 (OCCA G).

APPOINTMENTS

Graduate Chemist

Fire Retardants Specialist

Hickson's Timber Products Limited are a highly successful international company specialising in timber preservatives and associated chemical compounds.

We're now looking for a graduate chemist, aged 25–35, with experience in fire testing methods and standards – a specialist who can take on responsibility for formulating fire retardants for timber.

We aim to strengthen our expertise in order to support our business in this important market. As such, the man or woman appointed should be capable of working independently and be able to understand the commercial implications of technical development.

An attractive salary is offered and benefits include assistance with relocation expenses.

Applicants should write or telephone for an application form to: Mr C. R. Turner, Personnel Manager, Hickson's Timber Products Limited, Castleford, West Yorkshire. WF10 2JT. Tel: Castleford (0977) 556565.

HICKSON

EXPERIENCED PAINT TECHNOLOGIST

Paint Manufacturer in the Middle East is seeking a Paint Technologist for its expanding Development and Process Division.

Management skills, coupled with a knowledge of research in polymer chemistry are essential.

Previous overseas experience would be an advantage.

Salary according to experience and qualifications which will ideally be to BSc or equivalent level. Professional grading in OCCA will be a strong recommendation.

Apply in writing with detailed C.V. to:

dh

David Hawksworth Consultants

43 Poole Road Bournemouth BH4 9DN

SITUATIONS WANTED

Position of Responsibility Sought

Industrial chemist (MSc, CChem, MRSC, ATSC) and member seeks position of responsibility with supplier or user of raw materials of Paint, Surface Coatings, Ink and Allied Industries.

Reply in confidence to **Box No. 528**

Overseas Managerial Position Sought

Paint chemist (ATSC) with 25 years experience in formulation, production etc., seeks overseas managerial position.

Please reply in confidence to **Box No. 529**

Printing inks. Qualified chemist, mid-fifties seeks employment. Any opportunity including sales and service considered. **Box No. 534**

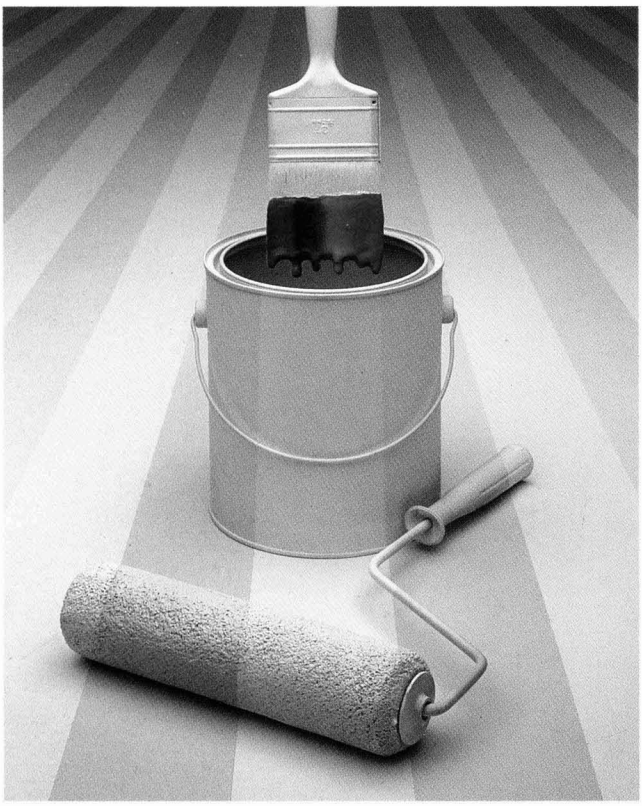
MISCELLANEOUS

TRANSLATIONS:

FRENCH/ITALIAN INTO ENGLISH. ADVERTISER WELL EXPERIENCED IN COATINGS. SEND S.A.E. WITH TEXT FOR QUOTE.

STRICTEST CONFIDENCE

Box No. 532



Formulating paint to get just the surface characteristics you want is no easy task. And once you have your formula, variations in the ingredients can't be tolerated.

As the world's largest supplier of diatomite functional fillers to the coating industry, Manville produces a number of Celite grades to give you the exact control you need.

But we don't stop there. With over 50 years' experience in the industry, we know how important consistency is to you. So whether it's for emulsion or solvent coating, the Celite grade you call for is the Celite grade you get. Always consistent.

When you need high quality extenders and flatting agents for uniform gloss and sheen control in your coating formulation, specify Celite. It's consistent bag after bag.

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391 Richmond Road
Twickenham, Middlesex TW1 2EQ
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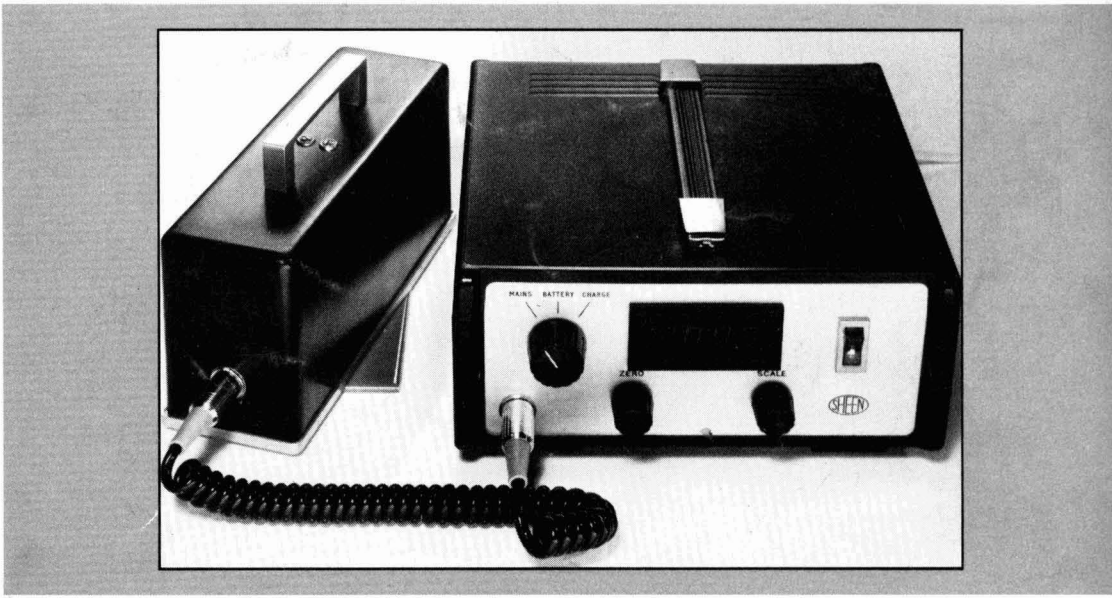
Tlx: 928 635

Control gloss and sheen with Celite® fillers.

Consistent— bag after bag after bag.

Manville

Reader Enquiry Service No. 219

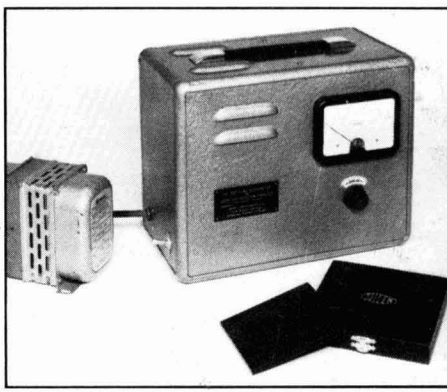


Sheen 150 glossmeter for use on mains or battery with interchangeable glossheads. Conforms to ASTM/BS ISO specifications.

NEW GLOSSMETERS FOR OLD!

Sheen Instruments is offering a 150 portable glossmeter, plus choice of one glosshead, in part exchange for an old analogue model.

An allowance of £200 (no matter what the condition) will be given off the price of the new 150 glossmeter and head.



Old bench glossmeter with constan voltage transformer

Offer is open until 30 September 1983

PHONE OR WRITE TODAY:

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Richmond, Surrey TW9 2JL.
Tel: 01-940 0233 and 1717.

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