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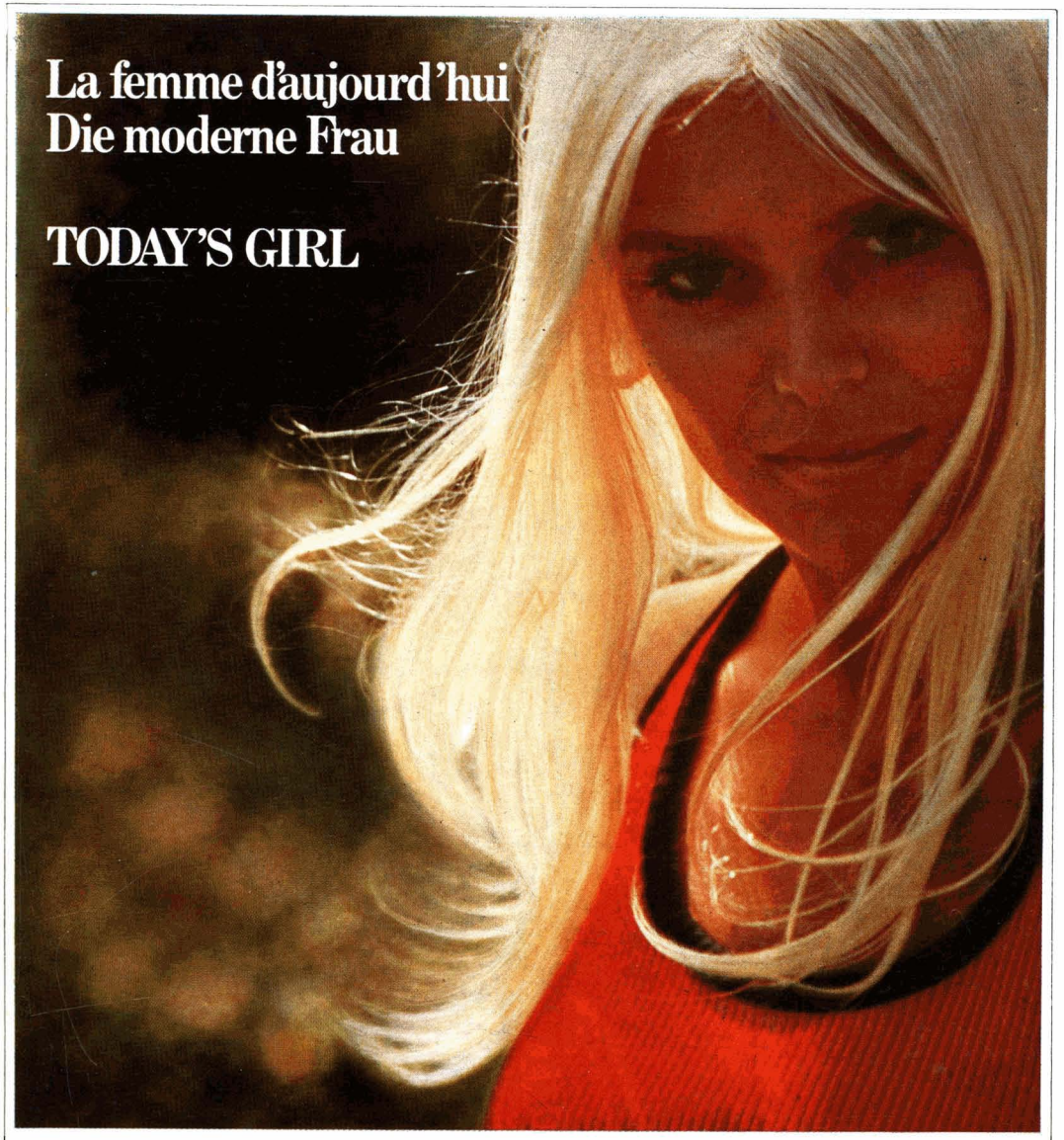

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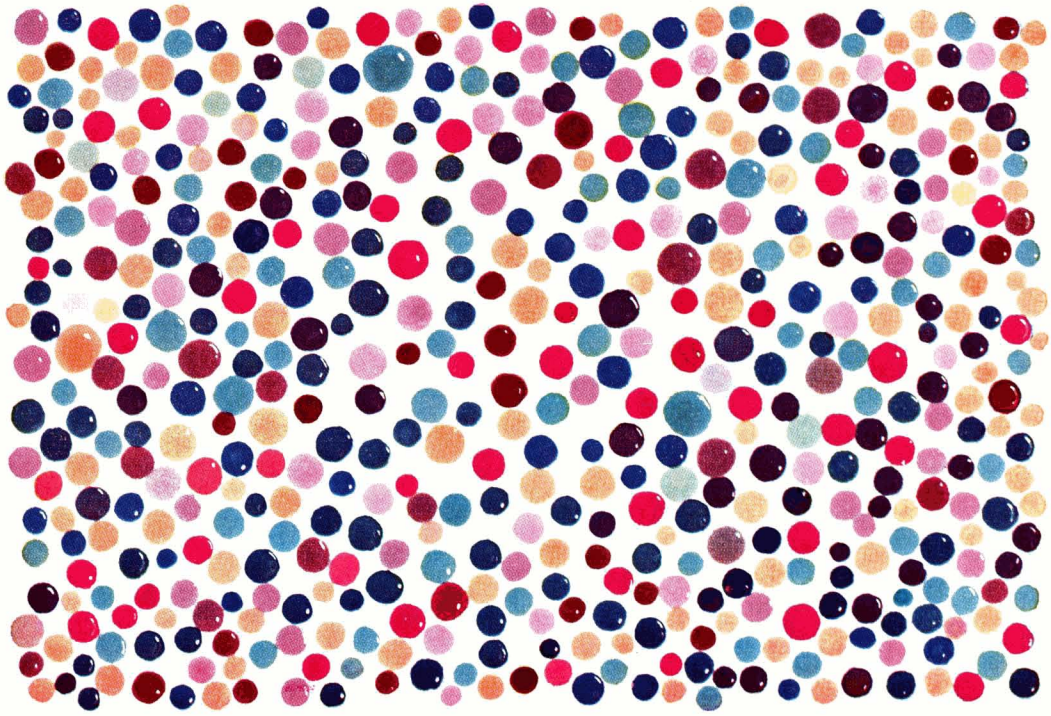

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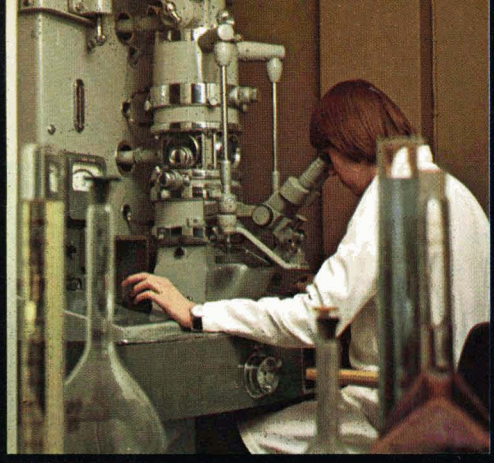

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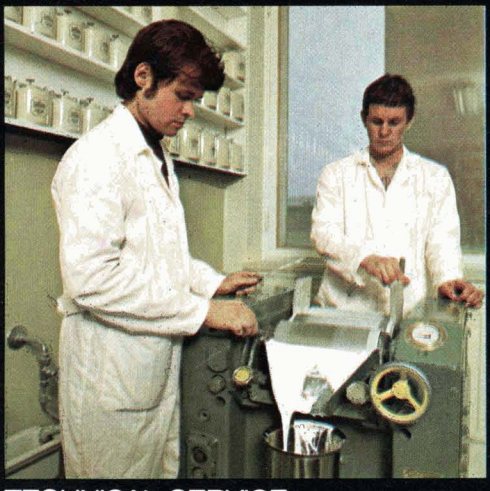

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Contents **Vol. 57 No. 6** **June 1974**

Transactions and Communications

Owing to the illness of the translator, the papers published in this issue do not include translations of the summaries in Russian.

В виду болезни переводчика нет возможности публиковать выдержки статей на русском языке.

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Transactions and Communications

Gas chromatographic analysis of the carboxylic acid components of alkyd resins*

By W. Mazurek and G. C. Smith

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Summary

Methyl esters formed from the reaction of the transesterifying reagents hydrogen chloride/methanol (HCl/MeOH), boron trifluoride/methanol (BF_3/MeOH) and lithium methoxide/methanol (LiOMe/MeOH) with alkyd resins have been analysed by gas chromatography. Satisfactory separation of the components has been achieved by the use of two complementary columns containing diethyleneglycol succinate and Carbowax 20M as the liquid phases.

Of the three reagents used, LiOMe/MeOH was found to be the most reactive. However, none of the reagents was found entirely satisfactory for quantitative determination of the phthalic acid content of alkyd resins. The fatty acid determinations were more reliable and the vegetable oils used in the manufacture of the resins could, consequently, be easily characterised. Variations in the fatty acid distribution between a long oil length linseed alkyd and a medium oil length linseed alkyd were found to be significant. This is attributed to the two different processes used in the manufacture of these resins.

Keywords

Raw materials—binders: resins, etc
alkyd resin

—used in the manufacture or synthesis of ingredients for coatings
fatty acid

Processes and methods primarily associated with analysis, measurement or testing
gas chromatography

L'Analysè chromatographique des composants aux acides carboxyliques des résines alkydes

Résumé

A l'aide de la chromatographie en phase gazeuse on a analysé les esters méthyliques formés par la réaction entre des résines alkydes et les réagents de transesterification suivants: le chlorure d'hydrogène/méthanol (HCl/MeOH); le trifluoride de bore/méthanol (BF_3/MeOH); et le méthoxyde de lithium/méthanol (LiOMe/MeOH). On a effectué une séparation convenable des composants au moyen de deux colonnes en séries contenant du succinate de diéthylèneglycol et du Carbowax 20M en tant que les phases liquides.

Le mélange LiOMe/MeOH se trouve le plus réactif parmi les trois réagents utilisés. Toutfois, aucun réagent ne se démontre complètement satisfaisant lors de la détermination quantitative de la teneur en acide phtallique des résines alkydes. Les déterminations des acides gras étaient plus fiables, et par conséquent, on pouvait caractériser facilement les huiles végétales dont on se sert pour la fabrication de résines. Les différences à l'égard de la repartition de l'acide gras mis en évidence par une résine alkyde longue en huile de lin d'une part, et par une résine alkyde de moyenne longueur en huile de lin se sont révélées d'une certaine significance. On l'attribue aux deux procédés différents utilisés pour fabriquer ces résines.

Gaschromatografische Analyse der Karboxylsäurekomponenten von Alkydharzen

Zusammenfassung

Methylester, die sich bei der Trans-Veresterungsreaktion Chlorwasserstoff/Methanol (HCL/MeOH), Bortrifluorid/Methanol (Li O Me/Me OH) mit Alkydharzen bilden, wurden mittels Gaschromatografie analysiert. Bei Verwendung zweier komplementärer, Diäthylenglycolsuccinat und Karbowax 2 OM als flüssige Phase enthaltenden Kolonnen war es möglich, die Komponenten zufriedenstellend zu trennen.

Von den drei benutzten Reagenzien wurde Li O Me/Me OH als am reaktivten befunden. Keines der Reagenzien wurde jedoch als für die quantitative Bestimmung des Phthalsäuregehaltes von Alkydharzen völlig befriedigend befunden. Die Fettsäurebestimmungen waren jedoch verlässlicher, und infolgedessen konnten die für die Herstellung von Harzen angewandten pflanzlichen Öle ohne Mühe charakterisiert werden. Variationen in der Distribution der Fettsäure zwischen einem langöligen und einem mittelöligen Lemölalkyd wurden als bedeutsam festgestellt. Dies wird den beiden verschiedenen in der Fabrikation dieser Harze verwendeten Herstellungsprozessen zugeschrieben.

Introduction

Ref. 1

In spite of the fact that alkyd resins were introduced some 45 years ago they are still the most widely used synthetic paint resins. In Australia, for the year 1968-69, alkyd resins constituted two-thirds of the total paint resin production.[1] This may be attributed to the low cost and the suitability of the alkyd resin for modification by physical or chemical blending.

Alkyd resins consist of a back-bone of an aromatic dicarboxylic acid (e.g. *o*-phthalic acid) esterified with a polyhydric alcohol (e.g. glycerol) to which fatty acids are joined at the remaining hydroxyl sites. The performance of alkyds as paint resins is largely dependent upon the nature and the concentration of the unsaturated fatty acid esters present. Various commercially available vegetable oils such as linseed, soya bean, safflower and sunflower are used in alkyd manufacture (see Appendix B). These oils contain the fatty acids, palmitic, stearic, oleic, linoleic and linolenic in the form of triglycerides. The last three of these acids contain, in turn,

*This paper was issued as Technical Note 302 of Defence Standards Laboratories. It is published by kind permission of the Chief Superintendent.

one, two and three olefinic double bonds (sites of unsaturation). On exposure to oxygen the molecular chains crosslink and this results in the "drying" of the paint film.

In the formulation of an alkyd, a number of factors need to be considered which determine the type and quantity of vegetable oil used. For example, the concentration of polyenoic acids in the alkyd determines the drying time. However, an increase in their concentration renders the resin more prone to yellowing. Further, the hardness of a paint film is affected by the proportion of unsaturated fatty acids.

On this basis alone, a knowledge of the fatty acid composition of an alkyd will enable, to some extent, a prediction of its performance.

Previous analytical work

Ref. 2-19

Early methods of characterising vegetable oils largely relied on the determination of iodine values[2] (which is a measure of unsaturation).

Although ultra-violet spectroscopy has been used in the determination of fatty acids in vegetable oils,[3, 4] the main instrumental method of fatty acid analysis has been gas chromatography[5-9] (GLC). The methyl esters of the fatty acids have been found to be suitable for GLC analysis and the conversion of vegetable oils and alkyd resins to fatty acid methyl esters has been achieved by transesterification, and by saponification followed by methylation.[10-16] Due to the speed and simplicity of the transesterification method compared to the saponification procedure, the former method is more appealing. A comparison of the two methods has shown very little difference in the distribution of fatty acid methyl esters. Transesterification of lipids with methanolic sodium methoxide has given a fatty acid methyl ester yield of 96 per cent of the theoretical yield and the saponification method gave a comparable result.[10]

Saponification has a further disadvantage in that it has been observed that after 1 h of reaction of linseed oil with 0.5 M methanolic potassium hydroxide, at reflux, followed by methylation of the liberated acids, an extraneous peak appeared in the chromatogram. This peak was attributed to the isomerisation of the polyenoic acids during saponification.[15]

The analysis of the carboxylic acid components in alkyd resins by GLC has been largely confined to a quantitative determination of the fatty acids[15] and qualitative estimation of the dicarboxylic acids.[17, 18] In this application a number of reagents have been used for transesterification reactions including methanolic solutions of sodium methoxide,[6, 10, 16, 17] potassium methoxide,[10] lithium methoxide,[18] boron trifluoride,[15, 18] hydrogen chloride[17] and diazomethane.[19]

In the present work the transesterification technique was evaluated as a quantitative method for the determination of carboxylic acid derivatives in alkyd resins. The use of transesterifying agents was restricted to methanolic solutions of hydrogen chloride, boron trifluoride and lithium methoxide.

Experimental

Ref. 20

Reagents

(i) Hydrogen chloride/methanol (HCl/MeOH). A 3 per cent solution of hydrogen chloride in methanol was prepared by the addition of acetyl chloride to absolute methanol in the proportions 1:19.

(ii) Lithium methoxide/methanol (LiOMe/MeOH). A methanol solution of lithium methoxide (approximately 0.5 M) was prepared by dissolving lithium (3.5 g) in absolute methanol (1 litre) under an atmosphere of nitrogen. This solution was stable for at least two months.

(iii) Boron trifluoride/methanol (BF_3/MeOH). The methanol/boron trifluoride solution (11 per cent) was commercially available (British Drug Houses Laboratories).

(iv) The methyl esters of palmitic, stearic, linoleic, linolenic, and oleic acids, which were used as standards, were commercially available (Fluka).

(v) The dimethyl esters of *ortho-* and *iso*-phthalic acids were required as standards and were prepared as follows. *o*-Phthalic anhydride (or *iso*-phthalic acid) (3.32 g) was dissolved in a 3 per cent solution of hydrogen chloride in methanol (see above) (220 ml). The solution was kept at room temperature for three days then diluted with water (150 ml). Extraction with chloroform followed by drying (with magnesium sulfate) and removal of the solvent gave the required dimethyl ester, dimethyl *o*-phthalate (3.4 g) or dimethyl *iso*-phthalate (3.9 g).

Transesterification

Transesterification of the glyceride esters was carried out by mixing the transesterifying reagent (15 ml) with the resin (0.3 g) and heating the solution under reflux for 15 minutes (unless otherwise stated). Distilled water (30 ml) was added to the solution and the organic material was extracted with chloroform. In the case of the lithium methoxide/methanol reagent, the reaction mixture was neutralised with 0.5 M sulfuric acid prior to chloroform extraction. The chloroform extract was washed with distilled water and dried over magnesium sulfate.

The extract was concentrated by distillation to a volume of about 0.5 ml and the concentrate was transferred to a phial capped with a rubber septum. Chromatography of this concentrated extract was completed within two hours of extraction, in order to avoid the possibility of oxidation and polymerisation of the methyl esters.

Evaluation of chromatograms

The identity of the components in the chromatogram was confirmed by the comparison of their retention time with those of the pure methyl esters. The peak areas were determined by the approximation[20]

$$\text{Area} = (\text{Peak height}) \times (\text{Peak width at half height}).$$

Peak areas were related to the weight per cent of components by calibration with the known methyl esters.

Results

The detailed results of the present work are given in tabulated form (Tables 1-9) below.

The figures in the following Tables denote percentages of total fatty acid methyl esters as indicated by the chromatogram (unless otherwise stated). The phthalate content is expressed as a ratio of the amount of dimethyl phthalate to the total fatty acid methyl esters.

Table 1

Gas chromatographic analysis of a transesterified linseed alkyd

Methyl ester	HCl/MeOH	BF_3/MeOH	LiOMe/MeOH
Palmitate	7.9	6.6	5.4
Stearate	5.7	5.2	3.8
Oleate	23.8	23.2	19.9
Linoleate	19.2	18.9	21.7
Linolenate	43.3	46.2	49.3
Phthalate	0.043	0.000	0.490

Table 2

Gas chromatographic analysis of a transesterified soya bean alkyd

Methyl ester	HCl/MeOH	BF_3/MeOH	LiOMe/MeOH
Palmitate	11.3	8.9	8.7
Stearate	3.8	3.3	4.0
Oleate	22.9	22.6	21.0
Linoleate	54.5	56.6	57.1
Linolenate	7.5	5.4	9.3
Phthalate	0.000	0.000	0.484

Table 3

Gas chromatographic analysis of a transesterified tall oil alkyd

Methyl ester	HCl/MeOH	BF_3/MeOH	LiOMe/MeOH
Palmitate	0.0	0.0	0.0
Stearate	3.0	3.2	2.3
Oleate	53.8	54.3	51.3
Linoleate	43.2	42.4	41.7
Linolenate	0.0	0.0	4.8
Phthalate	0.077	0.061	0.744

Table 4

Phthalate content (as dimethyl phthalate) as percentage of non-volatile resin

Source	Alkyd Type		
	Linseed	Soya bean	Tall oil
Specification[22]	42	40	53
Hydrolysis[21]	41.6	40.3	50.3
LiOMe/MeOH	27.2	27.0	34.5

Table 5

Fatty acid composition of linseed oil and linseed alkyd[15] corrected to constant saturated acid components

Acid	Linseed oil	Linseed alkyd
Palmitic } Stearic }	8.8	8.8
Oleic	18.0	11.9
Linoleic	14.6	8.2
Linolenic	58.6	30.8

Table 6

A comparison of fatty acid content of two linseed oil alkyds

Methyl ester	Medium oil length alkyd	Long oil length alkyd
Palmitate	5.4	19.6
Stearate	3.8	6.3
Oleate	19.9	23.6
Linoleate	21.7	13.3
Linolenate	49.3	37.2

Table 7

Fatty acid composition of linseed oil values taken from various sources (expressed as percentage of total fatty acids)

Acid	Sources (Reference no.)			
	15	12	16	23
Palmitic	5.0	6.3	6.5	6
Stearic	3.8	3.8	2.5	4
Oleic	18.0	20.4	18.0	22
Linoleic	14.6	15.6	20.5	16
Linolenic	58.6	53.9	52.0	52

Table 8

Effect of reaction time on the transesterification of a linseed oil alkyd with the LiOMe/MeOH reagent

Methyl ester	Reflux time (hr)			
	0.25	0.5	1	2
Palmitate ..	5.4	6.4	7.3	7.6
Stearate	3.8	5.6	5.5	5.3
Oleate	19.9	22.8	23.4	23.2
Linoleate ..	21.7	20.8	18.8	16.5
Linolenate ..	49.3	44.4	45.0	47.4
Phthalate ..	0.490	0.567	0.488	0.417

Table 9

Fatty acid methyl ester concentrations from table 8 corrected to constant saturated ester components (saturated methyl esters are assumed to be unreactive under the prevailing conditions)

Methyl ester	Reflux time (hr)			
	0.25	0.5	1	2
Palmitate } Stearate }	9.2	9.2	9.2	9.2
Oleate	19.9	17.5	16.8	16.5
Linoleate ..	21.7	16.0	13.5	11.8
Linolenate ..	49.3	34.1	32.4	33.8

Discussion

Ref. 21, 22, 12, 15

The fatty acid methyl esters were chromatographed using both the diethyleneglycol succinate (DEGS) (Fig. 1.) and the Carbowax columns (Fig. 2.) It was found that, in general, the DEGS column afforded the better resolution. However, resolution of dimethyl *o*-phthalate and methyl linoleate was poor on this column, and the Carbowax column was found to be superior in this case.

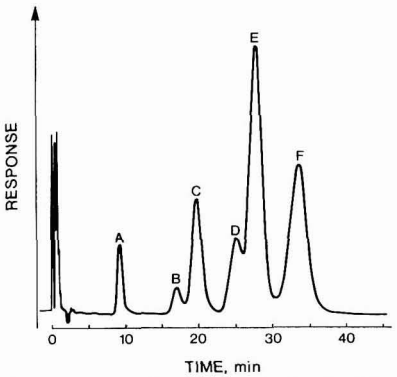

Fig. 1. A chromatogram (from a DEGS column) of the methyl esters of carboxylic acids derived from a linseed oil alkyd

(A, methyl palmitate; B, methyl stearate; C, methyl oleate; D methyl linoleate; E, dimethyl *o*-phthalate; F, methyl linolenate)

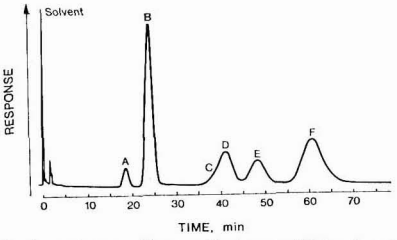

Fig. 2. A chromatogram (from a Carbowax 20M column) of the methyl esters of carboxylic acids derived from a linseed oil alkyd

(A, methyl palmitate; B, dimethyl *o*-phthalate; C, methylstearate; D, methyl oleate; E, methyl linoleate; F, methyl linolenate)

The transesterifying agents HCl/MeOH, BF_3/MeOH and LiOMe/MeOH were equally useful in the determination of the fatty acid derived components of the linseed oil (Table 1), soya bean oil (Table 2) and tall oil (Table 3) alkyds which were studied. However, the acidic reagents (HCl/MeOH and BF_3/MeOH) gave very low results for the determination of the concentration of the phthalate derived components. The basic reagent, LiOMe/MeOH gave a result for the phthalate component which was significantly lower than the concentration determined by classical methods,[21] or specified for the alkyd resins[22] (Table 4).

Generally, the fatty acid distribution of alkyds varies significantly from the parent glyceride oils,[12] (Table 5). The linoleic and linolenic acid content is generally lower in the alkyd than in the parent oils. This is particularly noticeable in the case of linseed and soya alkyds. In addition, variations occur within alkyds derived from the same oil. A comparison of a long oil length (70 per cent oil) linseed alkyd with a medium oil length linseed alkyd (52 per cent oil), illustrates this point (Table 6). The long oil alkyd was produced by the fatty acid/oil process and the medium oil alkyd by the alcoholysis process (Appendix B). The source of the variation may be due to either the parent glyceride oils[15] (Table 7), or to the reaction conditions used in the two processes. The fatty acid/oil process involves a higher temperature and twice the reaction time required for the alcoholysis process. These more vigorous conditions may induce decomposition or polymerisation of the linoleic and linolenic acids thus reducing their concentrations in the resulting alkyds. Table 6 shows that the long oil linseed alkyd contains a lower concentration of the two acids in question than does the medium oil alkyd.

The effect of reaction time on the methyl ester determination was also considered. A medium length linseed alkyd was reacted with the LiOMe/MeOH reagent for various lengths of time. The relative proportions of the methyl esters produced was found to vary with changes in reaction time. The largest variation occurred in the formation of dimethyl *o*-phthalate. The concentration of dimethyl *o*-phthalate in the product was determined with respect to the fatty acid methyl ester concentration and so the variation with time of the dimethyl *o*-phthalate concentration may be due to a difference in rate of transesterification between the aromatic ester and the fatty acid esters. The reaction time also affected the individual fatty acid methyl ester concentrations. This may again be due to a difference in reaction rate or perhaps side reactions occurred which reduced the concentration of the more unsaturated fatty acids (Tables 8 and 9). It was found that a reaction time of 0.25 hours at reflux was the most suitable for obtaining a reliable determination of the individual fatty acid ratios. The dimethyl *o*-phthalate determination by this method was not satisfactory but may be used as a guide to oil length.

Conclusions

Three reagents have been examined in the transesterification of alkyd resins, with a view to developing a method of determining the concentration of the carboxylic acid components present. A 0.5M methanolic solution of lithium methoxide was found to be superior to the other reagents used, which were a methanolic solution of boron trifluoride and a methanolic solution of hydrogen chloride.

The lithium methoxide reagent was used for determining the concentration of the various fatty acids in the alkyd. The vegetable oil used in the manufacture of the resin could thereby be ascertained. The phthalate content of the alkyd could not be determined accurately by any of the three

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reagents; however, the lithium methoxide solution gave a value for the phthalate content which served as a guide to the oil length of the resin.

The concentrations of the various methyl esters were determined by means of gas-liquid chromatography using a diethyleneglycol succinate column and a Carbowax 20 M column.

[*Received 31 October 1973*

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Appendix A

Apparatus

The gas chromatograph used in this work was a Bendix Model 2230-A fitted with flame ionisation detectors. Chromatograms were recorded on a Hitachi model QPD-54 chart recorder. The columns used were stainless steel, 2 m × 3mm o.d. and 2.2mm i.d. 20 per cent Diethyleneglycol succinate (DEGS) and 20 per cent Carbowax 20 M were used as the liquid phases and the solid support was 60-80 mesh Chromasorb AW in both cases.

Operating conditions

Inlet port temperature	200°C
Detector cell temperature	200°C
Column oven temperature	180°C
Nitrogen flow rates, DEGS column	20 ml/min
Nitrogen flow rates, Carbowax column	40 ml/min
Sample volume	0.2-0.7 µl

Appendix B

Ref. 23

There are a number of processes by which alkyd resins may be prepared.[23] The four most commonly used are set out below.

1. *The fatty acid process* involves the simultaneous condensation of the polyol, dibasic acid and fatty acid at temperatures between 200°C and 240°C.

2. *The monogylceride or alcoholysis procedure* enables the use of the vegetable oil in place of the fatty acids. The oil is the first subjected to alcoholysis prior to condensation with the dibasic acid. Alcoholysis involves reacting the oil with a polyhydric alcohol, usually glycerol, in the molar ratio of 1:2. Monoglycerides are formed in the presence of a basic catalyst at temperatures in the region of 240°C.

3. *The acidolysis process* is an alternative to alcoholysis and requires the use of higher reaction temperatures than the latter process. The acidolysis process involves the reaction of the vegetable oil with a dibasic acid followed by addition of a polyol. This process is often used when *iso-* or terephthalic acids are involved.

4. *The fatty acid/oil process* involves the reaction of a mixture of fatty acid, vegetable oil, dibasic acid and polyol. The vegetable oil may also be added after the alkyd has been formed. This process enables the production of high viscosity alkyds with the concentration of vegetable oil (oil length) in excess of 60 per cent.

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A parallel plate tackmeter for measuring the splitting resistance of printing inks*

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Summary

A parallel plate tackmeter which measures forces during splitting as a function of time by means of a piezoelectric crystal has been constructed. The motion of the top plate of the instrument is generated by a spring which makes the plates separate at a virtually constant acceleration of 50 ms^{-2}. A detailed description of the instrument is given, some preliminary results are presented, and the limits of performance discussed.

Keywords

Types and classes of coatings and allied products
printing ink

Equipment primarily associated with analysis, measurement or testing
tackmeter

Processes and methods primarily associated with analysis measurement or testing
testing

Properties, characteristics and conditions primarily associated with materials in general
tack

Un tackmètre aux plateaux parallèles pour déterminer la résistance à fendage des encres d'imprimerie

Résumé

On a construit un tackmètre aux plateaux parallèles qui permet, à l'aide d'un cristal piezoélectrique, la détermination des forces en vigueur pendant le fendage en fonction de temps. Le déplacement du plateau supérieur est effectue par un ressort qui fait séparer les plateaux à une accélération presque constante de 50ms^{-2}. On donne une description circonstancée de l'instrument, on présente quelques résultats préliminaires et on discute les limites du rendement de l'appareil.

Ein Parallel-Platten Tackmessgerät für den Abrisswiderstand von Druckfarben

Zusammenfassung

Ein Parallel-Platten-Tackmessgerät, welches mittels eines piezoelektrischen Kristalls als Funktion von Zeit die während des Abreissens wirkenden Kräfte misst, wurde konstruiert. Die Bewegung der oberen Platte des Instruments wird durch eine Feder hervorgerufen, welche die Trennung der Platten bei sozusagen konstanter Beschleunigung von 50ms^{-2} veranlasst. Eine in Einzelheiten gehende Beschreibung des Instruments wird gegeben, einige vorläufige Resultate vorgelegt, und die Begrenzungen hinsichtlich seiner Verwendbarkeit besprochen.

Introduction

In printing technology, tack is defined as the splitting resistance of materials when measured under conditions which simulate the conditions in printing. In a printing nip, an ink should not have too high a splitting resistance because high tack decreases the quantity of ink which transfers to the paper (thus decreasing the effectiveness of printing), and may cause partial or total breakage of a paper surface. On the other hand, in wet-on-wet printing the splitting resistances of the lower printed ink layers in the subsequent printing nips should be sufficiently high, so that these inks will neither decrease excessively the transfer of the inks to be over printed, nor themselves be back transferred on the printing plates.

Because of the significance of tack in practice, it is important to be able to predict reliably the splitting behaviour of printing inks by measurement. Most of the instruments with which this is done operate with a roller geometry and measure the displacement of a freely rotating rider roller caused by the splitting resistance of an ink film, which is continually split in the nip between the rider roller and the driving roller. This type of measurement gives the result as a single tack figure which depicts the phenomena over the whole width of the contact of the two rollers.

The other geometry for tack measurement is the parallel plate in which splitting is effected by pulling two plates apart by moving one of them perpendicularly against the plane surfaces. In parallel plate testing, splitting may be followed as a function of time and consequently more information is obtained than is possible by testing with a roller geometry. This is vital when an attempt is made to study tack more closely.

A new parallel plate tackmeter

Ref. 1-4

The new tackmeter (Fig. 1) to be discussed in this paper was designed and constructed because to the authors' knowledge, no parallel plate tackmeter with the necessary performance

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is available. Plate tackmeters[1, 4] for research purposes have been constructed before, but it appears that such activities are at a standstill at the moment.

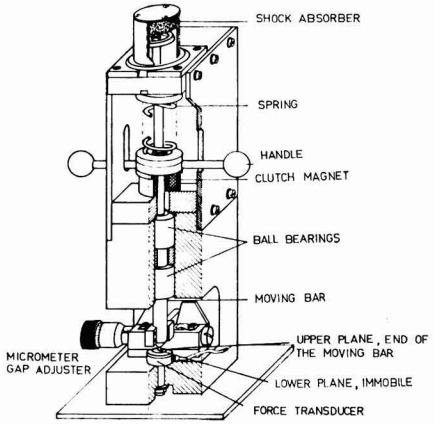

Fig. 1. Schematic diagram of the parallel plate tackmeter

When measuring the splitting resistance of printing inks, it is essential to try to simulate the conditions of practical printing as closely as possible. The two most important aspects to be considered are the speed and the thickness of the sample.

Form of motion

If a pair of rollers, which revolve in contact with each other, is examined, it is noted that the distance between two points which are in contact at some arbitrary time ($t = 0$) is proportional to the product of the square of the angular velocity and the square of the time of observation (that is, $R\omega^2t^2/2$). This approximation is valid near the centre point of contact. On the other hand, if a mass point is moving under a constant force, it is accelerated by a constant acceleration a and the displacement of the point is proportional to the product of the acceleration and the square of the time ($at^2/2$). This means it is legitimate to simulate the splitting in a roller nip by planes which move apart with a constant acceleration ($a = R\omega^2$).

This consideration of the form of motion was the starting point in the construction of the tackmeter. As calculated from practical roller radius and speed figures, the acceleration to be used was chosen as 50 ms^{-2}.

The motion of the top plate in the tackmeter is generated by means of a spring which is part of a moving bar whose lower end is the top plate (Fig. 2). When the tackmeter is in the measuring position the spring is strained, the tension being maintained by a clutch magnet. Switching off current through the magnet relieves the tension and results in a virtually constant acceleration of the top plate. This is demonstrated in Fig. 3 as measured with an acceleration transducer. The velocity and the displacement curves for the top plate are also presented. The vibration in the acceleration curve is due to the characteristic vibration of the spring.

In order to ensure a constant acceleration, irrespective of the disturbing effect of a sample, the spring had to be sufficiently stiff. Whether or not this was the case was investi-

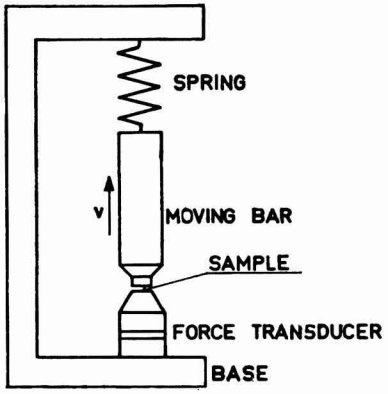

Fig. 2. Construction of the parallel plate tackmeter

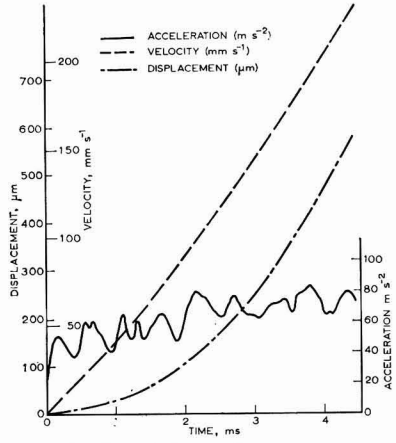

Fig. 3. The acceleration, velocity and displacement curves of the top plate; transducer measurement

gated by high speed photography and the results are shown in Fig. 4. Because of unsuccessful synchronisation of the photography with the splitting test, the frame speed was not sufficiently high (about 2500 frames per second) to give information on the form of the motion at the commencement of movement and immediately after it. Nevertheless, the displacement curves obtained without a sample in the gap, using a transducer and secondly using high speed

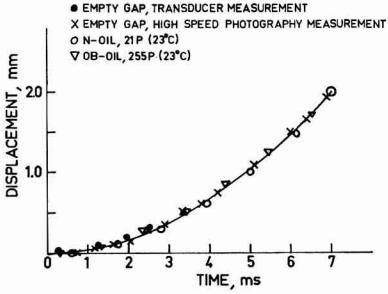

Fig. 4. Displacement of the top plate; transducer and photographic measurement

photography, and with a Newtonian sample of about 255 P in the gap, using high speed photography, gave grounds for believing that the effect of a sample was negligible, if the tack forces were of the order of magnitude measured in this specific test, namely about 600 gf mm.$^{-2}$ As far as lithography and letterpress inks are concerned this is quite a high value.

Film thickness

In practical printing inks, the film thickness ranges from less than 5 μm upwards. In the tackmeter, the gap between the two plates can be adjusted from zero to about 50 μm. The practical lower limit is set by the smoothness tolerances of the plates and is about 3 μm, the accuracy being about ± 0.5 μm. To guarantee a gap as small as this, the construction is very rigid.

The gap is set using a micrometer which moves a wedgepiece which again moves the bar. Because the position of the moving bar, and thus the air gap in the magnet, depends on the gap, current through the magnet has to be adjusted accordingly.

The size of the measuring area in the instrument is 1 mm^2.

Force measuring system

The forces at splitting are measured with a piezoelectric transducer which is mounted below the lower plate (Fig. 5). The crystal consists of ceramic discs and has a constant frequency response from two to at least 4,000 Hz. The measured force signal is fed through a charge amplifier to an electronic sampling memory. For immediate observation, the force signal is displayed on an oscilloscope, and for detailed observation it is plotted on a chart recorder.

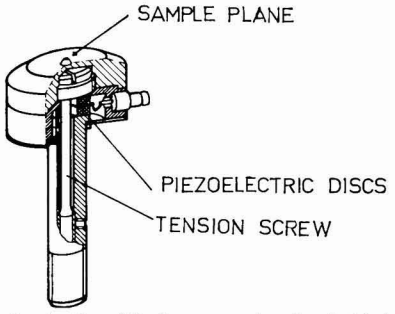

Fig. 5. Construction of the force measuring piezoelectric transducer

Experimental

Ref. 5, 6

Methods

Previous studies have revealed the mechanism of the splitting of materials, such as printing inks.[5] Considered as a function of time, the force in the splitting sample layer first increases, reaches a maximum, and then decreases as a consequence of cavitation. New flow fields are formed around the cavitation bubbles whose expansion gives rise to filamentation. Breaking of the filaments terminates splitting. According to one opinion, stretching of the filaments may give rise to another peak in the tack curve. In the authors' preliminary tests, a distinct second tack peak was not observed. The force at the first tack peak and its position on the time axis is discussed below.

Tests were made with Newtonian oils, mildly non-Newtonian printing ink media and strongly non-Newtonian carbon black pigment suspensions. Although the printing ink media and the carbon black suspensions are elastic, only the relationships between tack and viscosity will be discussed here.

The temperature during the tack and flow curve tests was 23 ± 0.5°C. In the tack tests, the gap was varied between about 5 and 36 μm. The flow curves were measured with a Ferranti cone-and-plate viscometer, and the viscosities were calculated as tangents to the equilibrium flow curves.

The tack tests were made by applying a small amount of the sample to the lower plate of the instrument; excess of sample around the edges of the plates were wiped off only in one separate series of tests. The results are given as the means of sets of ten duplicated measurements.

Results

Fig. 6 demonstrates how the force at the tack peaks changes as a function of film thickness for six Newtonian oils. The viscosities of the oils range from 21 to 675 P as indicated by the curves. The point at 5 μm for the most viscous of the oils suggests that the true splitting force might be so high that the acceleration is affected and as a consequence a lower force is obtained.

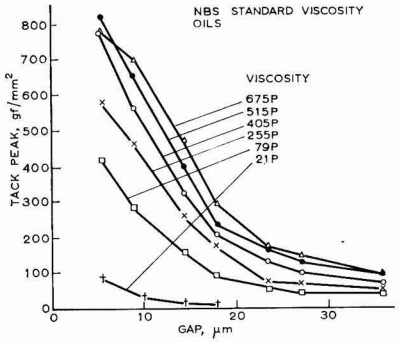

Fig. 6. Force at the tack peaks for Newtonian oils

Fig. 7 gives the same plot but in logarithmic co-ordinates. According to the expression first derived by Stefan,[6] a logarithmic plot of tack force versus film thickness for Newtonian oils should give a straight line. This may be the case with the least viscous of the oils, but is not so with the others. It is likely that the cause is cavitation, which relieves the tension before the hydrodynamic maximum is reached. The curves of the test series in which excess amounts of sample around the edges were wiped off have the same shape as can be seen in Fig. 8.

In Fig. 9, the peak forces are plotted against viscosity for the Newtonian oils and the slightly non-Newtonian printing ink media. The graphs clearly indicate that the tack forces of the media are, at any viscosity level, lower if comparison is made at shear rates of either 72 or 288 s^{-1}. This might mean that to give the same tack force readings as Newtonian oils, the viscosities of the non-Newtonian media should be measured at much higher shear rates than were possible in this study, or that properties other than viscosity such as

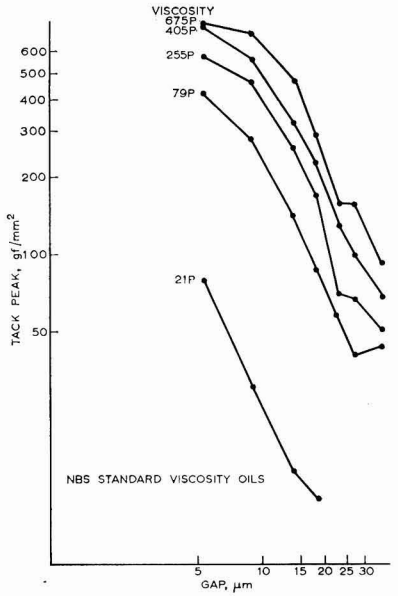

Fig. 7. Force at the tack peaks for Newtonian oils in logarithmic coordinates

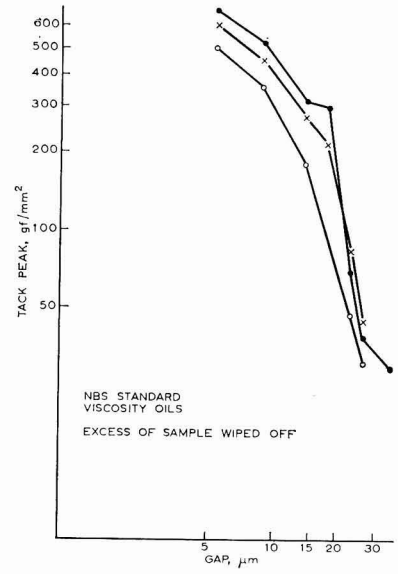

Fig. 8. Force at the tack peaks for Newtonian oils in logarithmic coordinates; excess sample wiped off

viscoelasticity account for tack. The same result is seen in Fig. 10, in which the tack force curves of the carbon black suspensions are shown together with the curves for the Newtonian oils. Again the tack forces of the Newtonian oils are higher at any viscosity level. The strongly non-Newtonian suspensions give even lower readings than the slightly non-Newtonian media.

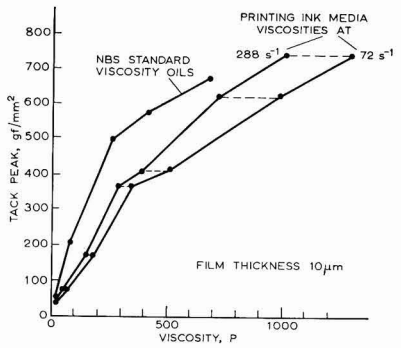

Fig. 9. Force at the tack peaks as a function of viscosity for Newtonian oils and non-Newtonian printing ink media

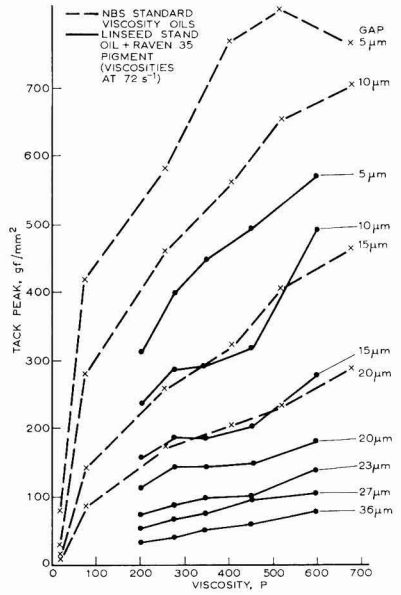

Fig. 10. Force at the tack peaks as a function of viscosity for Newtonian oils and non-Newtonian carbon black suspensions

Fig. 11 shows a plot of the viscosity of a Newtonian sample which has the same tack force as each of the carbon black suspensions studied, as a function of pigment content of the suspensions. Despite of some discrepancies, this viscosity is seen to be higher for a wider gap. This may mean that the wider the gap the lower is the "effective shear rate" at splitting. This seems reasonable because the form of the motion of the top plate is independent of the gap size.

The positions of the force peaks on the time axis as a function of film thickness are shown in Figs. 12 and 13. With increasing film thickness, there is more sample available to flow and fill the increasing space between the plates and thus a longer time interval occurs before breaking of a sample takes place. On the other hand, the fluidity of a sample increases the time interval from rest to a peak. It is also seen that, at low film thicknesses, the curves of the more

viscous samples tend to approach the time interval of 0.25 ms. It could be that this limit is set by the piezoelectric crystal which might be not sufficiently fast.

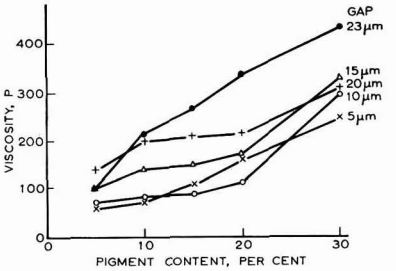

Fig. 11. Viscosity of a Newtonian oil which has the same tack force as a carbon black suspension as a function of pigment content; gap size varied

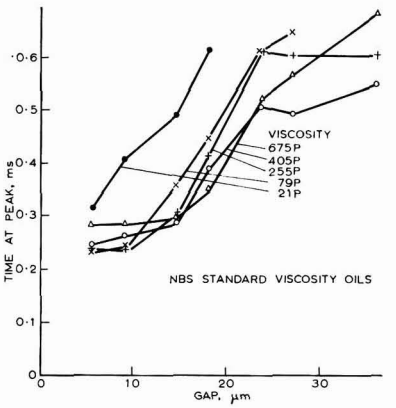

Fig. 12. Position of the tack peaks at the time axis for Newtonian oils

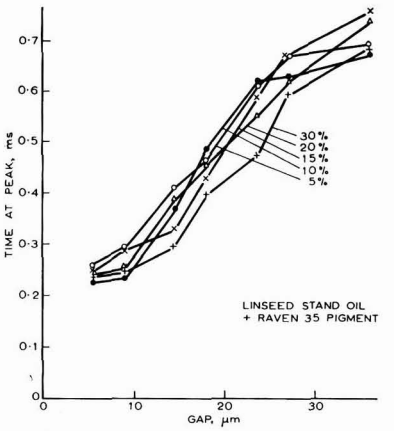

Fig. 13. Position of the tack peaks at the time axis for carbon black suspensions

Conclusions

The preliminary tests show that the parallel plate tackmeter gives rational results and measures ink properties which a viscometric flow curve does not readily give. Future studies will show how the tack force curves are related to other rheological properties, such as elasticity, and to the behaviour of printing inks during printing.

The instrument will be developed further to eliminate the weakresses revealed by this study.

| *Received 19 November 1973*

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Comparison of exposure sites at Innisfail, Australia, and at Canal Zone, Panama, for the testing of paint

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Summary

Four paints which were known to have different resistance to weathering and microbial growth in a hot wet tropical environment have been used in a trial to compare the severity of conditions at Innisfail, Queensland, and Canal Zone, Panama. They chalked and lost gloss quicker at Panama, but checked and cracked more at Innisfail. Fungi and green algae colonised the paint surfaces to similar extents at both sites.

Keywords

Types and classes of structures or surfaces to be coated

metal
wood

Raw materials: binders—oils

linseed oil

—resins, etc

alkyd resin
chlorinated rubber
polyvinyl resin

Properties, characteristics and conditions primarily associated with—dried or cured films

chalking
cracking
exterior durability
fungus
gloss retention

—the environment

tropical environment

Une comparaison des emplacements pour effectuer les essais de vieillissement de peintures situés à Innisfail en Australie et dans la Zone du Canal au Panama

Résumé

Quatre peintures dont chaqu'une avait de différentes résistances aux intempéries et à la croissance de microbes dans un environnement chaud, humide et tropical ont été utilisées au cours d'un essai pour faire comparer la rigueur des conditions qui se trouvaient à Innisfail, Queensland, et dans la Zone du Canal au Panama. Elles ont mis en évidence au Panama une tendance plus rapide à fariner et à perdre le brillant, mais d'autre part elles ont démontré plus de faiençage et de craquelage à Innisfail. Le degré de colonisation des surfaces des peintures par végétation mycélienne et alguale était le même, à peu près, à tous les deux emplacements.

Vergleich von Bewitterungsstationen bei Innisfail in Australien und bei der Kanalzone in Panama für Zwecke der Anstrichmittelprüfung

Zusammenfassung

Vier Anstrichfarben, deren unterschiedlicher Widerstand gegen Bewitterung und Mikrobenwachstum in heissfeuchter, tropischer Umgebung bekannt war, wurden in einem Vergleichsversuch zur Feststellung der Schärfe der Bedingungen bei Innisfail in Queensland und der Kanalzone in Panama benutzt. Sie kreideten und verloren Glanz schneller in Panama, zeigten jedoch Haar- und tiefere Rissbildung mehr in Innisfail. In beiden Stationen bildeten sich Pilz-und Grünalgenkolonien etwa im gleichen Ausmasse.

Introduction

Facilities for exposing materials in hot wet tropical conditions are a necessary requirement in developing and testing materials. The US Army has its Tropic Test Center at Canal Zone, Panama, and the Australian Department of Supply and the British Ministry of Defence operate the Joint Tropical Research Unit at Innisfail, Queensland, Australia. To compare the severity of degradation of materials at these two sites, paints, plastics and fabrics were exposed at each. This report deals with the paints trial and gives an account of microbial growth on them and of the durability.

Test materials

Ref. 1-3

Test paints

Four paints, which had been used in previous exposure trials[1-3] and which were known to cover a range of durability and resistance to microbial growth were used in this trial. A summary of their expected performances, based on previous tests, is given in Table 1.

This paper was issued as Technical Note 293 of Defence Standards Laboratories. It is published by kind permission of the Chief Superintendent.

Table 1
Expected performance of paints used in the trial

Paint	Expected durability	Expected resistance to microbial growth
Linseed oil paint	Fair	Poor
Long oil alkyd paint	Excellent	Moderate
Latex paint	Good	Good
Chlorinated rubber paint ..	Fair	Excellent

All the test paints were white, to enable easy and consistent assessments of surface deposits and characteristics. The formulations of the test paints are given in Appendix A.

Test panels

Both wood and metal test panels were used in this trial. The wood was Hoop Pine (*Araucaria cunninghamii*) and the metal was sulfuric acid anodised aluminium. Wood was used because this is the substrate to which these types of paints are most usually applied and metal panels were used in order to test the theory that paint films are sufficiently porous to permit fungal nutrients to diffuse through from wood below, thus influencing growth.

All panels measured 300mm × 150mm. Three coats of the test paint were applied to the front of the panels; the backs and edges of panels were protected by two coats of aluminium enamel.

Exposure conditions

Sites

The exposure sites were in cleared areas at Innisfail, Queensland, and Canal Zone, Panama. Both had distinct wet seasons; January to June at Innisfail and May to November at Panama. Both sites could be described as hot and Innisfail has a greater seasonal variation in temperature. Meteorological data from the two sites are presented in Appendix B. Panels were exposed at an angle of 45° to the vertical, facing north at Innisfail and south at Panama.

To examine the seasonal effects, two sets of paints were exposed at each site; the first set in June 1967 and the second in January 1968.

Withdrawal and inspection

Ref. 4

As the paints were known to have different rates of degradation, the schedule of withdrawals from exposure was not the same. A summary of withdrawal times is given in Table 2. These times have been selected using the expected microbial growth rates on the paints as a guide.

Table 2
Schedule of withdrawals

Paint	Duration of exposure (Months)						
	2	4	6	12	18	24	36
Linseed oil ..	1st	2nd	3rd	4th			
Long oil alkyd ..			1st	2nd	3rd	4th	
Latex			1st	2nd	3rd	4th	
Chlorinated rubber				1st	2nd	3rd	4th

All the panels were assessed on site at all withdrawal times. The panels withdrawn were returned to Defence Standards Laboratories, Maribyrnong, Australia, where they were examined microscopically, re-assessed and photographed. Assessments of the durability and microbial growth were made according to Australian Standard K41,[4] in which a set of photographic standards is used for comparative numerical rating. A rating of 10 is awarded when there is no deterioration, failure or growth and the rating decreases to 0 when complete failure or the heaviest growth and disfigurement occurs.

Microscopic examination of the paint surfaces enabled comparative assessment of the amounts of fungi and algae. The presence of debris was also noted.

Results

The durability results obtained from the two on-site assessments of the paints varied considerably, as could be expected from the subjective nature of the methods of assessment employed. These results were neglected, therefore, as a means of comparison and only the results obtained from the laboratory assessments were considered. Only one laboratory team should be employed to assess results in trials involving the comparison of sites until less subjective methods of durability assessment are developed. The on-site assessments were used to observe unusual changes in appearance during the trial.

General durability

Laboratory assessments of the durability characteristics (discoloration, colour change, loss of gloss, chalking, checking) and "microbial growth" (a gross assessment of fungi, algae and debris) are given in Appendix C.

Microbial growth

Relative assessments of the amounts of fungal and algae growth present on the paint surfaces are shown in tabular form in Appendix D. This also gives some account of the presence of debris. Several fungi were isolated from these panels and identified. Some of these isolates may have been derived from itinerant spores, but among the genera which were growing on the paint films were *Alternaria*, *Aureobasidium*, *Cladosporium*, *Curvularia* and *Helminthosporium*. The algae were not identified but those seen were filamentous or colonial unicellular green algae. Similar type of fungi and algae were found on panels from both sites.

Generally, the greatest increases in the amount of fungi occurred in the first six months, after which it increased slightly or even declined. Algae, on the other hand, tended to increase through the duration of the exposure period. These tendencies were common to the two sites.

Discussion

The results obtained have been used to make the following comparisons:

Comparison of substrates

The general durability of these coatings on wood and on metal were very similar. The chlorinated rubber paint, however, did crack and flake on the wood panel, but not on the metal one.

There were some instances of different assessments of microbial growth on wood and metal panels, but these were not consistent and, generally, similar growth was observed on each.

The wood substrate of the chlorinated rubber paint exposed at Panama for two or more years had been attacked by a Basidiomycete, but assessments were made on the remaining intact film.

Comparison of exposure sites

The general durability of the paints varied considerably between the sites. A large amount of inorganic dirt accumulated on the surfaces of the paints exposed at Innisfail, and this contributed to the poor general appearance of the paints which were exposed there. This could be due to the proximity of roads.

The general durability of the paints from the two sites are compared in the following tables. Table 3 compares the chalk ratings obtained on all paints and Table 4 compares the gloss ratings of the alkyd and chlorinated rubber paints. Discoloration of the coatings was not compared as this was partly dependent on the amount of microbial growth on the paint surface.

Assessments of microbial growth (Appendix C) and details of microscopic examinations, with details of the relative amounts of fungi, algae and debris (Appendix D) indicate little difference between the two sites. The same types of organisms were found on panels from each site.

Table 3

Comparison of chalking ratings of the paints

Paint	Time of Exposure (months)	Chalk ratings			
		Series 1 exposure		Series 2 exposure	
		Innisfail	Panama	Innisfail	Panama
Oil ..	2	9	8	8	8
	4	8	6	7	7
	6	5	4	5	2
	12	3	2	2	1
Alkyd ..	6	10	10	9	9
	12	8	6	9	6
	18	7	6	9	8
	24	9	4	6	4
Latex ..	6	7	4	9	5
	12	4	3	5	9
	18	4	2	5	4
	24	6	3	4	4
Chlorinated rubber ..	12	8	7	7	6
	18	10	7	6	6
	24	10	5	6	6
	36	7	6	8	6

The chalking ratings in Table 3 were compared statistically by using "Student's" *t*-test. This analysis showed that there was a significant difference between the chalking ratings on the paints from both sites at the 0.1 per cent level, indicating that there is a highly significant difference between these ratings. The paints exposed at Panama had chalked more severely than those exposed at Innisfail.

The gloss ratings on the paints from each site shown in Table 4 were analysed in a similar manner to the chalking ratings. The difference was significant at the 5 per cent level,

Table 4

Comparison of the gloss ratings of the paints

Paint	Time of exposure (months)	Gloss ratings			
		Series 1 exposure		Series 2 exposure	
		Innisfail	Panama	Innisfail	Panama
Alkyd	6	8	8	8	8
	12	7	6	6	5
	18	5	5	3	3
	24	6	6	1	3
Chlorinated rubber	12	6	5	5	4
	18	6	5	4	3
	24	6	4	5	4
	36	4	1	0	0

indicating that gloss was possibly lost more quickly at Panama than Innisfail. Although only two paints were assessed for gloss, these observations are in accord with the greater amount of chalking at Panama.

There was a tendency for the oil, alkyd and latex paints to check and the chlorinated rubber paint on wood panels to crack during exposure at Innisfail but not at Panama.

Comparison of wet- and dry-season exposures

The weather details (Appendix B) show that temperatures at Panama are much more constant through the year than those at Innisfail, where the average daily maximum can vary up to 7 or 8°C between summer and winter. Both sites have a wet season of similar duration but the mean annual rainfall is about 760mm (30in) less at Panama. In looking for any seasonal influence on the appearance of exposed paints, the second series at Innisfail (June 1967) and the first series at Panama (January 1968) were placed on exposure early in the respective wet seasons and might be expected to give similar results.

The only marked difference relative to the season, however, was with the early withdrawal of the second series (dry season) of linseed oil paint from Panama, which bore less microbial growth than the corresponding panels from the first series (wet season). This microbial growth was also less than that on the linseed oil paint exposed at Innisfail. Table 5 summarises the assessments of microbial growth on the linseed oil paint.

In all other cases, there was no apparent consistent difference between "wet-season" and "dry-season" exposures at the two sites.

Table 5

Microbiological growth on linseed oil paint

Site	Series	Season	Exposure duration (months)			
			2	4	6	12
Innisfail	1	dry	5	2	2	7
Panama	2	dry	10	5	3	8
Innisfail	2	wet	5	1	1	7
Panama	1	wet	4	0	0	5

Conclusions

The conclusions obtained from the trial are given below:

1. The paints exposed at Panama chalked and lost their gloss more quickly than did those at Innisfail.

2. The chlorinated rubber paint on wood panels tended to crack at Innisfail, but not at Panama.

3. There was a greater deposit of debris on the paints exposed at Innisfail.

4. The development of fungi and algae on the paints was similar at both sites, except for the linseed oil paint at Panama exposed at the start of the "dry" season, which was apparently colonised less rapidly.

5. A difference in the amount of microbial growth which could be related to the influence of the weather of a season was only observed on one paint (linseed oil) at Panama.

6. The amounts of microbial growth on the wood and metal panels was similar, generally, indicating that either there was no diffusion of nutrient through the paint film from the wood, or if there were then it did not noticeably influence growth.

Acknowledgments

The authors thank Mr R. Bird, Mr H. E. Sokol and Mr R. Krolik for their assistance with the experimental work.

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3. Hill, L. A., Camina, M., and Grey, C. A., "Comparison of Lae, New Guinea and Innisfail, Queensland as exposure sites for the testing of paints." Defence Standards Laboratories Technical Note (in course of publication).
4. Australian Standard No. K41. "Standard Methods of Test for Paints, Varnishes, Lacquers and Related Materials." Method 481.1 and Method 481.3.

Appendix A

Formulations of paints

Linseed oil paint

Rutile titanium dioxide (Rutiox RCR 3)	20.3
Blanc fixe	32.0
Asbestine	8.7
Raw linseed oil	20.2
Linseed stand oil, 120-140 poises	7.2
Mineral turpentine	11.4
Cobalt naphthenate drier (6 per cent Co)	0.2
	100.0

Long oil alkyd gloss paint

Rutile titanium dioxide (rutiox RCR 3)	32.1
Linseed drying alkyd, 65 per cent oil length, 24 per cent phthalic anhydride, 70 per cent solids	54.0
Mineral turpentine	13.6
Cobalt naphthenate drier (6 per cent Co)	0.3
	100.0

White chlorinated rubber paint

Rutile titanium dioxide (Rutiox RCR 3)	13.2
Chlorinated rubber resin (Alloprene N 20)	23.4
Cerechor 48	10.2
Shellsol A	37.2
Cyclohexanone	8.0
Mineral turpentine	8.0
	100.0

White latex paint

Rutile titanium dioxide (Rutiox RCR 3)	21.0
Micafine (mica)	4.2
Lithopone	6.3
China clay	2.0
Sodium benzoate	0.8
Sodium nitrite	1.2
Lissapol N	0.1
5 per cent solution Cellofas A	6.3
5 per cent solution Calgon	0.6
Water	2.7
Polyvinyl acetate emulsion (Vinamul N 9700, 55.6 per cent solids)	32.8
Butyl cellosolve phthalate	2.7
	100.0

Appendix B

Meteorological data

	PANAMA					INNISFAIL				
	Average daily temperature (°C)		Average daily relative humidity (%)		Total precipitation (mm)	Average daily temperature (°C)		Average daily relative humidity (%)		Total precipitation (mm)
	Max	Min	Max	Min		Max	Min	Max	Min	
January ..	28	24	94	72	129	31	22	93	78	490
February ..	29	25	97	73	26	31	22	94	71	602
March	29	26	97	75	14	29	21	92	70	687
April	30	24	96	75	54	28	19	90	66	468
May	30	24	99	77	231	26	17	93	66	324
June	30	22	100	71	384	24	16	96	63	187
July	29	22	100	72	371	24	14	94	53	119
August	31	22	99	71	415	25	14	94	52	106
September ..	31	23	99	75	328	27	16	94	45	81
October ..	31	23	99	67	274	28	18	92	54	94
November ..	29	23	100	77	408	30	19	90	59	133
December ..	29	24	99	78	131	31	21	89	58	243
Mean	29	24	98.3	73.6	2,765 (Total)	28	18	93	61	3,534 (Total)

Appendix C

Part 1: Linseed oil paint

			Two months						Four months						Six months						Twelve months					
Site	Series	Panel	Discoloration	Colour change	Loss of gloss	Chalking	Checking	Microbial growth	Discoloration	Colour change	Loss of gloss	Chalking	Checking	Microbial growth	Discoloration	Colour change	Loss of gloss	Chalking	Checking	Microbial growth	Discoloration	Colour change	Loss of gloss	Chalking	Checking	Microbial growth
I	1	M	1	7	0	9	10	5	1	7	0	8	10	2	1	8	0	5	10	2	6	8	0	3	10	7
I	2	M	1	5	0	8	10	5	1	7	0	7	10	1	0	7	0	5	10	1	6	8	0	2	7	7
P	1	M	1	5	0	8	10	4	0	6	0	9	10	0	0	7	0	4	10	0	5	7	0	2	10	5
P	2	M	7	8	2	8	10	10	2	7	0	7	10	5	0	5	0	2	10	3	7	8	0	2	6	8
I	1	W	1	6	0	9	10	5	1	7	0	8	10	3	1	8	0	5	10	2	6	8	0	3	10	7
I	2	W	1	5	0	8	10	5	1	7	0	7	10	2	0	7	0	5	10	1	6	8	0	2	9	7
P	1	W	1	5	0	8	10	4	0	6	0	9	10	0	0	7	0	4	10	0	5	7	0	2	10	5
P	2	W	7	8	2	8	10	10	2	8	0	7	10	6	0	5	0	2	10	3	7	8	0	2	6	8

Part 2: Long oil alkyd paint

I	1	M	6	8	8	10	10	8	5	7	7	8	10	8	4	7	5	7	10	5	1	7	6	9	10	5
I	2	M	5	7	8	9	10	8	4	8	6	9	10	6	5	7	3	9	10	5	1	8	1	6	5	4
P	1	M	5	8	9	10	10	7	6	8	6	6	10	8	7	8	5	6	10	7	5	7	6	4	10	7
P	2	M	5	7	8	9	10	9	6	8	7	6	10	8	6	7	3	8	10	7	5	7	5	4	10	7
I	1	W	6	8	8	10	10	8	5	7	7	8	10	8	4	7	5	7	7	5	1	7	4	9	6	5
I	2	W	5	7	8	9	10	8	4	8	6	10	10	6	5	7	3	9	6	4	1	8	1	6	5	4
P	1	W	5	8	9	10	10	7	6	8	6	6	10	8	6	8	5	6	10	7	5	7	4	4	10	7
P	2	W	5	7	8	9	10	8	6	8	7	6	10	7	6	7	3	8	10	7	5	7	5	4	10	6

Part 3: Pva latex paint

I	1	M	6	6	—	7	10	9	7	9	—	4	10	8	6	8	—	4	10	8	5	8	—	6	10	6
I	2	M	7	8	—	9	10	9	5	8	—	5	10	8	5	8	—	5	10	7	5	8	—	4	10	6
P	1	M	8	8	—	4	10	10	8	9	—	3	10	10	7	8	—	2	10	9	6	7	—	3	10	7
P	2	M	8	8	—	5	10	10	7	8	—	2	10	7	5	7	—	4	10	7	4	7	—	4	10	6
I	1	W	6	6	—	7	10	9	7	8	—	4	10	8	7	8	—	4	10	8	5	8	—	6	10	7
I	2	W	7	8	—	9	10	8	5	7	—	7	8	7	4	7	—	6	8	6	4	8	—	5	8	6
P	1	W	6	8	—	7	10	9	7	8	—	3	10	8	6	8	—	6	10	6	5	7	—	6	10	6
P	2	W	7	8	—	7	10	9	7	8	—	4	10	9	5	7	—	6	10	6	3	7	—	4	10	6

Part 4: Chlorinated rubber paint

I	1	M	6	7	6	8	10	10	2	8	6	10	10	5	2	8	6	10	10	5	5	8	4	7	10	—
I	2	M	4	6	5	7	10	8	5	6	4	6	10	8	3	6	5	6	10	6	5	8	0	8	10	—
P	1	M	6	7	5	6	10	10	6	7	5	6	10	9	6	7	5	5	10	9	6	7	1	6	10	—
P	2	M	6	7	4	6	10	9	6	7	4	6	10	8	6	8	4	6	10	8	5	7	0	4	10	—
I	1	W	6	7	6	6	10	8	6	7	6	10	6[1]	6	—	—	—	—	—[2]	—	4	8	4	6	7[3]	6
I	2	W	5	7	5	7	10	8	4	7	4	8	6	7	2	8	4	9	6[3]	6	5	8	0	8	7[3]	4
P	1	W	5	7	5	7	10	7	5	7	5	6	10	9	6	7	5	5	10	9	6	7	1	6	10	7
P	2	W	6	7	4	6	10	10	5	8	5	6	9	8	6	8	4	6	—[4]	8	3	7	0	6	—[4]	4

[1]Also cracking, rating 9
[2]Flaking, rating 2
[3]Also cracking, rating 6
[4]Wooden panel disintegrating due to fungal attack
[5]Also cracking, rating 8

I = Innisfail P = Panama M = metal W = wood

Series 1. First exposed June 1967 Series 2. First exposed January 1968

Appendix D

Microscopic examination of paints

Part 1: Linseed oil paint

Exposure site	Month of exposure	Exposure duration (months)	Panel	Observations		
				Fungi	Algae	Debris
Innisfail	June	2	A	S	N	—
			W	S	M	—
		4	A	H	H	—
			W	H	H	—
		6	A, W	Not examined		
		12	A	M	M	—
			W	S-M	M	—
	January	2	A	S	M	Present
			W	M-H	S	Present
		4	A	H	S	Present
			W	M-H	S	Present
		6	A	M	H	—
			W	S	VH	—
		12	A	M	S	S
			W	M	S	S
Panama	June	2	A, W	Not examined		
		4	A	H	H	—
			W	H	H	—
		6	A	H	H	—
			W	H	H	—
		12	A	M	H	—
			W	S-M	H	—
	January	2	A	N	N	S
			W	N	N	S
		4	A	M	H	—
			W	S	H	
		6	A	S	H	
			W	S	H	
		12	A	M-H	M-H	
			W	M-H	S	

Part 2: Alkyd paint

Exposure site	Month of exposure	Exposure duration (months)	Panel	Observations		
				Fungi	Algae	Debris
Innisfail	June	6	A	S	S	P
			W	S	S	P
		12	A	M	M	—
			W	M	M	—
		18	A	S-M	M	M
			W	S-M	M	M
		24	A	S	H	M
			W	S	H	M
	January	6	A	M	S	—
			W	M	S	—
		12	A	M-H	M	M
			W	M-H	M	M
		18	A	M-H	S-M	—
			W	M	M-H	—
		24	A	S	M	M
			W	S	M	M
Panama	June	6	A	M	N	—
			W	M	S	—
		12	A	M	S	—
			W	M	S	—
		18	A	M	M	—
			W	M	M	—
		24	A	S-M	M	—
			W	S-M	M	—
	January	6	A	M	VS	—
			W	M	S	—
		12	A	M-H	S	S
			W	M-H	S	S
		18	A, W	Not examined		
		24	A	S-M	M	S-M
			W	S-M	M	S-M

Part 3: Latex paint

Exposure site	Month of exposure	Exposure duration (months)	Panel	Observations		
				Fungi	Algae	Debris
Innisfail	June	6	A	S	S	—
			W	S	S	—
		12	A	S	M	M
			W	S	M	S-M
		18	A	S	M-H	M
			W	S	M	M
		24	A	S	M-H	—
			W	S	M-H	—
	January	6	A	S	S-M	—
			W	S-M	S	—
		12	A	S	S-M	M
			W	S-M	M	M
		18	A	S	M-H	M-H
			W	S	M-H	M
		24	A	VS	M	M
			W	VS	M	M
Panama	June	6	A	VS	M	
			W	VS	M	
		12	A	S	M	
			W	S	M-H	
		18	A	S	M-H	
			W	S-M	S-H	
		24	A, W	Not examined		
	January	6	A	S	S	
			W	VS	M	
		12	A	VS	M	M
			W	VS	M	
		18	A	S	M-H	S
			W	S	M-H	S
		24	A	S	M-H	S
			W	S	H	M

Part 4: Chlorinated rubber paint

Exposure site	Month of exposure	Exposure duration (months)	Panel	Observations		
				Fungi	Algae	Debris
Innisfail	June	12	A	S	S-M	—
			W	S	S	—
		18	A	S	M	S
			W	S-M	S-M	S-M
		24	A	S	M-H	S
			W	S-M	S-M	S
		36	A	S	M	S
			W	S-M	S-M	S-M
	January	12	A	S-M	S	S
			W	S-M	VS	S
		18	A	S	S-M	—
			W	M	M-H	M
		24	A	M	H	M
			W	S	H	M
		36	A, W	Not examined		
Panama	June	12	A	M	S	
			W	S	S	
		18	A, W	Not examined		
		24	A	S	M	
			W	S	M	
		36	A	M	M-H	S
			W	M	M-H	S
	January	12	A	VS	M	S
			W	M-H	VS	
		18	A, W	Not examined		
		24	A	N	N	N
			W	S	N	S
		36	A, W	Not examined		

A = aluminium W = wood N = nil VS = very slight
S = slight M = moderate H = heavy

Errata

The following corrections should be noted to the paper

"Oxidation of copper phthalocyanine blue pigment with potassium dichromate in acid solution" which appeared in the April issue (*JOCCA*, 1974, **57**, 134):

Page 134, three lines from bottom of column 1: for "110°C" read "100°C".

Formula on page 136: for "$Cr_2(SO_4)_8$" read "$Cr_2(SO_4)_3$".

Page 137, Reference 18: for "Ain Shams University" read "Al-Azhar University".

Next month's issue

The Honorary Editor has accepted the following papers for publication and these are expected to appear in the July issue:

The athermal theory of vehicle adsorption and the structure of pigmented paints *by H. Schutte and K. Řehaček*

Relative permitivities of some printing ink pigments *by G. F. Lewin and J. Chapman*

Practical evaluation of anti-fungal paints in the tropics *by J. R. Rischbieth, L. O. Freeman, K. R. Bussell, L. A. Hill and C. A. Grey*

The adhesion of multicoat systems after nine years' exposure *by P. Walker* (*Short communication*)

Reviews

Pigments in paint

By H. P. Preuss

Pp. vii + 134. Price $15.00

Noyes Data Corporation
New Jersey, USA; and London, England. 1974

This well printed and attractively bound American publication is based on a series of articles which Mr Preuss produced for the journal, "Metal Finishing" between June 1970 and May 1973.

In his introduction he defines a paint, briefly classifies pigment types and describes their main properties where applicable to paint systems. Mr Preuss states that his intention has been to discuss the role of pigments as one of the prime components in a paint system. This, he has done extremely well.

Pigments are sub-divided into 15 different groups according to colour and/or whether they are organic or inorganic, and these 15 groups form the subject of separate chapters and include white, black and "extender" pigments. Thus, "Inorganic Orange Pigments" forms one chapter, "Organic Yellows another," and so forth.

For each particular colour, mention is first made of spectral properties, and within each chapter different chemical types are then detailed together with typical recommendations for application and a survey of physical and chemical properties. This is followed by a list of manufacturers, their USA addresses and products which they produce within each "class". The product lists vary in their detail from manufacturer to manufacturer, but usefully describe shade, some physical and chemical properties, application recommendations, and other details.

It must be emphasised, of course, that this is an American publication. Hence, the accent is on pigments marketed in the USA and although many of the suppliers listed are international companies having either agencies, marketing organisations or even manufacturing plants within the UK, the product lists do not by any means cover all of the pigments available to the UK pigment user (nor indeed all of those available to him at the most attractive UK prices).

The final chapter usefully covers the most topical subject of lead in pigments, and though this is an ever changing scene, the information provided is as up-to-date as is possible for this type of publication, but again concentrates on the USA situation.

At the end of each chapter there is a most useful set of references for future reading.

In the foreword, the book is suggested for use by executives in research, technical service, marketing, development and market research. In the reviewer's opinion it could also prove invaluable to executives in purchasing, providing a rapid means of locating (predominantly USA) suppliers of specific types of pigment and, at the same time, comparisons under one cover of pigments available from different sources.

A. E. HONIBALL

Colour 73

Pp. xviii + 566. Price £12.00

Published by Adam Hilger, Rank Precision Industries Limited, London. December 1973

The International Colour Association, formed by national equivalents of the British Colour Group and the American Inter-Society Colour Council (AIC), held its Second Congress in York, 2-6 July 1973. Some 440 delegates from 26 countries took part and "Colour 73" is a record of the proceedings. The ICA covers every aspect of colour and the papers presented reflect this policy admirably, the only aspect missing being the chemistry of colorants, also missing from the First Congress. "Colour 73" is thus a very up-to-date account of current work in colour.

Like so many books on colour, it is printed in black and white and contains the full transcripts of the nine invited lectures which were given by recognised experts in their own field. Three are of particular interest to OCCA members—"Current developments in colorimetry" by Wyszecki, "Problems in colour reproduction" by Hunt, and "Computer colour matching" by Gall, which is wholly concerned with pigments. The nine Survey Lectures occupy about 250 pages: about 300 pages consist of the summaries written by the authors of the 100 or so papers presented at the Congress and grouped under headings such as Colour Vision, Colour Appearance, and Colorant Formulation. Though necessarily condensed, they do provide about as much information as the authors could impart in the time available for presentation and so "Colour 73" can be regarded as essential reading for all who want to keep abreast of this field: it will not become out-of-date before 1977, the date of the Third Congress.

K. McLAREN

IUPAC recommended methods for the analysis of alkyd resins

Pp. 23. Price £0.25

London, Butterworths, 1973

This little booklet is reprinted from Pure and Applied Chemistry, the official IUPAC journal, and is the outcome of a co-operative study by seven experts of international repute under the chairmanship of Dr L. A. O'Neill. It is the second report of the Sub-Committee on Analytical Methods of the Organic Coatings Section of the Applied Chemistry Division (now the Supported Polymer Films Working Party of the Macromolecular Division). Having worked on other projects under the same auspices, the reviewer can testify to the meticulous care which goes into the development and evaluation of these methods and the compilation of the recommendations.

Briefly, the quantitative methods covered are for acid value, saponification value, hydroxyl value, phthalic anhydride content and fatty acids content. These are supplemented by procedures for the identification of alkyd types by infra-

red spectroscopy, and of carboxylic acids and polyols in alkyds by gas/liquid chromatography.

It is well to remember that many quantitative procedures commonly applied to alkyds had their birth in the analysis of oils and fats many years ago, and that what works well on linseed oil does not necessarily work well on a linseed alkyd. Particular attention was paid by Dr O'Neill's team to the measurement of hydroxyl value, the original methods for which were designed for castor oil and were unreliable when applied to resins. A choice of two methods is given, both depending on quantitative acetylation.

Those who saw the earlier "Recommended methods for the analysis of drying oils" will know the detail and the standard to expect when they peruse this publication. The reviewer considers the booklet to be essential reading, for the surface coatings analyst who does not know these procedures by heart is simply not worth his salt; if he thinks he does know better, let him prove and publish his case.

A. R. H. TAWN

Information Received

Bayer reorganisation in Belgium

Bayer AG has merged the marketing companies in Brussels of its Divisions for organic and inorganic chemicals, rubber, plastics and surface coatings, polyurethanes, dyestuffs, fibres and pharmaceuticals in a new company to be known as Bayer Belgium SA—NV.

Electron-beam curing

Toray Industries Inc. and Nippon Steel Corp. have decided to commercialise an electron-beam curing process for high-grade precoating of steel sheets after years of joint studies with paints and ink developed by Toray for this specific purpose.

The commercialisation of high-grade precoated steel sheets will be undertaken by a subsidiary of Nippon Steel Corp., with the new plants entering into operations in 1975.

Many inquiries have been received by these companies from abroad on the new technology, for which more than 30 patents are pending.

Exposure testing

John Scott, Client Services Manager, Desert Sunshine Exposure Tests Inc., will be in England from 6 to 19 July visiting clients and would be pleased to discuss accelerated and conventional exposure testing with interested parties, who should contact the Holiday Inn, Marble Arch, London.

High pressure plunger pumps

The Kobe Triplex plunger-type pumps, for pressures up to 30 000 lb in^{-2} and displacements up to 200 gal min^{-1} in the —420° to 1000°F temperature range are now available from Kinder Janes Engineers Limited, the sole UK distributors. Designed to serve as high pressure sources of hydraulic power for many types of systems, they are particularly adapted for severe service involving frequent hydraulic shocks in the system, high temperatures and a variety of hydraulic fluids. Particularly interesting applications have included the handling of a petroleum product with viscosities up to 40 000 centipoise at a pressure of 20 000 lb in^{-2}.

Neumo appointed British distributor for Aro pumps

The Aro range of air-operated industrial pumping equipment is now available direct from the new appointed British distributor Neumo Limited, Quarry Road, Newhaven, Sussex.

Manufactured by the Aro Corporation, the pump range is particularly suitable for high and low viscosity liquid transfer applications in the chemical, paint and other industries. They are also compatible with the Neumo range of air-operated pumps and filling machines.

New marketing structure for Rohm and Haas

Rohm and Haas (UK) Limited has announced a major reorganisation of its sales structure. The company's existing sales departments for polymers and leather chemicals, paper and textiles chemicals, monomers and coatings, plasticisers and modifiers have been consolidated within a single new marketing division. A senior executive has been appointed to supervise overall market development and planning, and the Rohm and Haas sales department as a whole has been restyled the "Marketing department".

Paintmakers limit lead in decorative products

On 1 January 1973, members of the Paintmakers Association voluntarily agreed that as from last April, future production of proprietary decorative paints would contain no more than 1 per cent lead in the dry film and in the few products where this could not be achieved, containers would be labelled, "Do not apply on surfaces which might be chewed by children." The Paintmakers Association, on behalf of its members, has expressed its pleasure in announcing this development in limiting the use of lead-based compounds in decorative paints.

Queen's Award to Industry for Ciba-Geigy

The Pigments Division of Ciba-Geigy (UK) Limited cited a £2 million increase in the value of organic pigment exports between 1971 and 1973 as a major factor in the presentation to the company of the Queen's Award to Industry for export achievement. Exports represented 40 per cent of the total turnover of the Pigments Division in 1973.

A breakthrough in technology in the mid 1960s at the Paisley, Scotland and Manchester research and development laboratories resulted in the Division introducing the "Irgalite L" range of easily dispersible pigments for application in letterpress and lithographic inks. An export drive based on the Irgalite L range has, in the past six years, carried the Division's products into a commanding position in many of the world's major printing ink markets. Particular success has been achieved in the highly competitive West German market where the Division's pigment sales overall have more than doubled in the past four years.

Reorganisation in Carless

North Western Oil, the wholly owned subsidiary of Carless Capel & Leonard Limited, has changed its name to Carless Chemicals Limited and the substantial North Sea oil and gas exploration interests of the company have been put into a new wholly owned subsidiary, Carless Exploration Limited. Following this rationalisation of operations, Carless has put existing operations in solvents and condensate products into a separate subsidiary Carless Solvents Limited.

New products

New fluidised bed coating powder from Bayer

The range of fluidised bed coating powders marketed by Bayer AG of Leverkusen has been complemented by a new type "(R) Levasint," a powder based on a saponified ethylene/vinyl acetate copolymer specially developed for the fluidised bed coating process. This new product is expected to open up new applications for this process.

New polyamide inks from Lorilleux

A high performance flexographic ink system for converters of polyolefin films in the flexible packaging industry has been introduced by Lorilleux Bolton Clapham (Liquid Inks) Limited of Harlow, under the name of "Javelin."

Formulated to cover a wide range of end uses previously requiring a variety of individual ink types, polyamide-based Javelin inks feature high resistance to set-off and blocking on two-side treated polythene and polypropylene films. Results of running under production conditions on a variety of presses show that strong, clean prints at speeds of 100 up to 1000 ft per minute can be achieved.

Literature

Report of colour finishes for farm buildings

A report entitled "Revised Colour Finishes for Factory-made Cladding used in Farm Buildings" published by the Design Council, is now available. The recommended colours in the report have been revised to bring them into line with the "Basic Range for the Co-ordination of Colours for Building Purposes" (DD17:1972) published by the British Standards Institution.

London

Hastings conference

The Section held a two-day conference at the Queens Hotel, Hastings, on 23 and 24 February. Some 67 members attended, many with their wives and children. The section also entertained six members of the APTVF. A full programme of technical sessions was arranged as well as functions for the ladies and the children. The ladies' events included a trip "behind the scenes" at the local Marks & Spencer store.

The technical session was opened by Mr R. H. E. Munn, the Section Chairman, who stated that the weekend had been organised because it was felt that members rarely meet on a social basis.

The first paper entitled "Gloss measurement using the gonio-photometer" was given by Dr Carr, of CIBA-GEIGY Limited, assisted by Mr Davies. Dr Carr explained how the Goniophotometer measured both specular and diffuse gloss by taking reflectance readings over a 21° range. The resulting graph when plotted on a logarithmic basis yielded more information about the gloss of a surface than did the normal fixed angle specular gloss reading obtained with other gloss meters. Dr Carr described how the instrument could be automated and coupled to an x-y recorder. The paper was concluded with a short film about the instrument, after which Mr Davies gave a practical demonstration of its operation, and this was followed by a discussion of the paper.

The ladies joined the main group for the second and third events on the technical programme, the first of these being a film from Hoechst entitled "Adventure in colour." The film gave seven different views on the use of colour.

The second paper was given by Mme M. Tapin and was entitled "Colour in the home." The paper dealt with the historic background of home decoration from paintings in caves through various periods of decor, such as Roman and Greek, up to the harmonic colour schemes of today. Mme. Tapin explained the importance of colour choice on surroundings; a poor choice of colour in working environments could cause rapid fatigue. The emphasis then switched to fashion and colour vogues and how these colours were decided years in advance. A discussion period followed, and the ladies had many questions to ask on colour in fashion.

The first day was concluded with a reception followed by dinner and dancing. The Section was honoured by the presence or Mr Roire, Vice President of APTFV, and a small party of members from the French Association, in addition to two past Presidents of this *Association*, Dr H. Keenan and Mr C. Mundy, together with their ladies, Dr S. Wernick, Secretary General of the IMF, and Mr I. Walker, Chairman of the Organic Finishing Group of the IMF. Mr Munn welcomed the guests from APTFV and hoped that this would further a long relationship between the two Associations. Mr Roire replied on behalf of the guests. Dancing then commenced and continued until 12 a.m.

Mr Roire, Vice President of the APTFV, replies on behalf of the guests at the Hastings Conference

The first technical paper on Sunday was given by Mssrs J. Groom, R. Burrison and W. House of SCC Colours Ltd. The title was "Aqueous pigment pastes: surfactant effect." The authors had examined 16 different surfactants and their effects on dispersion. Two pigment types were used and the resultant dispersions compared for physical properties. It was noted that some of the surfactants produced very good dispersions, initially, but the dispersion deteriorated over a period of time. A discussion period followed, when the authors were able to put forward some tentative conclusions on their additional work with their dispersions in dispersions of polymers.

The ladies joined the technical session for the final papers of the weekend. The first of these was given by Mr J. Hirons, of the Ford Motor Company, on "Development and selection of colours in the motor industry."

The colour range was under constant review, and new colours were now being developed for the 1977 market. Mr Hirons' department was interested only in the colour; problems of production of colour, application and cost of the pigments to produce the colours chosen by his department were not his concern. It was normal for 100 colours to be examined as possible additions to the range and these were reduced in number to 25 following discussions between the sales and marketing departments.

The number was then further reduced by senior management. This year there were seven additions to the colour range, yet the next programme would have only four changes. Mr Hirons then showed a table of the most popular colours in Europe. At the top of the list was white, followed by yellow.

One of the many questions which followed concerned the naming of colours, and Mr Hirons said that this was the job of the marketing department. Care had to be taken to ensure that the name translated into other languages without slipping into the vernacular.

The final paper of the conference was given by Dr R. Denny entitled "Poison, presentation or packaging—the colours in your food." A food additive could be described as any chemical which did not appear naturally in the animal or plant concerned. Food additives fell into two groups. Indirect additives were materials absorbed by the foodstuff during processing and packaging, and included such materials as lubricants, pesticides and veterinary drugs: direct additives were added to give certain properties, such as, flavour, colour, emulsifying effects, bleaching and preservation.

Because an additive was used in a foodstuff did not mean it was safe. Dimethylamino benzene had been withdrawn because it had been found to cause cancer.

Dr Denny then went on to talk about the effect of joining the EEC on the use of foodstuff dyes. In this country there were 24 accepted foodstuff dyes. The EEC had 19, but there were only ten common to the two lists. Unless some agreement were reached, it would become necessary to use dyes not normally accepted as safe in this country. The amount of additives being used in food was increasing at an alarming rate considering so very little was being found out about toxicological properties of the additives.

This had resulted in the alarmist headings in the papers when a dye or additive was removed from the "Approved" list for close examination.

Mr Munn closed the conference. He was pleased that everybody had enjoyed the social and technical events. It was encouraging to see members taking the opportunities to attend such a function, particularly in family groups, and he hoped that a similar event could be organised in the future.

B.A.C.

Manchester

A meeting was held at the Manchester Literary and Philosophical Society, 36 George Street, Manchester, on Friday 8 February 1974, when two lectures were given.

The Zeiss goniophotometer

First, Dr W. Carr of Ciba-Geigy (UK) Ltd., Pigments Division, gave a talk entitled "The Zeiss goniophotometer". With this instrument both the specular and diffuse reflection of light from films could be measured; that is, both the gloss and the haze. Although the instrument was correct and sensitive, it was slow and tedious in operation. It could be fully automated, however, so that reflectance curves could be obtained readily and speedily without eye strain. The automated instrument was described and shown operating. Members had been invited to bring to the meeting specimen paint panels or printing ink films so that these or a selection of them could be measured for gloss and haze during the demonstration.

The gel permeation chromatograph

The second talk was given by Dr R. A. Ellis, of the Walpamur Company Ltd, who spoke on "The gel permeation chromatograph." Dr Ellis started with a historical survey of liquid chromatography and the development of gel permeation chromatography (GPC). He then proceeded to describe the nature of GPC separation, the column packing materials used and the equipment which could be constructed in the laboratory for carrying out GPC work. This was followed by a description of the method of interpretation of GPC data using the concept of extended chain length, including the relationship between molecular weight and molecular size (Q-factor). Dr Ellis concluded with illustrative examples of gel permeation chromatography applied to paint and resin systems, such as the comparison of data from two intruments, alkyd resin preparation, paint binders, autoxidative film formation, absorption of resin by pigment, alkyd resin intermediates and so forth.

A lively discussion period on the two papers concluded the evening.

A.McW.

Recent trends in wood finishing

A meeting was held on Friday 8 March at the Manchester Literary and Philosophical Society, Manchester, when a lecture was given by Mr K. Waddington, of Donald MacPherson & Co. Ltd., entitled "Recent trends in wood finishing."

Mr Waddington outlined the general trends since 1950, in so far as there had been little change between 1950 and 1960. Between 1960 and 1970 saw increasing automation with more sophisticated coatings being developed; raw material costs were beginning to rise. During 1970-74, further automation was necessary to cut production costs, shorter cure times were needed, and veneers were now being priced out of the market. At this stage, he outlined methods of applying the paint and the various finishes available. He then made reference to various curing techniques:

Hot air was very popular and often used in conjunction with infra-red curing. There was a growing interest in ultra-violet but fairly high capital costs could limit this interest, whilst electron beam curing was not yet used in the UK, and some continental plants were having expensive teething troubles. Infra-red was very popular, having lower capital costs, but it might become expensive to run with rising costs for energy. Radio frequency, laser and microwave techniques were also under investigation.

In general, it should be possible to use a portion of the electromagnetic spectrum to maximum efficiency, but this would require special monomers, which were expensive, thus defeating the object.

For the future, Mr Waddington suggested that continuation of mergers in the furniture industry would lead to more efficient and sophisticated coatings and methods being used, whilst developments of the coatings would appear to follow the general trend towards 100 per cent solid- or water-based products.

Mr Waddington concluded with a series of slides showing the type of work carried out and the equipment used in his own firm's laboratory.

After a short but very interesting discussion period the vote of thanks was passed with enthusiasm by the 40 members and guests attending.

A.McW.

Midlands

Trent Valley Branch

Marketing in perspective

A meeting was held on Thursday 14 March at the British Rail School of Transport, Derby. Some 30 members and guests were led by Mr J. Fowles-Smith, with a natural charm, through the dusty passages of two centuries of "Marketing in perspective." With torch in hand, Mr Fowles-Smith illuminated here and there, tall epitaphs to early marketing pioneers, with suitable pauses for reverence to allow the audience to take in such trail-blazing names as Adam Smith, Leslie Rogers and the Havard School of Business Studies.

Like Alice, the audience was shown monuments to well constructed marketing campaigns, where a company had earned its "Market-mix" right by managing to market and deliver value satisfaction at a profit, which loosely translated, means "making a killing with a gimmick." Not failing in his duty, Mr Smith also showed the tangled heaps of wreckage left behind when a company failed to get its "market-mix" right and product development innovation was not sufficiently consumer orientated. Throughout his lecture, Mr Fowles-Smith both dazzled, enthralled, sometimes shocked, but always entertained his audience in the best of OCCA traditions.

Those present left with the impression that "Marketing" was a mixture of art and science, but with more than a hint of craft.

An exciting if somewhat unusual question period followed, in which the audience were at times answering the speaker's questions, and one enterprising marketing "convert" actually started selling or "marketing" in depth to his neighbour.

The meeting was eventually interrupted by Mr D. Bishop, who proposed a vote of thanks on behalf of those members who could not for one reason or other continue the delightful discourse in the bar.

J.R.K

Design trends in colour television and report of AGM

The Trent Valley Branch held its tenth AGM at the British Rail School of Transport, London Road, Derby, on the night of Thursday 4 April 1974. Some twenty members and guests witnessed two new members welcomed to the committee and Mr J. R. Bourne hand over the office of chairman to Mr J. A. Burns.

There followed a pleasant talk by Mr C. Hodgson of Pye, on the interesting subject of "Design trends in colour television." Mr Hodgson touched on such aspects as the latest sliding controls on modern slim-line colour sets, the long-life transistors, and printed circuit "spin-offs" from space research.

It appeared that the average viewer could claim around 2000 viewing hours per annum and in order to give customer satisfaction, Pye tested their sets to destruction by recording old films week after week—a penetrating procedure guaranteed to stress the "telly" and distress the viewer.

The time honoured "vote of thanks" was eloquently proposed by Mr J. R. Kitchen, the sole member present at the meeting to own a Pye television set.

The evening was rounded off when the members invited their lady guests and Mr Hodgson to a delightful buffet supper at the Ascot Hotel.

J.R.K.

Scottish

Labelling of paints and varnishes in the EEC

Mr Kay, from HM Factory Inspectorate, presented the lecture on "Labelling of paints and varnishes in the EEC" at the meeting on 14 February. Mr Kay stressed that although the UK had not entered the EEC until after the directive had been given, our discussions in the Council of Europe had had an influence on the early drafting.

In general, the type of label and amount of information on the label was a source of considerable debate. A graphic label, as adopted by the UN on certain hazards, would give worldwide use—overcoming language and cultural difficulties. If a European label was to be printed in more than one language, then with several warnings on the one label it could become confusing and unlikely to be of value. With smaller sizes the label would be bigger than the container. The final directive, therefore, would be likely to carry certain exceptions.

The directive relating to paint would have to cover a range of constituents and the Italian delegation were proposing that these could be taken into account in a "balancing" equation; the Italians had very successfully applied this approach to solvents.

During a very lively discussion period, Mr Kay stressed the draft nature of the present proposals; these could be modified by representation through the appropriate channels. It was agreed by all that Mr Kay's lecture presented an excellent insight into the form of this specific draft and also into the working of an EEC committee.

G.H.R.

Paint and joinery

The lecture was presented by Mr A. Sherwood, of the Paint Research Association, on 14 March 1974. The lecturer stressed the importance of understanding the growth structure of wood and its chemical composition, which together present excellent conditions for "life support" to the detriment of structural stability. With the increasing demand for wood, a larger amount of young wood was being used in joinery and this softer (open structure) material was less resistant than older wood.

Another important feature of wood was the different cell structure in the spring wood (open cells, soft), and summer wood (light cells, hard). Mr Sherwood showed how the damaging uptake of water could be related to the absorption of water on the fibres and, after fibre saturation, as free water in the cell structure. It is this water uptake that must be prevented if wood is to be rendered more durable.

Any primer on wood must show good adhesion and good resistance to water and as a result of the differential expansion of spring and summer wood, it must also exhibit good flexibility.

To fully assess the primers, the PRA had devised a test method which involved the use of V-grooves on the upper horizontal surface. They also closely examined the effect of end-grain penetration. This test method gave realistic accelerated testing, one year on test being equivalent to 7-8 years in normal use.

Of the other primers investigated, those based on lead pigments, now not fully acceptable, proved to be of a high standard. Long oil alkyds of good flexibility also gave good performance. The water thinned acrylic resins had high water penetration and gave poor protection.

Mr Sherwood showed how improved results could be obtained, but was critical of the handling and storage of wood on building sites. Primers and other paints were very often applied to soiled surfaces, and an unsatisfactory combination of primer and preservative were used, for example a water thinned primer with a water repellant preservative. In addition, water could easily enter through non-protected end grain or non-treated wood adjacent to brickwork.

In his vote of thanks, Mr C. McLean expressed the sentiments of the audience by expressing appreciation of the interesting and wide ranging topics covered by Mr Sherwood.

G.H.R.

Thames Valley

Corrosion—the vulture of metallurgy

A meeting was held at the Beech Tree Hotel, Beaconsfield, on 21 February 1974, when Dr M. Clarke, of the Sir John Cass School of Science and Technology, gave a talk entitled "Corrosion—the vulture of metallurgy."

Dr Clarke said that corrosion science was a combination of chemistry and metallurgy, but its study had been neglected compared with similar subjects. Recently, a Chair in Corrosion (the first in this country) had been instituted at Manchester University.

Dr Clarke went on to show many slides, which illustrated that in the majority of cases corrosion was not being prevented, in spite of all the progress made by science. He thought that the main reasons for this failure were bad design in the structure and lack of proper surface preparation before painting. The slides indicated that many modern structures were showing signs of corrosion in a comparatively short time.

The lecture was delivered in a delightfully clear manner, and the thread of humour which ran throughout the talk kept the audience interested and highly amused.

A vote of thanks was proposed by Mr Bray and this was warmly supported by the audience.

W.G.A.

Paint Research Association inventions

A meeting was held at the Beech Tree Hotel, Beaconsfield, on 24 January, when Mr Holbrow traced the origins and development of the Paint Research Association from its inception in 1918. Originally, there were centres for basic research; now the main emphasis was on applied research under contract. Solving technological problems for the paint industry had resulted in a number of inventive developments at the Paint Research Station. Three examples were chosen to illustrate different routes to inventions.

Conductive paints resulted from a study of the properties of sodium silicate binders. Most of the technical capability already existed and it had largely been a matter of designing suitable paints of exceptionally high electrical conductivity, which would provide new markets for the paint industry.

Organosilicate resins developed from a chemical study of mineral silicates. Resinous materials, soluble in white spirit and other solvents, were obtained in a single stage, room temperature reaction from mineral silicates. Those resins examined so far had excellent waterproofing action on textiles and masonry.

A number of low toxicity fungicides and marine weed antifoulants had been discovered as a result of the screening of compounds supplied by pharmaceutical companies in a co-operative exercise.

The lecture was illustrated by samples, demonstrations, slides and two cine films taken from the BBC Television programme "Tomorrow's World."

EXHIBITION REVIEW

OCCA 26 sparkles!

Exhibitors from 14 countries and visitors from more than 50.

Against the background of industrial difficulties arising from world shortages of raw materials and the result of the recent three-day working week in the United Kingdom, the twenty-sixth annual Technical Exhibition sparkled with an international gathering of exhibitors from thirteen overseas countries and visitors from more than fifty countries.

A special party of Japanese visitors from the Osaka area travelled to the Exhibition, were present at the Exhibition Dinner, visited the Paint Research Association and Silver Paint and Lacquer Group and arrangements were made through OCCA for them to meet various industrialists to discuss licensing arrangements.

Many exhibitors have expressed themselves as amply rewarded for their support in these troublesome times of this most important annual technical forum for the surface coating industries in the world. OCCA 26 proved beyond doubt the Association's claim that the value of the Exhibition would actually be enhanced this year by the critical conditions facing the industries, since it enabled exhibitors to discuss informally with their customers and others at all levels what was being done to alleviate the problems and shortages, and, in so doing, they built up good will for the future.

The Exhibition is unique in its endeavour to bring together the technical personnel of the supplying and consuming industries at an annual gathering, allowing for the free interchange of ideas and the rapid dissemination of knowledge of new products and new developments on existing products.

The countries from which exhibitors were drawn (many showing for the first time) were:

Australia, East Germany, Finland, France, Holland, Hungary, Italy, Poland, Rumania, Spain, Switzerland, United Kingdom, USA and West Germany.

The turn-stiles at the entrance to the Exhibition showed admittances of approximately 13000 and the overseas countries from which visitors were known to have come to OCCA-26 were:

Algeria, Angola, Australia, Austria, Bangladesh, Belgium, Bermuda, Brazil, Brunei, Canada, Cuba, Cyprus, Czechoslovakia, Denmark, Egypt, Ethiopia, Finland, France, Germany, Ghana, Greece, Holland, Hungary, Iceland, India, Iran, Iraq, Ireland, Israel, Italy, Japan, Kenya, Lebanon, Luxembourg, Malaysia, New Zealand, Nigeria, Norway, Pakistan, Poland, Portugal, Qatar, Rumania, South Africa, Spain, Sweden, Switzerland, Syria, Turkey, USA, Venezuela, Yugoslavia, Zaire, Zambia.

The Exhibition was open for four full days starting at 9.30 am on Tuesday 23 April.

Exhibition dinner

On the first day, a dinner was held at the Savoy Hotel. The President, Mr L. H. Silver, gave an address of welcome to exhibitors, members, visitors and guests of the Association. It had been the custom for Presidents on these occasions to look back over the period since the last exhibition and Mr Silver drew attention to the incredible position which had faced the industries since the last Exhibition dinner in May 1973. Who would have predicted then the acute shortage of raw materials, the energy crisis in the autumn and the three-day working week in the United Kingdom? The paint industry and its suppliers had experienced one of the most astonishing years on record and it was not surprising that these events had had their effect on the Association.

First of all, although the Association was delighted to welcome many new exhibitors, including for the first time direct exhibits from Hungary, Poland and Rumania, it was very disappointed that many of those companies, both British and from overseas, who had been regarded as regular exhibitors, although not necessarily annual exhibitors, had felt unable to participate. Many had reasoned that although they supported the aims of this unique Exhibition, they felt embarrassed at not being able to supply the raw materials they marketed because of shortages. Mr Silver re-emphasised that it was just because the OCCA Exhibition was special in allowing the free interchange of ideas between personnel at all levels, that its value was actually enhanced in the present day circumstances. Those who were exhibiting had grasped this opportunity to explain to their customers, and potential customers, precisely what they were doing

Throngs of visitors engrossed in exhibits, literature and discussion—a view from the first floor of part of the Exhibition

to help in these difficult times and in so doing were building up good will for the future.

Just as the industry had survived all the problems of the last year, however, so OCCA had not only survived, but had taken on other burdens: the *Journal* had been completely reshaped to fit in with the international A4 size; another volume in the series Paint Technology Manuals "Works Practice" had been published; the growth of the Association's optional Professional Grade had been fostered; a splendid Conference was held at Eastbourne in June of 1973; and last October a reunion was arranged for all past and present members of Council. As President, Mr Silver had visited two other members of the international alliance, the SLF Conference at Sandefjord and the FSPT Convention in Chicago, and was planning to visit the FATIPEC Congress in May 1974, thus completing the "tour." The Association had bestowed its highest award (that of Honorary Membership) upon Mr Robert Matlack, retiring Executive Vice-President of FSPT, in recognition of the part he had played for so many years in fostering the liaison between the four societies.

★ ★ ★

The President, Mr L. H. Silver, presents a commemorative scroll, shown above enlarged, to Dr S. H. Bell (right) who was recognised in the New Year's Honours List by the award of the Order of the British Empire

The Technical Education Stand, featuring "Powder coating" this year, adjoined the OCCA Information Centre where literature was freely available on membership, aims and activities of the Association. Members found particularly interesting the chart showing new regulations for admission to the optional Professional Grade (for further details, see page 214 of this issue)

Finally, Mr Silver said that at this stage in the proceedings he would normally extend a welcome to a guest speaker from outside the Association, but Council had decided that on this occasion, which was the very first occasion possible, it was right and proper to honour one of its own members, a past President who had done so much for the Association and the industries and who had been connected with the Paint Research Association for over forty years. He referred to Dr Sidney Bell, whose work had been recognised in the New Year's Honours List by the award of the Order of the British Empire. Council felt that they could not let such a significant event pass without showing their pleasure and esteem to Dr Bell. A commemorative scroll was then presented by Mr Silver amid warm and generous applause.

Dr Bell, in his reply, thanked Council for a very memorable evening. He remembered his term of office as President and looked back over some of the crisis peaks which had affected the Association, particularly the periods which had followed the two world wars. Many changes were now taking place and it was significant that OCCA should be so active in these critical times.

Exhibition motif

As has been the case for many years, the presentation of the Exhibition has been integrated with a special design which gives each exhibition its identity. The motif for OCCA-26, designed by the Director & Secretary, showed the flags of the enlarged European Economic Community, linked by the initials OCCA. By converging on the flag of the United Kingdom, the motif symbolises the welcome extended by OCCA for many years to exhibitors and visitors from these countries and from further afield to its exhibitions in London, one of the capital cities of the EEC.

Information Centre

Enormous interest was aroused at the Association's Information Centre where the OCCA publications, ties, badges etc. could be purchased and where information was available on the optional Professional Grade, membership of the Association, subscription to this *Journal* and details of the one-day symposium being held in conjunction with the Paintmakers Association later this year. As usual, interpreters were available at the Centre for the many overseas exhibitors and visitors.

Technical Education

The theme of the Technical Education Stand was "Powder coating" and an informative leaflet was prepared by the Association for distribution. The Association expresses its thanks to the following, who assisted in the compilation of the leaflet: Mr S. R. Finn, the Honorary Editor, BIP Chemicals Limited and Shell Chemicals (UK) Limited. Staff from various Technical Colleges in the London area manned the Stand and were able to advise on courses for students. Copies of the leaflet may be obtained from the Association's offices by sending a stamped self-addressed envelope, marked "Powder coating" in the top left hand corner (UK addresses only).

Exhibition Report 1974

Technical journals and services ● Extenders, fillers and matting agents ● Pigments ● Additives, driers, surfactants and hardening agents ● Chemical intermediates ● Manufacturing equipment, drums ● Laboratory apparatus and testing equipment ● Resins ● Miscellaneous

Technical journals and services

CIECH showed an unusual display for an *OCCA* Exhibition, and this is probably the first occasion on which a paint manufacturer has been represented. The products of the Union of Paints and Lacquers Industry, "Polifarb" of Gliwice, are exported and cover a wide range of marine and decorative products, as well as lacquers for the furniture industry and anti-corrosive paints for steel. An advisory service is offered wherever the paints are used.

MIXING & DISPERSION 1974 is a new reference annual published by A4 PUBLICATIONS LTD, intended for the mixing and ancillary industries. It is published in two sections, the first covering the design and selection of plant and equipment, recent developments and a review of the recent patent literature. The second part gives a guide to manufacturers and the products available from them.

POLYMER, PAINT & COLOUR JOURNAL is too well known to need any detailed description and this year it was the only journal represented at the exhibition. Recent issues have been largely involved in the difficulties experienced as a result of the current severe shortages of raw materials. The journal provides up-to-date technical and commercial news. Advance notice was given of two forthcoming symposia to be organised by the journal, and details were given of specialised reports by AVIACHEM LTD which have been published.

TIN RESEARCH INSTITUTE exhibited its recent publications which cover the use of tin compounds, particularly the tributyl- and triphenyl-tin derivatives, such as the oxides for wood preservation where the liability of fungal attack has become more serious due to changes in the types of wood available, the design of houses and the increased use of central heating. Information was available too on the use of tin compounds as paint biocides and the polymeric tributyl-tin compounds for use against marine fouling.

WAYFARERS TRAVEL AGENCY were represented for the first time at the exhibition. In addition to providing tickets and documents for visitors to the exhibition, the agency presented information on the other extensive facilities which it offered.

Extenders, fillers and matting agents

JACOBSON VAN DEN BERG exhibited the Sedapol range of anti-settling agents for use in either polar or non-polar systems and a wide range of polyethylene wax dispersions manufactured by POLYCHEMIE of France to give matting and mar resistance. The Armoform range of lightweight glass microballoons varying from 10 to 250 microns diameter for use as fillers were also shown.

JOSEPH CROSSFIELD showed its wide range of fine silicas, including extenders and matting agents. Microcal ET is intended for use in emulsion paints of medium to very high PVC, and the company described its latest work on formulations containing the minimum amount of TiO_8. The range of Gasil matting agents was also exhibited for use with wood finishes, coil coating, fabric coatings and paper coatings and which are now available for use in aqueous systems. Developments in the use of these materials in powder coatings to prevent caking and blocking was described.

KINGSLEY & KEITH (CHEMICALS) LTD showed a wide range of products which included Cab-O-Sil, a submicroscopic fumed pyrogenic silica for thickening and imparting thixotropy for the prevention of settling and control of flow. The Diowax range of low molecular weight wax dispersions are for use in printing inks for improved rub resistance, whilst the Veba Wax A235 is also available to give excellent rub and mar resistance to all types of surface coatings. Details were given of a new stippled finish which is obtained by the addition of pva micro-flakes.

Pigments

IMECO exhibited a range of inorganic pigments suitable for use in offset litho, and flexographic inks.

INDUSTRIAL COLOURS LTD showed the latest developments in its range of Flare fluorescent pigments and aqueous fluorescent pastes, giving technical data on the particle size, ultra-violet absorption, dispersion and reflectance levels. The range now includes ultra-violet stabilised pigments and the 600 series of thermoplastic pigments suitable for plastics, screen inks and paints. The 610 series of "stir-in" fine particle size pigments give high colour intensity and maximum fluorescence. The 630 series ultra-fine particle thermoplastic pigments of great colour strength are for use in thin films, and the 810 series of solvent and heat resistant "stir-in" colours are formulated for use in paints but may also be used for plastics and rubber manufacture where high processing temperatures are involved. The Flare aqueous pastes are finely dispersed and are intended for rapid blending in paper coating and textile printing.

KINGSLEY & KEITH showed the Molywhite non-toxic pigments. The 101 grade is based on zinc molybdate and suggested formulations for epoxy ester industrial stoving finishes and for general purpose alkyd primers were given. The new 212 grade is intended for use in latex paints, and suggested formulations for electrodeposition were available.

LAPORTE INDUSTRIES LTD displayed data on the efficient use of titanium dioxide in water-based gloss systems using Runa RH 472 and RO 676 for air drying and cured water-based systems. The computerised control of TiO_2 production was demonstrated; this enables a continuous monitoring of properties such as particle size, opacity, colour and many others.

MONTEDISON GROUP exhibited the ACNA range of pigments and dyestuffs, which included the Segnale and Segnale Light pigments for paints and printing inks as well as the Termosolido, Termosolido Supra and Stenoplast ranges for thermoplastic materials. The Sintosol range of pigment pastes is intended for use with emulsion paints and emulsified vehicles, Segnale Light 57 for use in the paper industry, Microfil for dyeing viscose and Vulcol and Vulcolene for rubber and latices, respectively, were also shown. Also exhibited were the Indulines and Nigrosines dyes, which are soluble in water, alcohols and fatty acids and have a wide field of applications.

SCC COLOURS LTD introduced three new product lines: two series of flushed colours for general-purpose offset printing inks and a completely new range of high density aqueous pastes for use in any water-based system.

The flushed colours are offered in two media: a two-pack heat-set system for web offset, and an alkyd system designed for sheet-fed offset. These latest flushings will initially comprise the red, yellow and blue of the process colours, and other colours, including reflex blue, will be introduced later.

Also new from SCC are the high density aqueous pastes available in 13 colours. The pastes have been developed to meet customers' requirements, including high pigment concentration and colour strength, very good resistance to drying-out during use, freeze-thaw stability and resistance to normal process temperatures and very good foaming resistance. Other properties of these latest SCC high density pastes are a minimal tendency to flotation and flocculation, freedom from settlement and separation, and excellent lightfastness; they are especially suitable for gloss emulsion paints based on the SCOTT-BADER pvdc resin system. Wet scrub resistance of normal pva systems is also frequently improved by using these pastes. Paint, printing ink, rubber, wallpaper, soap and leather industries have already reported favourably on these high density pastes.

SUN CHEMICAL CORPORATION were exhibiting at the exhibition for the first time and demonstrated the application of flushed colours in printing inks and its latest developments in the production of low odour, low emission products. A recent development is a range of press cakes of 50 per cent pigment content for use in water-based inks, and SUN showed a range of flushed colours for colouring polyethylene. The high performance pigments on show included Carbazole Violet, Quinacridone Red and Magenta, intended for use in automotive paints, textile printing inks and plastics. The latest work on pigment yellow 12 (diarylide) to improve the transparency and gloss of printing inks was described.

SWADA (LONDON) LTD introduced this year a new range of Fiesta Daylight fluorescent pigments for use in plastics; marketed as the "Z" series, they have


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IMECO-ROMANIA


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THE METAL BOX COMPANY LIMITED
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27


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SWADA (LONDON) LTD H.HAEFFNER & CO. LTD
SWADA
Fiesta Fluorescent
Products


PROXEL CRL
PROXEL CRL


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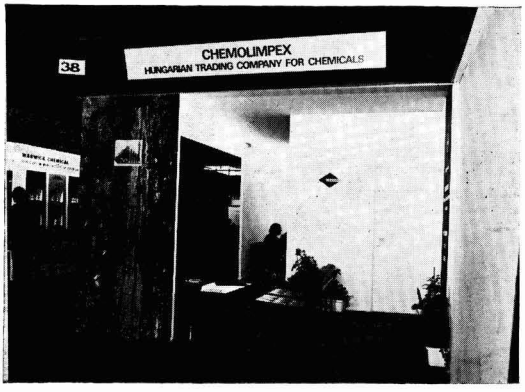
SANGAMO WESTON CONTROLS LTD
SANGAMO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CHEMOLIMPEX
HUNGARIAN TRADING COMPANY FOR CHEMICALS

exceptionally bright colours and are stable at temperatures up to 290°C. At 1 per cent concentration they are twice as lightfast as the "CQ" series at 2 per cent concentration. They are compatible with a wide range of plastic materials. New shades available in the A, D and T Series are Corona Magenta and Flame. A new range of thermoset fluorescent pigments of high strength and Aurora Pink SP4 were featured.

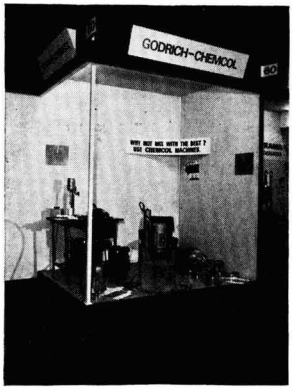
TIOXIDE INTERNATIONAL LTD concentrated its exhibit on the increasing growth of water-based coatings and illustrated how pigmentation affects water-based decorative and industrial paints. The properties considered with decorative paints were exterior durability, gloss and ease of cleaning, and in particular the effect of pigmentation of latex paints on concrete after outdoor exposure. The effects of a number of formulation factors on the ease of cleaning and the performance of paints based on a number of water-based media were illustrated. The cathodic process of electrodeposition was demonstrated and shown to give improved colour and corrosion resistance. The deposition was of a white one-coat finish.

Additives, driers surfactants and hardening agents

ABBEY CHEMICALS LTD introduced a new range of predispersed gel products which can be added to a paint at any stage of manufacture. These Bentone gellants may be extensively used in surface coatings, inks, mastics, adhesives and many other products for the control of rheology and pigment suspension. They are available for use with decorative, industrial and water-reducible industrial stoving systems. The company also exhibited its range of pvc stabilisers for use in plastisol and organosol formulations.

ALLIED COLLOIDS LTD exhibited its range of highly efficient polymeric dispersants in the Dispex range: the N40 and A40 grades are recommended for conventional paint formulations, whilst G40 is intended for use with full or semi-gloss systems and has the advantage of being soluble in glycols. The Viscalex range of acrylic based thickeners was also shown. EP30 is intended as a general replacement for cellulose ethers, whilst the HV30 grade imparts a high degree of thixotropy to emulsion paints; it is recommended for use with textured finishes and for sprayed water-based wood primers. The Aloclecs range of acrylic based polymers are produced in bead form for ease in use and giving a maximum choice of solvent system; the carboxylated polymers may be used as replacements for some naturally occurring resins.

ANCHOR CHEMICAL CO LTD showed its specialised curing agents in the Ancamine range, which includes MCA, a modified amine which effects the cure of epoxy resins at low temperature and also under water, and AD which gives a fast cure with thin films and will cure under cold damp conditions and is suitable for use on concrete. LO and LOS provide a range of cure times from 40 minutes to 12 hours at room temperatures. NC is a rapid room temperature agent mainly for use as an accelerator for other amine and polyamide curing agents. Anquamine 100 is a new type of product for use in water dispersible



coatings; it promotes easy emulsification and pigmentation and provides gloss to cured coatings. Epodil L and Epodil S are epoxide diluents to improve gloss and chemical resistance. The "S" grade is a solid hydrocarbon resin for epoxy and other powder coatings.

CHEMOLIMPEX showed a range of single and mixed driers based on metallic versatates as well as a number of peroxide catalysts.

R. H. COLE featured the Troykyd range of paint additives which include anti-cratering, anti-floating, levelling and bodying agents. Also shown were Methocel for thickening water-based paints and suspending pigments, and the Coathylene range of finely divided polyethylene powders for the preparation of textured finishes and improving the scuff resistance of inks.

EASTMAN CHEMICAL INTERNATIONAL AG exhibited a new material, CP-343-1, which imparts excellent adhesion of coatings to polypropylene.

ICI ORGANICS DIVISION showed Proxel CRL a new non-mercurial, non-phenolic microbiocide of proven efficiency for latices and paints. The long term efficiency and low toxicity were illustrated.

JACOBSON VAN DEN BERG showed a range of corrosion inhibitors manufactured by LOMBARD GERIN which enable emulsion paints to be filled into unlacquered cans. The Surwet R hydrophobic curing agent was also shown.

KINGSLEY & KEITH featured Metatin 53-01, a metal-free fungicide of very low toxicity and Metatin K505 a tin complex which is an excellent preservation for all aqueous systems. Omacide 645 is a safe non-mercurial preservative for latex systems, having a wide range of activity and whose cost compares favourably with other non-mercurial biocides. Cycloxim FF and Pentoxim FF are anti-skinning agents soluble in most hydrocarbons, ketones and alcohols.

LAPORTE INDUSTRIES LTD illustrated the use of inorganic colloids of the Laponite range in aqueous systems.

GEORG M. LANGER & CO exhibited a range of additives which included Lanco-Wax PE 1544, a micronised polyethylene for easy incorporation into inks and all types of solvent based paints. Lanco-Waz PP 1362 is a micronised hard polypropylene wax easily dispersed in both solvent and water-based systems. Also shown was Antibubble L, a silicone-free anti-bubble agent for use with finishes applied by spraying, brushing, roller and curtain coating. Lanco-Glidd ET is a newly developed low molecular weight polyethylene dispersion to provide high quality prints and give surface protection to inks applied on polyethylene and other foils. A range of anti-floats D14, F113 and S119 were exhibited as well as Hectorite and Macaloid which are suspending and thickening agents for emulsion paints, water-based adhesives, plasters and putties.

SUN CHEMICAL CORPORATION exhibited a range of printing ink additives manufactured by WARWICK CHEMICAL (YORKSHIRE) LTD.

URACHEM INTERNATIONAL is now distributing a complete range of organic peroxides manufactured by US PEROXYGEN, a division of the WITCO CHEMICAL CORPORATION, USA.

Chemical intermediates

ANCHOR CHEMICAL LTD featured its Sartomer polyfunctional acrylic monomers which are of interest in connection with radiation cured coatings and inks, and are suitable for electron beam, infra-red and

ultra-violet applications. These monomers are valuable also as polymerisable plasticisers for the production of rigid coatings and castings from low viscosity pastes and in pvc plastisols. These monomers include trimethylolpropane trimethylacrylate, trimethylolpropane triacrylate, pentaerythritol monohydroxy triacrylate, pentaerythritol tetra-acrylate and 1.6 hexane diol diacrylate.

EASTMAN CHEMICAL INTERNATIONAL AG showed its latest work with TMPD glycol as an intermediate in the manufacture of polyester resins for the manufacture of gel coats, aqueous coating and powder coating systems.

JACOBSON VAN DEN BERG exhibited a new silicone resin intermediate for use in the manufacture of silicone alkyds and the preparation of heat resisting resins.

KINGSLEY & KEITH LTD is able to supply acrylate monomers.

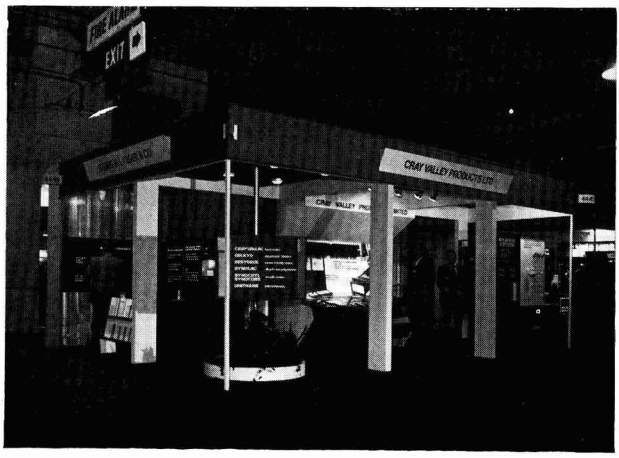
Manufacturing equipment, drums

WILLY A. BACHOFEN exhibited the Dyno-Mills range of machines for grinding and dispersing paints, printing inks, dyestuffs, enamels, and so forth, which operate more quickly than most conventional machines of similar size. KD15 is a compact 15 litre machine with an output of 750 litres per hour. KD45 is a new model. The range includes six models with outputs varying from 2 to 2 000 litres per hour, from free standing, enclosed systems which may be rapidly cleaned.

WILLIAM BOULTON LTD showed its range of vibratory machines, which included a new Vibro Energy machine for mixing and blending powders, and for mixing powders with semi-viscous liquids, as well as a new Vibratory machine for the colour coating of polymer granules or powders. The Podmore-Boulton Vibro Energy mill for grinding, the Vibro Energy strainer for separating solids and liquids and the Vibro Energy separator were also on display. Zircon grinding media is cylindrical and spherical forms were also displayed.

BUHLER-MIAG (ENGLAND) LTD showed three machines from its range of triple roll mills. SDH-200 is a laboratory mill and is described under "Laboratory equipment". The intermediate SDW-1000 (100 × 300mm) is equipped with an automatic tub tilting device which operates as the liquid level falls and when the level falls still further a switch stops the mill before the rolls run dry. The larger SDV-1300 (1 300 × 400mm) is fitted with the same tub tilting device. All mills are fully hydraulically operated and fitted with an automatic water-cooling system.

ALEXANDER CARDEW & CO LTD showed a range of control equipment mainly intended for use in manufacturing plant. A range of switches to control flow were shown to operate at a predetermined flow rate and suitable for use in pipelines from $\frac{1}{16}$in upwards at temperatures within the range −450 to 1 500°F and at pressures up to 5 000 psi. Float switches are also available. The Norcross viscosity measurement and control instruments were exhibited; the viscosity measuring instrument is immersed in the liquid concerned and may be installed in a variety of plant, such as



mixers, pipelines or reaction vessels. The electrical output from the viscometers may be used in conjunction with a computer for the control of a fully automatic process.

R. H. COLE LTD showed its range of Steatite balls in a wide range of sizes for high milling efficiency and having high abrasion resistance, great hardness and accuracy of size. Steatite and Stemalox in grain sizes 0.5/1.5mm and 1.5/2.5mm are available for use in attritors, perl mills and sand mills, as well as steel mills and lining bricks.

D.H. INDUSTRIES LTD displayed a wide range of equipment from a number of manufacturers. These included, from SUSSMEYER and OLIVER and BATLLE the orthodox open types of sand mill and the RS range of fully sealed machines. Solvent recovery plants and plants for resin manufacture heated by gas, oil or electric induction are available. The Centrimill range of batch bead mills, high speed cavitation and low speed high torque mixers, the latter with "bow-tie" blades, can be obtained. From J. DE VRIES weight operated and volumetrically operated semi- and fully-automatic filling machines are available with devices for, for example, automatic tin feeding, adhesive tab colour or batch marking, lid dispensing, packing, and sealing filled tins into cartons. From PAUL VOLLRATH single-, two- and variable-speed mixers are supplied, ranging from 0.3 to 200 hp output and including the Exentrik and dual shaft dissolvers. The range of Cuno filters, pumps and cartridges from AMF INTERNATIONAL LTD and from AB METAL the Prebag filters and Filbags were shown. Also on display were the AMK heavy duty "Z" blade kneaders, extruders and planetary mixers. From PAMASOL a complete range of aerosol filling plant, and from LUDWIG SCHWERDIAL a range of pump equipment for handling heavy-bodied materials are available.

DRAISWERKE GmbH introduced four machines to the UK market: the Drais Perl mill, PM-75 RS-S, a "slot-separation" mill using steel beads, now includes an integral pre-disperser; the Drais Perl mill PM250 Tex is now in both horizontal and vertical versions intended mainly for low viscosity products; the Drais Turbulent T630 mixer is for the dispersion of heavy products at high rates of output and as a replacement for "Z" blade mixers; and in conjunction with the continuous version of the T630, the Drais Turboplan K-TT80, a new continuous intensive mixer for the automatic production of emulsion paints, etc.

G. J. ERLICH LTD showed a variety of manufacturing plant, which included the MOLTENI plant for paint, chemical and pharmaceutical products, hydraulically driven planetary mixers operating under vacuum, high speed mixer-dispersers TM300 with up to three rotating vessels of up to 5 000 litres capacity (obviously too large to show at the exhibition), and MICROSFERA machines for grinding with glass or steel balls. Also available were triple roll mills of new construction with hydraulic drives and high speed mixers with single or twin shafts and able to operate under vacuum. Information was also available on the KARCHER tank cleaning system and the GE-HALIN filling machines for viscous pastes.

GAF (GREAT BRITAIN) LTD showed the latest improvements in its range of pressure filtration vessels, which incorporate a patented snap ring bag system. One bag size is employed for convenience and the flow rates required are obtained by using a number of bags simultaneously. RB1A takes one snap ring bag, RB2A two bags, whilst RB4A utilises four bags giving a range from 40 to 160 gallons per hour. A small laboratory model RBX (15 gallons/hour) is also available. The GAF Cartridge unit was also exhibited. A feature of the stand was the new Gaflo® RB2-A mild steel pressure vessel, shown for the first time in Europe.

GODRICH-CHEMICOL showed its MS0, MS1, MS2 and MS3 mixers, which are so constructed that no bearings are in the immersed portion of the machines. This ensures that all the charge must pass through the mixing head, giving excellent dispersions together with savings in time, labour and costs. Several types of stator and rotor are available, together with ancillary items for various types of product.

JOHN GODRICH provided information on machines manufactured by ORIGINAL HANAU GmbH, WERNER MATHIS AG, AHIBA AG and SALVIS AG.

JACOBSON VAN DEN BERG exhibited the range of dissolvers, mixers and mills manufactured by RUDOLPH NEULINGER of Austria.

JENAG EQUIPMENT LTD showed the range of JENAG liquid strainers which now include an intermediate 1200 model. These machines feature an enclosed system and a back flushing system for cleanliness and ease of cleaning. The range covers five models capable of handling from very small quantities up to 2,700 gallons per hour, and are able to pump at pressures of up to 85 psi. Liquids with viscosities of up to 200 poise can be handled.

MASCHINENFABRIK HEIDENAU VEB showed its range of triple roll mills. The horizontal types are available with roll 280 × 540mm and 280 × 740mm, the "L" form are supplied with rolls 322 × 800mm, and 400 × 800mm. All mills are robust and have chilled nickel iron rolls on self-aligning bearings with a two-speed drive. The mills can be provided with a pan lift, four-point hydraulic roll pressure control and automatic water cooling.

MASTERMIX ENGINEERING CO LTD exhibited its wide range of equipment which included the new batchmill with bottom drive and a centrifugal discharge system, and the MASTERMIX twin head disperser which provides high torque, intense mixing and high speed cavitation dispersion suitable for viscous or thixotropic consistencies. Other items included the HVS high speed cavitation dispersers, the HVS high torque mixers, and the PMD dispersers which combine slow speed mixing with high speed cavitation dispersion for large scale production. The PMD dispersers now include improvements to assist the control of dust and solvent vapours. The exhibit also included the Mastermill continuous bead mills, portable clamp-on mixers and mixing tanks.

THE METAL BOX COMPANY LTD exhibited the new pulvermatic shredders for the economic handling of most of the problems of waste and security document disposal, and a new machine for compacting waste. The one-litre Handitin intended for the retail market because of its ease of opening and reclosing, the ten-litre pails and oblongs and drums are also available.

MIKOPUL LTD showed two types of pulveriser. The high speed hammer mill, which depends on a high impact velocity to shatter particles of the feed stock. The particle size obtained is controlled by changing the relationship between the peripheral speed of the hammers and the aperture size of the screen through which the ground material passes. A new development is the ACM Pulveriser which is designed to give finer particle size within a narrower range and to provide cooler operation; it employs tungsten carbide tipped hammers mounted on a horizontally placed rotor disc. It is suitable for the production of powder coatings which have a low softening point because it can operate continuously with an outlet temperature below 100°F. Mikro collectors are fitted to the ACM installations ensuring a collection efficiency of 99.99 per cent.

SANGAMO WESTON CONTROLS LTD showed transducers for load, pressure, etc which may be employed for control of both manufacturing and laboratory apparatus.

STRAZDINS LTD showed its full range of Blendorama colourant dispensers. The 50ml capacity single-pump model, the 150ml capacity double-pump and the large 600ml double-pump models were shown. An improved machine for punching holes in the lid of base paint for the addition of colourant was also exhibited.

TORRANCE LTD exhibited a pilot plant featuring the Attritor circulation system. This system has been shown to narrow the particle size range of the products obtained and to reduce labour and floor space to a minimum. All Attritors in the TORRANCE range can be incorporated into this system. Also shown were the TORRANCE high torque paste mixer with hydraulic transmission, a Microflow for continuous production of liquid inks and a Bowerscoder for marking crates, boxes and similar items.

WINTER OSAKEYHTIO showed the Wintermix tinting system which can be used to tint a wide range of products by injecting colourants through a hole pierced in the lid of the tin and reclosing it with a plastic stopper. A new mixer system was displayed which is able to complete the mixing of the tinted product within 30 seconds. The method of fastening the tin is also new, and this operation can now be performed very rapidly. The Wintermix colourants have high pigment content which enables strong colours to be prepared, as well as pastel shade from white bases.

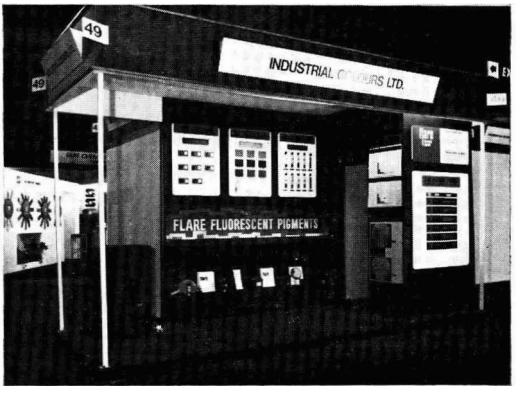
Laboratory apparatus and testing equipment

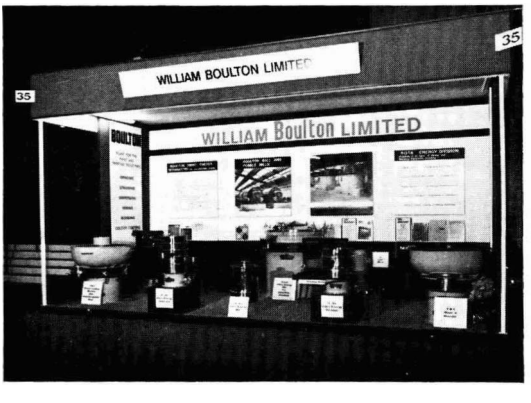
WILLY A. BACHOFEN showed a laboratory model Dyno-Mill KDL (see Manufacturing equipment) which has a continuous output of 2 to 20 litres per hour and is also able to mill batches of volumes 75 and 150ml.


ANCHOR CHEMICAL COMPANY LIMITED
NEW PRODUCTS


TRANSPORTMASCHINEN EXPORT-IMPORT


ROHM AND HAAS
PRIMAL GLOSSY EMULSIONS


INDUSTRIAL COLOURS LTD.
FLARE FLUORESCENT PIGMENTS


WILLIAM BOULTON LIMITED
WILLIAM Boulton LIMITED


WILLY A. BACHOFEN

BUHLER MIAG (ENGLAND) LTD exhibited its hydraulic laboratory three-roll mill SHD-200 (200 × 150mm) which is so constructed that laboratory formulations may be repeated on a larger production mill, to eliminate the usual scaling up problems.

CRAY VALLEY PRODUCTS LTD provided information on the CB150 "Electrocurtain" electron beam source, which is installed at the company's laboratories at St. Mary Cray and is available for demonstration and test purposes.

DIFFUSION SYSTEMS LTD showed a range of optical electronic testing equipment, including a number of instruments derived from CORNING which featured the spherical haze meter conforming to ASTM D 1003 and a number of reflectometry instruments including the DSL series small aperture glossmeter with four different gloss heads. Also exhibited were the model 99 spectrophotometer for colour matching, the reflectometer head model 11 Mk 3 for brightness and opacity measurements, densitometers, photometers and the Unigalvo read-out unit for use with various optical heads.

ELCOMETER INSTRUMENTS LTD showed for the first time the Roughtector for examining and measuring the profile of rough surfaces, and new versions of the Minitector, Eddytector and Twintector which incorporates a holding device to retain the reading until the next is taken. A range of paint testing equipment manufactured by ERICHSEN was on display, as well as the abraser from TELEDYNE TABER of the USA.

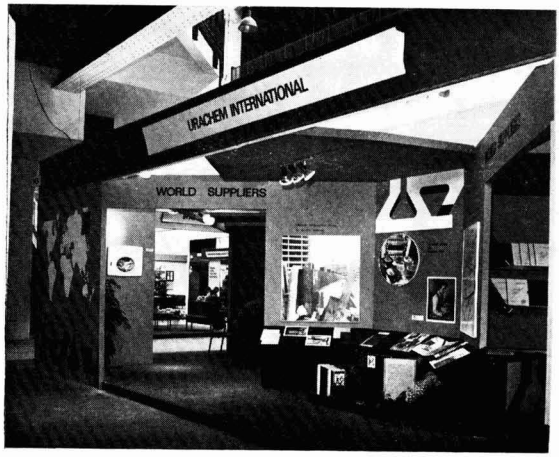
FISCHER INSTRUMENTATION (GB) LTD showed its equipment for the measurement of film thickness and porosity which includes nucleonic, eddy current, dielectric and magnetic inductance thickness gauges, as well as the Betascope and Permascope series and the new high voltage Poroscope for porosity measurement. New instruments were the Mini-Betascope and the Dualscope for film thickness measurements of ferrous and non-ferrous metals. For users of anodised aluminium, the Anotest sealing tester was of great interest.

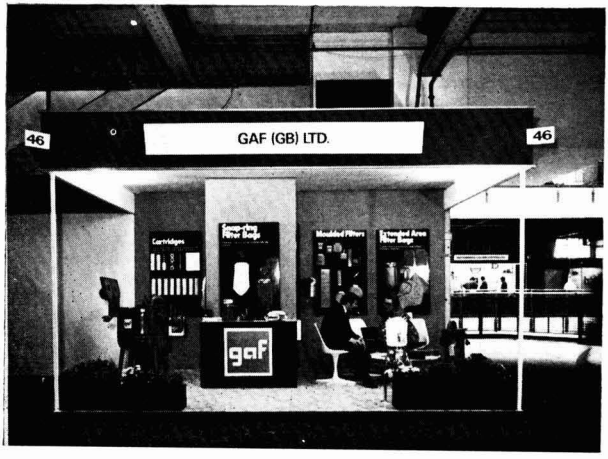
GAF (GREAT BRITAIN) LTD demonstrated the RBX pressure vessel for laboratory filtration operations, which utilises the same snap ring bag system of the production scale models.

JENAG EQUIPMENT LTD showed small scale models of its liquid strainers, described under manufacturing equipment.

INSTRUMENTAL COLOUR SYSTEMS LTD showed the new DIANO Chromascan abridged spectrophotometer covering the range 380 to 760 nm at 20 nm intervals. It is fully automatic in operation, and may be used in conjunction with a computer for the measurement, prediction and control of colour. Also shown was the PRETEMA Spectromat and the ICI Colorimeter and Colour difference meter.

KG DR-ING HERBERT KNAUER & CO GmbH exhibited an instrument for the determination of molecular weight; it employs an electronic temperature measuring device in conjunction with freezing point, vapour pressure and membrane accessory heads. Also available was a liquid/gel chromatograph system with a





choice of detectors, a high pressure pulse-free pump, degassing device, alternative injection systems and optional high temperature equipment. The detector systems are a differential refractometer, an ultra-violet photometer, an ultra-violet RL dual photometer and a spectral photometer in the range 200 to 500mm. A new instrument is the DEER variable stress rotational rheometer which incorporates a substantially frictionless support for the rotating member, which with the variable stress function allows the measurement of creep and yield value.

MARCHANT BROTHERS LTD displayed some of its laboratory triple rolls which included the roller sizes 76 × 153mm, 152 × 304mm and 152 × 406mm. Information was also available on the company's overhaul and repair service, including the modernisation of roll mills, mixers and other dispersion equipment, and the reconditioning service and camber grinding of modern high speed rollers.

MASTERMIX ENGINEERING CO showed a range of laboratory high speed dispersers and high torque mixers based on the principles used in the production scale equipment.

MICROSCAL LTD continues to expand its range of research and test equipment. The utility of the flow microcalorimeter has been extended by the Mark 2V vacuum model which facilitates heat of immersion and degassing measurements. The wide angle scanning photosedimentometer is now supplemented by the MICROSCAL-LADAL X-ray sedimentometer for materials having an atomic number of less than 13. The spinning riffler is now available in an additional 40 litre size and the light-fastness tester now includes an additional Mark 2 model and a "rapid fade" mercury lamp.

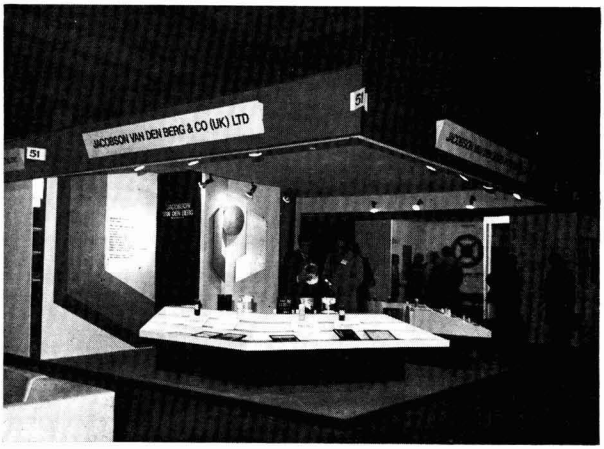
RESEARCH EQUIPMENT showed the latest models of its wide range of test equipment which includes the new drying time apparatus developed by ICI LTD. Also on display were the ICI cone and plate viscometer and pressure weight per gallon cup, as well as the REL humidity cabinet, scratch test apparatus, salt spray cabinets, film spreader abrasion tester and other pieces of apparatus.

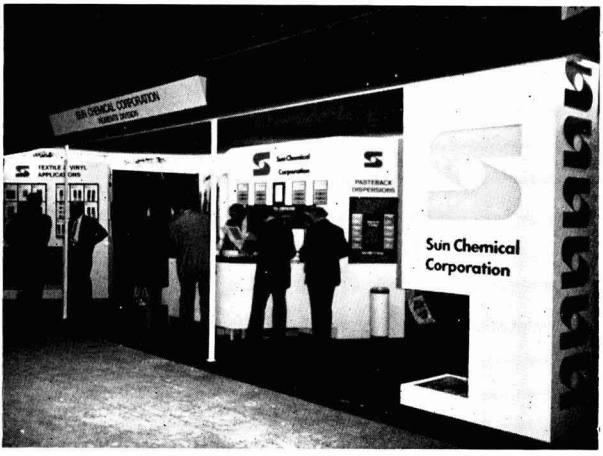
SANGAMO WESTON CONTROLS LTD showed an improved version of the WEISSENBERG rheogoniometer for the complete determination of the rheological properties of a wide range of materials under a wide range of conditions, including steady and oscillating shear. Various geometries such as the cone and plate, Mooney and Couette arrangements are available, as well as solid state electronic measuring and recording instruments.

TORRANCE showed a laboratory high speed disperser with an infinitely variable speed from zero to 8,000 rpm.

TORSION BALANCE CO (GB) LTD exhibited its unique FP Flexure Pivots system of crossed beryllium copper strips which provide frictionless bearings to eliminate the wear present in knife edge systems, which are incorporated into a range of full digital read-out top pan balances.

THE WORSDALL CHEMICAL CO LTD showed a prototype of the new BK Recorder for the evaluation of stoving





finishes of all kinds, including paints and printing inks. It will be manufactured by the MICKLE LABORATORY ENGINEERING CO LTD, Gomshall, Guildford.

CARL ZEISS (OBERKOCHEN) LTD showed the versatile automatic colorimeter RFC 3 which can be supplied with either 16, 18 or 24 interference filters in the range 400 to 700nm. Reproducibility of better than 0.04 per cent for light samples and 0.01 per cent for dark samples is obtained, together with a long term stability of 0.05 per cent at the zero point and 0.1 per cent at the 100 per cent point during an eight-hour working period. It may be used in conjunction with the PDP 8/E computer to carry out the determination of tristimulus values, chromaticity co-ordinates for illuminants A, C, and D65 and with the larger HEWLETT PACKHARD 2100A computer can provide formula prediction facilities for colour matching. Colour difference computations according to either Friele-MacAdam-Chickering or Adams-Nickerson-Stultz systems may be made by either model. Other instruments shown were the Elrepho reflectance photometer and the PMO3 spectrophotometer.

Resins

CHEMOLIMPEX exhibited a range of amino resins, colophony based resins, rosin esters and phenolic modified colophony resins, including special grades for printing inks, in addition to polyester resins for the furniture industry and a range of more than 30 types of alkyd resins.

R. H. COLE LTD showed a new series of Piccolac resins for use in pressure sensitive adhesives and Piccotex water white resins for hot melts requiring light stability. Also shown was Inkovar 315, a new resin for gravure inks and Inkovar 180 for heat set and new inks. Several grades of Coumarine-indene resins for the paint industry were also shown.

EASTMAN CHEMICAL INTERNATIONAL AG demonstrated new applications for cellulose acetate butyrate in powder coating applications and aqueous coating systems.

IMECO showed its range of unsaturated polyester resins and alkyd resins.

JACOBSON VAN DEN BERG displayed the latest range of heat resisting resins from the Silicone Products Division of GENERAL ELECTRIC COMPANY.

URACHEM INTERNATIONAL showed a wide selection of resins, which included epoxy ester resins, water thinnable resins, polyurethane, maleic, phenolic, cresylic, and olefinic resins, resins for powder coating and printing inks, and a range of urea, melamine and benzoguanamine resins.

WORSDALL CHEMICAL CO LTD concentrated this year on showing some of its materials intended for use in printing inks, placing emphasis on the availability of laboratory reports with prints made on a DUNCAN LYNCH print tester. Two sets of these are available; one deals with the Pyrogloss system for the manufacture of heat set web offset inks, and the other with VG-266, which is highly chelated and added to a pigment paste to complete the ink. Two other ink vehicles, Estovar B504 and B505, can be used with each other or blended with the Estokyd range of alkyd resins to make a range of ink vehicles. Other resins for printing inks are those made according to formulations of the POPE CHEMICAL CORPORATION. Surcoprene rubber hydrocarbon resins, which have been re-introduced to the market, were also exhibited.

Acrylic resins

ALLIED COLLOIDS LTD displayed the Aloclec range of acrylic based polymers, which are produced in bead form for convenience in use and offering a maximum choice of solvent system. The carboxylated polymers are of interest as they may be used as replacements for certain natural resins. Glascol 934 is intended for use as a pressure sensitive adhesive.

CRAY VALLEY PRODUCTS LTD showed new developments in the field of acrylic resins and new products for radiation curing were featured. The results of recent work in the field of non-aqueous dispersions were exhibited. X7489 + X8161 are recommended for use with white spirit tolerant melamine type resins to provide sprayable paints of higher solid content than conventional alkyd stoving paints. A new range of acrylic bead polymers has been introduced which is chiefly of interest in the field of flexographic, gravure and screen inks to meet the need for heat resistance on pvc coated film. The beads facilitate handling and improve the rate of solution in a range of solvents. The exhibit included a range of solution in a range of solvents. The exhibit included a range of clear coatings which may be cured by ultra-violet radiation. Information was also provided on electron beam curing and the experimental unit available at the company's laboratories was described.

URACHEM exhibited a range of thermosetting and hydroxylated acrylic resins.

Emulsion and water based resins

ANCHOR CHEMICAL CO LTD gave information of its latest developments in the field of water dispersible resins.

JACOBSON VAN DEN BERG exhibited the Airflex vinyl ethylene emulsions which have outstanding wet scrub resistance.

ROHM & HAAS COMPANY have developed a unique range of water based resins which now includes Primal AC507 and Primal AC25 for the preparation of water based gloss paints with excellent flow and levelling with good gloss and colour retention. Primal MV1 extends the use of water based systems into the field of maintenance paints having excellent protective properties in industrial atmospheres and forming a basis for use in wood and metal primers.

GEORG M. LANGER & CO exhibited the new Lanco Glidd ET polyethylene dispersions especially designed for printing inks which have to be applied to polythene and other plastic foils.

URACHEM INTERNATIONAL showed a number of vinyl acetate, styrene and acrylic polymer emulsions, as well as water thinnable resins.

SCOTT BADER CO LTD showed high gloss paints based on its Polidene 33-061 polyvinylidene chloride emulsion, providing data on formulation, and evidence of exposure test results. Future trends and developments in Polidene resins for higher gloss finishes, intumescent paints, chemically resistant paints and primers were indicated. Texicryl 13-011 acrylic copolymer emulsions for use, where necessary, as additives to paint systems and in printing inks were also exhibited.

ALLIED COLLOIDS LTD showed its Glascol G16 acrylic emulsions intended to provide temporary protection and which may be removed by alkaline solutions.

Epoxy resins

ANCHOR CHEMICAL CO LTD showed a range of special epoxy resin diluents.

JACOBSON VAN DEN BERG showed the PVO INTERNATIONAL INC. water-based epoxy system, Surwet E, together with the hydrophobic epoxy curing agent, Surwet R.

URACHEM showed its range of epoxy esters.

Polyamide resins

ANCHOR CHEMICAL CO LTD showed its latest developments in the field of reactive polyamide resins and a polyamide-imide resin offering superior flexibility and good chemical resistance.

URACHEM INTERNATIONAL exhibited its range of polyamide resins.

SUN CHEMICAL CORPORATION showed the range of polyamide resins manufactured by its subsidiary, WARWICK CHEMICAL (YORKSHIRE) LTD.

Miscellaneous

JACOBSON VAN DEN BERG exhibited its range of oil products based mainly on safflower oil, including the conjugated safflower oil 122-G intended for alkyd production.

URACHEM INTERNATIONAL showed a range of modified drying oils.

KINGSLEY & KEITH exhibited its range of chlorinated solvents.

Acknowledgment

The Exhibition Committee is indebted to the Honorary Editor, Mr S. R. Finn, for his work in the compliation of this report.

Members of the party of Japanese visitors, who had chartered a flight specially for the OCCA 26 Exhibition, were greeted at the OCCA Information Centre by the Director & Secretary, R. H. Hamblin, before dispersing to visit individual stands

Arrangements were also made for the party to tour the SPL Group works in Batley, Yorkshire. In the photograph above, Mr K. Yamanaka, President of Mie Yushi Kako Company and tour leader, is greeted by Mr L. H. Silver, President of OCCA and SPL's Managing Director

Report of Council Meeting

A meeting of the Council was held at the Great Northern Hotel, London N1 on 4 April 1974 when 23 members of Council were present. The President, Mr L. H. Silver, took the chair.

Council considered and accepted a new procedure for the election of candidates which would obviate delays. It also considered the level of entrance fees which had remained unchanged since the foundation of the Association.

A report was received on the Dinner Dance to be held on 31 May at the Savoy Hotel where a scroll of Honorary Membership for Mr Robert Matlack, retiring Executive Vice-President of the FSPT, will be presented to the President of the FSPT, Mr Michael W. Malaga, who will reply on behalf of the guests to the President's Address of Welcome.

A report on the progress made in connection with the 1977 Conference at Eastbourne was received.

Council considered, in view of the success of the Reunion Dinner for past and present Council Members in October 1973, that a further Dinner should be arranged and this would be held at the Cafe Royal on 16 October 1974.

Council received information on the progress made with the introduction of an Association tie with a single motif under the knot and a maroon background.

Council was pleased to hear that an illustrated scroll would be presented to Dr S. H. Bell (President 1965-67) on the occasion of the Exhibition Dinner at the Savoy Hotel on 23 April in recognition of the recent award to him of the Order of the British Empire.

It was reported that the joint symposium in conjunction with the Paintmakers Association scheduled to take place on 26 June would have to be postponed until Tuesday 17 September at University College, Gower Street, London. Further details regarding the symposium will be announced in the Journal in due course. The Annual General Meeting will still take place as originally planned at 5.30 p.m. on 26 June 1974 in the Engineering Conference Room, University College Gower Street, London WC1E 6BT.

Council heard that Mr Kurt Engelbert was retiring as Hon. Treasurer of the South African Section and agreed that a Commemorative Award should be made to him in appreciation for his many years of work for the Association.

It was reported that the Scottish Section had made arrangements for a Symposium to be held at Aviemore in May 1976 and Council agreed that the 1976 Annual General Meeting should be held during the symposium provided this did not clash with the dates of the FATIPEC Congress.

The President took the opportunity of thanking the Honorary Officers who were retiring from office at the end of this session (Mr D. S. Newton and Mr A. W. Blenkinsop) and all other retiring members of Council.

There being no other business, the President thanked members for attending and declared the meeting closed at 3.15 p.m.

Oil and Colour Chemists' Association Australia

UNITED KINGDOM VISITOR TO AUSTRALIA

During his visit to Australia in March Dr D. Brook, of Titanium Intermediates Limited, Teesside, gave a lecture to the New South Wales Section on titanium chelates as thixotropic additives in latex paints.

The paper was of particular interest as thixotropic latex paints, as such, are not marketed in Australia at the present time. When the Chairman, Mr B. Bettison, called for questions no less than twelve gentlemen took the opportunity for further discussion on the topic with Dr Brook. Mr T. Collins, Technical Director of British Paints Australia, led the "cross examination" with questions ranging from in-store tinting of thixotropic paints to the availability of these chelates—the latter being of particular interest to any manufacturer in this time of raw material shortages.

After a stimulating question time, Mr R. Watts proposed the vote of thanks to Dr Brook.

Optional Professional Grade

Amendments to regulations for admission to the optional professional grade for Ordinary Members

At its meeting on 26 February 1974 the Council accepted the recommendation of the Professional Grade Committee in respect of the periods of Ordinary Membership to be completed before admission to the professional grade.

The amendments, which take place immediately, reduce the obligatory periods as Ordinary Members for candidates for Associateship and Fellowship to two years *in all cases*, i.e. amending the regulations C9 and D2 as last printed in the *Journal* (page 463, September 1973).

Forms of application for admission to the professional grade may be obtained from the Association's offices.

Admission

The following Ordinary Member, having completed the obligatory period of Ordinary Membership, has been admitted as an Associate of the Professional Grade:

Saeed M. Sheikh, *General Overseas Section* (Pakistan).

Association Annual General Meeting

The Annual General Meeting of the Association will take place in the Conference Room of the Engineering Block at University College, Gower Street, London WC1E 6BT (entrance through Torrington Place) at 5.30 p.m. on Wednesday 26 June 1974.

Postponement of Symposium

The one-day Symposium originally scheduled for 26 June has been postponed until 17 September 1974. Further details are available from the Association's offices.

Register of Members

The following elections to Membership have been approved by Council. The Section to which new Members are attached is given in italics.

Ordinary Members

BOSMAN, HERMAN IZAK, BComm, PO Box 50064, New Redruth, Transvaal. (*South African*)

CARTER, DAVID, BSc, MSc, ARIC, 25 Brunswick Place, Hanley, Stoke-on-Trent, Staffs. (*Manchester*)

CHIDDICK, KELVIN SPENCER, AMIET, Duco Dulux Ltd., Box 3704, Alrode, Transvaal. (*South African*)

DEIGHTON, GEOFFREY MAURICE, BSc, 44 Fillingham Crescent, Cleethorpes, Lincs. (*Hull*)

DENNEY, RONALD COLIN, BSc, PhD, FRIC, "Manteo," 21 Lake View Road, Sevenoaks, Kent. (*London*)

LLOYD, DAVID CHRISTOPHER, BSc, LIRI, British Titan Products Ltd., Stratford House, Stratford Place, Camp Hill, Birmingham. (*Midlands*)

PAYNE, CHRISTOPHER JOHN, BSc, GPI, Dussek Bros. Ltd., Thames Road, Crayford, Kent. (*London*)

SIMPSON, ALAN GEOFFREY, BSc, LRIC, 15 Beckway Road, Norbury, London SW16 4HB. (*London*)

TYRRELL, MAURICE, 16 Leam Road, Myton Road, Warwick. (*Midlands*)

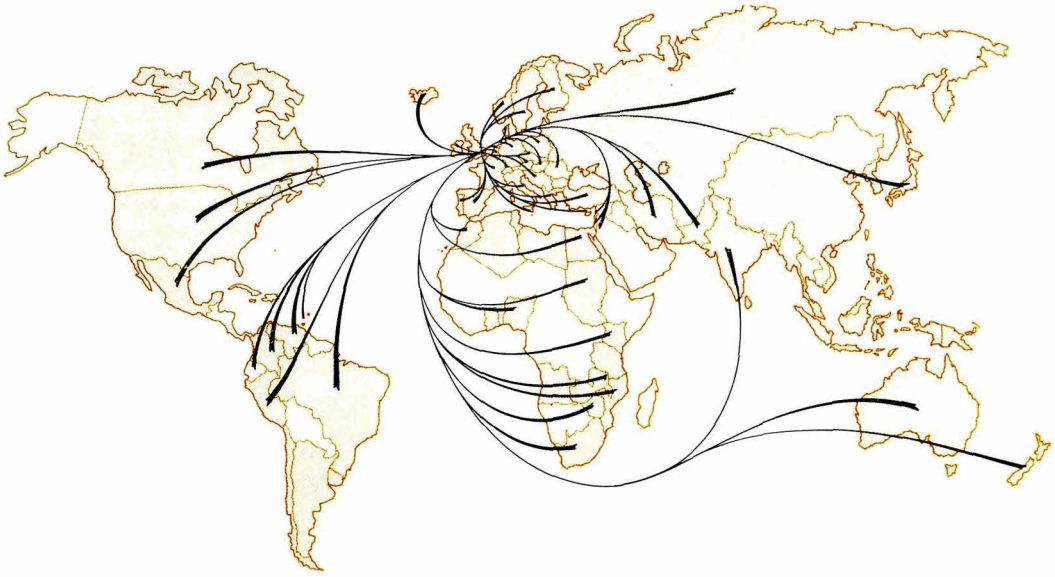
WARREN, CHRISTOPHER BERNARD, LRIC, 56 Outwood Drive, Heald Green, Cheadle, Cheshire SK8 3QQ. (*Manchester*)

Associate Members

MCGEEHAN, RAYMOND PATRICK, 99 Battery Heights, Athlone, Co. Westmeath, Eire. (*Irish*)

TWEEDY, GEORGE BERNARD CLWYD, Masonite (Africa), Estcourt, Natal. (*South African*)

Just look at JOCCA's cover!



We don't just mean the cover of this *Journal* (but lots of people do, of course, since our ABC circulation is larger than that of any other UK publication covering the surface coatings industries—see graph on page xxiv of this issue). Consider what advertisers get by taking space in OCCA publications:

Firstly the *Journal*, with its unrivalled circulation, is sent each month to readers in over 70 countries shaded on the map. Can you as advertisers afford not to take advantage of this coverage?

Secondly, there is the "Official Guide" to the annual technical Exhibition at Olympia, London. The arrows show the 50 countries from which visitors travelled to OCCA-25 in May 1973. The basic rates for advertisements in this publication are the same as for the *Journal*. Why not take advantage of the reduced six or twelve insertion rates and advertise in both the Official Guide and the *Journal*?

For further information concerning advertisements in these or other OCCA publications, contact C. A. Tayler, JOCCA, Journal of the Oil and Colour Chemists' Association, Priory House, 967 Harrow Road, Wembley, Middlesex, England, HA0 2SF. Tel: 01-908 1086. Telex 922670 (OCCA Wembley).

CLASSIFIED ADVERTISEMENTS

Classified Advertisements are charged at the rate of 75p per line. Advertisements for Situations Wanted are charged at 20p per line. A box number is charged at 20p. They should be sent to the Director & Secretary, Oil & Colour Chemists' Association, Priory House, 967 Harrow Road, Wembley, Middlesex HA0 2SF

SITUATIONS VACANT

PAINT TECHNICIAN

WORMS, WEST GERMANY

W. R. Grace Limited, a very large multi-national organisation, is looking for a Paint Technician for its new Plant at Worms in West Germany.

The job will be concerned with the evaluation of Grace products, trade names Syloid and Sylodex, and their uses in paint and lacquer applications.

The likely candidate will have about 2-3 years experience in the Paint Industry and would preferably have qualified to a minimum of City & Guilds in Paint Technology. A knowledge of German would of course be desirable but not essential.

An excellent salary and fringe benefits, together with re-location expenses will be offered to the successful applicant.

Preliminary interviews will be conducted in London and applicants should write or telephone for an application form to The Personnel Manager, W. R. Grace Limited, Northdale House, North Circular Road, London, NW10 7NS. Telephone 01-965 0611.

GRACE

SOUTH AFRICA

Company situated in Durban requires

GRADUATE CHEMISTS

for the following duties:

(a) Quality Control

(b) Development Work.

Applicants should be between 25 and 35 years of age and preferably, but not essentially, have had experience in the Paint or Polyester Industries. Benefits include Pension Scheme, Medical Aid, and Annual Bonus.

All applications treated in the strictest confidence. Box No. 390.

A foreign company wants a Technician to advise on the manufacture of intermediates for pigments and specialised pigments such as quinacridones, dioxazines, etc.

Please apply in confidence. Box No. 392.

WANTED

Triple Roll Hydraulic Mill. 6in dia × 16in Cox Pilot Major type preferred. In good condition. Box No. 391.

TECHNICAL SALES REPRESENTATIVE

(LONDON BASED)

Following internal promotion, Synthetic Resins Limited require a Technical Sales Representative to cover Southern England from the London area.

We are looking for applications from people with a technical background in the Paint or Resin industries who are interested in, and may already have experience of maintaining technical and commercial contact with the Surface Coatings industry.

This is an important position which carries an attractive salary and the usual large company benefits. Please forward brief personal details to the Company Personnel Manager, or if you would like more information, ring Cyril Williams—Surface Coatings Division, Marketing Manager—on a transfer call.

SYNTHETIC RESINS LIMITED

Edwards Lane, Speke, Liverpool L24 9HR. Telephone: 051-486 3922.

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

SENIOR PAINT TECHNOLOGIST

required by expanding progressive specialist paint manufacturer situated in pleasant rural area 20 miles from London.

Excellent prospects. Varied and interesting development work. Experience required in either:

1. Clear and pigmented lacquers, including nitro-cellulose; or
2. High duty coatings for anti-corrosive, chemical and solvent resistance, with particular emphasis on epoxies.

Some background in general industrial finishes or decorative paints useful. Salary commensurate with experience. Four weeks' holiday. Pension scheme. Life assurance. Apply in strictest confidence to:

Technical Director,
E. Wood Limited,
Stanstead Abbotts,
Ware, Hertfordshire.
Telephone: Ware 870174

PAINT TECHNOLOGIST

required by expanding progressive specialist paint manufacturer situated in pleasant rural area 20 miles from London.

Excellent prospects. Varied and interesting development work in field of paints and lacquers for the painting and vacuum metallisation of plastics. Experience preferred but not essential.

Salary commensurate with experience. Four weeks' holiday. Pension scheme. Life assurance.

Apply in strictest confidence to:

Technical Director,
E. Wood Limited,
Stanstead Abbotts,
Ware, Hertfordshire.
Telephone: Ware 870174

SALES REPRESENTATIVE

PAINT TECHNOLOGIST

Midlands/South

Rohm & Haas (UK) Limited is a subsidiary of the world's largest manufacturer of acrylic materials.

The Company now wishes to appoint a salesman, experienced in paint technology, both to sell existing products and to assist an imminent breakthrough into new fields of emulsion paint technology and other non-polluting systems. Aged 26 or more, the man we require may already be a salesman. Alternatively, he may be working in a development or production capacity in the paint or paint servicing industries. He should be able to communicate at all levels, and have the ability to organise his own work and objectives. Success in the field can be expected to lead to managerial opportunity in the medium term.

A competitive salary will be offered, with car, and Pension and free Life Assurance Scheme. Relocation expenses, if applicable, will be generously assisted and there are four weeks' holiday per year.

Please write to Mr B. C. C. Compton, the Personnel Department.

ROHM AND HAAS (UK) LIMITED.
LENNIG HOUSE, 2 MASON'S AVENUE,
CROYDON, CR9 3NB, ENGLAND.
TELEPHONE 01-686 8844

PLANT FOR SALE

2,200 gallon vertical bulk storage tanks, glass lined 7ft 4in diam. × 10ft.

5,750 gallon horizontal bulk storage tanks 9ft 6in diam. × 16ft long.These are prodorglass lined and are in excellent condition. Some fitted with agitator. Ideal for paint, varnish, solvents, etc. 35lb SWP.

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Tel. 061-338 4486

AT ANY TIME
DAY OR NIGHT

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YOUR CLASSIFIED AD

FOR

JOCCA

Telex 922670 (OCCA Wembley)

See page xxii for details of rates for Classified Advertisements.

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