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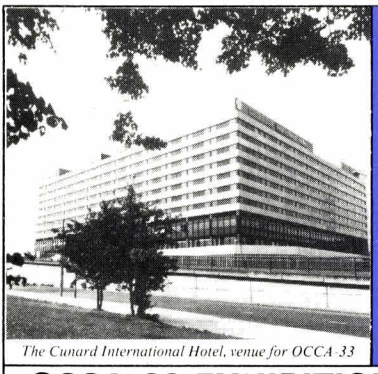

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Transactions and Communications

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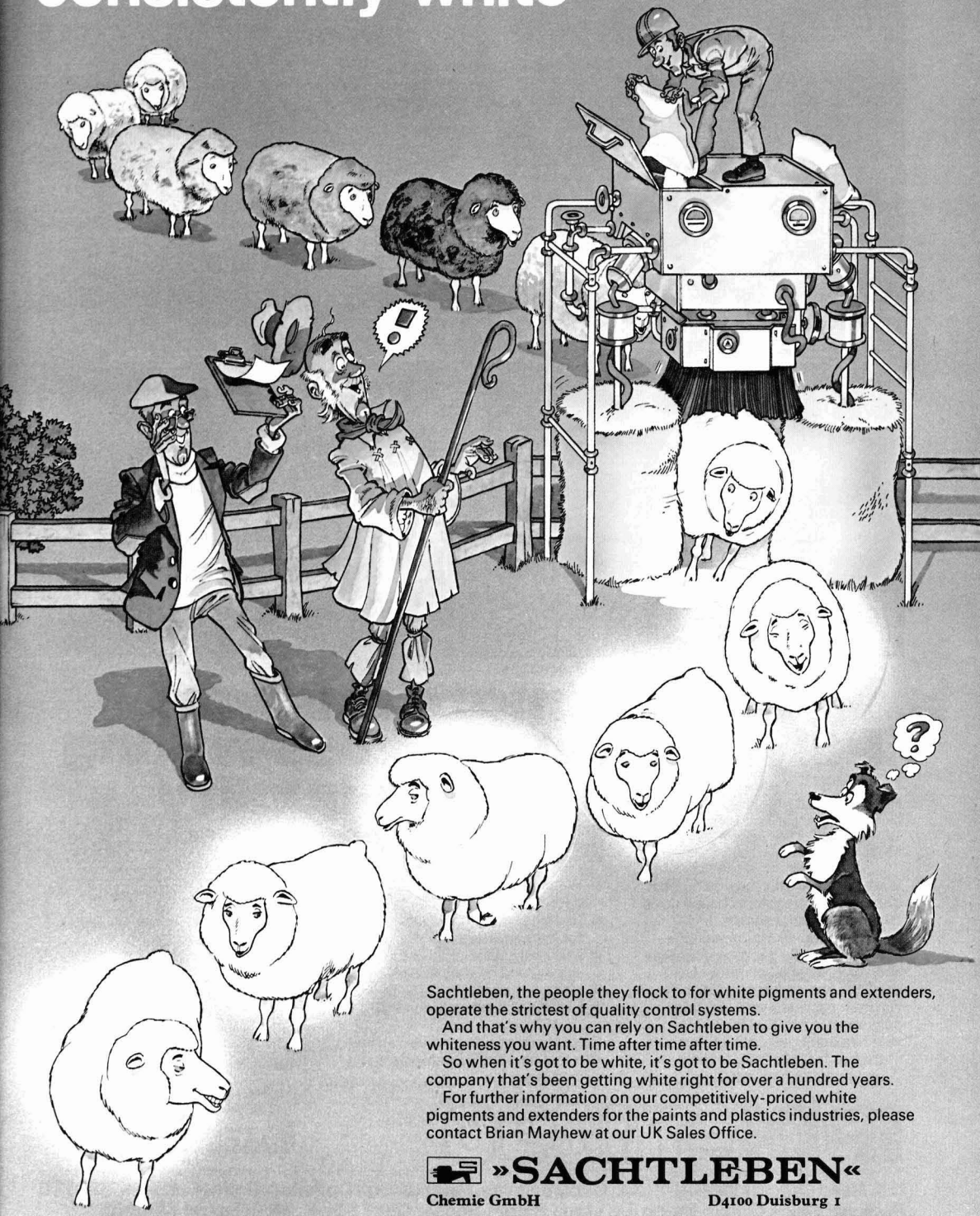

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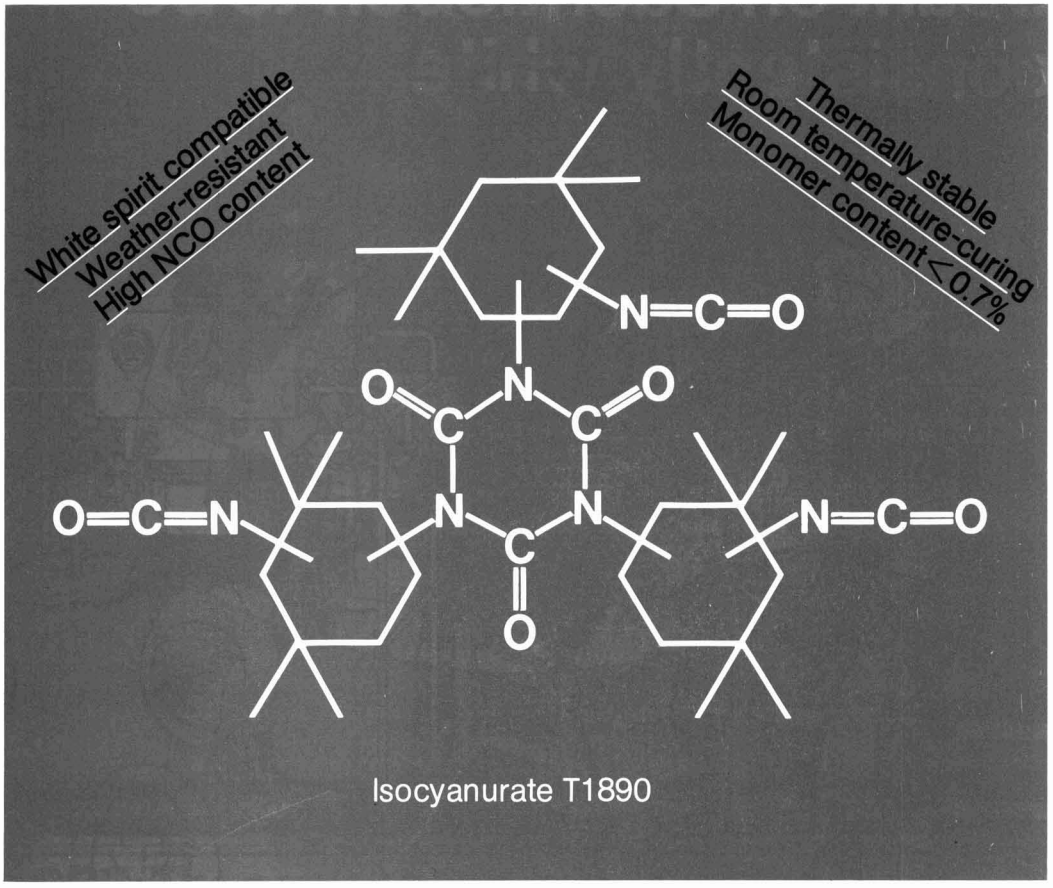

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Transactions and Communications

Coating formulation; its effect on the durability of exterior wood finishes

By J. Boxall

Department of the Environment, Building Research Establishment, Princes Risborough Laboratory, Princes Risborough, Aylesbury, Buckinghamshire HP17 9PX, England

Summary

A range of exterior coatings of known composition have been assessed for durability by natural exposure on redwood timber.

Trends are found which suggest that certain aspects of coating durability were dependent upon the formulation variables of pigment volume concentration and binder content. The number of coats applied also affected performance; for some systems the mode of failure changed as film thickness was increased.

Keywords

Types and classes of structures or surfaces to be coated

redwood

Miscellaneous terms

formulation

Properties characteristics and conditions primarily associated with

dried or cured films

exterior durability
film thickness

L'influence de la formulation du revêtement sur la résistance aux intempéries des finitions pour bois

Résumé

On a apprécié la résistance aux intempéries d'une gamme de revêtements de composition connue, pour l'usage à l'extérieur et appliqués au bois de Séquoia.

On a trouvé des tendances qui indiquent que certains aspects de la résistance aux intempéries d'un revêtement dépendaient des variables de la formulation telles que la concentration pigmentaire par volume et la teneur en liant. En outre le nombre de couches exerçait une influence sur le comportement de certains systèms où le genre de défaillance changeait au fur et à mesure que l'épaisseur du feuil était augmentée.

Der Einflus der Beschichtungsrezeptierung auf die Dauerhaftigkeit der Aussenbeschichtungsmittel für Holz

Zusammenfassung

Das Bewitterungsverhalten einer Reihe von Aussenbechichtungsmitteln, deren Zusammensetzung bekannt ist, wurden auf Rotholz bewertet.

Tendenze wurden befindet, die vorschlagen dass von etlichen Gesichtspunkten die Beschichtungsdauerhaftigkeit von solchen Rezeptierungsvariablen als Pigmentvolumenkonzentration und Bindermittelgehalt abhängt. Die Leistung wurde auch von der Schichtzahl betroffen; für einige Systemen veränderte sich die Versagensmode als die Schichtdicke vergrössert wurde.

Introduction

Refs. 1-2

There are several factors that can affect the performance of an exterior coating on timber. These factors can be loosely sub-divided into internal influences caused by formulation: the ingredients used and their addition levels; and to external effects: with possibly the most important being the substrate and its condition (including pretreatment), the nature of the components comprising the coating system, and film thickness.

This work is part of a research programme at the Princes Risborough Laboratory (PRL) and is designed to identify the factors required to optimise coating performance on exterior timbers. A range of model solvent-soluble coatings was prepared using an iron oxide as pigment and a long oil alkyd resin as binder. Ratios of these components were varied to produce coatings of differing pigment volume concentrations (PVC) and non-volatile binder content. In addition, the effect of film thickness was examined by applying two- and four-coat applications of each system.

The coating formulations produced encompassed a wide range of product types including paint-like materials, semi-transparent low and high-build exterior wood stains and opaque exterior wood stains[1,2]. All finishes were applied to preservative pretreated softwood cladding panels. The results reported here relate to the assessments made after four years of weathering.

Experimental

Paint formulation

A range of sixteen model coating formulations was prepared using a red oxide of iron as pigment and a long oil length drying oil modified alkyd resin as binder. In an attempt to inhibit mould growth within the film, a fungicide of the sulphamide type was added at 0.5 per cent of total solids content. No viscosity modifiers were used in the formulations.

The percentage by *weight* composition in respect of major ingredients is shown in Table 1, and the relationship between the various formulations according to pigment *volume* concentration (approximately) and non-volatile binder is shown in Figure 1.

It was found that defect-free films with overnight re-coat times were achieved, without addition of metal driers, for all formulations except 9, 10, 11, 14 and 16 – in these cases cobalt and lead naphthenate driers were added to give 0.025 per cent and 0.25 per cent metal respectively on binder solids. Coatings were prepared using conventional ball milling techniques and dispersed to better than 15 μm on a Hegman gauge.

The coatings prepared from the different formulations may be classified as follows:

1, 2, 7 and 8	semi-transparent, low-build stains
12, 13, 15 and 16	semi-transparent, high-build stains
3, 4, 5, 6, 9, 10 and 11	opaque stains
14	full-gloss type alkyd finish.

However, because of the wide spectrum of ingredients that can be used by manufacturers it is recognised that this classification is not rigid. Furthermore, it was realised that some of the formulations at the extremes of the axes, Figure 1, would not be commercially acceptable, they are added only for completion. In the formulation area to the right of numbers 6, 11, 14 and 16, Figure 1, it was impossible to prepare coatings with the ingredients used in this study.

Panel preparation

Tongued and grooved cladding panels, 1000 x 140 x 20 mm, were prepared from joinery quality Baltic redwood, selected to maximise sapwood. Prior to painting, the boards were dip-treated for three minutes in an organic-solvent, water-repellent wood preservative containing 1 per cent tri-n-butyl tin oxide fungicide, 0.5 per cent paraffin wax and 10 per cent hydrocarbon resin, in a white spirit solvent.

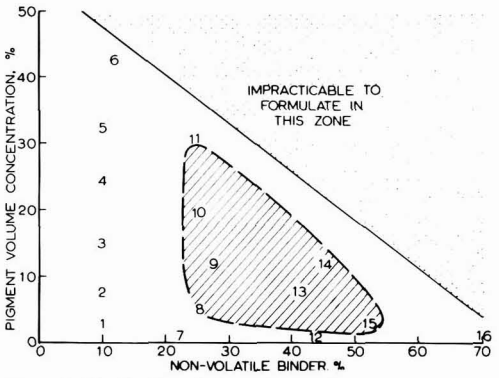

Figure 1. Coating formulations. Formulation parameter values within the area defined by the broken line have resulted in finishes with good exterior durability

After drying to constant weight, the boards were brush coated; all painting being performed in a conditioning room at 20°C and 65 per cent relative humidity.

Duplicate panels of each formulation were prepared with two coats overall, allowing an overnight drying period between applications. The bottom half of each panel then received two further applications to produce a four-coat system. The backs of each panel received one coat only of the appropriate formulation.

All coatings were applied at what were considered to be natural spreading rates, taking into account such factors as penetration into the substrate, coating viscosity and ease of brushing. The application rates achieved for the two- and four-coat systems, expressed in square metres per litre of coating, and the corresponding dry film thicknesses in micrometres, are presented in Table 2.

Exposure testing

After drying for one week the boards were fixed on to free-standing insulated modules which provided similar thermal characteristics to a timber frame house wall. The panels were exposed vertically, facing south for four years at the PRL weathering site.

During exposure the panels were assessed for their general appearance, cracking of timber, film erosion, film cracking over panel edges, film flaking and mould growth. Not all of the above assessments were appropriate for each formulation. In particular, with certain formulations the weathering process of the film was by erosion – a micro-flaking failure typified by a non-uniform rate of loss from the substrate; fastest from latewood growth bands

Table 1

Coating formulations; weight ratio of main components

	Formulation number															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Red oxide of iron	1.4	3.4	7.2	14.0	20.5	38.4	0.9	5.6	16.0	27.2	45.2	0.9	15.7	27.9	6.0	3.1
Long oil alkyd (75% solids)	13.3	13.3	13.3	13.3	13.3	16.0	30.0	33.3	37.3	34.7	33.5	58.7	56.0	60.0	69.4	93.4
White spirit	85.3	83.2	79.5	72.7	66.2	45.6	69.1	61.1	46.7	38.1	21.3	40.1	28.3	12.1	24.6	3.5

Table 2
Panel preparation; application rate, metres² litre⁻¹, and dry film thickness, micrometres

Coating classification	Formulation number	Application rate and film thickness for			
		Two coats		Four coats	
		m^2 litre^{-1}	μm*	m^2 litre^{-1}	μm*
Low build, semi-transparent stains	1	10.4	8	5.1	16
	2	12.6	7	6.3	14
	7	12.4	15	6.1	31
	8	14.9	15	7.5	31
High build, semi-transparent stains	12	24.2	16	11.8	33
	13	25.8	18	14.0	33
	15	20.2	25	11.3	45
	16	30.7	22	16.3	42
Opaque stains	3	11.6	9	5.8	17
	4	12.2	10	6.2	20
	5	15.7	9	7.8	19
	6	24.9	11	12.6	21
	9	22.4	14	11.2	28
	10	26.9	13	13.6	26
	11	26.3	19	13.6	36
Alkyd gloss paint	14	38.1	16	18.6	33

*Dry film thickness presented as theoretical on non-absorbent surface.

and somewhat slower from the earlywood. Therefore only the formulations that weathered in this manner received a rating for erosion. Conversely, the formulations susceptible to erosion were not rated for edge cracking and flaking since these modes of failure were not characteristic for these finishes. Colour and gloss variation were not considered important in respect of a coating's protective ability and accordingly were not rated separately. However weight was given to such factors when assessing general appearance.

A five point rating scale was adopted, 0, 1, 2, 3 and 4, where 0 represented no change, and 4 represented complete failure/totally unacceptable performance.

Results

In Tables 3 and 4 the two- and four-coat systems are ranked according to their performance ratings after four years of exposure. The two-coat systems which failed by erosion are grouped separately in Table 3.

Performance of two-coat systems, Table 3

Coating formulations 1-6 failed by film erosion whereas all the other two-coat systems failed by cracking or flaking. After four years of exposure the appearance of formulations 1-6 was poor with extensive checking of the timber and erosion of the film, the latter being such that the latewood growth bands were bare of coating. Mould growth was more pronounced on the higher PVC formulations, 3-6.

The more resinous formulations, group 7-11, were largely in a poor condition, although system 11 was reasonable with only minimal timber checking and cracking around the panel edges. The others (7-10) exhibited extensive checking of the timber, edge cracking and some tendencies for flaking – particularly formulation 7. Mould growth was also evident in this group, again increasing with PVC, although 11 was unaffected.

Formulations in the group 12-14 varied in performance. Number 12 was in very poor condition with considerable film flaking and checking of the timber. Formulations 13 and 14 had a poor appearance due to timber checking and mould growth on the surface. Complete cracking around panel edges had occurred with these formulations, although no flaking had developed from these or from the timber checks.

The high resin, low PVC formulations 15 and 16, were flaking from edge cracks and timber checks. Mould growth was pronounced.

Performance of four-coat systems, Table 4

The appearance of the four-coat systems was superior, in all instances, to that of equivalent two-coat applications.

None of the formulations applied as four-coat systems failed by erosion. With formulations 1-6, the mode of failure changed from erosion (found in two-coat applications) to the cracking-flaking experienced elsewhere. Within this group the best performance was exhibited by formulations 4 and 5, but even here some flaking and timber checking was evident.

With the exception of formulation 7, where flaking was in evidence, better performance was shown by the group 7-11, which showed only minimal timber checking and cracking around panel edges. Mould growth was only evident in the lower PVC formulations 7 and 8.

Table 3
Two-coat systems; performance assessment after exposure

	Formulation number	Formulation type	Flaking	Erosion	Timber checking	Edge cracking	Mould growth	Appearance
Formulations susceptible to flaking	11	opaque	0		1	3	0	1
	13	high build	0		2	4	2	2
	14	alkyd	0		2	4	2	3
	9	opaque	0		2	4	2	3
	15	high build	1		1	4	2	2
	8	low build	1		3	3	2	2
	10	opaque	1		3	3	3	3
	16	high build	2		2	4	3	3
	12	high build	3		4	4	0	4
	7	low build	3		4	4	1	4
Formulations susceptible to erosion	3	opaque		2	3		1	3
	4	opaque		2	3		2	3
	2	low build		3	3		0	3
	6	opaque		3	3		1	4
	5	opaque		3	3		2	3
	1	low build		3	4		0	4

Notes: 1. See text for explanation of performance assessment ratings
2. "low build" and "high build" = semi-transparent stains; "opaque" = opaque stains; "alkyd" = alkyd gloss paint

A similar pattern of performance was found in the group 12-14, where 12 was in poor condition compared with 13 and 14, which were showing only minimal timber checking but no flaking.

Formulations 15 and 16 had an acceptable appearance although timber checking had developed, especially with number 16. Both systems showed almost continuous cracking around the edges of the panel.

Discussion

The results of this study show that good performance on exterior softwood can be obtained from a diverse range of formulations; the best performance after four years weathering being obtained from formulation 11, an opaque stain, and the semi-transparent high-build stain, 13. It is interesting to note that those formulations giving generally acceptable performance appear to define a zone bounded by systems 11, 10, 9, 8 and 15, and containing numbers 13 and 14, Figure 1. This trend is particularly well defined with the four-coat applications.

Coating durability then, can be modified by variation in both formulation and film thickness.

Effect of film thickness

Good performance over the four year exposure period was found to be difficult to achieve with a two-coat application, but an increase in system film thickness always produced some improvement in coating performance, and over half of the finishes could be considered as giving reasonable performance with four coats.

The best coating performance from the four-coat applications was shown by formulations 11 and 13. However, even with formulations that showed good integrity over the panel face, edge cracking was always evident, and clearly this might have adverse effects on future coating performance.

There were two distinct types of failure within the systems, erosion (a micro-flaking of film preferentially from latewood growth bands of the timber) and gross flaking of the coating. Erosion failure was exhibited only by the two-coat applications of formulations 1-6; a mode of failure which was replaced by flaking in the equivalent four-coat applications. Despite any limitations in the formulation of these particular coatings (see later) this suggests a possible problem for finishes which are purpose designed to exhibit erosion failure, and indicates that some control of the coating thickness applied might be necessary.

Timber checking (or splitting) was found on all panels and was generally related to coating integrity as assessed by erosion or flaking. As expected, checking of the timber was less frequently observed with the higher-build and less permeable four-coat applications compared with the equivalent two-coat systems. Frequently the extent of substrate checking changed markedly at the boundary separating the two- and four-coated areas of the test panels.

Effects due to formulation

It is evident from this work that variations in both pigment loading (pigment volume concentration, PVC) and in the binder content of the formulations affect subsequent coating durability.

The poor performance at both two- and four-coats for formulations 1-6 can be attributed to a low binder content which has resulted in films of poor integrity and durability. It is interesting that these were the only systems susceptible to erosion and that this type of failure was not markedly influenced by PVC. This indicates that to

Table 4
Four-coat systems; performance assessment after exposure

Formulation number	Formulation type	Flaking	Timber checking	Edge cracking	Mould growth	Appearance
11	opaque	0	1	1	0	1
13	high build	0	1	1	0	1
10	opaque	0	1	2	0	1
9	opaque	0	1	3	0	1
14	alkyd	0	1	3	0	1
15	high build	0	1	3	0	1
8	low build	0	1	3	1	1
16	high build	0	2	4	0	1
3	opaque	0	2	4	2	2
4	opaque	1	1	3	1	1
5	opaque	1	1	3	1	1
2	low build	1	3	4	1	2
7	low build	2	2	4	2	3
12	high build	2	2	4	2	3
6	opaque	3	3	4	2	3
1	low build	3	4	4	0	3

See Notes Table 3

achieve long-term coating integrity the binder content of exterior wood finishes does need to be above a certain level; the poor performance of formulations 1-6 suggests a minimum value in the region of 15-20 per cent, although this might vary for other combinations of pigments and binders.

For the other formulations, an increase in pigment loading was generally beneficial in reducing flaking tendencies, which were most marked for coatings with the lowest PVC's: formulation 7 in group 7-11, and 12 in the group 12-14. This factor may be of importance in the formulation of semi-transparent exterior wood stains, where low pigment loadings may need to be adopted for aesthetic reasons.

Despite the presence of a film fungicide, mould growth occurred on several of the formulations. This did not appear to follow any well defined pattern although growth tended to be more prolific on two-coat than on four-coat applications. It is probable that higher fungicide loadings would have reduced colonisation further.

Conclusions

For a range of external timber coatings, it is demonstrated that performance is modified by changes in two formulation variables: pigment volume concentration and binder content. In general, higher pigment loading reduces film flaking tendencies, and binder levels need to be above a certain minimum to maintain coating integrity.

Within a system, increasing film thickness always resulted in improved performance, and in some instances altered the mode of coating failure.

[*Received 27 October 1980*

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J. Oil Col. Chem. Assoc., 1981, **64**, 140-143

Electrochemical impedance measurements on coated metal electrodes. Part 3: Measurements at constant potential

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

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Summary

Three electrode potentiostatic impedance measurements were carried out on immersed lacquered mild steel with the specimen potential held constant at all times. The impedance response changed in a regular manner with time showing the development of two semi-circles (graphical) after sixteen hours immersion. The high frequency semi-circle was largely invariant and thought to be due to the lacquer. The low frequency behaviour, thought to be due to corrosion at the base of pores, indicated some influence of Warburg diffusion phenomena after 24 hours.

Keywords

Properties, characteristics and conditions primarily associated with

dried or cured films

film defect

Processes and methods primarily associated with

analysis, measurement or testing

electrical impedance

L'Impédance électrochimique des revêtements appliques aux électrodes métalliques. 3. Les mesures au potentiel constant

Résumé

Sur trois électrodes en acier doux, revêtus de vernis clairs et immergés dans l'eau, on a effectué des mesures de l'impédance potentiostatique où le potentiel de l'éprouvette a été maintenu au constant en tout temps. L'impédance se variait régulièrement en fonction du temps et après une période d'immersion de seize heures elle démontrait le developpement de deux courbes demi-circulaires. Le demi-cercle d'haute fréquence était largement invariable ce que l'on considère à être dû au vernis clair. Egalement on considère que le comportement à basse fréquence est dû à la corrosion qui se produit au fond des pores et qui indique, après 24 heures, une certaine influence du phénomène de diffusion de Warburg.

Die elektrochemische Impedanz der auf Metallelektroden aufgetragenen Beschichtungen. 3. Messungen bei Gleichpotential

Zusammenfassung

Auf drei Elektroden aus niedriggekohlten Stahl, die mit Klarlack aufgetragen und in Wasser eingetaucht wurden, und als der Probepotential ständig konstant gehalten wurde, wurden Messungen der potentiostatischen Impedanz durchgeführt. Die Impedanz sich mit der Zeit regelmässig anderte, und zeigte, nach einer Eintauchung von sechzehn Stunden, die Entwicklung von zwei halbkreisförmigen Schemas. Der Hochfrequenzhalbkreis war im grossen und ganzen invariabel, welches man für eine Klarlackwirkung hält. Das Niederfrequenzbenehmen soll von der am Porenboden vorkommenden Korrosion verursacht werden, welches nach 24 Stunden zeigt etwas Einfluss des Warburgischen Diffusionsphänomens.

Introduction

Refs. 1, 2

In the two previous papers[1,2] in this series it was shown that the mannner by which the specimen was polarized, significantly affected the shape of the impedance curve obtained. It was found that potentiostatic polarization was preferable when a steady rest potential was measureable. When this is the case two major options are available. Firstly, the changing potential can be monitored and the potentiostat voltage setting adjusted to this measured value or secondly this setting can be preset to the value that the specimen is expected to eventually take up. Experiments carried out using the first option were described in the previous paper[2]. It was found that changes in potential either made a large contribution to the shape of the impedance curve or that the process causing the change in impedance was mirrored by potential change. It was not possible to monitor fully the transition with time between these curves and this resulted in apparent discontinuities (e.g. those between figures 6 and 7A and figures 7B and 8 in the previous paper[2]).

In an attempt to obtain a smooth family of curves the second option outlined above was taken up. This had the additional advantage that the measuring system could be automated in that there was no requirement to follow the rest potential. Experiments carried out in this manner form the substance of this paper.

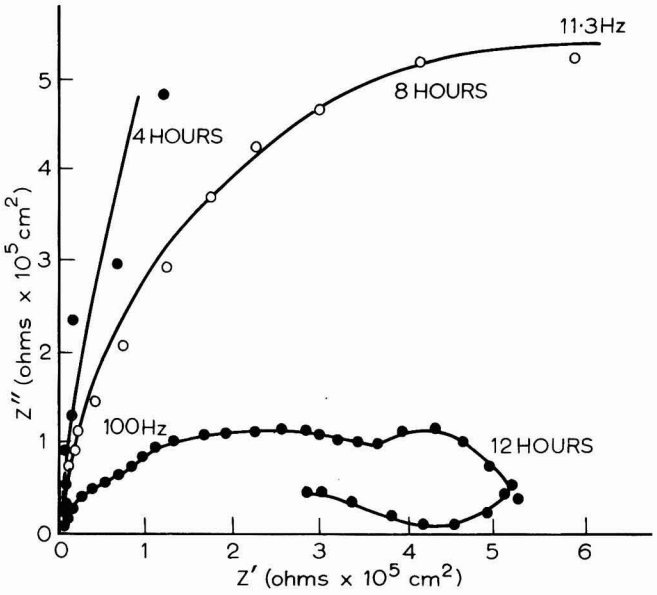

Figure 1. Impedance diagrams for a 50μm vinyl acrylic lacquer on abraded mild steel in sea water after 4, 8 and 12 hours

Experimental

Refs, 1, 2

Based on the rate of change of impedance observed previously it was decided to take impedance measurements once every four hours. A precision integrated circuit timer type ZN1034E was wired to give a pulse every four hours. This pulse was used to synchronise a series of relays by means of a number of short term timers, type 555, set at one second each. The relays in turn supplied power to solenoids which operated the relevant buttons on the Solartron 1172 frequency response analyser and in addition allowed a photograph of the specimen to be taken simultaneously.

The specimen was a single coat vinyl acrylic lacquer on mild steel prepared and masked in a manner described previously[1,2]. The specimen thickness was 50μm. The solution was 80 litres of aerated BDH sea water at a temperature of 22°C. The electrode arrangement has been described in the first paper in this series.

Results and discussion

Ref, 3

The electrochemical impedance curves obtained from the first specimen subjected to the above experimental procedure are presented in figures 1 to 4 which represent a time span of 56 hours. These curves represent a uniform progression and have no apparent discontinuities as were observed when the potential was followed[2]. Further, the plot dimensions became consistently smaller with time. Figure 1 shows the curves obtained at 4, 8 and 12 hours after immersion. Initially highly capacitive behaviour was observed indicating that the paint film was not grossly defective. Increase in the parallel resistive component enabled the curve obtained after 8 hours to be extrapolated to form a semi-circle with a diameter of approximately 1.2 mΩ cm². The capacitance associated with this semi-circle was 350 pF cm^{-2} which suggests that it was due to the paint film. At twelve hours two semi-circles were developing simultaneously. The distortion of the low frequency data was because the rate of change of

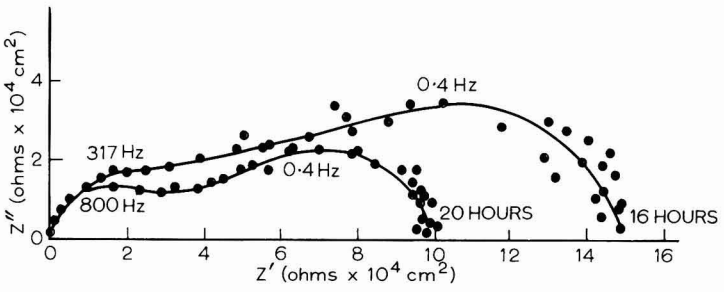

Figure 2. As Figure 1 after 16 and 20 hours

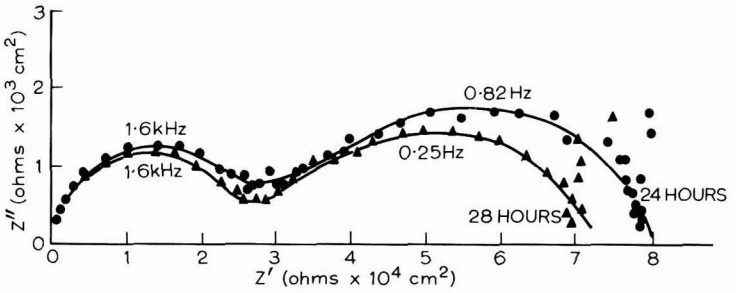

Figure 3. As Figure 1 after 24 and 28 hours

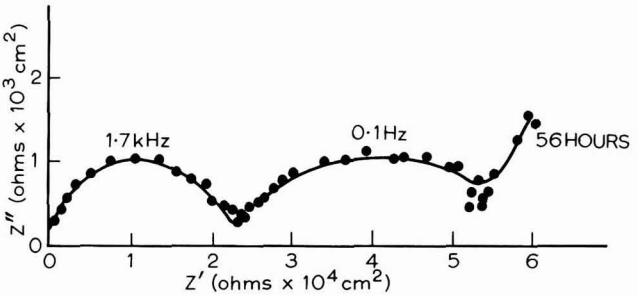

Figure 4. As Figure 1 after 56 hours

impedence was high at this juncture and the time taken to obtain a measurement was significant. The development of the second semi-circle observed at low frequency was probably due to the corrosion process becoming observable at the base of pores in the paint film. At sixteen hours, Figure 2, this separation of time constants had progressed to the stage where two distinct semi-circles could be seen. Increased water uptake in the film had affected both time constants but the continued rapid change of impedance with time was still causing scatter in the low frequency points. After 20 hours a distinct separation had occurred between the semi-circles, Figure 2. From this time onwards, relatively little change occurred in the high frequency semi-circle thus indicating that the paint film had become fully equilibrated with the water. The ratio of the diameter of the second semi-circle to that of the first changed little over the remainder of the period of the experiment. This was thought to indicate that part of the control of the corrosion process depended on the passage of species through the paint film.

During the latter stages of the experiment, Figure 3, a low frequency response associated with increased phase shift became more pronounced with time. This feature has been reported previously by Piens[3], who attributed this phenomenon to Warburg impedance. The effect is clearly reproducible and is not thought to be low frequency scatter.

A second series of experiments was carried out using a similar specimen; data obtained from this specimen after 24 hours immersion, Figure 5, were very similar to the data obtained at this stage in the previous experiment, Figure 3. The low frequency phenomenon reported for the previous specimen above was also observed, Figure 6. The extended low frequency approximation to a straight line is an additional confirmation of Warburg behaviour. It can

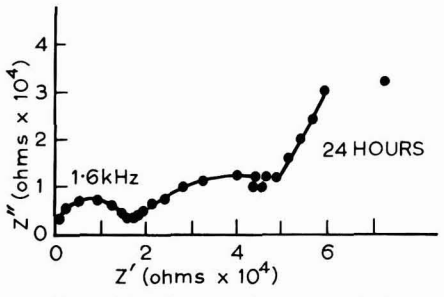

Figure 5. Duplicate experiment as Figure 1 after 24 hours

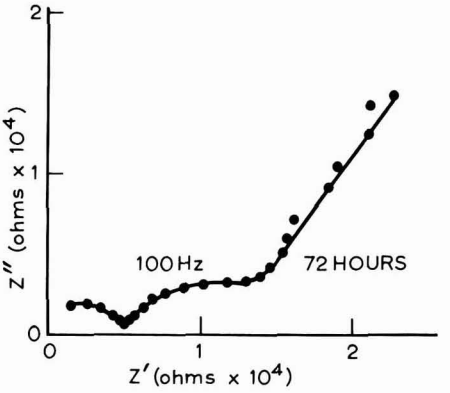

Figure 6. As Figure 5 after 72 hours

be seen from the above that the reproducibility of this technique is better than the method described previously, in that curves of very similar shapes are obtained after similar periods of immersion. The slightly different numerical values are well within the limits of accuracy attributable to variations in paint film thickness.

Conclusions

1. Three electrode impedance measurements on lacquered specimens where the set potential is held constant resulted in a smooth family of curves with time.

2. The reproducibility of this technique appears to be relatively high.

3. Indications are that the corrosion process is controlled by diffusion through the film.

Acknowledgements

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J. Oil Col. Chem. Assoc., 1981, 64, 144-155

The outlook for the eighties*

By F. M. Smith

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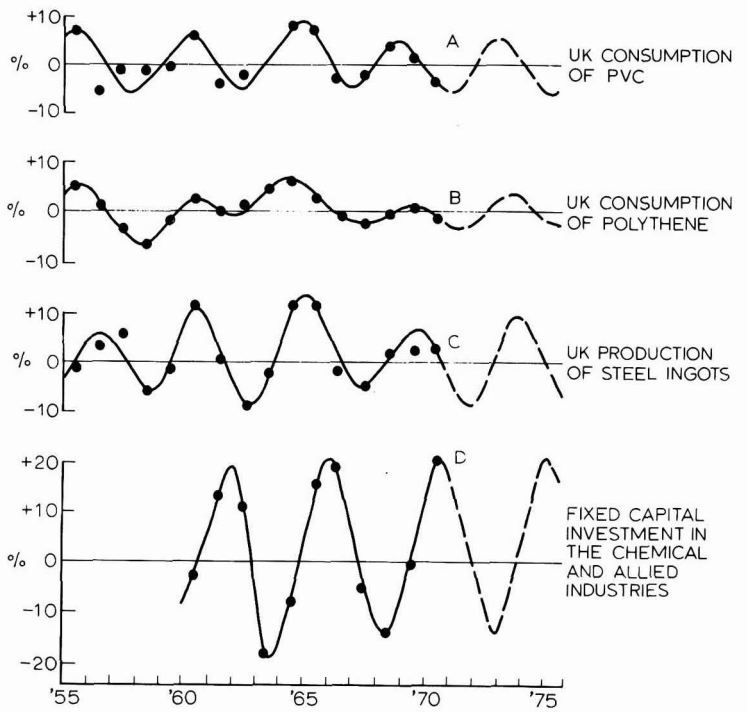
Predictions

The economic and financial pundits all start their predictions from today. Popular wisdom and the press tell us whether we are in a recession or a boom and the so-called expert purports to tell us how long it will last. The answer is always a significant change within a few months rarely more than a year away. Most explanations relate to money supply, rates of inflation and are dependent on government policies, what is happening to the American economy or the price of oil. Computer programs have been designed to juggle the parameters and to give us alternative scenarios. What they don't allow for is the human reaction to situations. These act like feedback mechanisms on process control systems and one of their most characteristic properties is the tendency to oscillate. The more complex the system in terms of its interconnections and the number of stages of transfer or delay, the greater the tendency for oscillation to start and to be self-sustaining and the greater the difficulty of damping out such oscillations.

Business cycles

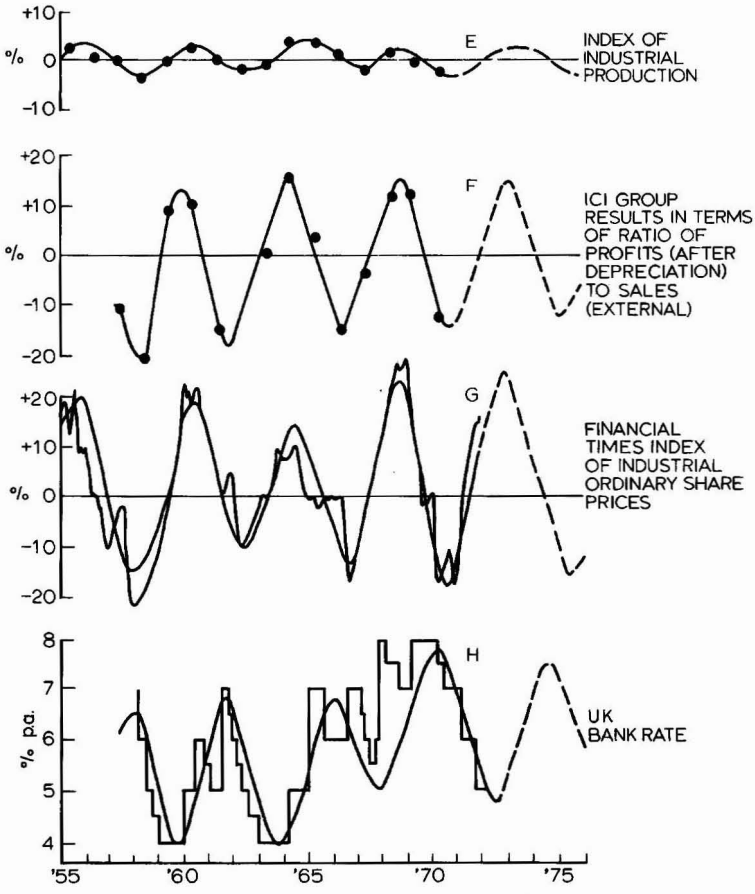
Refs. 1-3

The above observations were made by S. T. Lunt[1] in 1971 when he was a member of the Plastics Division of ICI Ltd but not published until 1975 under the title "Trade cycling in UK industry". He observed that "UK industry, and the economy as a whole, has experienced a series of ups and downs in the last two decades: the consistency of the time intervals between successive peaks and troughs, and the relative timing of high and low values in different sections of the economy may be less clearly realised by many people". A few examples of his observations suffice to show that the predictions he made in 1971 by extrapolating his curves came very true in 1974 and 1975. These graphs[2], shown in figures 1-8, cover the period 1955-75 and the vertical axes represent the extent to which any achieved annual value deviates from the smooth curve in that year and is expressed as a percentage. Not all the curves coincide although each of the cycles lasts 4-4.5



From top to bottom, figures 1 to 4

*The Keynote Address of the 8th National Symposium of the Oil and Colour Chemists' Association, Durban, South Africa, 6 and 7 November, 1980, sponsored and organised by the Natal Section.



From top to bottom, figures 5 to 8

years; as might be expected there are time lags between some of the economic factors and the industrial figures. This led to the concept of anti-cyclical investment, the theory being that if investment or expansion is carried out in a recession, then capacity will be available for the boom.

It was interesting at that time to observe that in the 1960s, growth very often tended to hide the cyclical movements, but they were there as illustrated by Lunt's analysis[3] of fixed capital in the chemical and allied industries in Figure 9. The same oscillation is observable in the sales of the products from Ciba-Geigy's Pigments Division in the UK as long as the curve is not smoothed too much (Figure 10 Sales growth 1950-1979). Here the 4-4.5 year cycle can be seen quite clearly (Figure 11 Sales growth with cyclical trend) and furthermore other related factors like the cyclical introduction of new products, shown in Figure 12 have been detected. It can be clearly seen that new products are brought to the market place immediately following the onset of a recessionary period.

More recently several changes have been observed: first the reduction in the rate of growth, the second the synchronisation of the cycle between countries round the world,

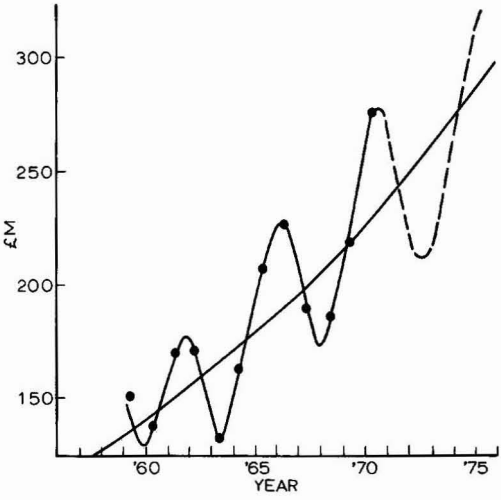


Figure 9. Fixed capital investment in the chemical and allied industries (at 1963 prices)

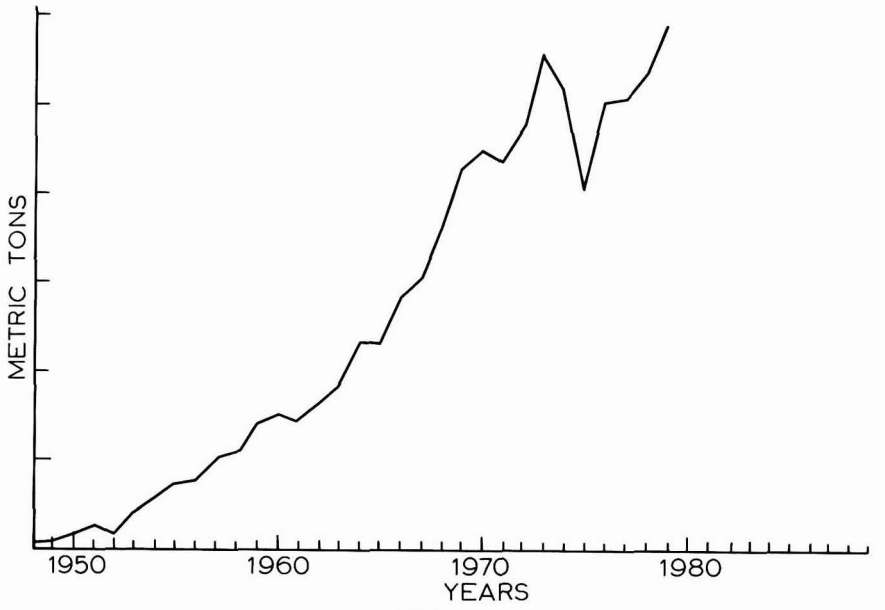


Figure 10. Pigment sales

third an increase in the amplitude, fourth a decrease in the cycle time and a suspicion that the cyclical movements might become irregular or turbulent. It would seem that this has now happened and the 1980 recession appears to be entirely out of phase. The 4.5 year cycle is no longer operating and we have to carefully consider whether history is repeating itself against a broader back-drop.

Long-term cyclical trends

It is at this stage that we turn to a serious consideration of the less well-known Kondratieff cycle which relates to a 55 year period. Could it be that the trends observed by this Russian economist would hold good again. It was in the early years of the Russian revolution that, having

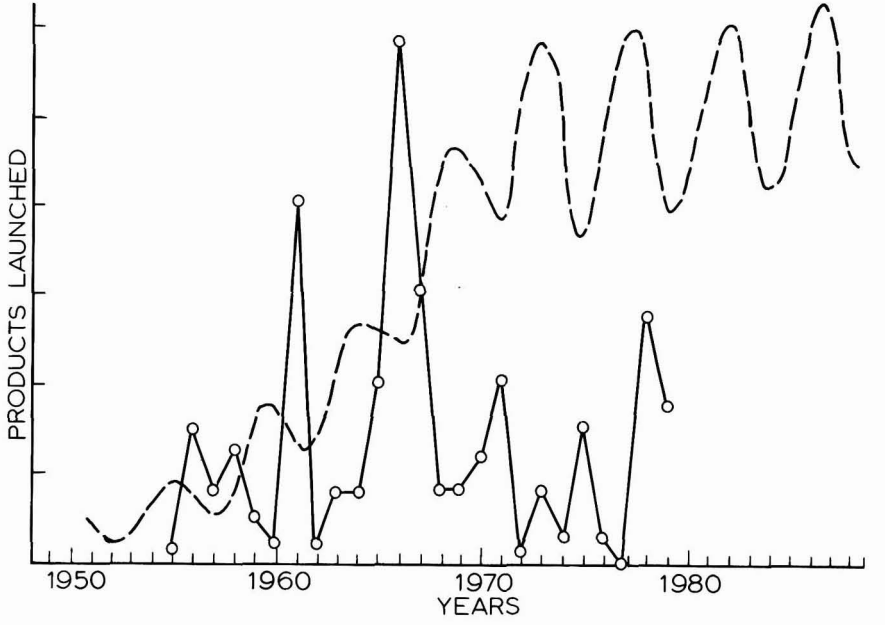


Figure 11. Cyclical launching of products

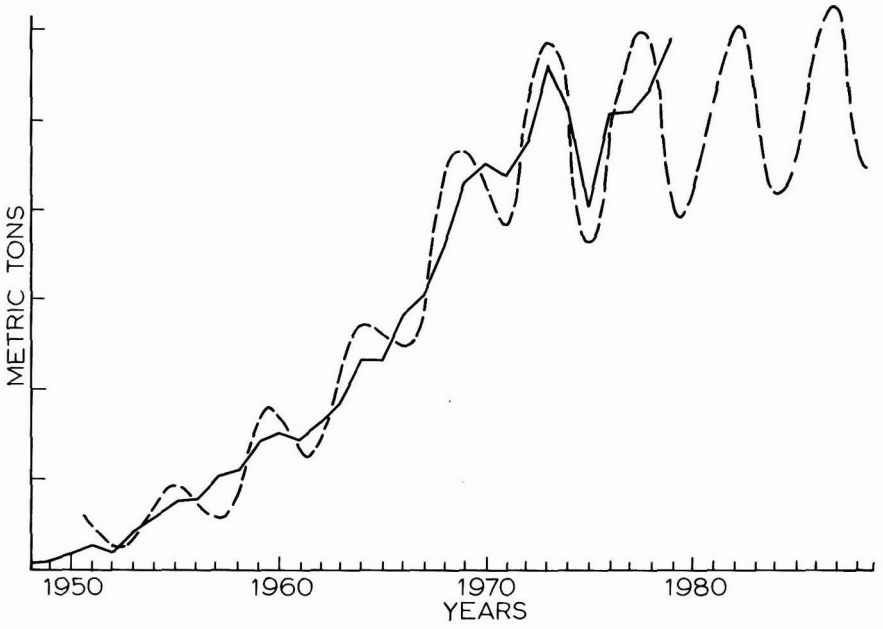


Figure 12. Cyclical movement of pigment sales

observed a cyclical trend over the previous 150 years and, having seen that after previous economic recessions, the capitalist world recovered, he predicted that despite the severe depression of 1929 and the 1930s, the capitalist world would recover. This was directly against the predictions of the communist/Marxist economists who foresaw the capitalist world bringing about its own downfall. Kondratieff was banished to Siberia but his prediction did come true.

The researches by Kondratieff suggested that there was some connection between technological innovation and the appearances of cycles of prosperity and recession. Subsequently much more detailed researches have been carried out by Kuznets, Schumpeter and, more recently, by Professor Mensch of Berlin University. The way the economic and financial world reacts to the fundamental changes going on in the economy is similar to the mechanism which feeds the 4.5 year cycle but the interaction leads to a 55 year cycle with a much greater amplitude. An understanding of the fundamental interaction between the economic world and the introduction of innovations into manufacturing industry is essential if we are to avoid the distress caused by recessions and the dangers of renewed world war.

The presentation of the relationship between innovation and the Kondratieff cycle is based on a very thorough analysis by Professor Mensch in his book "Stalemate in technology: innovations overcome the depression", published in English in 1979. Following this we shall consider the position of the surface coatings and printing industries in relation to the world situation.

The Kondratieff Cycle

Refs. 4, 5

The Kondratieff Cycle is recognised as a period of prosperity, followed by recession, depression, and finally revival, each period consisting of about 14 years, the total cycle occupying about 55 years as shown in Figure 13. Using the detailed presentation by Professor Mensch as a basis, it will be useful to follow through a typical cycle starting with a period of revival as shown in Figure 14.

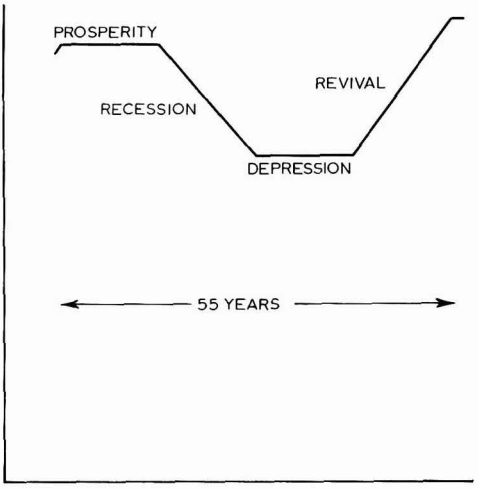


Figure 13. Kondratieff cycle

The main events in a period of revival are a large number of technological basic innovations. These occur when a newly discovered material or a newly developed technique is put into regular production for the first time, or when an organised market for the new product is first created. This is eagerly followed in the early phase of the growth cycle by many smaller, younger companies with a

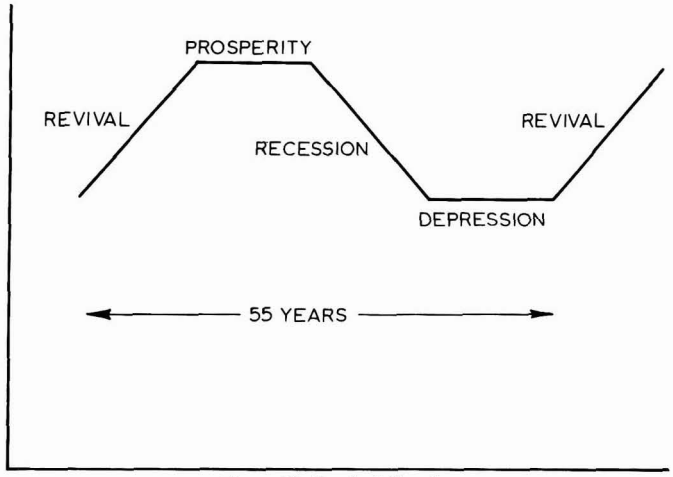


Figure 14. Kondratieff cycle

series of improvement and related innovations in quick succession. Thus, we have a cluster of innovations during this period, leading to a period of considerable prosperity. There is considerable expansion in industry with series of life cycles of products and interconnected growths, for example road construction machinery and cars. The economic growth of the UK in the middle of the last century and the economic miracle in the USA and Germany in the 1940s and 1950s well illustrate this.

This growth and prosperity leads to reduced costs per unit and to further production potential. Exports become an essential part of this continuing growth. As production capacity increases, demand is exceeded and we move from a seller's market to a buyer's market. All manufacturing countries are now reaching the same conditions. Products themselves become international and standardised and we have only pseudo-innovations. The consumer is demanding something new but only finds a minor modification of the old. Stagnation has arrived.

Investment in the industry of the day begins to be unattractive and the accumulated money begins to be invested in the international capital and money market rather than in business. Thus, in Germany, already in 1976, only 10 per cent of capital was being reinvested, wheras the figure was 25 per cent in 1970.

Consequently a huge money and capital market builds up since there is temporarily a lack of innovative investment alternatives. This was clearly illustrated in the time of the Conservative government of Mr Edward Heath in the UK in the beginning of the 1970s when he was unsuccessfully trying to persuade British industry to invest; the reason was not "lack of faith in the country or the government", but the beginning of stagnation.

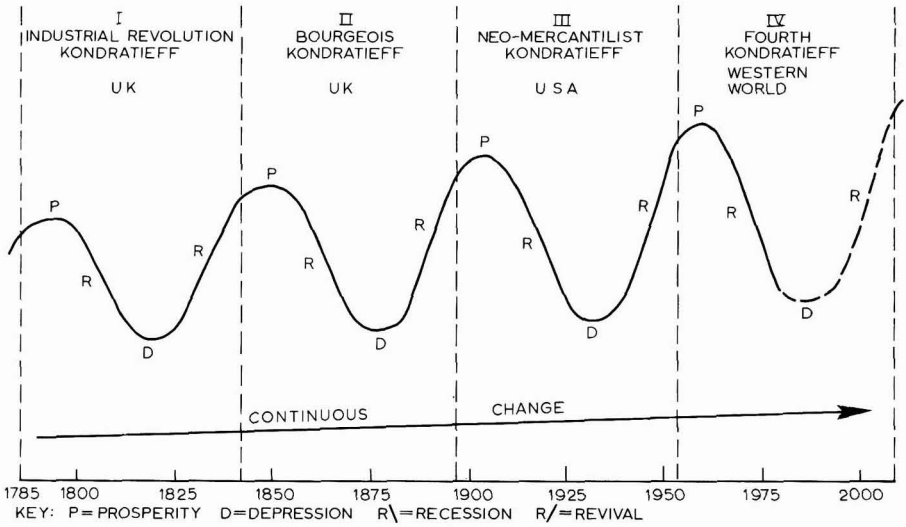
It was about this time that Langrish, Gibbons, Evans and Jevons[4] were studying the Queen's Awards to Industry in the UK for Technological Innovation in the years 1966 and 1967. They were of course seeing the end of a period of technological innovation and on the verge of a period of stagnation and therefore they were only seeing the pseudo-innovations at the end of the line. They, and also Schon[5], observed that management attitudes were frequently very much directed against innovation.

This is typical of this period in the cycle where the market is becoming saturated, improvement innovations have little impact, big companies are becoming inflexible (the dinosaur effect) and it is not worthwhile for the smaller companies to do battle against the giants. The economy first reacts to this situation by cutting back on R & D, the "we can't afford it" syndrome. In production the priorities are set for higher profitability which leads to fewer products, concentration on the most popular, biggest volume products and hence the reduction of choice; at the same time competitive products become more and more indistinguishable. When demand falls the first reaction is to put up prices to preserve profitability. This only reduces demand and hence prices fall as competition increases.

Recession is then followed by depression as unemployment begins to rise significantly and the monetarist policies aimed at controlling the money supply in an attempt to control inflation, merely aggravate a condition of stagnation.

It has been observed that in this situation, no amount of investment in existing technologies improves the macro-economic situation although it might favour one manufacturer against his competitor on a micro-scale. The only way out is for a series of new technological basic innovations to be made. Investors are, in desperation, prepared to back more risky ventures and managements are forced to consider new technologies. But it takes time for these to work through the industrial world and to regenerate employment and wealth. As they do, another period of revival can begin.

The four Kondratieff Cycles which have been identified are shown in Figure 15 and are the Author's diagrammatic presentation of the work of Kuznets, Schumpeter and Mensch. The first cycle was almost exclusively in the UK and was based on cotton textiles, iron and steam power. In 1840 Britain was mining 68 per cent of the world's coal, producing 50 per cent of world pig iron, 70 per cent of world steel and 50 per cent of the world's cotton goods. The second cycle, also identified in the UK, depended heavily on the railways, and the third, most clearly seen in the USA, on electricity and the motor car. The fourth cycle derived from a cluster of basic innovations



after Kuznets, Schumpter, Mensch

Figure 15. Kondratieff cycles

in the 1930s, namely television, colour films, communications, jet engines, radar and modern transport, plastics and artificial fibres. We are of course still in the fourth Kondratieff Cycle and looking for the basic innovations to pull us out of the depression.

The dates relating to these cycles are shown in Table 1, the last 2 years being estimates based on Professor Mensch's extrapolations.

The relation between invention and innovation

Refs. 6-8

It has been observed that basic innovations occur in clusters. Professor Mensch and his co-workers have studied in detail the relationship between basic scientific inventions and the basic innovations derived from them. Their conclusion is that basic scientific inventions and the sub-inventions which spring from them, occur at a fairly steady rate. There is a delay in taking them up due to the series of events leading to stagnation, and it is only in time of dire need that they are taken up. Thus the cluster of basic innovations occurs at specific times in relation to the Kondratieff Cycle.

A basic invention is usually deeply rooted in scientific discovery and usually astounds even the experts. It probably contains a strong general theoretical element and is the foundation for many more sub-inventions. Thus, the basic electrochemical innovations in the second half of the nineteenth century[6], shown in Figure 16, all started with the invention of the Leyden jar. Similarly, the basic chemical innovations in the second half of the nineteenth century[7], shown in Figure 17, all started with Lavoisier's oxygen theory of combustion.

In general, basic innovations follow their respective basic inventions in the same order. The relationship between them in time however, shows a very significant and characteristic delay[8] between invention and innovation as seen in Figure 18. Here is the evidence of a steady production of inventions which are ignored until the desperate necessity of a depression causes them to be taken up in comparative haste.

This pattern is repeated in each Kondratieff Cycle. Although the cycles are of very similar time construction over the 200 years studied, there is some evidence that inventions are now called on in a shorter time span than previously.

Table 1
Kondratieff Cycles

	Prosperity	Recession	Depression	Revival		
I	1787	1800	1813	1827	1842	(55)
II	1843	1857	1869	1885	1897	(54)
III	1898	1911	1925	1939	1953	(55)
IV	1954	1965	1979	1994	2009	(55)

after Kuznets, Schumpeter, Mensch

New concept	Inno-vation	Inven-tion	Years lead time	Tempo of change
Electrodynamic measurement	1846	1745	101	0.99
Lead battery	1859	1780	T 79	1.26
Double armature dynamo	1867	1820	47	2.12
Commutator	1869	1833	36	2.77
Cylinder armatured motor	1872	1785	87	1.14
Arc lamp	1873	1802	71	1.40
Incadescent light bulb	1879	1800	79	1.26
Electric locomotive	1879	1841	38	2.63
Electric heating	1882	1859	23	4.34
Cable construction	1882	1820	62	1.61
Telephone	1881	1854	27	3.70
Steam turbine	1884	1842	42	2.38
Water turbine	1880	1824	56	1.78
Transformer	1885	1831	54	1.85
Resistance welding	1886	1841	45	2.22
Arc welding	1898	1849	49	2.04
Induction smelting	1891	1860	31	3.22
Meters	1888	1844	44	2.27
Electric railroad	1895	1879	16	6.25
Long distance telephoning	1910	1893	17	5.88
High tension insulation	1910	1897	13	7.69
Gasoline motor	1886	1860	26	3.84

Figure 16. Basic electrotechnical innovations in the second half of the nineteenth century

New concept	Inno-vation	Inven-tion	Years lead time	Tempo of change
Thomas steel	1878	1855	23	4.34
Safety matches	1866	1805	61	1.63
Aniline dyes	1860	1771	89	1.12
Cooking fat	1882	1811	71	1.26
Indigo synthesis	1897	1880	17	5.88
Sodium carbonate	1861	1791	70	1.42
Aluminium	1887	1827	60	1.66
Refrigeration	1895	1873	22	4.54
Rayon	1890	1857	33	3.03
Gas heating	1875	1780	95	1.05
Oxyacetylene welding	1892	1862	30	3.33
Dynamite	1867	1844	23	4.34
Chemical fertilizer	1885	1840	45	2.22
Preservatives	1873	1839	44	2.27
Electrolysis	1887	1789	98	1.02
Antitoxin	1894	1877	17	5.88
Chloroform	1884	1831	53	1.88
Iodoform (antiseptic)	1880	1822	58	1.72
Veronal (barbiturate)	1882	1863	19	5.26
Aspirin	1898	1853	45	2.22
Phenazone (synthetic pain-killer)	1883	1828	55	1.81
Baking powder	1856	1764	92	1.08
Plaster cast	1852	1750	102	0.98
Mass production of sulphuric acid	1875	1819	56	1.78
Synthetic alkaloid (cocaine)	1885	1844	41	2.43
Synthetic alkaloid (chinoline)	1880	1834	46	2.17
High-grade steel	1856	1771	85	1.17

Figure 17. Basic innovations in chemistry in the second half of the nineteenth century

It is fascinating to observe the enormous delay which can occur between a significant invention and its subsequent commercialisation. The ball point pen, for example, was invented in 1888, but was first marketed 50 years later in 1938.

It is also very significant that many of the inventions which will lead to innovations, which will retrieve us from an industrial depression, were made between 20 and 100 years before, but never taken up. The trouble is that it is often not possible to tell in advance which invention will become a basic innovation. Even from the first production it takes time; for example the first manufacture of Portland cement in 1824 could not prevent the world economic crisis of 1825, although it would be a major product subsequently in the revival. The world crisis of 1873 was more severe and still more severe in 1929. At that time three-quarters of the basic inventions had already been made but recovery was not complete till decades after.

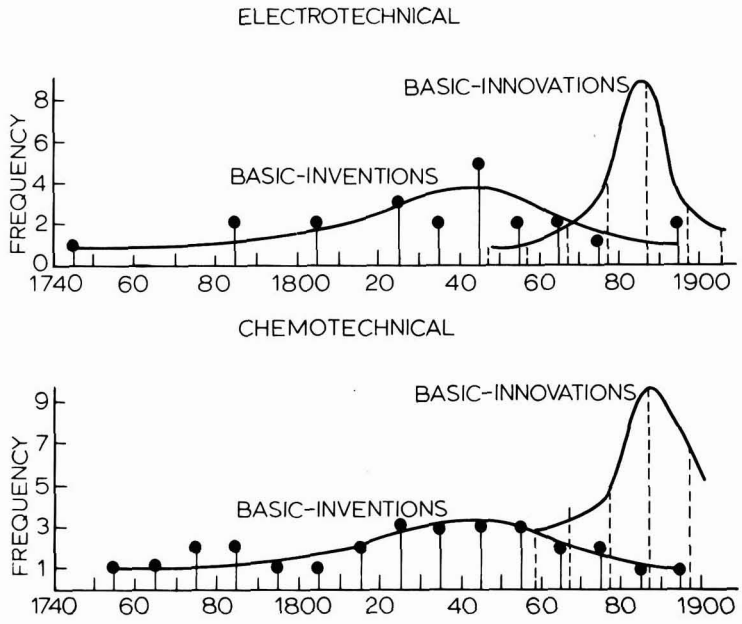


Figure 18. Frequency of basic inventions and innovations in chemistry and electrotechnique before 1900

The current depression can be expected to last from 1979 to 1994, and Professor Mensch predicts the swarm of basic innovations which will save the day will be made between 1983 and 1995. The peak year for innovations will be 1989 and two-thirds of the innovations which will have been implemented by the year 2000 will be produced in the decade around 1989. The surge of innovations will begin in 1984; such surges have always occurred previously during years of iron rule by national government in 1825, 1886 and 1935. Perhaps Orwell was right after all!

The view from the ground

Ref. 9

Professor Mensch presents us with a magnificent helicopter view of technological evolution. Let us examine our own experience over the last years from ground level.

Technological forecasting was the vogue in the 1960s and was intended to deduce how technology would move forward – mostly on existing tracks. This was often the spur to new venture groups which were set up in the 1960s but failed and were, almost without exception disbanded. According to Carson and Rickards[9] this was because the business situation was not bad enough to justify the risks or sufficient investment in experimentation. This illustrates the truth that innovations of all types were being identified by technological groups but were not getting off the ground because industrial management did not see the need for them and the economic necessity was not recognised.

The British Institute of Management, in a report prepared by Management Research Groups, 1980, entitled "The industrial and social consequences of *technological shock*", states that "the main reasons for fearing further decay, can be seen as a combination of inter-related factors amongst which are: the conservatism of management, similar attitudes on the shop floor and among many trade unions, and the slow and inadequate responsiveness of the financial world in providing venture capital to high technology companies aiming to expand rapidly in world markets. Of concern also is the failure so far of government to devise policies that will strengthen the competitiveness of British industry and increase the creation of wealth rather than...". The extent to which they are unaware of the severity of the world crisis and how we shall come out of it is illustrated by their assertion that "Technological change contributes a major part of Gross Domestic Product growth though the amount is small in terms of the economy as a whole, estimated roughly at 1-2 per cent per annum". We shall need more than that.

Carson and Rickard's experience was particularly related to the chemical industry, and the "Scimitar" approach to new product development rightly emphasises the importance of techno-commercial forecasting in the search for potential new ventures. Success is considered more probable if the new venture is not too far removed from current experience. This is true but it does not take us into entirely new areas of basic innovation and illustrates the reality of our self-propelled dive into recession.

Whilst companies and countries are all desperately trying to improve efficiency in known areas of technology and industry, and are cutting back on unprofitable exercises and public expenditure respectively, they are hoping against hope to reduce inflation. But in reality they are generating an increasing speed of recessionary movement which leads to more inflation and does not help to pull the world economy out of the dive. Each company and each country is on its own survival course and whilst competition between companies leads to a better deal for

Table 2
Inventions and innovations in resins

1909	Phenolformaldehyde resins discovered by Backeland.
1914	Use of cellulose acetate industrially.
1924	Condensation products of urea and formaldehyde discovered.
1930s	Polyurethanes and polyamides discovered.
1935	Arcylic resins first marketed.
1937	Polyvinyl resins produced.
1939	Epoxy resins for coatings first produced.
1940	Production of nylon.

Table 3
Alkyd resins

1856	Basic invention by J. M. von Bemmelen from succinic acid and glycerol.
1901	Watson-Smith attempted commercial exploitation from glycerol and phthalic anhydride.
1919	Phthalic anhydride commercially available.
Late 1920s	Basic innovation in alkyd resins.
1933	US production reaches 4,500 tons.

the customer, competition between countries can lead to economic battles and then to real war. If this tragic outcome can be avoided we are in fact witnessing the economic pressures which will bring forward basic innovations to save the day. These are to be far preferred to the manufacture of armaments.

Perhaps some world or even continental co-ordination is needed. In the *Financial Times* of 3 October 1980, there were two reports which illustrate the uncertain situation in which companies find themselves. Whilst "Hoechst is hoping to invest significantly in expanding polyester production for the manufacture of plastic bottles. The bottles will be returnable and in a further processing stage, Hoechst aims to re-cycle the used bottle into other plastic products", ICI are reportedly expecting a £70m loss for the year in polyester. We have of course already seen the enormous over-capacity in polyolefin and other synthetic fibres for many years, which is now spreading to all manufactured goods in existing technology areas.

The surface coatings and printing industries

Ref. 10

How will this affect the surface coatings and printing industries? What is likely to happen to the paint and printing ink industries with which OCCA is primarily concerned, because its future is also somewhat precariously dependent on these industries.

Printing has evolved over 500 years to a high state of technical efficiency with three basic printing processes, letterpress declining and lithographic offset and gravure increasing. Copying processes have proliferated but none has seriously threatened printing. New ways of storing and transmitting information have grown very rapidly in recent years and the place of the printed word and picture is seriously threatened. Computers combined with extensive storage systems and long distance transmission by cable or satellite, are already revolutionising communications. Print-out systems using non-impact printing are coming on apace and can also be used for packaging printing on the finished article without intermediate preparation of packaging material. It is estimated that 20,000 ink jet printers are already in use (they are a great help with Japanese characters). Promising forecasts are made for ion bombardment through an ink mist by means of a high voltage corona discharge which propels the ink onto the paper. The ink research centres are cautious in their predictions for these new systems, still rating them well behind the conventional printing methods in 10 years time. R. E. Whitworth[10] says there is "a need for an injection of capital development on a courageous scale". Here we have the crunch. Have we reached the Concorde step where the next technological advance is too sophisticated and does not meet our current needs or is this a basic invention which deserves exploitation to produce a basic innovation. Only time will tell.

In surface coatings, it is interesting to note the dates of the introduction of new resins as shown in Table 2. These were the innovations which, together with titanium dioxide gave a huge impetus to the surface coatings industry in the post-war period. Of particular interest is the discovery and introduction of alkyd resins shown in Table 3. They were a basic invention in 1856 by J. M. von Bemmelen, who reacted succinic acid and glycerol. Watson-Smith, in 1901, attempted commercial exploitation from an industrial point of view using glycerol and phthalic anhydride. But it was not until phthalic anhydride became amply available in 1919 that the commercial manufacture of alkyds became possible in the late 1920s. By 1933 in the USA there was a production of 4,500 tons out of a total of 20,000 tons of resins.

And where has the paint industry gone since then? MF resins, polyester resins and some others of low volume, but essentially a "one route" technology which cares to go on solving old problems by the same or similar techniques indefinitely without allowing for the reducing chances of success. Why not accept the inevitable in existing lines and go vigorously for new lines such as 2-coat metallic finishes or hot spray methods?

By and large, except for the non-aqueous dispersion concept for making concentrated resin suspensions, all the innovations in recent years have been concerned with new methods of application and more attention to surface preparations: powder coating, cationic electro-painting, protection of metal surfaces by new techniques, including cathodic protection. It has been said that paint is good enough and the preparation and application need more attention; this has led to supervision by approved inspectors – at last this concept of terotechnology (total cost during the life time of a project, not merely the initial capital cost), has been recognised in the paint industry although it is still difficult to get a real guarantee for a surface protection contract.

A lot of what was done in the industry and its supply industries in the 50s, 60s and 70s seemed so important at the time to fuel perpetual growth; but it was in reality the development of basic innovations derived from basic inventions, some coming from the nineteenth century. The industry was maturing but was quite oblivious to the possibility of growth coming to an end.

The future

Surface coatings and printing, as far as the paint and printing ink industries are concerned, will continue fulfill-

ing a useful function similar to the present one during the 1980s. There is unlikely to be any significant growth or major new developments until major technological changes occur. These are most likely to be dictated by the rise and then fall in the use of plastics, followed by the much more extensive use of aluminium as a construction material in the following decade. The Author expects to see the introduction of long life inorganic coatings as a commercial basic innovation after 1989. The use of grown crops for the supply of organic materials for the chemical industry though, seems to be a long way away. When it is considered that the whole of the current world grain crop is not sufficient, in the form of alcohol, to replace fuel for automobiles, the size of the problem may be realised. With a rapidly rising world population and the demonstrated inability to produce and supply food for fellow human beings around the world, it would seem that there is not enough volume of regenerable materials for anything else but food.

The world economy

Refs, 11-18

John Naisbitt[11] is the publisher of *The Trend Report* which relies "almost exclusively on a system of monitoring 'local' events and behaviour", mostly derived from a content analysis of 150 daily newspapers in the United States since 1970. Thus, whilst he says that "Yesterday is over. We have to look to new technological adventures: electronics, biochemistry, alternative sources of energy, mining the seabeds. We have to work out policies (or at least let the market place do it) to make the transition from the old to the new", he sees "dropping productivity figures will finally force industry, in economic desperation, to give more than token attention to the mental health of workers". "US industry leaders may not understand such a trend as changing personal values, but they do understand dropping productivity." The deduction which clearly represents the popular wisdom is that the only weapon against inflation that is in the full control of the US is productivity improvement. The President of the US National Paint and Coatings Association is recorded[12] as quoting former President Carter's chief anti-inflation advisor as saying "Anybody who is not confused by today's economic situation cannot be thinking too clearly!" If this is also the official wisdom, maybe they would like a copy of this paper.

Similarly, we are exhorted by politicians and by many economists and writers of the right, as exemplified by Tom Kempner[13]: "Sacrifices are required of the most unspectacular kind: quiet, docile hard work over long periods for an uncertain reward which may come only to the next generation. The human condition seems to need a closer link in time between effort and reward. And all this after some 30 years of remarkable economic growth which has made most people significantly better off".

Essentially the criticism is of not working hard enough, efficiently enough, for low enough reward; for not investing enough, for not working flexibly enough, for not retraining, for not accepting change, for blaming everyone else. It is true that industry has not invested enough but it is clear that it has invested too much in today's technology and not enough in tomorrow's. It will of course when it knows which way to go. Workers will move to new jobs and new industries quickly enough when they are there. It is their creation which takes the time, as has been seen.

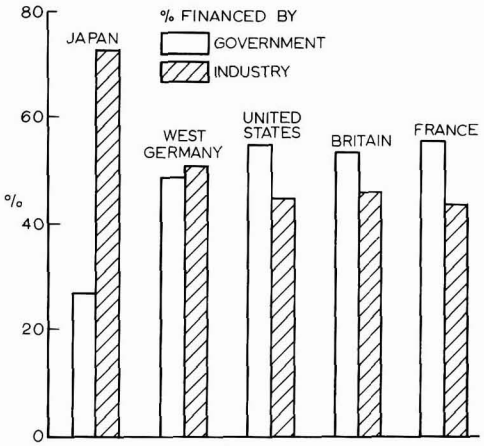


Figure 19. Paying for R&D

There are some encouraging signs. Peter Drucker[14] touches on it where he says "we must, therefore, learn how to make existing large companies capable of innovation." He recognises that "innovation" is not "research" and that "Planning tries to optimise tomorrow the trends of today. But the most probable assumption today is the unique event which changes the configuration drastically. Unique events cannot be planned." How then is the introduction of new basic innovations speeded up?

If big companies are traditionally bad at making unique events, where do they occur? The basic research is essential and should be encouraged by government as its prime contribution. But everywhere the percentage contribution to R & D has declined, in America from 2.6 per cent of GNP in 1970 to around 2.2 per cent today. The amount financed by government is high (see Figure 19)[15] and 60 per cent of government support for R & D in America is tied to defence and space research. In the UK a very high percentage has traditionally gone to aerospace research, and few of these government supported areas have led to new innovations. Total spending on R & D in the UK and the USA as a percentage of GNP, has shown a decline since 1965 (see figures 20 and 21)[16]. It is surely no coincidence that this is the year that the recession started, according to Mensch.

The National Research Development Council (NRDC), a UK government body, was set up to invest public money in situations of high technological risk where the private sector feared to tread. There has been an 80 per cent increase in its backing for new prospects. This is good at a time when new innovations are needed, but the amount involved annually was an increase from £8.6m to £15.4m. What is disappointing is that the NRDC says the cause of the rise in its backing for new projects was the recession and the reduced availability of funds from other sources. Thus demonstrating once again that investors and industry have not fully appreciated the need to back really new innovation.

Some have got the message. South Africa has invested successfully and profitably in oil from coal; this will be supported by the announcement by Hoechst of a project for a R5m polyphosphoric acid plant, which will provide the basic raw material for the catalyst used by Sasol. It is encouraging to see France's leading cement manufacturer,

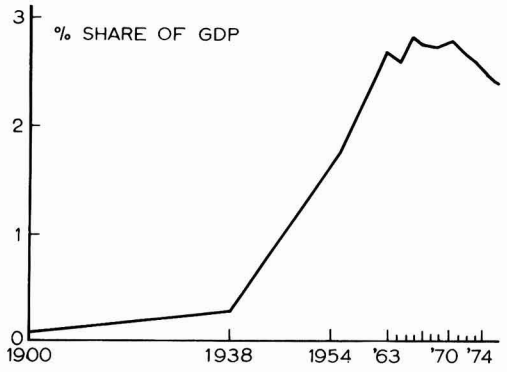


Figure 20. UK investment in R&D

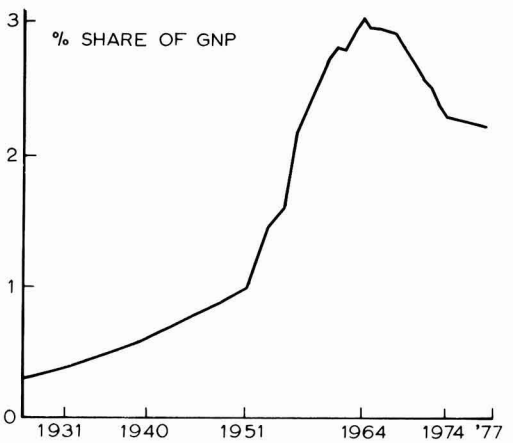


Figure 21. US investment in R&D

Lafarge, selling its stake in the paper wrapping company, Lafarge-Emballage, and buying into the Belgian engineering group, Coppee de Developpement Industriel, because biochemicals represent 22 per cent of that company's turnover. ICI researchers "are confident of coming up with more new fibres and material from abundant minerals like silica and alumina", and forecast that "By the end of the century the world's chemical industry will be starting to change shape. One of the most promising areas will be the development of biochemistry on a large scale to make chemicals, both new and existing products, in a way that uses less energy and hydrocarbon feedstock. The theory is that this new biotechnology, already teeming in ICI's laboratories and in those of new specialist companies, will be able to use genetic engineering techniques of molecular biology. This will breed organisms, working on vegetable matter such as sugar cane, maize or even trees, to produce chemicals at present made by using expensive quantities of energy and hydrocarbon oil and gas"[17].

In this situation the role of government is critical. It is of no value to use the watering can practice of sprinkling money widely over ailing industries; this merely prolongs the inefficient, over-capacity situation although it may appear to be protecting jobs. The best way for government to provide jobs in the long term and to bring it about as quickly as possible is to firstly remove all barriers to innovation and, secondly, to carefully consider all ways of positively promoting innovation. At all times this is important but it is most critical in recessionary periods where new basic innovations must be encouraged so that they are available as soon as possible to assist in lifting the economy out of the inevitable forthcoming depression.

This requires considerable foresight which few governments seem capable of generating. The Rothchild principle, as a basis for sponsoring government support for R & D in the UK, was entirely the wrong sort of government backing, since it emphasised the customer/supplier relationship for short term benefits. Government should use its unique position to encourage longer term results which will come from basic inventions helped along the route to experimentation, development and finally commercial exploitation as a basic new innovation. The problem is the selection of the right adjustment policies and the right points in the innovation process to inject money and motivation.

In Europe the greatest number of packages of measures by governments are in France, Holland and West Germany. Ways are being sought to help companies to identify and exploit high technology or new product opportunities and to direct resources where future advantage is believed to lie. There is, however, a tendency to prefer across-the-board policies because of past failures by governments to pick winners or because of the tendency of governments to pick the same industries or for powerful lobbies to lead to money being spent on propping up losers. Undeterred, the French government is spending £3 billion per annum on "télèmatiques" which combines the use of computer and telecommunications. In an attempt to become the world leader, the plan involves increasing the number of telephone subscribers from 14m to 34m by 1992 and providing each with a free view data terminal. If this is what people want, they are making a real contribution to the revival of industry. Note however, that even at that rate of expenditure, it takes time to develop new innovations including, for this project, electronic digital exchanges, high capacity optical fibres and an all French satellite – Telecom I. This is a brave venture and rightly goes alongside significant help in restructuring existing industries.

In conclusion, it is likely, therefore, that the Oil & Colour Chemists' Association will continue to decline in numbers in the industrialised countries, and to grow in the developing countries where current technologies are still expanding, and eventually an equilibrium will be reached. Those no longer in the surface coatings industry will be in entirely new technologies which will form the basis of new industries supplying new needs. For, as James Mills[18] asserted in 1807, "a nation may easily have more than enough of any one commodity though she can never have more than enough of commodities in general". The Author is confident that new technologies will spring up in time to forestall the less acceptable alternatives.

[*Received 27 November 1980*

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Next month's issue

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

Skin irritation due to hexanediol diacrylate; problems of the evaluation of results from animal studies *by H. P. Gelbke and H. Zeller*

Recent formulation developments in chlorinated rubber paints *by R. G. Humphries*

Thermal stability of microvoid coatings *by M. S. Ramaiah and W. Funke*

The Analysis of alcohols using n-bromosuccinimide *(Short Communication) by J. K. Haken and D. Srisukh*

letters

"Effect of pigmentation level on the efficiency of triple roll milling", *JOCCA* 1980, 63, 438-445

Sir – The statement is made in the above reference that the Hegman Guage "is neither a sound nor a sensitive method of measuring dispersion and it may be that triple roll mill users have been badly misled by using it as their criterion of dispersion". I fully agree with this and also the fact that strength development is a more reliable, sensitive and indeed practical criterion of dispersing efficiency. Perhaps I could illustrate this by the following experiments I carried out some time ago.

All inks were prepared with 20 per cent Regal 660R in a blended lithographic varnish except in the last case. Assessment of strength and gloss was carried out by visual ratings. The effect of mill base temperature was also examined. The results are tabulated below.

Number of passes and roll pressure	Temp-erature °C	Hegman Guage: Grind (scratches) microns	Hegman Guage: Dispersion (pepper)	Strength	Gloss
1 pass at 8 kg cm^{-2}	15	25	poor	3	3
1 pass at 8 kg cm^{-2}	45	9	fair	2	2
1 pass at 20 kg cm^{-2}	15	10	good	2	2
1 pass at 20 kg cm^{-2}	45	5	excellent	1	1
4 passes at 8 kg cm^{-2} (3 at 30%, 1 at 20%)	15	18	fair	1	1

It will be seen that Hegman grind and dispersion ratings do not give a reliable indication of colour and gloss development. In particular the improvement obtained in the final batch by additional high viscosity milling compared to the initial batch is only marginal on the gauge in contrast to a significant improvement in strength and gloss.

The role of temperature is also evident. Merkle and Herbst ("Dependence of CPVC on dispersion", *American Ink Maker*, 1972, January) suggest that higher temperature gives better wetting of the pigment leading to improved dispersion. On the other hand they state that milling a concentrate may lead to reduced strength development due to the presence of smaller amounts of good wetting components per unit pigment surface. This factor may have affected the results of the subject study.

In conclusion I would stress the point that the grinding gauge is of limited usefulness except as a quality assurance tool for the ink manufacturer. It should not be used for comparison of different milling conditions or equipment. Such variables will result in different particle size distributions causing different ratings on the gauge in comparison to quality assessment on the resulting inks.

Yours faithfully,
Neville Scott
Newspaper Inks Manager

Usher-Walker Ltd,
Seymour Street,
Heywood,
Lancashire
OL10 3BR

7 January 1981

Dr Carr Comments

Sir – It is both encouraging and interesting to learn that a person of Mr Scott's experience supports our views on the shortcomings of the Hegman gauge as an instrument for measuring pigment dispersion and that he, too, believes that strength development is a much better criterion of dispersing efficiency.

I cannot comment on his results because there is insufficient detail, except to say that I am surprised at the effect of temperature.

Like Mr Berg in the correspondence columns of the January 1981 issue, Mr Scott raises the question of "good wetting" without defining it. I personally believe that this phrase is something of a red herring and that the resultant degree of dispersion achieved is the key parameter in any milling technique.

However, the comments of both Messrs Berg and Scott on our paper, and their interest, supports my own personal conviction, that the whole subject of grinding techniques and mill efficiencies needs to be re-examined carefully, using a reliable and sensitive method of assessing dispersion. It would also seem to me to be a project best carried out by an independent research body with no axe to grind.

Yours faithfully,
Dr W. Carr

31 Lindow Fold Drive,
Wilmslow,
Cheshire
SK9 6DT

21 January 1981

reviews

Exterior water based trade paint formulations

By Ernest W. Flick

Noyes Data Corporation, Cloth bound US$36

By the Author's own admission in the foreword, this is a compilation of 292 published formulations and certainly shows that one can use almost any fillers in recipes from resin manufacturers, as long as one uses their resin. The same view is expressed by the filler manufacturers. The difference in environmental conditions existing in North America must be considered when assessing the recipes however.

This book demonstrates the complete lack of comparability between raw material manufacturers tests and results. There are 23 formulations with over 20 raw material additions, and the most startling example is in the

wood primers section, where one recipe from Amoco has nine raw material additions (the lowest) followed by one from Georgia Kaolin with 21 additions. There are five suggestions with 24 additions which, with todays labour costs, must make for an expensive product with many chances of incorrect dosage.

The book is well bound and printed, but pages 335-6 are reversed. It will provide an insight to US practice and market problems, but the economic considerations will be of little value due to different costs in different continents.

Reader Enquiry Service No. 21

G. Fowkes

reviews

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

occa meetings

Newcastle

Training for R & D

The second meeting of the 1980/81 session was held at St. Mary's College, Durham on 6 November when Mr C. Murray of CAPITB presented a paper entitled "Training considerations for R & D". The speaker covered systematic training in some detail giving personal views on established methods and inviting audience participation during the talk. Other items covered were assessment of individuals before, during and after training and also new staff selection. Following a discussion period the speaker was given a vote of thanks for a very interesting paper.

Legislation and health & safety

The third meeting of the 1980/81 session was held at the same venue as the above on 4 December when Mr D. Howe, Toxicological Adviser of the Paint Makers Association presented a paper entitled "The impact of recent legislation on health and safety aspects of paint products and processes". Mr Howe dealt in an expert manner with UK and EEC legislation relating to pollution, food contact, health and safety at work and the labelling of products.

The concern of those present was apparent by the length of the discussion period which followed the presentation of the paper. After a vote of thanks those present continued their discussions whilst partaking of the excellent buffet meal provided.

T. Harbottle

Midlands

"Automotive paints"

The annual dinner lecture of the Midlands Section was held on Friday, 16 January 1981 at the Birmingham Chamber of Commerce and Industry, Edgbaston, Birmingham.

After an excellent meal, members and guests heard a two-part talk on "Automotive paints". The views of the user were presented by Mr M. Kelly of British Leyland and those of a manufacturer were given by Mr R. Tennant of Carrs Paints Ltd.

Mr Kelly opened his talk by saying that the motor industry expects three things from the paint industry:

1. Service to the existing situation.
2. How to improve today's technology.
3. New ideas for the future.

One of the main things a motor supplier looks for is consistent quality. If the quality is consistent, output is maintained, so helping productivity.

Mr Kelly went on to say that the motor industry had to look at new technologies and a joint understanding between user and supplier was needed.

In conclusion Mr Kelly said that every time a person touched a car it cost money, so the result is more automation. This means the introduction of robots to the industry. At the present time Japan has about 100 robots in its paint booths, America has 60, Europe about 40, but there are only 2 in the UK.

Mr R. Tennant then put forward the views of a paint manufacturer by saying that two of the objectives of a manufacturer were to produce technically acceptable products and to improve technical quality. To achieve these objectives the production department of a paint producer requires the following back-up services:

1. An application department.
2. The analytical section.
3. The colour styling section.
4. The development section.

With the aid of numerous slides Mr Tennant showed examples of some of the equipment and instrumentation his company uses to produce and control the quality of automotive finishes.

In conclusion Mr Tennant said that the vital link between the customer and supplier was the sales and technical service department.

After a lively question time the meeting was brought to a close with a vote of thanks proposed by Mr D. Hopper and enthusiastically endorsed by the audience.

B. E. Myatt

occa meetings

Manchester

Pigment packing and the optimum use of extenders

This Student Lecture was delivered by Mr W. K. H. Lakin, Market Development Manager, Manchem Ltd, to 50 members and guests on 19 November 1980, at the Manchester Polytechnic, All Saints, Manchester.

Ken Lakin, a Manchester Section member, commenced his lecture by defining the terms pigments and extenders, by courtesy of the FSCT dictionary. He then progressed by reference to the historic development of paint composition initiated in 1908 by the American Society for Testing Materials. In 1926 Calbeck analysed the exposure data of a series of paints that had been weathered for 10 years, contained in his conclusions was the criterion that "The pigment concentration by volume should be considered".

The lecturer then dealt with several subjects in detail and which can be summarised thus: (with apologies for the omission of the many transparencies used.)

1. Pigment volume concentration – definition.
2. PVC and the potential ranges in coatings.
3. PVC and its influence on gloss level and opacity measurement.
4. PVC – effect on film properties such as blistering, rusting, etc.
5. PVC – transitional areas and the critical point.
6. Critical pigment volume concentration.
7. CPVC – calculations and pigment/extender structural forms.
8. Perry's law of minimum voids.
9. Titanium dioxide pigmentation – optimum PVC.
10. Pigment extender balance.
11. Extender choice.
12. Darcy's law – relationship with porous substrate.

This excellent, one hour lecture was concluded by a discussion/question period before the vote of thanks, proposed by Geoff Flood, was enthusiastically acclaimed. It is proposed to consider this paper for publication in *JOCCA*.

Solvent based masonry paints

Twenty-four members and their guests attended the Manchester Polytechnic, All Saints on Wednesday 12 December 1980, to hear Barry L. Wood, Technical Representative, CIE Francaise Goodyear, deliver his lecture ably assisted by Andre Gindre, Technical Manager, Surface Coatings European Technical Centre, also of Goodyear.

Barry Wood began his lecture by dedicating it to Vincent Boned whose work was the basis of the lecture and who tragically passed away in April 1980.

The various types of Masonry Coatings available were listed as follows:

alkyds; two pack polyurethanes; acrylic – solvent based; emulsion polymers; thermoplastic, solvent soluble, copolymers of styrene or vinyl/toluene with butadiene or various acrylate monomers such as Pliolite resins.

The lecture then developed as a comparison between solvent borne and water borne systems. It was claimed that the advantages of solvent borne systems included:

1. Better penetration into substrate
2. Lower MFT, i.e. −20°C
3. Resistance to rain during application.

The safety aspects of solvents were then discussed especially in relation to the reduction of aromatic content of mineral spirits and the use of glycol ethers with very low TLV.

Barry Wood then developed the lecture by the use of slides and by discussion of the following subjects:

1. Formulation – permeability – pore dimensions
2. Sheen level – flat – disguise of surface defects
3. CPVC – Darcy's law
4. Textured coatings – variation of 1-5 Kg/m^2
5. Test procedures
   (a) laboratory veritas: using wooden blocks/cement render and test cycling based on high/low temperatures plus exposure to UV and "rain". Duration of test – 75 days.
   (b) Breeze block test: Vettel TTP 001411 water pressure test. This utilises the effect of water pressure from the interior of the block through the external painted surface.

The question period that followed the lecture included reference to the following subjects:

1. Particle size distribution – accept manufacturers figures
2. Details of accelerated weathering – xenon arc 6 KW, minimum requirement 150 cycles
   If coating passes crack resistance test it usually passes veritas test
3. Low permeability combined with good adhesion was one formulation target
4. Performance on damp surfaces – very good
5. Chalking factors to counteract plasticizer migration effect
6. Type of plasticizers used
7. White spirit – toxicity – aromaticity
8. Coating – mudcracking/pinholing test. Tests at BRE – hydrostatic head – difficulty of reproduction "Should the pressure be on the outside?" a question posed by P. Whitely.
9. Water/vapour transmission rates through films – coated concrete block in oven at 60°C
10. Practical case histories – those described included the coating of the Town Hall at Tampere, Finland and Le Bourget Airport, France. It was claimed that 15 years life had been obtained in N. Europe prior to overcoating necessitated by erosion.

This interesting lecture was concluded by a vote of thanks given by David Wilcox and acknowledged by all present.

F. B. Windsor

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

news

International Paint in Korea

A new company, International Paint (Korea) Limited, has been established in Korea to cover the Company's rapidly developing heavy duty coatings business in that country.

The new company is a joint venture between International Paint and the Daihan Paint and Ink Company and will operate as a member of the International Paint Group. With the establishment of this new company there are now 28 International Paint companies overseas.
Reader Enquiry Service No. 31

Glen Creston move

Glen Creston moved to larger premises on 1 March, the new address is as follows: Glen Creston Machinery Limited, 16 Dalston Gardens, Stanmore, Middlesex HA7 1DA Tel: 01-206 0123; Telex: 925791 (unchanged)
Reader Enquiry Service No. 32

New moisture measuring specialists

Moisture Systems Ltd, a new company specialising in moisture content measuring and density measuring instruments, are now in operation.

Formed as the UK division of the Moisture Systems Corporation, USA, the company can offer a range of high-accuracy, non-contacting moisture analysers and process refractometers.
Reader Enquiry Service No. 33

Thick liquids and pastes

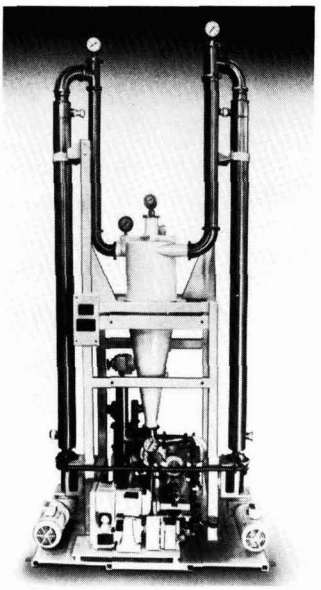
Pastes, dispersions, suspensions and most other forms of "thick liquids" often provide frustrating and costly handling and processing problems for plant managers and process engineers, problems such as: deagglomeration of powders into liquids, paste mixing, product formulation of high solids content suspensions, material characterisation and quality control, entrainment or removal of air, production of defect free coatings by rollers, and handling and conveying of wet solids and pastes. However, these problems are being investigated and recommendations on design and operational procedures are being developed by a team of research engineers at Warren Spring Laboratory. This work is part of a collaborative programme of work funded jointly by Government and industry. Any UK industrial company can join the programme and receive regular reports, design guides, review articles and research results on each topic.
Reader Enquiry Service No. 34

£1M factory investment

Gordon Phillips, Managing Director of Ault & Wiborg Paints Ltd has outlined a £1M capital investment programme.

Commenting on the current financial and commercial climate, Mr Phillips pointed out that the Ault & Wiborg Paints Division had, in spite of the recession, more than maintained its market share and, in some specific areas, increased its share in real terms. He stated that in seeking to improve its product range AWP had launched two major developments during the Autumn of 1980 and was introducing two new products in the industrial and refinishing industries in the Spring of 1981.
Reader Enquiry Service No. 35

new products



The new SAN-LOC evaporator

Solvent recovery

A Johnson & Co. Ltd have announced a new evaporator, the Votator SAN-LOC. It is designed for solvent recovery applications and can handle volumes from 50 to 240 gallons per hour.

Solvent volumes of up to 1,000 gallons may be used to clean pipelines and process vessels, for example, when changing pigments in paint production. The evaporator is designed for small to medium applications and can recover up to 90 per cent of the solvent used, making it available for re-use.
Reader Enquiry Service No. 36

Spray gun for metallics

Kremlin Spray Painting Equipment Ltd has introduced a spray gun that has been specifically designed for metallic refinishing paints.

This is the outcome of a study made by Kremlin on the traditional problems that have beset refinishers when spraying metallics.

Some of the advantages of the new gun are as follows: a sealed cup secured by a quarter turn on a ratchet mechanism enabling the paint to be shaken up without risk, a simple and effective non-drip system enabling bonnets and wings to be sprayed without any risk of drips, a graduated regulator at the base of the gun handle for precise colour adjustment and a special projector (nozzle, needle and air cap) to maximise the metallic effect.
Reader Enquiry Service No. 37

New curing agent for epoxy resins

Ciba-Geigy has introduced a new solid granular bisphenol-A novolac curing agent for epoxy resins – XD 4049.

It has been designed for use in the formulation of two types of epoxy resin coatings: first, in the formulation of solvented high solids coatings based on solid or liquid epoxy resins, e.g. drum and can coatings, and coatings for chemical plant; second, in the formulation of epoxy resin powder coatings as used in drum and pipe coatings.

Coatings cured with XD 4049, the company claims, offer several advantages over coatings cured with amines or anhydrides; greater flexibility, improved resistance to hydrolysis, higher solids content in solvented coatings and lower stoving requirements.
Reader Enquiry Service No. 38

Bund material

Regulations governing the formation of a bund around tanks containing hazardous chemicals have safety as the keynote. Conventionally, bunds are made of concrete structures with brick or blockwork walls and the effects of time, spillage and normal wear and tear may mean that safety regulations are not being met.

Industrial Resins are producing a new material which enables a flexible coating to be applied over bund surfaces giving them a new lease of life.
Reader Enquiry Service No. 39

news

Venturi for powder feed systems

A new patented Venturi designed to improve the flow of powder to the electrostatic spray guns of powder finishing systems has been developed by Volstatic Coatings.

Called Vibro-Venturi, the unit incorporates a ball race around its circumference within which a single ball bearing is excited by the same compressed air supply that supplies the venturi. The effect is to set up localised vibration which dislodges powder preventing it from clogging.

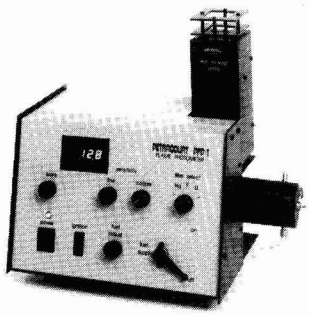
Production is therefore maximised by keeping equipment downtime to a minimum. If necessary, it is possible to drop the venturi into an unfluidised powder supply and spray for a limited period.

Especially suitable in conditions of high humidity, the venturi has a capacity range from 0 to 10 kg of powder per hour, and is efficient even at low emission rates.

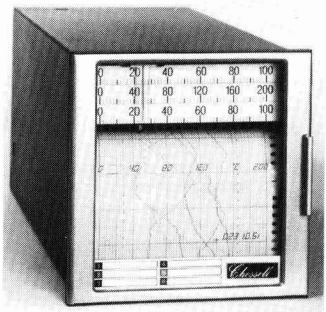
A further advantage of Vibro-Venturi is that it is infinitely variable over the full capacity range simply by adjusting the gap from the outside of the unit. It thus eliminates the cost of stocking three different sizes of venturi in plants where a wide range of powder feed rates are used.
Reader Enquiry Service No. 40

Flame photometer

Petracourt have launched a digital flame photometer. It has a reading of 0-199.9, and has a full scale reading of Na 3 – 100 ppm, K 3 – 100 ppm, and Li 5 – 100 ppm.
Reader Enquiry Service No. 41



The Petracourt digital flame photometer



Chessell's six colour chart recorder

Multipoint chart recorder

A new all electronic multipoint recorder which produces six coloured traces and automatic alpha-numeric chart annotation is now available from Chessell.

Designed for process control and general industrial monitoring applications, the new instrument, called the Model 306 and offered in three versions, can record six channels and print-out on a calibrated chart 100 mm wide. The alpha-numeric chart overprint facility produces hard copy recordings which can be directly related to a specific instrument, the time and the parameters even after the chart has been removed and filed.
Reader Enquiry Service No. 42

Clamp-on energy (Btu) measurement instrument

A new instrument for measuring the flow of heat energy (Btu's) in a pipe from outside has been introduced by Controlotron. The System 450 measures both liquid flow and temperature by means of clamp-on sensors. Installation is made in minutes on existing pipe without cutting the pipe or requiring shutdown of operation.

The instrument provides direct reading in Btu's. It can be used at temperatures from 0 to 500°F and it measures flow rates from 40 ft/second down to and including zero with a sensitivity of 0.001 ft/second. Flow calibrated instruments are available with an accuracy to 0.25 per cent of rate. The instrument is available in either permanent or portable forms.
Reader Enquiry Service No. 43

Atalan Fast Orange YF

Atlantic Chemical Co. recently completed its first production of Atalan Fast Orange YF (Acid Orange 69). It is a yellow shade orange, recommended by the manufacturer for applications to a wide variety of leathers. It can be used from pastels to full shades on vegetable tanned leathers, chrome tanned leathers, and chrome syntan leathers.
Reader Enquiry Service No. 44

New antifouling copolymer

C-Pol, a new antifouling copolymer from Camrex Ltd, is a new ablative type system that works on the principal of smoothing whilst moving.

For optimum results it should be applied at the new-building stage over a suitable anticorrosive system. With the use of a sealer however, it is also possible to up-grade existing non-ablative antifoulings.

Once the vessel is coated with C-Pol ablative antifouling it is sufficient at subsequent drydockings, to touch-up mechanically damaged areas with the anti-corrosive and apply the requisite number of coats of C-Pol to give the desired service life.
Reader Enquiry Service No. 45

New pump for problem products

Kingdom Engineering Co. Limited have designed a new air powered drum pump, the Kecol series 100.

It provides a clean, efficient and economical method of pumping low to medium viscosity materials especially from open or closed top drums or similar containers.

An important consideration in the design of this Kecol double acting pump was quiet operation and long life. The stroke is cushioned and there are no trip rods or mechanical linkages to fail. All moving parts are enclosed for operator safety.

The pump is available in 10:1 and 4:1 ratios with 50 and 75 mm tube diameters.
Reader Enquiry Service No. 46

literature

Cadmium in the EEC

The Cadmium Association has published two special reports on the production, consumption and use of cadmium in the EEC and its impact on the environment. The work reported was undertaken on behalf of the Commission of the European Communities in 1978/1979 and with their permission is now being made available for wider circulation.
Reader Enquiry Service No. 47

Market research reports

Frost & Sullivan have produced a list of their market research reports available, covering such topics as "Electroplating chemicals (US)", "Powder coatings market in Europe", "The World market for high performance resin-based composites", "Hot melt adhesives market", "Industrial solvents in Europe", etc.
Reader Enquiry Service No. 48

Safety and powder coatings

CEPE has produced a 3rd edition of its brochure on the safe use of powder coatings. In the booklet, 51 pages (in English, French, German and Italian) consideration has been given to the new methods of application including tribo-electric charging, secondary charging of powder particles from secondary electrodes and certain new equipment involved in these principles. The booklet gives detailed recommendations for the construction of plant and equipment both to powder users and manufacturers.
Reader Enquiry Service No. 49

Occupational hygiene

Science Reviews Ltd have produced four occupational hygiene monographs covering: "Hazards of occupational exposure to ultraviolet radiation", "Electrical safety-interlock systems", "The toxicity of ozone" and "A literature survey and design study of Fumecupboards and fume-dispersal systems".
Reader Enquiry Service No. 50

PRA publication

The second edition of "Health and safety, environmental pollution and the paint industry" has been published by the Paint Research Association. Price: £130 (for 4 issues + subject index in 1981) £110 to Paint RA members.
Reader Enquiry Service No. 51

meetings, etc.

RSC courses

The Royal Society of Chemistry will be running two courses, the first of which, "Quantitative treatment of experimental data" is to be held on 6-10 July 1981 at the University of Manchester Institute of Science and Technology. The second, "Water soluble polymers" is to be held on 14-18 September 1981 at Newnham College, Cambridge. For further information contact Miss L. Hart, Royal Society of Chemistry, 30 Russell Square, London WC1B 5DT

SDC conference

The Society of Dyers and Colourists is holding a conference on "Colour-difference measurement – a reliable basis for quality control". It is to be held on 12 May 1981. For further information contact The Society of Dyers and Colourists, Perkin House, PO Box 244, 82 Grattan Road, Bradford, West Yorkshire BD1 2JB.

news

appointments

Mr G. W. Garrard has been appointed to the Board of Directors of Thor Chemicals Ltd. Mr Garrard in his long service with the Company has been responsible for developing the many markets for the Company's biocidal chemicals.

Mr Tony Coles has been appointed Sales Director of Colorblend Ltd. Mr Coles gained considerable experience of the pigment industry during his years as Sales Director of H. Haeffner & Co. Ltd.

Mr D. D. Green, Commercial Services Director of Mond Division of ICI, has been appointed a director of Ellis & Everard Ltd.

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

occa news

Report of Council Meeting

A meeting of Council took place at the Great Northern Hotel, King's Cross, London N1 on 25 February 1981 with the President, Dr F. M. Smith in the chair. There were 28 members of Council present.

Mr M. Dickinson was appointed to serve on the BSI Committee PVC/1/8 Chrome pigments, prussian blue and zinc phosphate and Mrs E. Stretton was confirmed as the Association's nominee to serve on PVS/14 – Colour schedules. Nominations are still required for BSI Committees PVC/1/10 Miscellaneous pigments and DHS/14 Viewing conditions (graphic arts production).

The Annual Report of the Council for 1980 was approved, together with the Agenda for the Annual General Meeting which will take place on 19 June 1981.

It was unanimously agreed that any member whose subscription was three months in arrears would not receive the April issue of the *Journal* and would not be entitled to copies of the *Journal* published during the period of arrears.

It was agreed to hold the Council Reunion Dinner after the meeting of the Council on 21 October 1981 at the Great Northern Hotel, King's Cross, London N1. Details would be sent to former Council members during the summer months.

It was reported that an extra-ordinary meeting of the Finance Committee had been held in order to discuss recommendations which could be effected on circulars, agendas etc. and various proposals were made and agreed.

Reports were received on the 1981 Exhibition and the 1981 Conference. The Honorary Editor reported on the number of papers in hand for the Journal and Council offered their congratulations to the Director and Secretary on the winning of the ABC Reed International Award by the *Journal* for the best submission of a media data form from an association or society journal.

A long discussion took place on technical education and its various aspects.

Council discussed and agreed amendments to the regulations for admission to the Professional Grade and it was agreed that these amendments would be brought into force during the summer months.

It was unanimously agreed to confer upon Mr E. Armstrong (twice Chairman of the Hull Section) a Commendation Award for his long and outstanding service to the Association.

Details of forthcoming overseas conferences were given and it was hoped that the Association would be maintaining its unbroken record of nominating a speaker at the conferences organised by the FSCT, FATIPEC and SLF.

Discussions took place on the venue for the 1983 Conference and it was agreed that this should take place in York 15-18 June 1983.

There being no other business the President thanked members for their attendance and declared the meeting closed at 4.15 p.m.

OCCA CONFERENCE 1981

The Beaufort Hotel, Bath, England 17-20 June 1981

Alternative technologies in coatings

As already announced in the *Journal*, the next Biennial Conference of the Association will take place at Bath from Wednesday 17 to Saturday 20 June 1981. The headquarters will be the Beaufort Hotel, with overflow accommodation at the Francis Hotel and the Royal York Hotel. The title for the Conference will be "Alternative technologies in coatings". Summaries of most of the papers and biographies of the lecturers are given below. The programme for the technical sessions is as follows:

Session I

Thursday 18 June 9.15 a.m.–12 noon — *Chairman: Mr C. N. Finlay, ATSC (Hon. Research & Development Officer)*

Alternative technologies in coatings – The challenge and the response *(Keynote address)* — *By Dr L. Valentine (Director of Research & Development, Berger Jenson Nicholson Ltd)*

Pigmented UV dual cure coatings *(Paper presented on behalf of FATIPEC)* — *By Mr A. Noomen (Sikkens BV, Netherlands)*

Developments in aqueous powder systems — *By Mr A. G. North (Managing Director, Cray Valley Products Ltd)*

Modern practices in formulating powder coatings — *By Mr S. T. Harris (Consultant)*

Session II

2.00 p.m.–4.30 p.m. — *Chairman: Dr G. de W. Anderson (Managing Director, Paint RA)*

Caprolactone in surface coatings — *By Dr B. E. Bailey and Mr J. Lister (Laporte Industries Ltd)*

Obtaining opacity with organic pigments in paints — *By Dr H. Schäfer (Hoechst AG)*

Alternative means of controlling paint viscosity/temperature phenomena — *By Dr N. Reeves (NL Chemicals Europe Inc., Belgium)*

Precision spectral ultraviolet measurements and accelerated weathering *(Paper presented on behalf of FSCT)* — *By Dr M. L. Ellinger and Mr G. A. Zerlaut (DSET Laboratories, USA)*

Session III "Alternatives to coatings"

Friday 19 June 9.15 a.m.–12 noon — *Chairman: Mr F. D. Timmins (Mebon Paints Ltd)*

How not to paint bridges — *By Dr R. R. Bishop and Mr M. A. Winnett (Transport and Road Research Laboratory)*

Short presentations–To be followed by discussion period

(i) Don't paint–use wood stains — *By Dr F. W. Brooks (Hickson Timber Products)*

(ii) Don't paint–galvanize — *By Dr J. Wilcock (The Galvanizers Association)*

(iii) Don't paint–use plastics — *By Dr D. Gardiner (Building Research Establishment)*

(iv) If you must paint–coil coat — *By Mr N. S. Makins (European Coil Coating Association)*

Session IV

2.15 p.m.–4.15 p.m. — *Chairman: Mr A. C. Jolly (Synthetic Resins Ltd)*

Plastic pigments: A novel approach to microvoid hiding. Part IV: Effect of composition on latex paint performance — *By Dr A. Ramig (Gliden Coatings and Resins, USA)*

Flow in coatings and orientation in metallics *(Paper presented on behalf of SLF)* — *By Mr P. Fink-Jensen (Consultant)*

Prospects for automation in the paint industry — *By Mr M. Camina (Paint RA)*

Conference preprints

Preprints of the papers are now being prepared and it is expected that these together with details of accommodation, badges, programmes etc, will be sent to those who have registered early in June 1981. It is a feature of the Association's Conferences that preprints are sent well in advance of the function, in order to enable delegates to read them before the Conference, at which the lecturers illustrate their topics, but do not read the papers in their entirety. This allows for a much longer discussion period than at many other conferences, and has proved of immense value to those attending previous Association Conferences.

Registration fees

Forms of registration will be despatched shortly to all Members of the Association attached to the Sections in the UK, Ireland and General Overseas Section, and for the benefit of non-members registration forms can be obtained by filling in the form on page v.

Council has fixed the registration fees for the Bath Conference at £80.00 (plus Value Added Tax at the standard rate) for Members, £105.00 (plus VAT) for non-members, and £25.00 (plus VAT) for wives. A daily registration fee for Members of the Association of £45.00 (plus VAT) and of £25.00 (plus VAT) for Registered Students of the Association has been set.

Non-members wishing to avail themselves of the preferential Conference fee for Members should request application forms from the Association's offices and these should accompany registration forms.

Further information may be obtained from the Director & Secretary at the address on the Contents page of this issue (Tel: 01-908 1086; Telex 922670 OCCA G).

OCCA-33 Exhibition

28-30 April 1981

Cunard International Hotel
Hammersmith, London W6

occa news

EXHIBITION PREVIEW

The OCCA Exhibition, which is known as the international focal point for the surface coatings industries, is the most important annual event of its kind and offers an unparalleled opportunity for personnel in the manufacturing industries to meet and discuss their requirements with their counterparts in the supplying industries.

Aim of the Exhibition

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

Dates and times

The thirty-third annual OCCA Exhibition, a three day event, will be open as follows:

Tuesday 28 April 1981 . . 09.30 to 17.30
Wednesday 29 April 1981 09.30 to 17.30
Thursday 30 April 1981 . 09.30 to 17.30

The Cunard International Hotel

The venue for the 1981 Exhibition will be the Cunard International Hotel, Hammersmith, London W6, and the Exhibition will be in two sections: on the ground floor, forming the entrance to the Exhibition, traditional style stands will be accommodated in the New Exhibition Hall; in addition there will be several suites and syndicate rooms on the third floor of the hotel, either for companies who wish to use this type of facility to exhibit, or for those who wish to have somewhere convenient to entertain their visitors in addition to their main stands elsewhere in the Exhibition.

The hotel has a selection of restaurants, shopping facilities and bars, and there will be a bar and seating area in the main part of the Exhibition in the New Exhibition Hall (see map on page 165).

Official Guide

The *official Guide* to the Exhibition has now been published and despatched to all members of the Association and those requesting copies as a direct result of the Association's widespread publicity.

Additional copies of the Official Guide are available at £1.50 (pre-payment only, post and packaging inc.) from the Association's offices and **they will also be available for purchase at the entrance to the Exhibition.**

Information in foreign languages

As in previous years, interpreters will be in attendance on the Association's Information Centre at the Exhibition to assist overseas exhibitors and visitors with their queries.

Travel arrangements

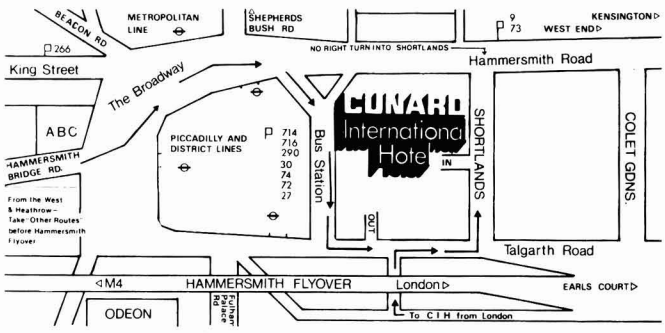
The Hotel is situated near Hammersmith Station on the Piccadilly Underground Line between Heathrow Airport and the centre of London. Visitors from overseas may board the Piccadilly Line in the Airport complex, which will take them direct to Hammersmith Station or to central London where they may be staying. Hammersmith Station is also served by the Metropolitan and District Underground Lines (the latter of which connects to Victoria Station for those arriving at Gatwick Airport). The Hotel is adjacent to the Hammersmith flyover on the M4 Motorway, which links Heathrow Airport by road. Reference to the map below will show that the Cunard International Hotel is within easy walking distance of Hammersmith Station. The entrance to the Exhibition will be via the New Exhibition Hall on the ground floor. Car parking at the Hotel is limited, but there is a large NCP car park close by in King's Mall off King Street.

Admission

Admission to the Exhibition will be free, and visitors will be asked to complete registration cards which will be available from the Association's offices with copies of the *Official Guide* in advance. Copies of the *Official Guide* will be charged at £1.50 each, and both registration cards and copies of the *Official Guide* will also be available at the entrance to the Exhibition.

Accommodation

In addition to some rooms at the Cunard International Hotel; the Grand Metropolitan Hotels group will once again, together with the following British Transport Hotels, be making accommodation available at specially reduced rates for those attending the Exhibition: Charing Cross Hotel, Strand, London WC2N 5HX. Great Eastern Hotel and Abercorn Rooms, Liverpool Street, London EC2 P2AN. Great Northern Hotel, King's Cross, London N1 9AN. Grosvenor Hotel, Buckingham Palace Road, London SW1W 0SJ.



Location of the Cunard International Hotel

occa news

Exhibitors at OCCA-33

For position of stands or rooms, see plan of Exhibition opposite

For numerical list of Exhibitors, see Analysis of Exhibits table on pages 166 and 167.

Stand/Room	*Exhibitor*
151	Anglian Chemical and Processing Plant Ltd
105	Baird & Tatlock (London) Ltd
153	BDH Chemicals Ltd
138	Betta-Tech Equipment Ltd
108	BOC Automation
107 & Room 3126	British Oxygen Chemicals
126	Cappelle Freres
131/133	Capricorn Chemicals/G. M. Langer & Co
125	Chemolimpex
128	Contraves Industrial Products Ltd
143	Eiger Engineering Ltd
120	Elcometer Instruments Ltd
146	FMK International (MFG) Ltd
114	Fryma Maschinen AG
119	GAF (Great Britain) Ltd
112	Glen Creston Machinery Ltd
149	Geosource UK Ltd
102	Grace, W. R. Ltd
Room 3111-13	Hercules Ltd
108	Hunterlab
103	Impex Trading Ltd
132	Industrial Colours Ltd
139	Industrial Dispersions Ltd
113	Institution of Corrosion Science & Technology
115	Instrumental Colour Systems Ltd
111	International Tin Research Institute
129	ISC Alloys Ltd
121	John Godrich
Room 3124	Kirklees Chemicals Ltd
118	K & K Greeff Chemicals Ltd
116	Macbeth Division of Kollmorgen (UK) Ltd
114	Mason & Morton (Engineering) Ltd
101	Micro Products Co.
122	MSE Scientific Instruments
130	Netzsch (UK) Ltd
Rooms 3115-17 & 3119-21	NL Chemicals (UK) Ltd
127	Norwegian Talc (UK) Ltd
134	OBS Machines Ltd
123	OCCA Information Centre
135	Paintmakers Association of Great Britain Ltd
137	Paint Research Association
150	Peirson Process Equipment
140	Polymers Paint Colour Journal
104	Q-Panel Co.
141	Roban Engineering Ltd
142	Sartorius Instruments Ltd
Room 3127-29	Schering Chemicals Ltd
145	Silberline Ltd
109	Society of British Printing Ink Manufacturers
136	Society of Dyers & Colourists
117	Stratford Colour Co. Ltd
Room 3107-9	Sun Chemicals Corp. Pigments Division
125	Tiszamenti Vegyimüvek Szolnok
147	Unishear Mixers Ltd
106 & Room 3128	Victor Wolf Ltd
144	Werner & Pfleiderer (UK) Ltd
110	Westlairds Ltd

In addition to the Exhibitors listed above, reference is also made in the *Official Guide* to the following companies whose products are also on show:

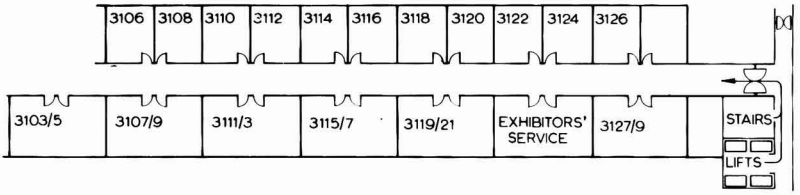
Stand/Room	
134	AMK Peter Kupper
110	Atlas Electric Devices Company of Chicago
112	Willy A. Bachofen AG
118	Barford Chemicals Ltd
105	Brookfield Engineering Laboratory
121	Chemcol
116	Daylight
134	De Vree
112	Diaf AS
118	Dow Chemical Company
120	Erichsen
101	Floridienne
103	Gain Associates
120 & 110	Gardner Laboratory
122	Haake
108	Hunterlab
131/133	ILP-Valencia
142	Janke and Kunkel
101	S. C. Johnson & Son inc.
121	Jorgen Jorgensen (Rotostat & Rapidex)
134	Karcher
105	Karl Fischer
134	Klieverik
131/133	Lanco
145	Lansford
120	Leneta
121	Liebisch
Room 3127-29	Magie Brothers
122	Mettler
101	Micro Powders Inc.
121	Mirap
116	Munsell Colour Products
103	R. K. Printcoat Instruments Ltd
120	Saberg
Room 3127-29	Scherex Chemical Co. Inc.
Room 3127-29	Schering AG
Room 3124	Shell Chemicals Ltd
149	Smith Meters
Rooms 3115-17 & 3119-21	Steetley Minerals Ltd
Room 3107-9	Sun Chemical Ltd
141	Tokheim

Plan of the Exhibition

occa news

The main part of the Exhibition is in the New Exhibition Hall which also forms the Entrance to the Exhibition. Registration cards should be completed and handed in to the commissionaires who will be present. Official guides (Price £1.50) will be available from the OCCA Information Centre, Stand 123. Access to the third floor Syndicate Rooms will be via the lifts in the hotel foyer.

Drawings diagrammatic only.



SYNDICATE ROOMS — Third Floor

NEW EXHIBITION HALL — Ground Floor

Analysis of Exhibits

Stand	Exhibitor **NEW EXHIBITION HALL – GROUND FLOOR**	Resins	Extenders, fillers, matting agents	Pigments	Additives, driers, surfactants etc.	Chemical intermediates	Manufacturing equipment, drums etc.	Laboratory apparatus and testing equipment	Miscellaneous
101	Micro Products Co.	•	•		•				Services
102	W. R. Grace Ltd.		•		•				
103	Impex Trading Ltd.						•	•	
104	Q-Panel Co.							•	
105	Baird & Tatlock (London) Ltd.							•	
106	Victor Wolf Ltd.	•				•			
107	British Oxygen Chemicals					•			
108	BOC Automation							•	Quality control equipment
109	Society of British Printing Ink Manufacturers								Technical career and educational prospects in the printing ink industry
110	Westlairds Ltd.							•	
111	International Tin Research Institute			•					Technical advice to tin-users
112	Glen Creston Machinery Ltd.						•	•	Grinding media
113	Institution of Corrosion Science & Technology								Professional qualifying organisation
114	Mason & Morton (Engineering) Ltd./ Fryma Maschinen AG								Stirrer ball mill. Jet mixing unit
115	Instrumental Colour Systems							•	
116	Macbeth Division of Kollmorgen (UK) Ltd.							•	Production control colour monitors
117	Stratford Colour Co. Ltd.		•	•					
118	K & K Greeff Chemicals Ltd.	•			•	•			
119	GAF (Great Britain) Ltd.								Filtration equipment
120	Elcometer Instruments Ltd.							•	
121	John Godrich						•	•	
122	MSE Scientific Instruments							•	
123	**OCCA Information Centre**								Services
124	Interpreters								Services
125	Chemolimpex/Tiszamenti Vegyimüvek Szolnok	•		•					
126	Cappelle Freres			•					
127	Norwegian Talc (UK) Ltd.		•						
128	Contraves Industrial Products							•	Process viscosity controllers and viscometers
129	ISC Alloys Ltd.			•					

Stand	Exhibitor	Resins	Extenders, fillers, matting agents	Pigments	Additives, driers, surfactants etc.	Chemical intermediates	Manufacturing equipment, drums etc.	Laboratory apparatus and testing equipment	Miscellaneous
130	Netzsch (UK) Ltd						•		
131/133	Capricorn Chemicals/G. M. Langer & Co.	•	•		•				
132	Industrial Colours Ltd.			•					
134	OBS Machines Ltd.						•	•	Glass grinding media, etc.
135	Paintmakers Association of Great Britain Ltd.								Training
136	Society of Dyers & Colourists								Publications, testing materials
137	Paint Research Association								Publications etc.
138	Betta-Tech Equipment Ltd.							•	
139	Industrial Dispersions Ltd.			•					
140	Polymers Paint Colour Journal								Publications
141	Roban Engineering Ltd.							•	
142	Sartorius Instruments Ltd.							•	
143	Eiger Engineering Ltd.						•	•	
144	Werner & Pfleiderer (UK) Ltd.								Machines for the manufacture of powder coatings
145	Silberline Ltd.			•					
146	FMK International (MFG) Ltd.								Powder dispensing systems
147	Unishear Mixers Ltd.						•	•	
149	Geosource (UK) Ltd.								Flow measurement equipment
150	Peirson Process Equipment						•		
151	Anglian Chemical and Processing Plant Ltd						•	•	
153	BDH Chemicals Ltd			•	•	•			UV hardeners and dyes

Room	**SYNDICATE ROOMS – THIRD FLOOR**								
3107-9	Sun Chemicals Corp., Pigments Division			•					
3111-13	Hercules Ltd.	•				•			Water soluble polymers defoamers
3115-17 & 3119-21	NL Chemicals (UK) Ltd.			•	•				Thixotropes
3124	Kirklees Chemicals Ltd.	•							
3126	British Oxygen Chemicals					•			
3127-29	Schering Chemicals Ltd.	•			•	•			
3128	Victor Wolf Ltd.	•				•			

occa news

News of Exhibitors at OCCA-33

The OCCA Exhibition "Official Guide" is published many weeks before the dates of the Exhibition, so that visitors can obtain copies in advance and plan their itineraries. The "Official Guide" contains full descriptions of Exhibitors' Stands and much other useful information; copies of the "Official Guide" may be purchased (at £1.50 each) either *in advance from the Association's offices* or *at the Information Centre (Stand 123).*

Stand 149

Geosource UK Limited

For more than 50 years Smith Meters have been associated with the supply of accurate and dependable measuring equipment for the petrochemical industry.

Smith Meters now form part of the Flow Measurement and Control Division of Geosource Inc. and is backed up by an international network of manufacturing and after sales assistance enabling a comprehensive service to be given to the petrochemical industry in measuring and controlling flow for production, distribution, refining and marketing.

Smith Meters are recognised throughout the world as the ultimate in range, accuracy and reliability.

We offer a complete range of meters including stainless steel oval gear meters, rotary vane meters, piston meters and turbine meters. A wide range of accessories, strainers, valves and batching equipment can also be supplied to provide a comprehensive package for all requirements.

On show will be a selection of these units including a 1 inch Industrial Piston Meter with preset and valve for the measurement of solvents and non-corrosive fluids up to 75 LPM, a 2 inch T-11 Meter suitable for a wide range of duties for measurements up to 375 LPM, and a selection of OT stainless steel meters with particular application to the food industry.

We offer a complete after-sales service including meter repair, maintenance and meter calibration.

Stand 103

Impex Trading Ltd

Impex Trading Limited, is a new company established to service pigment using industries.

The company currently represents R. K. Printcoat Instruments Ltd, a British company of high repute, who manufacture film applicators and Gain Associates of Taiwan, who are manufacturers of horizontal milling equipment.

The R. K. film applicators are used whenever it is necessary to lay down a pre-determined thickness of film on substrates of various kinds, where accuracy and repeatability of application are of utmost importance. An example of this is the making of draw-downs in paint manufacturing in order to check hiding power and colour at a given thickness. Various units are available, either manually operated, or the more accurate motorised coaters of various sizes, for use in the paint, textile, printing industries and in the pigment and printing ink manufacturing fields. Also available are gravure and flexo proofers for the printing industry. In this area the company also makes available a unit which allows multi-colour proofing using film coating techniques, thus obviating the necessity of a proofing press. Also available is the rotary coater, for proofing of laminations and printing onto continuous paper or other substrates. These products fall into a price range from £500 – £5,000.

The Unimill range, manufactured by Gain Associates, comprises three sizes of mill featuring 5 litre, 10 litre and 15 litre vessels. The main advantages of all these models are that all are seal-less up to 5,000 cps, no foundations are required for static mounting and being horizontal mills their throughput is approximately three times that of comparable conventional vertical mills.

These mills are available in a price range of between £6,000 and £9,000.

For further information, please contact Impex Trading Limited.

Stand 150

Peirson Process Equipment

Peirson Process Equipment will be offering their "Design and Installation" service for storage tanks, pipe work, pumping, flow metering, electrical control and lighting schemes. This service is applicable to all users of bulk solvents, resins, varnishes and other liquid raw materials. Overseas enquiries are particularly welcome.

PPE also offer a comprehensive range of equipment including:

March-May pumps; comprising bronze or stainless steel centrifugal gear pumps, particularly suitable for solvents and resins etc., and also a sophisticated range of polypropylene, glandless, magnetically driven pumps.

Flow meters; PPE specialise in flow meter equipment especially by Tokheim, but will supply the most cost-effective solution to your metering problems regardless of source.

Valves; PPE supply a highly competitive range of gate or ball valves suitable for most liquids.

Storage tanks and vessels; PPE will design and have manufactured the storage or mixing vessels most suitable for your applications whether constructed from mild steel, stainless steel, GRP, polypropylene or HD polythene.

Agitator-mixing units; our specialised knowledge extends through the design and manufacture of mixers for most liquid combinations.

Chemical recovery; we will undertake this specialised task in association with Gee and Company of Birmingham.

Mobile equipment; most of the above listed equipment can be mounted on wheeled trailers or skids facilitating the easiest delivery and installation to the customer's site, which is particularly relevant for projects in the Middle and Far East.

Peirson Process Equipment await your enquiries.

Stand 106 and Room 3128

Victor Wolf Ltd

As one of the leading UK producers of unsaturated and poly-unsaturated fatty acids, Victor Wolf will have all the latest information available on the use of these products in synthetic resin manufacture. Experts will be available to discuss dehydrated castor oil fatty acid specialities and their effective use in a wide range of products. They will also be very interested to discuss production of "tailor-made" fatty acids to suit individual processing problems.

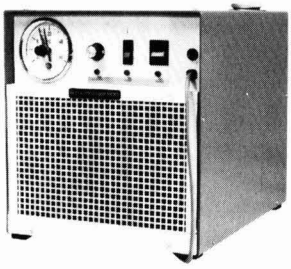
Victor Wolf Limited will be exhibiting their established range of reactive polyamides for the curing of epoxy resins, and their non-reactive polyamides for the formulation of flexographic and gravure printing inks, thixotropic alkyds and hot melt adhesives.

Stand 138

Betta-Tech Equipment Ltd

Betta-Tech will be showing their improved MK IV Tackmeter now fitted with flat bed recorder and tack measuring rider rollers in nitrile or polyurethane covering for better low tack results. The Tackmeter is being used in ink and varnish manufacturing for quality control and research tack testing. It has become the standard tack measuring system in the UK with over 120 installations. Also featured will be the Falling Rod Viscometer with the new fully automatic digital electronic timing unit together with a water circulator temperature control unit for accurate temperature control in the viscometer body. A new compact water circulating chiller unit will be shown for temperature control between −10 and +60°C with a heat extraction of 200 watts.

Units to be shown:
1. MK IV Tackmeter
2. Falling Rod Viscometer
3. Automatic Viscometer Timer
4. Water Circulator Controller
5. Water Chiller Circulator.



The Betta-Tech Water Chiller Circulator

Room 3127/29

Schering Chemicals Ltd

Apart from the general range of products mentioned in the Official Guide, Schering will also have available information on the following development products:

XE11; A fast hardener with high reactivity, light colour and low viscosity.

XE75; A special hardener for tough elastic epoxy systems. With XE 75 the cured system has good elongation, higher tensile and tear strengths and good ageing resistance.

XE 37; A dispersion hardener which allows a high solids content and good processing properties in the final paint. XE 37 is light in colour, solvent free and has a favourable viscosity.

XE 422; A polyamide adduct hardener for solvent containing, epoxy based, corrosion resistant coatings. Comparable with Euredur 115/70 but with the advantage of being largely unaffected by humidity.

XE 784; An epoxy resin notable for its low viscosity, resistance to crystallization, low aroma and good wetting power.

All are available in commercial quantities and have been proved in practical conditions. They represent a significant addition to Schering's comprehensive epoxy resin and hardener range.

In addition, information can also be obtained on new biocides being offered by Schering. These are mainly for use in the wood preservative sector.

Room 3124

Kirklees Chemicals Ltd

A range of styrene-acrylics and homopolymers has been added to our well known Viking® range of vinyl acetate/Veova® 10 copolymers and terpolymers.

Our technical staff welcome discussion on these products and other aspects of paintmaking.

Stand 147

Unishear Mixers Ltd

Unishear Mixers manufacture two ranges of advanced fluid mixers for high and low abrasive materials, that both disintegrate, emulsify and disperse; utilising their unique two stage rota/stator system, that allows two degrees of shear without removing mixer from vessel to change over stators.

Units with and without bottom bearings, single and variable speed drive machines will be on display.

Illustrations will be shown of complete turnkey mixing installations with stainless steel or mild steel vessels.

Stand 118

K & K-Greeff Chemicals Ltd

The surface coatings industry is, for K & K-Greeff Chemicals Ltd, a major business area where they supply binders, pigments, fillers, solvents and speciality additivies.

This year their stand will reflect involvement with a number of UK and international companies, emphasising the extensive and comprehensive range of products available.

occa news

The Dyno-Mill KDL Pilot

Stand 112

Glen Creston Machinery Ltd

The revolutionary Dyno-Mills, renowned world-wide and introduced into Britain in 1973, can once again be seen at OCCA, and Glen Creston expect to be able to show for the first time a brand-new large volume production model.

The new machine, suitable initially for large volume production of paints, printing inks and similar materials, will incorporate the renowned Dynamic Separator. A high performance mechanical seal and abrasive resistant hardened steel milling components will be supplied. The machine fills a gap in the Dyno-Mill range and will be of immense interest to all surface coatings manufacturers.

Dyno-Mills were the first horizontal bead mills in production and have since consistently led the field with their ever-improving milling/dispersion efficiency, cooling and ease of cleaning. Production, pilot scale and laboratory models – all on show – have a functional elegance and compactness unusual in such machines.

An example of the Diaf high speed dissolvers will be shown and a representative of Diaf will be on hand to discuss industrial mixing and dissolving problems.

Also on display will be a wide range of high quality Glen Creston grinding media suitable for use in all bead or sand mills. Glass, zirconium oxide and steel beads will be shown.

occa news

Stand 143

Eiger Engineering Ltd

The company will once again be exhibiting models from their highly acclaimed range of direct drive bead mills. The Motormills are now widely acknowledged as the most cost effective and reliable bead mill on the market today and are available in sizes of 50 ml, 0.75, 1.25, 10, 20, 40, 75 and 150 litres.

On show for the first time will be the Eiger 50 litre Recirculation Batch Bead Mill with its integral pump, pre-mixer and product hopper. The unique design eliminates pre-mixing and requires no scrape-down on discharge and is simply cleaned by solvent recirculation.

Stand 128

Contraves Industrial Products Ltd

Contraves will concentrate on demonstrating the capability and versatility of their multi-speed laboratory viscometers this year. The new Rheomat 115 introduces microprocessor technology to their range of viscometers. The Rheomat 30 in combination with a Rheoconverter will demonstrate how the tedium may be removed from processing results.

Room 3107/9

Sun Chemical Corporation

The pigments division of Sun Chemical Corporation have recently opened their new warehouse and technical service facility at Milton Keynes.

Technical and sales personnel will be in attendance to discuss the Sun range of organic pigments and flushed colours. Information will be available on recent additions to the flushed colour range designed for use in the manufacture of low energy heat-set inks.

Eiger's 75 litre automated Motormill

Stand 119

GAF (Great Britain) Ltd

Whilst exhibiting their well established range of pressure vessels, GAF are also showing a redesigned RBX in-line vessel, which is compact, yet highly efficient, with the added advantages of quick change handling and minimal cleaning. There are two models available giving up to 100 litres per minute (6 cu.m/hour) for the size 1 and 200 litres per minute (12 cu.m/hour) for the size 2.

Filter bags specially designed for these vessels are available in nylon felt and mesh, polypropylene, viscose and wool with micron sizes varying from 1-800. New accessories include back-flush restrainers for the P1S and P2S bag systems and a displacement balloon, useful for certain batch operations where it is desirable to reduce the volume of unfiltered liquid in the bag at the point of changeover.

An alternative type of Restrainer basket for the P1S and P2S series has also been produced in a conical shape for faster cake release.

Another new addition to the range is a tank-filling unit using a restrainer basket and the standard SNAP-RING filter bags. This provides a very effective method of safety-filtration for bulk liquids prior to charging/discharging tank containers.

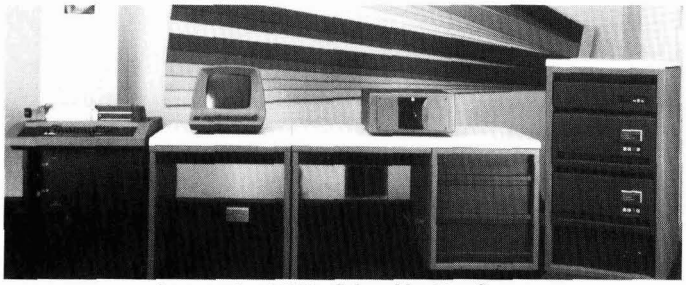
Stand 132

Industrial Colours Ltd

I.C.L. will be exhibiting Flare Daylight Fluorescent Pigments in conjunction with their exclusive UK distributor Capricorn Chemicals Ltd. I.C.L. are represented by agents in most countries throughout the world.

Flare Daylight Fluorescent Pigments are used throughout the surface coatings industry for the production of paints, printing inks, textiles and paper coatings, they are also extensively employed in plastisol coating and plastics applications. The exhibits shown will illustrate the wide product range, and will particularly highlight the new shades which have been considerably improved in strength, brightness and lightfastness.

A new product range designated Flare 315 Series Fluorescent Bases has been developed for the production of lithographic and letterpress printing inks with improved transfer properties, emulsification resistance and printing characteristics. This new series of products will dry by the standard auto oxidation process, and is also suitable for infrared drying applications.



An example of ICS's Colour Matching System

Stand 115

Instrumental Colour Systems Ltd

Instrumental Colour Systems Ltd are the makers of the computer colour matching system. This system is designed to enable companies to match colours extremely rapidly, accurately and most importantly as cheaply as possible.

The system consists of a mini-computer, to handle the complex mathematics involved, together with data storage for information on the individual dyes or pigments in use in the factory. Coupled to this is a spectrophotometer for measuring the colour and translating this information into numerical form.

Measure any material and in a few seconds a number of alternative formulations, with costs, are presented on the visual display unit and printer.

Stand 104

The Q-Panel Company

Q-Panel Co. announce the opening of their new European office in Manchester which will carry stocks of their range of products for research and quality control:

Q-Panels, standardised steel and aluminium substrates for paint research, sales samples, batch records, and quality control.

The QUV Accelerated Weathering Tester, which tests materials for resistance to both moisture and sunlight. Rain and dew are simulated by an elegantly simple condensation system which gives a new dimension of realism and control. The effects of sunlight are simulated by an array of 8 special fluorescent lamps.

The QCT Condensation Tester, this machine tests materials for resistance to moisture in the form of rain or dew. The QCT's condensation system gives tests that are faster than conventional humidity tests and more realistic than salt spray tests.

Stand 134

OBS Machines Ltd

The theme of the Oliver + Batlle/Sussmeyer exhibit this year emphasises the vast and unsurpassed experience gained by this international organisation, since the introduction into Europe of the first Sussmeyer Sandmill in 1956. The highlight of the exhibit being the result of 30 years evolution and represents the latest developments in the field of micro-element grinding mills.

The introduction of the Duplex and Triplex Supermill range, offers major advantages in the production of large batches of identical material and is of special importance for the grinding of products such as magnetic iron oxides, calcium carbonate, gypsum, agro-chemicals, aqueous-based pigment, dyestuff dispersions, etc.

OBS also have available many technical developments as options for the basic Supermill unit in order to achieve the ultimate in dispersion conditions over wide ranging variations in application requirements.

The exhibit will also include details of plant from their extensive range of equipment, designed specifically for the paint, ink and allied chemical industries.

Stand 145

Silberline Ltd

The demands of aluminium pigment users are continually changing as end user specifications highlight particular characteristics of pigment performance in the film. Silberline is continually developing production techniques so as to deliver new qualities in response to these demands.

The exhibit this year will highlight new products developed for the automotive paint industry. These have set new standards of DOI distinctiveness of image clarity for aluminium pigments. Several new products including Sparkle Silver® 5306AR and Sparkle Silver® 5101AR, will be compared with other Silberline products.

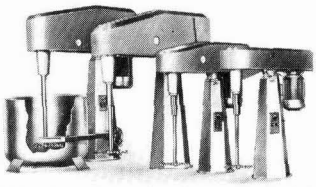
Information on Anglian Chemical and Processing Plant Ltd (Stand 151) and BDH Chemicals Ltd (Stand 153) will be shown on a sheet accompanying the Official Guide.

occa news

Stand 130

Netzsch (UK) Ltd

Netzsch (UK) Ltd will be exhibiting the Netzsch John Mill which can be used by manufacturers of printing ink, paint and water based dispersions. Netzsch (UK) will also exhibit their new 15 litre horizontal mill which is highly suitable for the production of low to medium viscosity dispersions. Both mills are equipped with systems to cool the chamber and an agitator to create the optimum cooling effect. These mills can be offered from 1 litre to 250 litre capacity. Highlight of the Netzsch (UK) exhibit will be a 25 hp high speed disperser from their new range of dissolvers which can be used for extremely pasty products. This is the first time Netzsch have exhibited their dissolvers which until recently have been unavailable in the British market.



Netzsch will be showing one of their range of dissolvers

Rooms 3115/17 and 3119/21

NL Chemicals (UK) Ltd

NL Chemicals (UK) Ltd is the new name of NL Chemicals' selling organisation covering the United Kingdom and the Republic of Ireland. This new company takes over and continues all the activities previously carried out by Kronos Titanium Pigments Ltd. NL Chemicals (UK) Ltd is responsible for the full range of NL Chemicals' products, except for the BENTONE Gellants, which are handled by Steetley Minerals Ltd.

Displays will include; titanium dioxide, rheological additives and anticorrosive pigments.

Stand 125

Chemolimpex

Chemolimpex of Hungary, export inorganic pigments manufactured by Tiszamenti Vegyimüvek.

occa news

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

Obituary

Dr Angus R. Cumming

We regret to record the death of Dr Angus R. Cumming born in Glasgow in 1941. Dr Cumming, an Ordinary Member of the Association, was at the time of his death Managing Director of Ciba-Geigy's Pigments Division in Paisley, Scotland.

Dr Cumming leaves a wife and two sons.

new members

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

Ordinary Members

JACKSON, TREVOR, 3 Byron Road, Greenmount, Bury, Lancashire *(Manchester)*

STENSTROM, PETER GERARD, 8 Brindlehurst Drive, Astley, Manchester M29 7NG *(Manchester)*

BROMLEY, DAVID, BSc, PhD, Springfield Lodge, Springfield Road, Sale, Gt. Manchester *(Manchester)*

SMITH, VAUGHN A., 65 Fernhill Blvd, Oshawa, Ontario, Canada *(Ontario)*

BOTTOMLEY, ANDREW REED HOLMES, BSc, PhD, BTP, Tioxide, Technical Services Dept., Portrack Lane, Stockton-on-Tees, Cleveland TS18 2NQ *(Newcastle)*

TODD, ROBERT BURNSIDE, 18 Corsebar Crescent, Paisley PA2 9QA *(Scottish)*

Associate Member

PRESTEDGE, BRIAN EDWARD, Union Carbide SA (Pty) Ltd, PO Box 1880, Durban 4000, South Africa *(Natal)*

Registered Students

PATEL, NARENDRA KUMAR, 55 Summerfield Drive, Intake Estate, Bramley, Leeds 13, LS13 1AJ, West Yorkshire *(West Riding)*

BOOTH, MICHAEL JOHN, 9 Firswood Drive, Swinton, Manchester M27 1QY *(Manchester)*

occa diary

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

April

Thursday 2 April

Newcastle Section: Annual General Meeting. *Details to be announced.*

Monday 6 April

Hull Section: Annual General Meeting at the Queens Hotel, George Street, Hull, commencing at 6.45 p.m.

Tuesday 7 April

West Riding Section: Annual General Meeting at the Mansion Hotel, Roundhay Park, Leeds 8, commencing at 7.30 p.m.

Thursday 9 April

Thames Valley Section: Annual General Meeting, talk "Tourism around the Thames" by Thames & Chiltern Tourist Board at the Beaconsfield Crest Motel (White Hart), Aylesbury End, Beaconsfield, Bucks, commencing at 6.30 p.m. for 7.00 p.m.

Scottish Section: "Glasgow theatres – behind the scenes" by D. Smith of Ault & Wiborg Ltd at the Albany Hotel, Glasgow. *Details to be announced.*

Friday 10 April

Midlands Section – Trent Valley Branch: Annual General Meeting followed by Buffet Dance at the Cross Keys Inn, Turnditch. *Details to be announced.*

Manchester Section: Annual General Meeting at LCC in the Library, Lancaster and Jubilee Suite. *Details to be announced.*

Wednesday 15 April

Scottish Section – Eastern Branch: Annual General Meeting followed by "Innovations in Wallcovering" by George Niven, Development Manager, Nairn Coated Products at the Murrayfield Hotel, 18 Corstorphine Road, Edinburgh, commencing at 7.30 p.m.

Friday 17 April

Irish Section: Annual General Meeting. *Details to be announced.*

Thursday 23 April

London Section: Annual General Meeting at the Rubens Hotel, Buckingham Palace Road, London SW1, commencing at 6.30 p.m. followed by a lecture of general interest to which members' ladies are invited. *Details to be announced.*

Friday 24 April

Bristol Section: Annual General Meeting. *Details to be announced.*

Saturday 25 April

Midlands Section: Annual General Meeting *Details to be announced.*

Tuesday 28 April-Thursday 30 April

OCCA-33 Exhibition at the Cunard International Hotel, Shortlands, Hammersmith, London W6. 9.30-17.30 each day. For details see page 163.

May

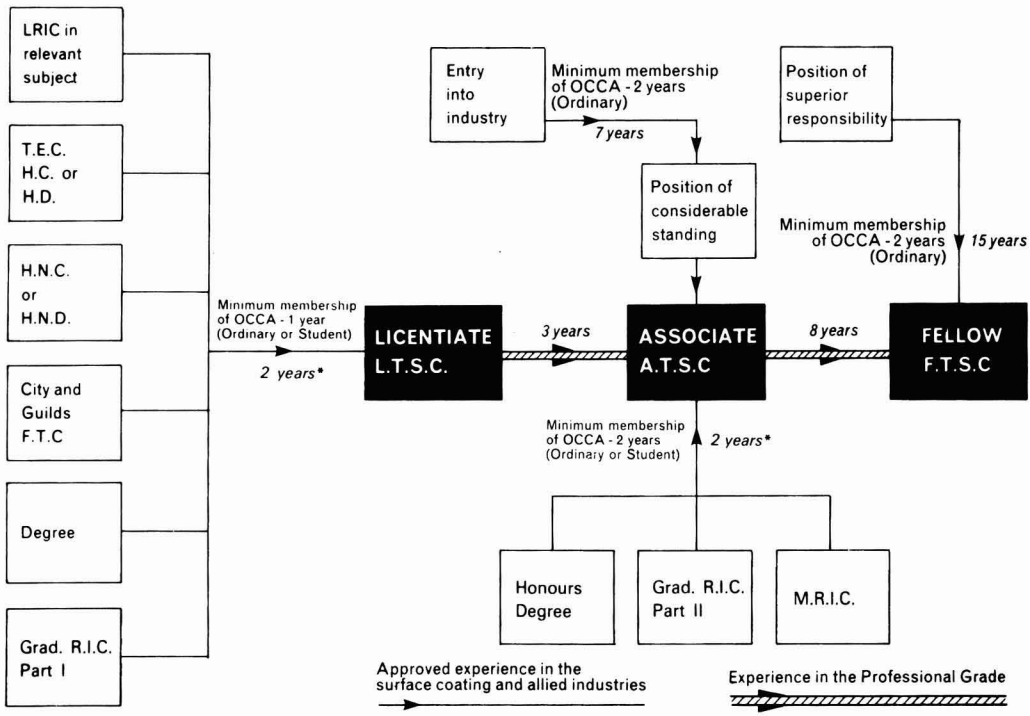
Wednesday 20 May

Ontario Section: Meeting at the York Suite of the Cambridge Motor Hotel, 600 Dixon Road, Rexdale (Toronto), Ontario, commencing at 6.00 p.m.

Optional Professional Grade for Ordinary Members

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

Routes to the Professional Grades



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

Regulations for admission to the Professional Grade – Amended December 1979

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

A. Licentiate

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

2. Shall have attained the age of 22.

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

OR (b) Shall have passed the Higher Certificate or Higher Diploma of the Technician Education Council in coatings technology or other relevant subjects.

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

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

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

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

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

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

5. Shall be required to satisfy the Professional Grade Committee, or some other body approved by the Professional Grade Committee in a *viva voce* examination and submit a dissertation on a topic previously approved by the Professional Grade Committee.

6. Shall normally be sponsored by three Ordinary Members of the Association in the professional grade (either

Associate or Fellow) at least one of whom must be a Fellow.

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

B. Associate, being already a Licentiate

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

2. Shall provide evidence acceptable to the Professional Grade Committee of his superior professional skill and maturity.

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

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

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

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

C. Associate, not already a Licentiate

EITHER

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

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

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

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

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

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

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

OR

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

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

10. Shall have been engaged in practising the science or technology of coatings for not less than seven years and shall have attained a position of considerable standing in the industry.

11. Shall normally be required to satisfy the Professional Grade Committee in *viva voce* examination of his professional competence.

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

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

D. Fellow

Note: This is the senior award of the professional grade and signifies that the holder has made outstanding contributions to the science or technology of coatings or has reached a position of eminence in the industry through the practice thereof. The Professional Grade Committee will require substantial evidence of professional maturity in the science or technology of coatings although commercial experience will be taken into account in assessing the merits of candidates.

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

2. Shall have been an Ordinary member of the Association for not less than two years.

3. Shall be engaged in a position of superior responsibility in the coatings industry.

4. EITHER (a) shall have been an Associate of the professional grade for at least eight years;

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

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

6. Shall normally be sponsored by three Ordinary Members of the Association in the professional grade, all of whom must be Fellows.

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

The fees payable with applications are as follows:

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

Application

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

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

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

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

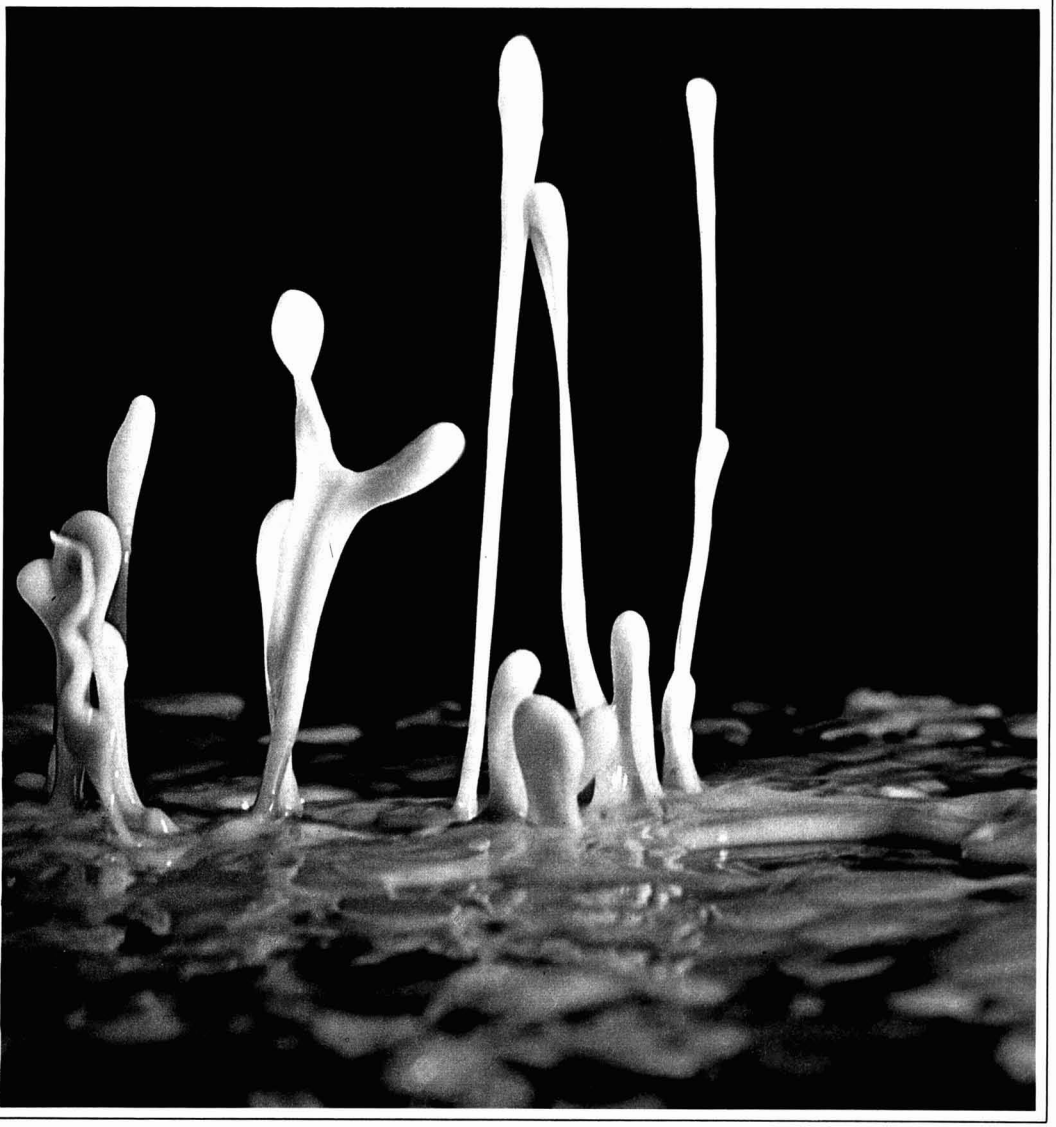
Flow Control

BENTONE Gellants give precise control over flow properties.

By modifying rheology they ensure, for a wide range of products and applications, that selected viscosity and levelling targets are met. BENTONE Gellants prevent sagging and settling in solvent or water based coatings, varnishes, printing inks and adhesives.

STEETLEY Minerals Ltd
Carlton Road
Worksop, Notts S81 7QG

NL Chemicals Europe Inc.
31, rue de l'Hôpital
B-1000 Bruxelles



BENTONE® Gellants

NL Chemicals

SYLOID®

Matting Agent for Surface Coatings

Index to Brochure

GRACE

W. R. Grace Limited
Davison Product Line
Northdale House
North Circular Road
London NW10 7UH
Tel: (01) 965 0611
Telex: 25139

Colour makes reading beautiful!

Yes you read it correctly, colour makes reading beautiful. Our new brochure "SYLOID – matting of Paints and Varnishes" will prove it to you.

Tables and graphs are all in colour and this helps you to grasp the context at a quick glance. Interesting illustrations bring the brochure to life and encourage your eyes to linger.

Information? The index, which is printed here on the top left hand side, gives you an idea what to expect.

The brochure, which makes reading beautiful, will be sent to you, obviously at no cost, just give us your name and address.

The 1981 Northern Sections' Golf Tournament organised by the Manchester, West Riding, Hull, Newcastle and Scottish Sections

Final Notice

Competitions: Tony McWilliam Trophy – open to OCCA members only. Additional competitions will be arranged.

Course: Pannal Golf Club, Pannal, Near Harrogate, Yorkshire.
Tel: 0423 871641.
Situated on the Leeds to Harrogate Road – A61.

Date: Thursday 25 June 1981.

Starting Time: Tee reserved from 1.30 p.m. onwards – 3 player grouping at 6 minute intervals.

Type: Singles Stableford. Handicap allowance 7/8. Maximum allowance 18 strokes. Competitors will play off their lowest club handicap. Any competitor without a current handicap will be allocated one, prior to starting, by a sub-committee.

Cost: £11.50 per head (cheque made out to OCCA – Manchester Section) covering the cost of green fees, evening meal, gratuities and VAT, but not sandwiches at lunch-time.

Catering: An evening meal has been arranged, presentation of the prizes will also take place during the evening.
Sandwiches will be available, at extra cost, between 12 noon and 2.00 p.m.

Eligibility: OCCA members and their guests.
Maximum numbers of entrants will be 60. Preference will be given to OCCA members. If it proves necessary to form a waiting list only those on the list will be notified.
Notification of withdrawal from the competition to be made to the undersigned as soon as possible.

Prizes: Offers of prizes to add incentive to the competition will be greatly appreciated.

Application: Members wishing to take part are requested to complete and return the attached slip plus £11.50 remittance not later than 11 June 1981.

1981 Northern Section's Golf Tournament

To: F. B. Windsor, ATSC,
England, Hughes, Bell & Co. Ltd,
Valley Works, Monton Road,
Eccles, Manchester M30 9HJ.
Tel: 061-789 5191.

I wish to enter for the Tony McWilliam Trophy _____

I will require sandwiches at lunch-time _____

I will require an evening meal(s)
(Enter No. required) _____

OCCA Member	**Guest(s)**
Name ..... *(Block letters please)*	.....
Address ..... *(Block letters please)*	.....
.....	.....
.....	.....
Tel.	.....
Handicap ..... *(Block letters please)*	.....
Signed	

CLASSIFIED ADVERTISEMENTS

Classified Advertisements are charged at the rate of £5.00 per single column cm. Advertisements for Appointments Wanted are charged at £1.50 per line. A box number is charged at £1.00. They should be sent to D. N. Buddles, Assistant Editor, Oil & Colour Chemists' Association, Priory House, 967 Harrow Road, Wembley, Middlesex HA0 2SF. JOCCA is published EVERY month and Classified Advertisements can be accepted up to at least the 12th, and in exceptional circumstances the 20th of the month preceding publication. Advertisers who wish to arrange for an extension of the copy deadline should contact the Assistant Editor, D. N. Buddles at the address given above (telephone 01-908 1086, telex 922670 OCCA G).

MISCELLANEOUS

AGENTS REQUIRED

for ink testing equipment (tackmeter and viscometers) in Europe and the Far East.

Please contact:

Betta-Tech Equipment Ltd
Unit 16 Star Road,
Partridge Green, Sussex
Telex: 87323

WANTED
by a foreign company

a chemist to advise on the manufacture of phthalocyanine pigments. *Please write in confidence to:* **Box 487**

BACK NUMBERS

Back numbers of the following are offered for sale:

JOCCA 1947-1969, bound
JOCCA 1970-1979, unbound
Official Digest 1950-1965 bound
J. Paint Technology 1966-1968, bound

Please reply to: **Dr T. A. Banfield, 47 Burses Way, Hutton, Brentwood, Essex**
Tel: 0277 216921

OCCA TIES AND SCARVES

Association ties with single Leonardo motif, with either dark blue or maroon background, and ladies' scarves (dark blue only with Leonardo motif in two corners) are now available from the Association's offices.

£3.50 per item, pre-payment only, post free by surface mail. Please state colour of tie required.

APPEALS

MATERIALS FOR SALE

AGENT WANTED

For a paint driers and additives company. Competitive prices, worldwide exports

Please write to:

Shen Enterprise Corporation
P.O. Box 777, Taipei,
Taiwan, Republic of China
Telex 21564 SLLE

SITUATIONS WANTED

INDUSTRIAL TRAINING/LABORATORY MANAGER

Semi-retired industrial training/laboratory manager (wood finishing specialist) seeks part-time or temporary consultancy in recruitment, setting-up laboratories or training-programmes or participation in German liaison.

Please reply to **Box No. 497**

4 WAYS YOU CAN BRING LOVE AND SECURITY TO A NEEDY CHILD TODAY

Every time you send a donation to Dr. Barnardo's, you are helping give love and security to over 9,000 children. Neglected, distressed or severely handicapped: they need your help so much.

£1 buys a cheerful bedtime story book. £2 buys a cuddly teddy to snuggle down with. £5 buys a warm blanket. And £10 buys a set of special reading books for a group of handicapped children. Please send what you can today to:

Nicholas Lowe, Appeals Director,
Room 909, Dr Barnardo's, Tanners Lane,
Ilford, Essex 1G6 1QG.

EXPERIENCED ADVERTISER

Advertiser now retired after 50 years in the paint industry requires to contact principals who could utilise his considerable and varied experience both home and abroad on a consultancy basis. Expert up-to-date knowledge on the formulation and manufacture of modern automotive refinish coatings.

Please write to Box No **495**

QUALIFIED PAINT TECHNOLOGIST

Qualified paint technologist with substantial experience in formulation, production, stock control etc, seeks overseas managerial position. Most locations considered. *Reply in confidence to* **Box No 496**

INDEX TO ADVERTISERS

OIL & COLOUR CHEMISTS' ASSOCIATION

THE INTERNATIONAL FORUM FOR THE SURFACE COATINGS INDUSTRIES

CUNARD INTERNATIONAL HOTEL

LONDON 28-30 APRIL 1981

ANNUAL EXHIBITION

28-30 APRIL 1981

Motif designed by Robert Hamblin.

TRAVEL ARRANGEMENTS FOR VISITORS TO OCCA-33

The Cunard International Hotel is within easy walking distance of the Hammersmith Underground Station (see map on page 163). Visitors arriving at Heathrow Airport may board the Piccadilly Underground line within the Airport, which will take them direct to Hammersmith Station. Those arriving at Gatwick Airport may take a British Rail train to Victoria Station, from where they may board the District Underground line which will take them to Hammersmith Station. Hammersmith Station is also served by the Metropolitan Underground line. For those arriving by car, there is a large NCP car park close by in King's Mall of King Street.