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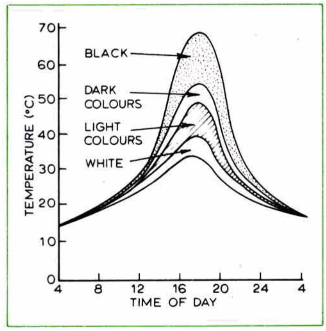
JOCCA

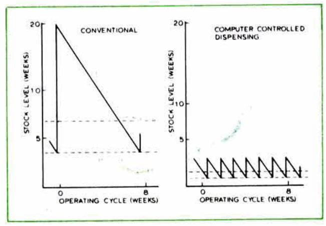
External wall insulation and surface coatings.

Variations in temperature of insulated wall surfaces facing west.



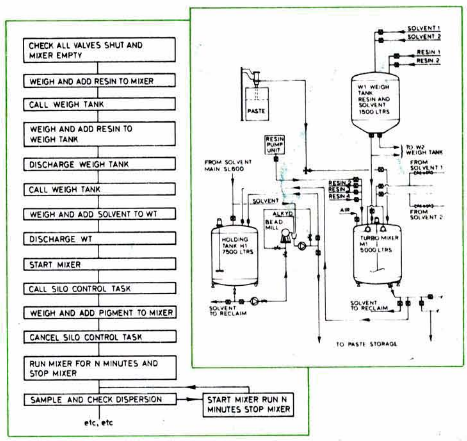
Speed and accuracy in surface coatings production.

Stock movement – conventional versus computer controlled dispensing.



Automated paint manufacture.

A section of the plant – white premix high speed mixer – with part of its process flow chart.



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The efficient use of surface coatings*

R. A. Fidler

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Introduction

The Conference title is concise and should leave no doubt as to the subject under discussion. But if we are to do it justice, we have firstly to establish some definitions or the scope of our deliberations, and secondly to ensure that we relate them to prevailing conditions.

Definitions

The dictionary defines efficient as "applying to what is actively operative through the exercise of energy so that it often is synonymous with capable or competent." That needs a little thinking about, and no doubt our own understandings of "efficient" will be the ones that we continue to use.

Turning to "surface coatings", is this to include electroplating and other methods of surface protection and embellishment, which theoretically could extend to wallpaper, Fablon, Formica etc? With the time available it is necessary to restrict the discussion to organic coatings and that will be sufficient with the multiplicity of types, methods of application, and substrates and articles to be coated, ranging from Dinky Toys to battleships, and supermarkets to oil rigs.

Finally, whilst we all have a greater awareness of the need to use resources as efficiently as possible, we cannot ignore economic considerations and also ask the question "efficient in whose eyes – the formulator, the applicator or the end-user?" The answer is probably a combination of all three plus other interested parties.

Of necessity, I have made my remarks as pertinent as possible and to recap I suggest that we equate:

"efficient" with "as economically as possible", and
"surface coatings" with "paint".

The Conference papers and discussions must reflect the interests of those attending, but there is a wider audience to be considered embracing all those engaged in the surface coatings industry. Whilst, therefore, concentrating on key issues, these cannot be plumbed to their depths, for as soon as the subject appears to be exhausted other considerations such as health and safety etc., underline its complexity.

The current state of the paint industry

Before exploring the theme of efficiency, and in whose eyes, a brief look at the paint industry.

From the 1981/2 Annual Statistical Review of the Paintmakers Association, volume sales in million litres were as follows:

1979/80	1980/81	1981/82
590	540	522

Whilst these figures relate only to PA members they constitute the major part of the industry, and the broad picture indicates a declining market. Much of this can be attributed to the economic situation and is reflected in the industry's profitability on sales.

1979/80	1980/81	1981/82
10.4%	8.5%	6.9%

Nevertheless, allowing for the economic situation, there is an underlying trend that has been recognised for some-time by most paint manufacturers in industrial markets and can be explained by:

1. Replacement of paint by other systems, e.g. plating, plastics.
2. Improved paints, i.e. one coat instead of two, higher solids coatings, electropaint.
3. Improved methods of application.
4. Reduction in the number of articles to be painted due to imports, e.g. motor cars, domestic appliances.

Whilst within the paint industry improvements have been made to be more efficient, this has been nullified to a large extent by reduced volume, smaller batch sizes etc., so that in 1972/73 the output per employee was 23,250 litres, in 1981/82 this had only risen to 24,300 litres, an increase of 4.3 per cent.

The paint industry has not been complacent and by amalgamations, take-overs etc. has regrouped to meet the challenge. Nevertheless it has these key issues to consider.

(a) How to improve output per employee.

(b) How to increase its profits to justify the necessary investment to fight off foreign competition.

The lessons of the motorcycle industry and others who held respected places in the UK business scene are with us, and we have to consider how to be an efficient, vigorous and modern industry, recognising that if paint is to remain an attractive "surface coating", every new product by virtue of improved application, increased durability or other characteristics, could result in less being used.

The efficiency and future of the surface coatings industry is therefore a study in itself, and within OCCA, PA, the PRA and other organisations and societies there must be enough data for those who should pursue such an investigation. There must be merit in all interested parties working together on such a project – pretreatment suppliers, application and equipment manufacturers as well as the paint companies – unless we believe "it can never happen to us".

The efficiency of the paint industry

The total amount of money spent on the coating of surfaces of whatever type and by whatever system and

*Keynote address of the Association's York Conference, 15-18 June 1983.

application method must be vast and difficult to estimate, but we can at least look at paint.

Estimated turnover in 1981/82 was £708 million with raw materials accounting for 37 per cent, or £262 million. (A figure of £300 million could be more realistic, either way its a lot of money.)

(a) How efficient is the industry in purchasing its raw materials? Although the situation is now changing, it would appear that, like motor cars, UK raw material prices have been higher than those in Europe.

(b) How often are formulations checked to ensure that they are relevant in terms of:

  (i) Existing standards

  (ii) Alternative raw materials

  (iii) Improved methods of paint manufacture

  Having once let a chemist loose on such an investigation there is no doubt in my mind of the savings that can be achieved.

(c) Are raw materials handled effectively from receipt through to manufacture and final despatch. A waste figure of 3-5 per cent may be the norm but that is £10 million a year.

The efficiency of the paint user

It has been suggested that paint manufacturers consider paint inefficiently applied or wasted as assisting profits, but no one who has pride in his product wants to see it abused nor is an inefficient customer a long term prospect in the competitive conditions of today.

Nevertheless many paint users still exhibit a woeful ignorance of true painting costs; they may know how much is spent on paint but have little idea of pretreatment, application, rectification and other costs, or the final figure of cost per square metre or the cost of painting a product. Volume solids, dry film thickness and such like are often a mystery. Is this a failure on the paint manufacturers part to educate his salesmen and thus the customer, or is the customer confused by conflicting claims further compounded by those of manufacturers of application equipment etc. Perhaps the time has come for all segments of the surface coatings industry to cooperate and speak with one voice to the ultimate benefit of all. Alternatively does each company pursue its own philosophy assuming that it alone can survive and grow and that all others will fail?

Throughout the industry there is scope for improved methods of manufacture, and whilst in laboratories sophisticated equipment is available, this does not always extend to the shop floor, whether in the preparation of raw materials or the manufacture and the application of paint.

It should be noted that one of the first uses of robots was for the painting of wheelbarrows, and whereas the surface coatings industry has been slow to build on that enterprise, the automotive and other industries have realised its potential and adapted it for many other uses. Within our industry there is scope for automation in many forms, so what hinders this progress? Is it the cost, the thought that we are still in a business which is an art not a science, or is it plain inertia?

The Conference papers

Presenting papers at the Conference will be people who are acknowledged experts in their particular fields, and their papers will be interesting, stimulating and at times provocative.

The real value of the Conference will, however, be determined by the way in which delegates respond to the challenge and return to their allotted tasks more dedicated to necessary change.

The paint industry employs expensive raw materials and machinery plus highly skilled people to manufacture high quality products that can enhance and protect. Without paint many articles would not have sales appeal, but whether decorative, marine or industrial, the coating system is often the last process and almost an afterthought.

Let us, therefore, continue to promote and believe the concept that surface coatings are efficient, so that this vital and viable industry continues to contribute to its own well being and that of the nation.

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Surface coatings in relation to external wall insulation*

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Summary

The influence of external wall insulation and the performance criteria of the decorative protective coatings applied over the insulation materials have been analysed. Particular attention has been directed towards solar gain and the affect of thermal stresses, fire performance of the systems, water vapour permeability, impact resistance, and the factors affecting the bonding of the coatings to the insulation.

Introduction

Recent studies have been carried out in the domestic sector which indicate that buildings account for just under half of delivered energy consumption in the United Kingdom. Out of a total delivered energy of 227 million tonnes coal equivalent (mtce) in 1980, buildings used 104 million tonnes coal equivalent. The estimated consumption by different types of buildings is given in Table 1.

*Paper presented at the Association's York Conference, 15-18 June 1983. An edited transcript of the discussion that followed this paper can be found on page 244.

Table 1
Energy consumption by type of building

Energy consumption by type of building	mtce	%
Housing	63.3	61
Commercial	13.4	13
Public service	14.2	14
Industrial	13.1	12
	104.0	100

For the domestic sector, typical energy consumption is illustrated in Table 2.

Table 2
Energy used in the home

Usage	%
Space heating	64
Water heating	22
Cooking	10
Electrical appliances, lighting etc.	4
	100

In the domestic sector, insulation and related measures are seen as providing the greatest potential for savings, with an estimated 42 per cent of the total conservation potential.

The keystone of Government policy has been to ensure that the price of fuel and power represent their true economic costs. This, together with changing living styles and inadequate building structures, has resulted in major problems of condensation and renovation. It has been estimated that at least two million domestic properties in the United Kingdom suffer from faults caused by condensation.

The renovation of the existing housing stock in the United Kingdom is therefore clearly of priority and has led to the development of new systems to overcome these problems.

For double skin buildings, the most economical system of insulating the wall area is by cavity in-fill. There is, however, a gathering reluctance to use this method because of water transfer, spalling of the outer layer and the uncertainty about urea-formaldehyde foam. For solid walled buildings and areas where cavity in-fill is not acceptable, external insulation systems are the most satisfactory solution. Unlike continental countries, it is only within the last five years that external insulation systems have been used to any extent, and for a time it appeared that owners of properties with solid walls would be literally left out in the cold.

There are three basic components to an exterior insulation system: the insulant, the fixing and the cladding. Classification of the systems can be in terms of any single or combination of these three items.

The major systems being promoted are:

(a) Low density renders

The materials usually have a density of between 200-450 kg/m^3 and are composed of expanded polystyrene beads or perlite held in a cementitious matrix. The material

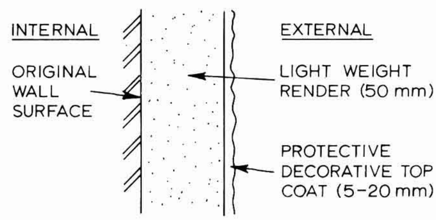

Figure 1.

is either trowelled or sprayed on to the wall. Surface coatings are applied to decorate and protect the insulant from the effects of weather and impacts.

(b) Insulation slab system

The insulation is in the form of a rigid slab on to the back of which is applied an adhesive. A protective coating is then applied into which a glass fibre scrim has been added. This is then followed by a thin decorative coat.

Where the substrate is spalling or crumbled, additional mechanical fixings are applied through the insulants into the wall until a stable position is obtained.

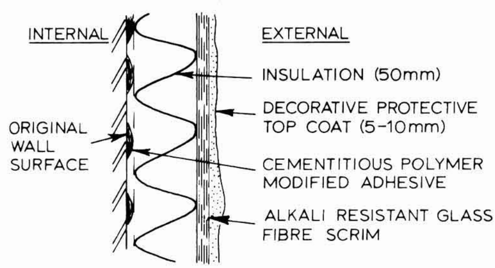

Figure 2.

(c) Insulation slab system using lathing

The system consists of insulation slab material bonded to building paper on to which metal lathing is held with pins which go through the insulation into the substrate. The fixing pins are either plastic or metal. The decorative protective finish normally used is a traditional sand/cement render.

The surface coatings systems used on the exterior of the insulants have many new performance criteria compared with coatings that are applied to the original substrate.

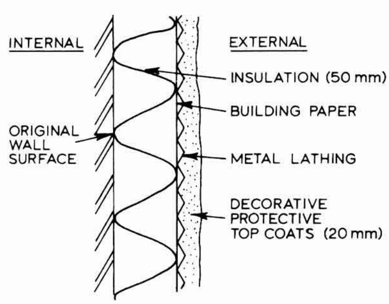

Figure 3.

Table 3
Hard body (steel ball) impact

Sample	Impact level (Nm)	Ball weight (kg)	Mean indent (mm)	Observation
Standard	6	0.5	0.70	no visible cracking
	10	0.5	1.40	5 of 10 areas cracked, approx. diameter 55 mm
	10	1.0	1.30	3 of 3 areas partially cracked
Heavy duty	10	0.5	0.40	no visible cracking
	10	1.0	0.10	

The areas which have been found to be of particular importance are:

(i) Impact
(ii) Thermal
(iii) Fire
(iv) Water penetration and permeability

Impact

The need for external wall insulation systems to have good impact resistance has long been appreciated. The various systems have been subjected to soft and hard body impact together with sharp object penetration. It was found that the soft body tests had little or no effect upon these systems. The hard body tests were much more severe and are based upon: the British Board of Agrement Test "Moat No. 22 Directive for the Assessment of External Insulation Systems for Walls", the Building Research Establishment "Current Paper 61/81 Assessment of External Walls", and the Cement and Concrete Association "Technical Report No. 538". The tests were carried out on slabs of insulating material of approximately one square metre which were fixed to the floor of the laboratory. A steel ball 50 mm in diameter and weighing 0.5 kg or 1 kg was dropped onto the slab from various heights to give the required impact energy. The variation in design of the protective decorative top coats was of paramount importance, as shown in Figure 4. The energy levels at which the surface of the sample being tested was damaged is shown.

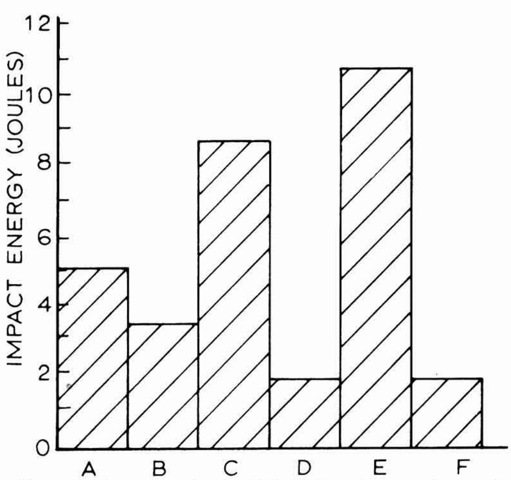

Figure 4. Energy levels at which surfaces became damaged

Sample reference

A Heavy protective render incorporating glass fibre scrim/spar dash

B Medium protective render incorporating glass fibre scrim plus fine organic texture coating

C Medium protective render incorporating glass fibre scrim plus heavy texture coating

D Medium protective render incorporating glass fibre scrim

E Medium texture coating incorporating glass fibre scrim

F Light protective render incorporating glass fibre scrim

These systems were all based upon 50 mm of expanded polystyrene with an approximate density of 20 kg/m^3.

Different design characteristics may have to be used if resistance to sharp object penetration is required. It has been found in general that protective decorative finishes based upon cementitious binders have excellent resistance to sharp object penetration, and that systems using organic-based protective coatings are usually inferior but have superior performance when subjected to hard body testing because of their inherent flexibility.

To highlight the importance of design and the need to assess all components within the protective decorative system, changes were made to the type of scrim used, designated in Table 3 as:

(a) Light weight
(b) Heavy duty

The impact levels shown in Table 3 are related to areas of usage as laid out in Building Research Establishment Information Paper 1P 19/81:

10Nm A zone readily accessible at ground level to the public and vulnerable to hard body impact but not subjected to abnormally rough use.

6Nm A zone liable to impacts from thrown or kicked objects.

3Nm A zone not likely to be damaged by normal impacts caused by people, or by thrown or kicked objects.

The results indicate that systems of this type should be designed specifically with intended usage in mind.

In the terms of the British Research Establishment criteria, then, the standard system would be acceptable in such areas as 1.5 m above ground level or in private open gardens, and the heavy weight system in areas which are readily accessible at ground level to the public and vulnerable to hard body impact.

Fire performance

Another important property of the total system, and in particular its surface, is its performance when tested to BS 476.

The fire performance of the systems as tested to BS 476 parts 6 and 7 is dependent upon a number of features within the systems themselves, such as:

(a) Type of insulant used
(b) Composition of top coat
(c) Construction of decorative protective layer above insulant

It has been found that organic-based heavy textured coatings achieve class 0 rating on normal substrates, for example brick, block or rendering. When tested as part of external wall insulation system they fail. The system types which cause this failure are those where the insulant is unaffected by the radiant heat used in the test. This means that the decorative protective surface reaches a much higher temperature than in a normal situation. However, if the insulant is affected by the radiant heat, such as is the case with polystyrene, then under the test conditions the material vaporises and leaves a situation where the decorative coating is once again adhering to a normal substrate. In some cases, though, the material may fail because the render coat itself has insufficient strength and disintegrates. The inclusion within the system of alkali resistant glass fibre scrim eliminates this problem.

Organic coatings which can perform satisfactorily under the conditions described in BS 476 parts 6 and 7 have been developed, as is shown in Table 4. It should be noted, however, that no problems have been found with traditional spar dash, harling or pebble dash finishes so long as the outer coating retains its integrity.

Table 4

System composition	BS 476 Part 7 results
Light weight render + 4 kg/m^2 heavy textured paint	Class 3
Light weight render + 4 kg/m^2 heavy textured paint with flame retardant	Class 1
Polystyrene slab (50 mm thick) + polymer modified render + 2 kg/m^2 textured paint	Class 4
Polystyrene slab (50 mm thick) + polymer modified render including glass fibre scrim + 2 kg/m^2 textured paint	Class 1
Polystyrene slab (50 mm thick) + polymer modified render including glass fibre scrim + spar dash	Class 1

The testing of external wall insulation systems has highlighted differences within the tests laid down in BS 476, and a research programme has been undertaken by the Building Research Establishment, East Kilbride, the Fire Research Station, and the External Wall Insulation Association to ascertain more about the systems when subjected to fire.

Water vapour permeability

Besides providing fire and impact resistances to the insulant, the decorative protective coatings have to resist the entry of liquid water, while remaining permeable to water vapour. There is a need to ensure the escape of water vapour from buildings without causing inconvenience or discomfort to the occupants. It is advantageous to allow as much vapour as possible to permeate harmlessly through the envelope. In an ideal wall the resistance to the flow of water vapour into the wall from the interior of the building should be greater than the resistance to flow from the interior of the wall to the outside air. If this is not the case there is a risk that water will accumulate within the wall under certain temperature conditions.

The exact processes taking place are complex and are further complicated by the fact that the condensed water changes both the thermal and vapour transmission properties of porous materials.

It is important to try and retain the rate of diffusion of water vapour through the original structure as the rate determining step.

Table 5
Water vapour resistivity

Material	Water vapour resistivity (MNS /g)
Brickwork	25-100
Concrete	30-100
Rendering	100
External insulation:	
(a) Light weight render	30-100
(b) Slab (expanded polystyrene)	100

To ascertain whether this will occur, the resistivity of the various layers to the diffusion of water vapour, and the conditions of humidity of the external and internal environment are set. Calculations are based on the above and then carried out to show whether condensation will occur in the insulation or in the wall.

To stop liquid water penetration, the cementitious render system contains admixtures such as re-dispersible polymers, rheological aids and surfactants. It is believed that in the presence of these materials, the internal surfaces of the pores become coated with either a layer of surfactant molecules and/or a layer of polymer materials. The end result being to produce hydrophobic surfaces exhibiting a high contact angle to water.

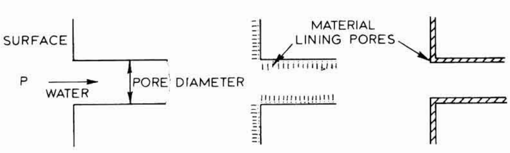

Figure 5.

The pressure required to force water into a surface is given by the expression

$$P = \frac{-2\gamma\cos\theta}{r}$$

Where γ is the surface tension (72 dyne cm^{-1}), θ is the approximate angle of contact and r is the radius of the capillary.

It has been found in practice that a 1.4 m head of water can be related to the pressure exerted by the impact of an average raindrop in various wind conditions, as shown in Table 6.

It is suggested from substrate testing that this type of render will not show significant uptake of surface water in conditions of rain with wind of speeds up to 100 km h^{-1}.

Table 6
Impact pressures of average raindrops at various wind speeds

Wind speed (km h^{-1})	Impact pressure of average raindrop of 0.05 g mass (cm head of water)
10	140
20	280
40	560
60	840
80	1120
100	1400
120	1680

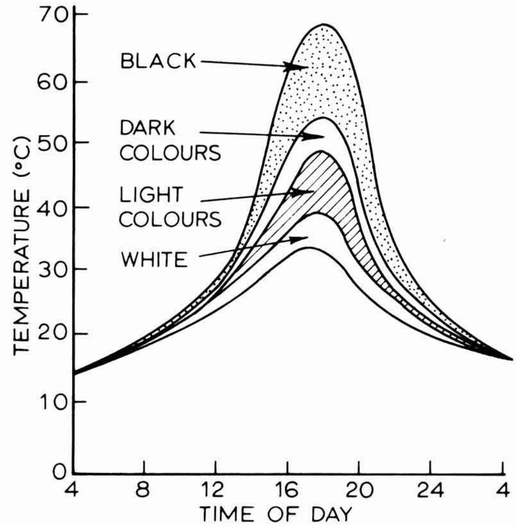

Figure 6. Variations in temperatures of insulated coloured surfaces (west facing wall)

Bonding

The requirement to be able to use different insulation materials beneath a standard range of decorative protective coatings is of importance. In order to overcome this problem, a number of systems mechanically fix a metal lathing. On to this surface is applied 20 mm of render, as specified in BS 5262/1976 for external rendering.

In some instances the insulant and the protective decorative top coats are separated by a breather paper. This means that the top coats and the insulant can move independently of each other.

However, because of the increases in surface temperature caused by the insulant not allowing the heat to dissipate into the substrate, cracking of the traditional sand/cement render coats are common.

Other slab systems enhance adhesion by having grooves cut into the board surfaces, so that not only is there chemical compatibility due to the addition of polymers into the coating but also a physical key, the limiting factor being the shear and tensile strength of the slab insulant.

The surface coating should be able to withstand a temperature range of −20°C to +80°C. No damage should occur as a result of a sudden temperature change, 50°C being taken as typical of the temperature of the outer skin.

These tests are carried out on a wall 2 metres × 3 metres on to which the complete system has been applied. The system is then subjected to 140 test cycles made up of:

1. 70°C for 3 hours
2. Spraying of water on to the surface at 20°C for 3 hours (1 litre m^{-2} min^{-1}).

After each cycle any damage is noted. When all the cycles are completed, the moisture content of the insulation is checked. Any cracking of the render surface means the system as a whole is a failure.

The need for such stringent thermal cycling can be seen by examining the daily variations in temperature of insulated wall surfaces facing west that have been coated in different colours (Figure 6).

The temperature variation in Figure 6 for white is from 16°C to 32°C, i.e. a 16°C change, whilst for black it is from 16°C to 64°C, i.e. a 48°C change. It must be remembered that the higher the afternoon temperature attained the more rapid is the heating and cooling.

In cases where the decorative protective coatings are applied directly to the surfaces of the insulant, the characteristics of the material must be taken into account. For example, the most used systems consist of expanded polystyrene boards, the board edges may be checked or tongue and grooved.

Shrinkage of the boards is substantial, and it is normal practice to allow the boards to stabilise for 2-3 months after manufacture so that a substantial proportion of the after-shrinkage has taken place. British Standard 3837:1977 sets limits for the dimensional stability of expanded polystyrene, and Figure 7 shows a typical graph of the rate of after-shrinkage for a 40 mm thick board of expanded polystyrene, density 20 kg/m^3.

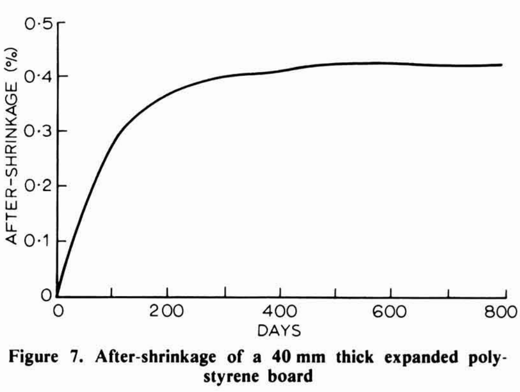

Figure 7. After-shrinkage of a 40 mm thick expanded polystyrene board

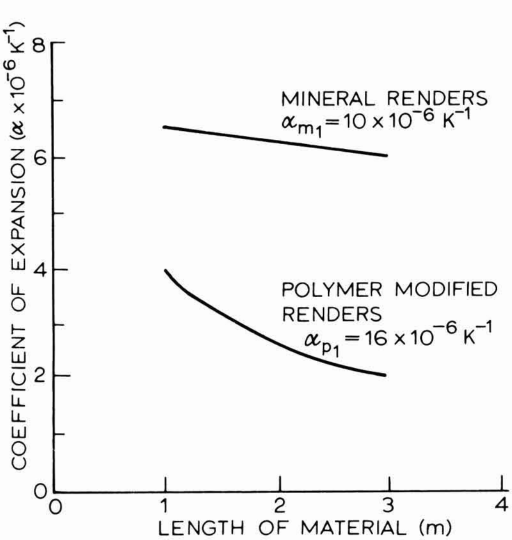

Figure 8. (α_{m_1} and α_{p_1} refer to the unrestricted coefficients of expansion)

Investigation into these parameters has led to the introduction of polymer modified renders. These may be produced by the addition of re-dispersible polymers to the dry blend, or by the addition of polymers on-site to dry pre-mixed render systems. It has been established that one of the differences between exclusively mineral renders and polymer modified renders is as the length of material applied increases the polymer modified renders demonstrate a reduction in coefficient of expansion. Being more elastic, the polymer modified systems withstand the thermal stresses imposed, whereas the mineral renders may show movements six times greater because of their inelasticity.

Conclusion

Only a number of the more important aspects which need to be considered in the design of external wall insulation systems have been discussed. The importance of understanding the complex interactions associated with providing the properties required cannot be understated. Although these systems are only beginning to be introduced into the United Kingdom, similar sytems have been used extensively on the Continent. In particular in Germany and France over the last 25 years these systems have become part of normal building practice. It is essential to thoroughly test these systems in the environment in which they are going to be used.

The need to conserve energy, renovate housing and solve problems of condensation are paramount in all our lives, and there is no doubt that these systems will be as familiar to people in the United Kingdom in the future as they are to people on the Continent today.

[Received 26 April 1983

The need for speed and accuracy in efficient production of coatings*

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Introduction

Over the last ten years, most large and medium sized surface coatings companies have computerised their administrative activities, at least in some measure. As a result, their control of the routine handling of orders, invoices, statements, credit control and, in some respects, finished goods stock control has greatly improved in speed and efficiency.

Leading from this has come a stream of statistics and management information enabling commercial and accounting functions to be directed in a way not previously possible.

What is surprising, however, is the slow progress which has been made in automation of the technical areas of many of these same companies, with perhaps the notable exception of instrumental colour control. It is commonplace to find companies who are administratively slick and efficient, yet when an order for production penetrates to the laboratory or the factory it follows a path which has altered little in decades. This involves manual preparation of documents using duplicating machines or photocopiers, manual adjustments to raw material and packaging stock control records and manual purchase order procedures, linked with costing techniques whose "simplicity" (often a synonym for inaccuracy) contrasts strangely with the apparent accuracy of the computerised systems of other departments. I say *apparent*, for many companies are under the illusion that their computerised calculations of gross profit per product or per sales region are virtually foolproof when, in fact, the cost figures utilised in the calculation may bear only a passing resemblance to what is actually taking place within the factory. If one doubts this statement, then please consider the variations in stock which are regularly found when physical stocktaking figures are compared with the theoretical ones derived from computerised commercial transactions.

Apart from these inaccuracies, often hidden under a cloak of technical jargon, the time factors are also extremely significant. Any procedure which requires the manual generation of paperwork at various stages takes a relatively long time to complete. The most worrying feature is that this is often accepted with complacency; the justification given for this is that the overall manual system, with its many built-in compensations developed over a period of time, works satisfactorily, whereas any attempt at automation might lead to problems. The same arguments could have been used to justify continuing the

*Paper presented at the Association's York Conference, 15-18 June 1983. An edited transcript of the discussion that followed this paper can be found on page 245.

use of clerks with quill pens sitting at high desks for bookkeeping, but fortunately these fallacious arguments were rejected on the commercial side.

In fact, the consequences of these administrative delays in production are every bit as serious to cash flow as weak credit control procedures but are seldom given the same prominence.

There is, therefore, a strong case for improving both the speed and accuracy of technical operations in many companies and this paper sets out to discuss the key elements which influence solutions.

Existing situation

Detailed examination of paint production units often throws up the following areas of difficulty:

1. Deliveries are a constant problem; even communications on what is happening within the factory are difficult.

2. Cost prices of finished goods items are inaccurate (although accounting and commercial management are sometimes blissfully unaware of variations).

3. Filled goods stock in the warehouse is too high in total and is often composed of the wrong items.

4. Accurate measurements of productivity are extremely difficult as no one really knows if labour is being effectively used or not.

5. Quality varies as the raw materials used may differ from batch to batch and utilisation of surplus and redundant stock is insufficiently controlled.

6. Handling losses in the course of manufacture are estimated but are not monitored against factual performance.

To suggest that introduction of modern automated procedures would immediately solve all these problems would be a gross over simplification. But experience shows that faster, clearer communications invariably improve management control, and the chemist or works manager who is made free of routine activities to concentrate on potential problems can usually solve them without too many difficulties.

System details

So what must an automated system do in order to satisfy all aspects of manufacturing efficiency? Obviously it must result in smooth deliveries, whether from warehouse or depot stock or alternatively by direct manufacture, so that sales divisions can offer their customers rapid service with accurate information on the progress of orders in hand. It must also provide the financial management of the company with exact information on cost prices, on stock levels and movements, on labour costs, overhead recoveries, and comparisons with budget forecasts. Most important of all, it must give technical management all relevant details on safety, performance, quality control, etc., and for production efficiency, the possibility of forward planning – allocating available resources of machines, men and material stocks to best effect. Finally, it must produce statistics and historical information which will assist in forward strategy and investment decisions.

With recent advances in computer technology it is now possible to do all these things utilising single entry, instant update procedures, similar in principle to those used for airline reservations with which most people are now familiar. Not only can these systems immediately reproduce batch manufacturing papers time after time, but they also permit immediate updating of formulations (both technically and with regard to cost) by simple *once only entry* of new information which is automatically transferred to every relevant formulation; compare this with a manual system when several thousand recipes may be involved!

In other respects these systems show great flexibility; the laboratory can evaluate on video screen the effects of potential formulation changes on cost, safety and stock availability without modifying the master file until everything is checked and decided. Factory management can test possibilities of substituting alternative raw materials to solve bottlenecks or of utilising redundant stocks for individual batches and, if it is decided to proceed, an accurate record of that individual batch is maintained, again without influencing the master file.

Raw material and packaging stock records are automatically updated with actual usage figures at the appropriate moment, and replacement purchase orders are triggered, based on fact rather than theory, awaiting the confirmation of management.

At this moment in the United Kingdom, legislation has been introduced to align the British surface coatings industry with its counterparts in the EEC regarding hazard labelling of products. This law means that each individual product must be evaluated for hazard to users by a series of calculations utilising constants for each individual component; worse still, each modification to a component or formulation must be rechecked to ensure continued compliance. Manually, the arithmetic takes about 30 minutes per formula, so a company with several thousand products faces a substantial problem in finding sufficient laboratory time; and as most companies modify a very significant proportion of their files each year, the problem becomes more or less continuous. However, by utilising computerised techniques, the calculations become virtually automatic, leaving the chemist free to decide on the key points.

In my opinion there are two key advantages in an automated system. The first is that the system is unambiguous: the laboratory, the factory and the cost accountant are all working every minute with the same formulations which is certainly not always true with manual systems, where blissful ignorance often reigns. Secondly, the automated system is once only entry with immediate transfer of all details: this means fewer operator errors and a very much faster flow of information throughout the complete chain. Correctly used, this can reduce stocks dramatically with substantial financial savings, as we will see later.

Being a dynamic system it is difficult to illustrate many of these points in static form, but figures 1 to 6 show the sort of information and documentation available from a computerised system, with indications of the variations possible. Needless to say, each production unit has its own particular needs but these normally represent changes in emphasis rather than fundamental differences. The computer can adapt readily to these specific demands; the layout of documents, the number of copies produced, the form of statistical reporting can all be modified to meet individual requirements. However, it is not intended to go into the detail of alternative computer configurations in

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STOCK CODE  MAN-4        Manufactured product 4            Manufactured                    Today  260483
                                                                                  Effective from  010383

  PROPERTIES          COSTING      Litre    Kilo      PLANNING                        HAZARDS

    UoM  K              Last RM     0.00    0.00      Manufacturing                    Handling   Irr
     SG    1.091     Current RM     0.58    0.53         Machine        MMM1        Flash point    70
   Vsol   18.05       Future RM     0.75    0.69       Setup hrs        5.00
   Hcarb  60.00                                          Run hrs        0.02          Gross lead    5.00
   Loss    2.00       Inter man     0.01    0.01        Cost/hr        10.00        Soluble lead    2.50
                     Production     0.27    0.25
  STOCKS                                              Filling                            Status
                     Total Cur.     0.88    0.81         Machine        FFF1
  Minimum       0    Total Fut.     1.06    0.97       Setup hrs        2.00
  Maximum       0                                        Run hrs        0.01
  Current    5000    Change date                         Cost/hr        4.00
 Customer                  Block          0
                                                           Level        1
                                                       Min batch         250
                                                       Max batch        8000

 COMPONENTS

 Code      Pct       Description              Handling  Ins         Manufacturing Instructions

PIG-1     30.00 Pigment 1                    Dust
INT-1     20.00 Intermediate 1                          M01  MIXING :- Mix for 10 minutes until dispersion is complete
                                                                      Remix if left for more than 1 hour before use
SOL-1     50.00 Solvent 1                    no spark

 TESTING

                                                        T01  TEST STANDARD :- Test to MOD standard specified for
                                                                              approved items

                                                        T03  TEST STANDARD :- Test all physical properties to within
                                                                              10% of specification


  E E C  CHEMICAL DATA

  E E C No     Pct       Risk codes            Safety codes          Chemical description


USED-IN

 Code      Pct       Description              Handling  Ins         Manufacturing Instructions
```

Figure 1. Typical formulation sheet – also showing costing and safety information

```
Scode  MAN-4            Manufactured product 4                                      Date  260483
---------------         ------------------------------

Flash point   15     Fire hazard          Cipher a - 4  R 11
                                                         R11          Highly flammable

 SOLVENT SUMMARY                                       No Solvent items

 LEAD   SUMMARY

  E E C No     Pct      Grs-%   Sol-%      Actgrs  Actsol
 082 002 00 1  21.00    100.00  60.00       21.00   12.60
                          TOTALS             2.10    1.26
          Soluble total exceeds 1.0Cipher c=4 -Preparation is harmful   P 50    R 20/22-33    S 20/21
                                                         P50          Contains lead - should not be used on surfaces
                                                                      liable to be chewed or sucked by children
                                                         R20/22       Harmful by inhalation and if swallowed
                                                         R33          Danger of cumulative effects
                                                         S20/21       When using do not eat drink or smoke
 PAINTS SUMMARY

 E E C No     Pct   *-- Range 1--* *-- Range 2--* *-- Range 3--*

082 002 00 1  21.00   0.10 T 100.00  0.05 X   0.10  0.00 _   0.00 Lead alkyls


              NOTIFIABLE CHEMICALS
  E E C No      Risk phrases              Safety phrases        Haz  Cipher-d

 082 002 00 1   26/27/28-33             13-26-36/37-45            T      4
                                                         R26/27/28    Very toxic by inhalation in contact with skin and
                                                                      if swallowed
                                                         R33          Danger of cumulative effects
                                                         S13          Keep away from food drink and animal feed stuffs
                                                         S26          In case of contact with eyes rinse immediately
                                                                      with plenty of water and seek medical advice
                                                         S36/37       Wear suitable protective clothing and gloves
                                                         S45          In case of accident or if you feel unwell seek
                                                                      medical advice immediately (show label where
                                                                      possible.


 SUBSTANCE SUMMARY

  E E C No        Pct   Haz        N                        Chemical name

 605 013 00 0     37.50  X         *                 (R)-1.2-O-(2.2.2-Trichloroethylidene)glucofuranose
 606 002 00 3     10.00  F                           Butanone

 Toxic Total      0.00   T     1.0
 Harmful Total   37.50   X    10.0
 Corrosive Total  0.00   C     5.0
 Irritant  Total  0.00   I     5.0
 Oxidising Total  0.00   O    25.0

               NOTIFIABLE CHEMICALS
  E E C No      Risk phrases              Safety phrases        Haz  Cipher-d

 605 013 00 0   20/22                   2-16-24/25-28            X      2
                                                         R20/22       Harmful by inhalation and if swallowed
                                                         S2           Keep out of reach of children
                                                         S16          Keep away from sources of ignition - No smoking
                                                         S24/25       Avoid contact with skin and eyes
                                                         S28          After contact with skin wash immediately with
                                                                      plenty of (to specified by the manufacturer)
```

Figure 2. EEC hazard labelling summary – showing label recommendations

this paper but rather to illustrate in general terms the influence of speed and accuracy on the manufacturing process, and to try to assess the benefits relative to cost factors.

```
STOCK CODE  RES-1        Resin 1                         Raw                              Today  260483
                                                                                 Effective from  010383

  PROPERTIES          COSTING      Litre    Kilo      PLANNING                        HAZARDS

    UoM  L              Last RM     0.35    0.29      Manufacturing                    Handling   Fumes
     SG    1.200     Current RM     0.35    0.29         Machine                    Flash point    68
   Vsol   30.00       Future RM     0.46    0.38       Setup hrs        0.00
   Hcarb  10.00                                          Run hrs        0.00          Gross lead    2.00
   Loss    2.00       Inter man     0.00    0.00        Cost/hr         0.00        Soluble lead    2.00
                     Production     0.04    0.03
  STOCKS                                              Filling                            Status
                     Total Cur.     0.40    0.33         Machine
  Minimum   10000    Total Fut.     0.50    0.42       Setup hrs        0.00
  Maximum   30000                                        Run hrs        0.00
  Current   17000    Change date  010683                 Cost/hr        0.00
 Supplier   110   Norway     Block          0
                                                           Level       99
                                                       Min batch          0
                                                       Max batch          0


  TESTING

                                                  G02  GOODS INWARD CHECK :- Test density  moisture and colour
                                                                             before acceptance


  E E C  CHEMICAL DATA

  E E C No     Pct       Risk codes            Safety codes          Chemical description

USED-IN

 Code      Pct       Description              Handling  Ins         Manufacturing Instructions

MAN-1     20.00 Manufactured product 1       Irr
MAN-2      5.00 Manufactured product 2
```

Figure 3. Raw material record – showing current and future unit cost and "used-in" list

```
                                      MANUFACTURING ORDER

Batch No     2  Week 8319                                                       Date of issue   260483
Code  MAN-1                  Manufactured product 1          Handling   Irr
                                   Customer      ALBERTS                        Date made

Batch Quantity    875 L          M/C  MMM1
                 1000 K          Max  8000  Min   250                    Quantity made

     Code      Litres  Kilos         Description            Handling         Actual code     Quantity used

 1  PIG-1         360    900    Pigment 1                   Dust        1
 2  RES-1         500    600    Resin 1                     Fumes       2

     MIXING :- Mix for 10 minutes until dispersion is complete
                Remix if left for more than 1 hour before use

 3  SOL-1        1765   1500    Solvent 1                   no spark    3


     TEST STANDARD :- Test to MOD standard specified for
                      approved items

     TEST STANDARD :- Test all physical properties to within
                      10% of specification



                                           FILLING  INSTRUCTIONS                          Date 260483

BATCH 1          Scode MAN-2     Manufactured product 2
Volume    1000            Handling                                            Date filled
 Machine  FFF2    Week 8319


*------------------------ PLANNED -------------------------* *--------------------- ACTUAL ------------------------*
 Can-ref       Description        Size       No       Vol      Can-ref      Description        Size      No      Vol
 CAN-1       CAN DESC 1           10.000      50       500
 CAN-2       CAN DESC 2           25.000      20       500


             LABEL                                       Totals


 TEST STANDARD :- Test all physical properties to within
                  5% of specification
 FILTERING :- Strain through GAF filter taking special care
              to exclude skins and deposits
```

Figure 4. Manufacturing order and filling instruction – showing planned and actual recording

STOCK LEVELS — Date 260483

CODE	Description	UOM	L-stock	K-Stock	C-Price	F-Price	C-Value	F-Value	Gain
INT-1	Intermediate 1	L	9500	9111	0.76	0.83	6924.36	7562.13	637.77
MAN-1	Manufactured product 1	K	7498	8570	0.45	0.61	3856.50	5227.70	1371.20
MAN-2	Manufactured product 2	L	6110	6690	2.01	2.11	13446.90	14115.90	669.00
MAN-3	Manufactured products 3	L	2500	3323	4.14	4.33	13757.22	14388.59	631.37
MAN-4	Manufactured product 4	K	4583	5000	0.54	0.70	2700.00	3500.00	800.00
PIG-1	Pigment 1	K	1400	3500	0.77	1.02	2695.00	3570.00	875.00
PIG-2	Pigment 2	K	917	2750	1.00	1.02	2750.00	2805.00	55.00
RES-1	Resin 1	L	17000	20400	0.30	0.39	6120.00	7956.00	1836.00
RES-2	Resin 2	K	18182	20000	1.22	1.23	24400.00	24600.00	200.00
RES-3	TEST RES 3	L	5500	5500	0.00	0.00	0.00	0.00	0.00
SOL-1	Solvent 1	L	15000	12750	0.30	0.42	3825.00	5355.00	1530.00
SOL-10	Solvent 10	L	15000	14250	0.30	0.42	4275.00	5985.00	1710.00
SOL-2	Solvent 2	L	24865	19892	0.59	0.61	11736.28	12134.12	397.84
STN-1	Stainer 1	L	750	750	28.00	28.00	21000.00	21000.00	0.00
STN-2	Stainer 2	L	150	188	32.00	33.60	6016.00	6316.80	300.80
X1	TEST RM X1	L	100	100	0.00	0.00	0.00	0.00	0.00
X2	TEST RM X2	L	50	50	0.00	0.00	0.00	0.00	0.00
Y1	TES MANUFACTURE Y1	L	25	25	0.00	0.00	0.00	0.00	0.00

A/D	CODE	TOTALS THIS BATCH / LISTING	Week	Quantity				
				129130	132849	123502.26	134516.24	11013.98
A	INT-1	1	8318	5000				
A	MAN-1	2	8319	1000				
A	MAN-2	3	8317	1500				
A	MAN-3	4	8320	750				
A	MAN-4	5	8319	500				

Figure 5. Stock report

BATCH COST MANAGEMENT REPORT Date 260483

CODE	DESCRIPTION	PLANNED Litres	PLANNED Kilos	PLANNED Cost	ACTUAL Litres	ACTUAL Kilos	ACTUAL Cost
INT-1	Intermediate 1	5000	4795	3620.98	5005	4800	3623.30
MAN-1	Manufactured product 1	875	1000	1284.00	873	998	1284.85
	TOTALS	5875	5795	4904.98	5878	5798	4908.15

BATCH COST REPORT Date 260483

CODE	DESCRIPTION		QUANTITY	COMPONENT	Litres*	Kilos	COST
INT-1	Intermediate 1						
		PLANNED	5000 L				
				RES-2		2398.0	2925.56
				SOL-1	2821.0		695.42
PLAN/Litre 0.7242	/Batch 3620.98						
		ACTUAL	5005 L				
				RES-2		2398.0	2925.56
				SOL-1	2821.0		695.42
				SOL-2	5.0		2.32
ACT /Litre 0.7239	/Batch 3623.30						

BATCH COST REPORT Date 260483

CODE	DESCRIPTION		QUANTITY	COMPONENT	Litres	Kilos	COST
MAN-1	Manufactured product 1						
		PLANNED	1000 K				
				PIG-1		900.0	675.00
				RES-1	500.0		174.00
				SOL-1	1765.0		435.00
PLAN/Kilo 1.2840	/Batch 1284.00						
		ACTUAL	998 K				
				PIG-1		905.0	678.75
				RES-1	495.0		172.26
				SOL-1	1760.0		433.84
ACT /Kilo 1.2874	/Batch 1284.85						

Figure 6. Batch reporting – shown at two levels of detail

Time factors

Let us consider the time factor in routine production and filling operations, starting from the origination of the order (whether from warehouse or from a direct customer order) until the correct quantity of approved finished goods is entered into stock or recorded as ready for despatch. You may think the following sequence is pessimistic but, in my experience, it is fairly representative and has its effects on the overall picture. Of course the chain can be shortened for individual rush orders, but usually at the expense of other items in the waiting list.

Day
1. Replacement order raised by distribution warehouse.
2. Received in factory, passed to planning section.
3. Production line and batch size selected, manufacturing documents requested.
4. Documents issued, raw materials checked and reserved.
5. Container stocks checked, held until quantities confirmed.
6. Documents released to production section.
7. Production starts; depending on the type of product and the complexities of manufacture, the total manufacturing time may be only a few hours or several days. We will assume one day only for this exercise.
8. After approval the batch is filled, labelled and over-packed.
9. Batch is passed to warehouse.
10. Finished goods stock records are updated.

In practice the total period probably averages 15 days, but with considerable variations due to product pattern. However, the time spent on administrative transfers remains fairly constant and is normally four or five working days. This can be thought of as the *Admin Delay.*

This has repercussions on the level of filled stock on the warehouse shelves. The distribution manager must obviously cater for the total time lapse in executing his stock replenishment order; he can only do so by raising his

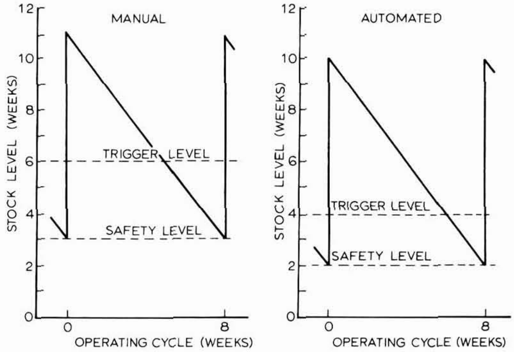

Figure 7. Comparison of stock movement cycle, manual versus automated production systems

re-order point to a safe level, leading to an overall increase in his finished goods stock value.

A parallel situation exists within the factory in the ordering of raw materials and packaging. Stocks are often reserved days or even weeks before manufacture actually starts. Furthermore, the period between the production unit requesting replacement deliveries and the actual purchase order, fully authorised, leaving the company can run to three or four working days, which is, of course, a further Admin Delay. Again, the normal solution to this problem (although many companies are not aware that any problem exists) is simply to elevate re-order points to a "safe" level at the expense of the company's overdraft.

The influence of Admin Delays on stock levels is illustrated in Figure 7, where the stock cycle is followed for a manual system with its Admin Delays in direct comparison with an automated system – the profound influence of instant communication is apparent. Without any change in batch size for this example, the average stock has fallen from 56 units to 42 units, a reduction of approximately 25 per cent.

But why should we assume that batch sizes are sacred? Admittedly there are very strong relationships between batch size and the unit costs of making a product, the graph usually following the curve shown in Figure 8.

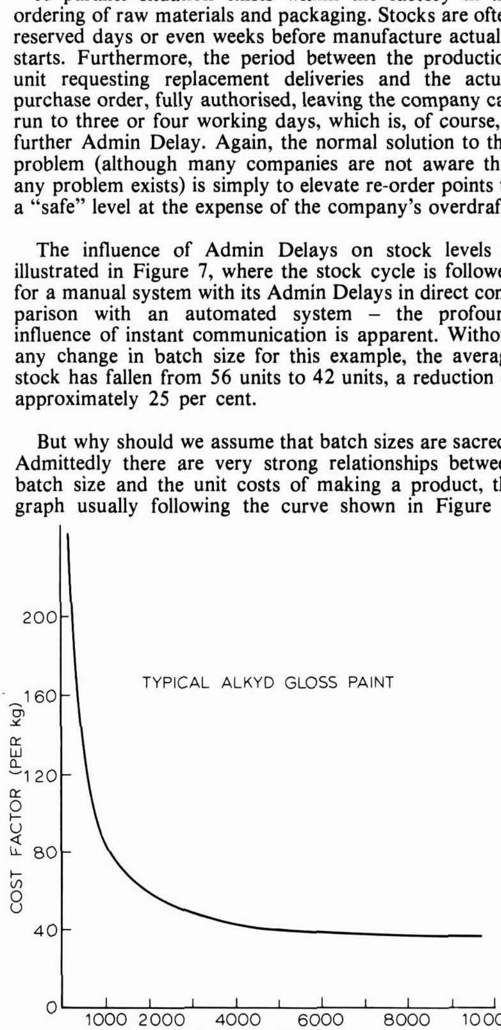

Figure 8. Effect of batch size on production cost

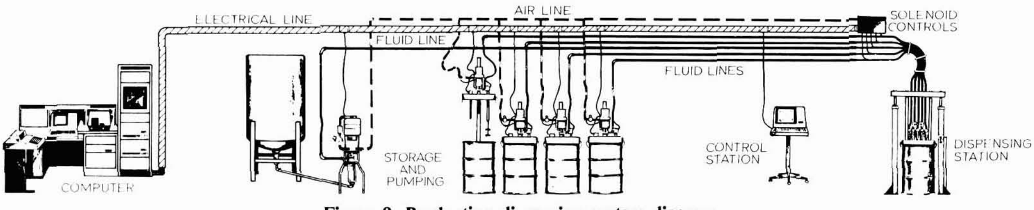

Figure 9. Production dispensing system diagram

However, calculations of this type often conveniently forget to include the cost of financing additional stock and the high cost of warehouse space. These factors become of real significance when a complete colour range is being supplied, such as a retail do-it-yourself range or British Standard colours for the trade sector. Here an economic batch may result in six months or more of filled goods stock in a variety of pack sizes, assessed by the distribution manager on historical figures.

In such cases, it is possible as an alternative to utilise computer technology to achieve speed and accuracy in smaller batch sizes. Two examples of this are given below:

1. The preparation of individual packs of a required colour using a dispensing machine, with computerised prediction of colour.

   This has the advantage of immediate preparation in the actual package, thus avoiding cleaning of vessels, straining, etc. However, it does introduce some risks, notably:

   - The dispensing cylinders are of limited accuracy, particularly at low dosage levels.
   - Operator error is a constant risk, except in the most sophisticated machines.
   - Where universal colorants are employed with the aim of restricting the number of colour concentrates to a sensible number, there can be technical disadvantages in gloss, drying time, opacity and available colour range.
   - The labour cost of mixing, dispensing, shaking and individually labelling is extremely high per unit, especially with small pack sizes.

   Nevertheless, where a demand pattern involves small quantities of many colours, and where demand is erratic, there is an excellent case for dispensing machines, but with appropriate safeguards.

2. Preparation of small factory batches by computer controlled mechanised systems.

   In effect this is based on the same principles as the first example above, but applied on a factory scale to produce batches in the range 200 litres to 2,500 litres and beyond.

   It overcomes most of the risks listed above, as accurate metering pumps which are computer controlled dispense the exact quantities untouched by human hand. It is still necessary to stir, strain and fill the final blend (and this is a not inconsiderable cost for small batches, particularly those filled into small containers) but in many cases this high cost per unit is more than compensated by the financial savings in stock.

A diagrammatic representation of the mechanics of such a system is shown in Figure 9. With this arrangement, and utilising pre-tested standardised intermediates (colour concentrates), it is possible to produce small batches exactly on shade and viscosity within a few minutes of pressing the button!

The incredible effect on stock levels is illustrated in Figure 10, where a troublesome colour, normally requiring an economic batch size which represented four months of sales, plus of course the traditional three weeks delivery from the factory, is compared with the same product made by computer controlled dispensing techniques. Here the stock reduction is to almost a quarter of the conventional manual system!

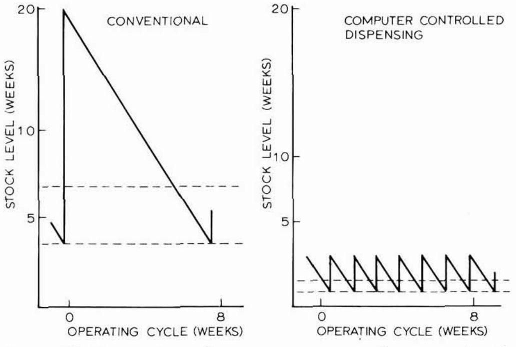

Figure 10. Comparison of stock movement cycle, conventional technique versus computer controlled dispensing procedure

Once again, these examples are simplified in order to illustrate the point. In practice it is necessary to include factors such as unit raw material cost, batch handling loss, relative cost of storage (bulk items in tanks versus warehouse shelf space) and the effects of erratic stock demand, which can make forecasting a nightmare when projecting several months ahead.

Also, only two examples are given briefly above. It is, of course, possible to design all sorts of compromise solutions, for example dispensing directly into 20 litre pails or utilising weight controlled manual additions to minimise the investment in equipment. Each production unit must analyse its specific mix of products and determine the optimum answer, both technically and economically, to achieve speed and accuracy. With some experience this is not so difficult.

Cost factors versus benefits

But what about the cost of introducing automated techniques? Well here, by good fortune, those who have delayed computerisation have an advantage. The cost of computer hardware continues to drop whilst the available speed and power continues to improve. Compact machines are currently on offer which surpass the computers of a few years ago, which required a suite of air conditioned rooms. This new generation costs, in real terms, only a fraction of earlier models, bringing computerisation within everyone's grasp.

However, a major part of the cost of automation lies in the software, that is the programs which drive the computer and direct its many functions. In general terms, the cost of software can be measured by the number of programming hours involved, including the salary and social costs of skilled systems analysts and programmers plus the many computer hours necessary for development. To write a complete system for laboratory, purchasing and production procedures within a major organisation could take several man-years and consequently the full cost of such a one-off project would be of the order of £40,000 to £60,000. Naturally the end result is a bespoke system which integrates with existing systems in that company.

Fortunately for smaller concerns, it is now possible to purchase ready made software packages, similar to those widely available for many commercial functions, and these accomplish more than 90 per cent of the average company's technical requirements. They can readily be adapted by skilled programmers to meet exact needs in a relatively short time. These standard packages are, of course, very much cheaper, the actual cost being dependent on the degree of tailoring required which in turn depends on the complexity of operations. The cost can also be influenced by purely commercial considerations, for software is often used as a bargaining point in a total offer involving computer hardware. Thus for a company considering purchase of new or additional equipment, there are excellent possibilities to obtain valuable software, such as packages designed specifically for the technical side of the coatings industry, at a discounted price which could be as low as £2,000!

If we consider a medium sized company, or an individual production unit within a larger organisation, making several thousand different products from a raw material inventory numbering perhaps 700 items, then, in my experience, most of the operations discussed earlier can be accommodated on a single-user basis on a computer with a 64K processor and a memory of about 5 megabytes. In some cases this same set-up will also handle all commercial and accounting functions in a smaller concern. Translated into cost terms, the complete cost of an automated laboratory, purchasing and production administrative system would look like the following:

64K processor, single-user VDU screen, printer and disc drive with 5 Mbyte available memory	£5,000
Essential software for computer operation plus special package for lab/purchase/production activities (allowing for some tailoring)	£7,000
Total investment	£12,000

This is considerably less than the cost of purchasing a spectrophotometer with dedicated computer for colour control work.

Everyone realises that a colour computer will result in faster and better colour matching. Similarly, the use of minicomputers allied with laboratory instruments, such as a gas chromatograph, is widely accepted as justified on the grounds of efficiency. And yet it is difficult to place an exact figure on the benefits which result from their use. With automated administration it is comparatively easy to identify the main savings, although there are in addition a host of further benefits which it is difficult to quantify.

Let us concentrate on the savings in financial costs due to reduction in stock levels. Obviously the potential savings vary with the complexity of the unit (expressed in terms of numbers of products made, raw materials utilised, packaging employed, geographical layout etc., all of which affect internal and external communications). For instance, a unit making a simple range of emulsion paints from a very restricted range of raw materials will show less benefit than an industrial unit with a complex product range using a multitude of raw materials. Generally speaking, the financial savings are found in practice to approximate to 1 per cent of the annual raw material bill for the unit, but with a bracket either side for the reasons given. From experience, an assessment can be made for any individual unit and this can be used to test the feasibility of the investment. If we return to the earlier example of the medium sized company, and if we assume an annual bill of £2 million, then the 1 per cent rule of thumb indicates potential savings of £20,000 per year or, in other words, a pay-out of approximately six months on investment.

With this rapidity of pay-out it is often advantageous for a company with existing computer facilities on the accounting side to adopt the complete technical package, complete with its dedicated hardware, and realise the savings at the earliest possible moment. In the course of time, when all modifications and improvements have been completed, it is then practical to consider a smooth integration with accounting systems, which can be accomplished without any pressure. In many ways this is preferable to developing completely new technical systems from scratch to be superimposed on a complex commercial structure, which may have grown in a haphazard manner over the years and itself be in need of an overhaul. Of course, this leaves a minicomputer (already written off) spare at the end of the exercise but this is an advantage rather than a problem. However, each company must decide on the basis of its current commitments, and probably the company which has no computer facilities whatsoever is the one with the simplest decision to make.

Switching now to the automated dispensing of colour concentrates to produce small production batches, obviously the investment depends again on the complexity of the envisaged computer controlled operations. To give some indication, however, in my experience the investment lies between £20,000 and £100,000. Consequently, one must carefully evaluate the potential colour ranges, calculate the stock level benefits, the reduction in colour matching costs and the commercial advantages in giving rapid response to customers' orders, before a meaningful pay-out can be predicted.

Future trends

All of the preceding procedures are immediately possible today, but what of the future? Perhaps we will see developments, in parallel with the paperless office concept, whereby all information is relayed and recorded electronically. Manufacturing details would be passed to the production unit via video screen, displayed at key points at the command of the foreman, updated at each stage by the simple pressing of a button, with the entire sequence being followed in summary on the wall of the works manager's office, supplemented by full colour displays on VDUs when necessary.

This may seem like science fiction but, if current progress in the electronics industry continues at the same rate as in recent years, nothing is impossible and the days of passing paint stained paperwork round the factory circuit could well be numbered.

Conclusions

The use of computerised techniques for increasing the speed and accuracy of laboratory and production administration in the surface coatings industry is now possible and gives numerous benefits, among which can be listed:

- Faster communications at all stages of formulation and manufacture.
- An overall reduction in stock levels, with consequent savings in financial charges and lower demands on warehouse space.
- A constantly updated record of formulations, from both technical and costing angles, including hazard labelling requirements.
- Improved production planning with men, machines and materials.
- Release of skilled management time from routine activities to concentrate on important decisions.

The necessary investment in computer hardware and relevant program packages can be repaid very quickly, in some cases within a few months.

Possibilities also exist for automated dispensing systems, which can substantially reduce stock levels in the warehouse leading to further reductions in financing charges and thus improved profitability, but viability depends on the volume and complexity of the product ranges under consideration.

[Received 16 February 1983

Automated paint manufacture*

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Summary

The central topic of this paper is the design and operation of an automated plant for the large scale manufacture of decorative paints and these subjects are discussed in detail. It is not possible to highlight essential features of operation without reference to the manufacturing plant and equipment, raw material measuring systems and services to the plant such as liquid and powder supply. Of these, liquid and powder supply plus the "in-process" weighing or metering of raw materials are discussed to help illustrate the flexibility of operation of the plant and the demands imposed on these services by an automated process.

The calculations necessary to determine the numbers of mixers, mills, thinning tanks etc. were completed in the full knowledge that the finished plant would be fully automated and, with one exception, this detail is not specifically relevant to the major topics discussed.

Plant design – general considerations

For both technical and commercial reasons, any proposed investment in new plant or process must generate: an adequate return on the capital to be employed, significant technical advantage, or some combination of these factors. These criteria are usually satisfied by the cumulative effect resulting from a number of changes from current practice. The potential for financial gain exists in lower levels of staffing, raw material and finished goods stock, "in process" losses, and reduced volumes of product to be reworked or dumped.

Within the decorative paint manufacturing industry, the formulating chemist exerts a major influence on the factory gate price of any product by keeping raw material costs at the minimum level consistent with the maintainance of specified properties. Hence, any new plant or process must not only satisfy immediate technical objectives but also allow the development chemist full licence to change or modify formulae throughout the proposed life of the installation. The flexibility of operation implied by this constraint should ideally be possible without the need for further capital expenditure.

Increased efficiency of operation is another subject for investigation during the planning stage of a project, as better use of the resources of plant, materials and labour all contribute to reduced operating costs. The total efficient control of manufacturing operations is best achieved by the introduction of mechanical handling systems in conjunction with the use of microprocessors or computers.

The dedicated process control computer can be used to store formulation data along with full manufacturing instructions, distribute and measure raw material to the appropriate equipment, route in process product to the thinning tank, log the batch and cumulative raw material consumption as well as controlling stock levels in the warehouse.

Labour savings

The cost of labour in any plant can be reduced by providing the workforce with equipment that replaces labour intensive operations. In the case of paint manufacture, manual handling of pigments is one such function that may benefit by the introduction of powder handling and distribution systems. These systems are relatively easy to control by automatic means and bulk pigments such as titanium dioxide and extenders can be

*Paper presented at the Association's York Conference, 15-18 June 1983. An edited transcript of the discussion that followed this paper can be found on page 245.

stored in silos from where they are delivered directly or indirectly to the point of use. Silos can be loaded from either road tankers, 1,000 kg big bags or 25 kg paper sacks. Possibly the most apparent potential for labour saving is seen in the case of tanker delivery, where a 20 tonne delivery of pigment can be discharged into a silo in approximately one hour with only the occasional intervention by production staff. Feed from the silo to the mixer being automatic results in tanker discharge supervision being the only time spent in handling the equivalent of 800 × 25 kg paper sacks.

In comparison, a 20 tonne delivery in 25 kg sacks would involve a fork-lift truck driver unloading the truck, transporting the material to store and finally delivering from store to the production area on demand. The machine operator must then manually slit and tip the bags into a mixer and bale the empty bags for disposal via the fork-lift truck driver. The advantage to be gained by loading silos from 1,000 kg big bags or paper sacks are less dramatic but still significant.

By releasing the machine operator from the arduous task of bag handling, further labour economies are possible as the operator can assume responsibility for more than one piece of equipment. Experience in the plant referred to later in this paper has demonstrated that, under these circumstances and with the assistance of an automated system, one operator can control the operation of two mixers and two secondary dispersers. An automatic plant control system also introduces the possibility of raw material stock levels being updated either on demand or on a daily or weekly basis without the need for clerical work.

Efficient use of machinery

The most popular colours of paint in the UK include white, which along with pastel shades tinted from white bases account for around 60 per cent of sales volume. Because of this, tanks for storing or "accumulating" concentrated white pigment dispersions are included in the plant design. This pre-manufacture of pigment dispersions allows mixers for white products to be used to their ultimate capacity at all times, i.e. a 4,500 litre mixer can produce a full charge with the maximum pigment content each time it is used.

Hence, the mid-production line buffer releases the mixers from the influence of demands for various batch sizes, allows efficient operation and can, in certain circumstances, reduce the number of mixers required to manufacture a given volume of paint.

A stock of finished mill base in the middle of the production line enables the manufacturing process to be more of a continuous operation, the mill base being treated as just another of the liquids to be mixed for production of the finished paint. This facility gives potential for a rapid response to changes in demand levels for white products by isolating the pigment dispersion process (often the most time consuming operation) from the finishing operation. Additionally, during periods of heavy demand for a particular product, all premixing equipment can be committed to that product while other qualities are manufactured from the stored mill base.

The availability of pre-manufactured pigment dispersion facilitates the laboratory evaluation of all relevant combinations of current raw materials. With operating experience, the completion of specially developed accelerated tests and the high level of process control afforded by a computer system, product can be packed, if necessary, in advance of results of the conventional 16 hour drying test being known.

Mechanical or electrical equipment failures at either end of a group of interrelated machines become less critical with the accumulator facility, as at least part of the machine group can be operated normally for two or three days before being affected by the breakdown.

The precise control of manufacture made possible by use of a computer system enables the master formulation issued by the laboratory to be closely matched in the plant. Formulations can include automatic tank or machine cleaning instructions using a part of the free solvent present in the formulation. This cleaning solvent being part of the batch in progress gives some saving of raw material and tight control over usage. Other examples of economies of this type include accurate addition of pigment quantities without the need to use part bags.

Mechanical handling of raw materials – liquids

Liquid raw materials are often stored in a tank farm that may be quite remote from the manufacturing plant, and delivery to the plant would be by pumps and pipelines. To enhance the efficiency of the manufacturing operation, mixer and vessel loading times should be minimised. In the case of 4,500 litre premixers where, for a typical white product 2,000 kg of liquid raw materials may be required, liquid loading times would be excessive if the pump and pipeline could only deliver 500 kg/hour. Transfer rates of 20 tonnes/hour are necessary because it must be remembered that a single delivery pipeline may be feeding more than one point at the same instant. With the required flowrate established it is a simple matter to calculate the size of pump and line necessary.

In order to smooth liquid flowrates it is advisable to lag and heat lines and tanks to guard against the possibility of large viscosity increases caused by winter temperatures. Failure to adopt this precaution may result in the generation of high pipeline pressures causing leaks and pump damage.

The transfer of pigmented pastes from a high speed mixer or at any subsequent stage of manufacture can be effected by pressure techniques. These methods require a ready supply of large volumes of compressed air and specially designed vessels incorporating shaft seals and pressure relief valves etc. Advantages of the system include the absence of pumps, whose rotors and seals may rapidly wear when handling abrasive slurries of titanium dioxide, and clean and leak free operation with pipelines left empty on completion of the transfer. Flowrates of 20 tonnes/hour at differential pressures of around 2 bar can be achieved with high viscosity mill bases. Low viscosity materials such as finished paints can be moved at rates of up to 200 tonnes/hour under the conditions specified earlier.

By these and similar techniques the ratio of mixer charging to running times can be decreased and more pugs/day are possible.

Mechanical handling of raw materials – solids

The automatic mechanical handling of solids allows a choice in the method to be used: pneumatic transfer and screwing or other forms of conveyoring all being possible.

In the paint industry, bulk pigments are probably best transferred by screwing or blowing or a combination of these techniques. Whichever method is selected it should allow the raw material purchasing department to obtain supplies in paper sacks, big bags or tanker loads, enabling the astute buyer to obtain material at the most advantageous price.

To process raw material in these forms a bag slitting and emptying machine, silos and big bag discharge unit are essential. Under ideal conditions all bulk pigments fed to mixers should emanate from the silos, as use of other methods requires the instant availability of labour when pigment is demanded by the manufacturing process.

Powder feed from the storage silos to the plant can be via screws, but this is only practicable if the mixers are sited immediately adjacent to the silos. Blowing is often the more practical method and by this technique pigments are transferred and weighed either directly into the mixers or into ready-use hoppers from which they are fed to the plant on demand via a screw conveyor. In each case the addition method should be capable of dual speed operation, high speed to get the bulk of the powder into the mixer and slow to aid accurate weighing and pigment incorporation at the end of the addition. Dependent on the blowing line size, distance, number of bends and valves, transfer rates of 12 tonnes/hour can be achieved and this speed of addition is considered to be close to the maximum tolerable when using conventional high speed mixers.

To obtain satisfactory transfer rates through a bag slitter, it is essential for the bag to be cut cleanly and the whole empty bag disposed of. If a clean cut is not possible, a separator screen is essential to prevent small pieces of paper falling with the bag contents. The screen serves two functions, to prevent paper fouling the rotary discharge valve and thus prevent paper entering the paint making machinery. A significant disadvantage to the screen separation technique results from the different flow properties of common raw materials: increasing the screen mesh size to allow adequate passage of "sticky" powders also increases the chance of paper passing through the screen. When fitted with an empty bag baler and a dust extraction system feeding back into the powder blowing line, much cleaner operation is possible than with slit and tip techniques. Big bags can be emptied with a minimum amount of dusting via a tundish arrangement incorporating a rotary valve. However, folding of the empty bag for return to the supplier may generate a lot of dust.

Mechanical handling – measuring

Weighing techniques must be used for powders and this can take place in the mixer, a ready use batch hopper or in some cases at the powder source, i.e. the silo. If the latter is chosen restrictions are placed on when the silos can be filled. In the first two cases the weighing vessels can be hung from or mounted on load cells. Both methods demand that all pipelines into or out of the vessel be fitted with flexible couplings so that all downward forces caused by increase in weight are transferred to the load cells and not the pipework. Regularly used solids added in small amounts require an extra system because of the difference in scale of the additions and the accuracy demanded by the formulator.

Liquids permit a choice between metering or weighing methods and in the paint industry a combination of both is probably best. Resins are eminently suitable for weighing as this removes some of the uncertainty associated with metering a raw material whose specific gravity may vary from batch to batch and certainly does with change in temperature. Solvents can be either weighed or metered but, because the weight of a solvent addition may be small compared with a resin addition, metering is a more suitable method which avoids the need for a separate weighing system.

In an oil paint plant where batch sizes vary considerably, driers and other small additions may present measuring problems. If a weighing system is provided to match the scale of additions required in large batches, the accuracy of the system may be insufficient for small additions in small batches. In these circumstances a combination of either different sized weigh tanks or weighing and metering facilities provides a satisfactory system. Small quantities of driers can be delivered to a batch of paint by the use of positive displacement metering pumps sited in small automatically filled reservoir tanks, while larger quantities are added via a weigh tank.

Manufacturing equipment

It is impossible to generalise on choice of equipment for all sizes of plant, as the machinery required to produce small batches of strong shades will be totally unsuitable for the production of large volumes of white products. Hence matching the production machinery to the current and projected demands on the plant is vitally important. For large volumes of white products, high speed mixing followed by refining through a bead or perl mill is eminently suitable. In this case the high speed mixer presents few problems especially if loading and discharge times are short. However, selection of a refining mill that can keep pace with the output from the mixer is not always straightforward. This is especially true if excessive pressures and temperatures have to be avoided for the sake of product quality. In these circumstances, where the performance required of the secondary disperser is quite specific, there exists a strong case for modifying a standard machine to suit process demands. By changing the characteristics of the secondary disperser it is possible to match the output of large pre-mixers with relatively small machines at a low energy cost.

Smaller high speed mixers manufacturing a range of strong shades present a different set of problems, not the least of which is avoidance of excessive product or solvent loss during discharge and subsequent cleaning. This is especially true when dealing with thixotropic mill bases, where the installation of a bottom entry close fitting side scraper in the mixing vessel can be of great benefit.

The action of the side scraper is two-fold: it aids homogeneous mixing and therefore prevents the generation of excessive local heat, and, possibly more importantly, can be left running during mixer discharge. Correctly positioned, the scraper blades direct product towards the vessel outlet and ensure a minimum of material is left on completion of the discharge operation. The remaining material is then easily washed out of the mixer by addition of a small volume of solvent via a sprayball.

Thinning tanks and all process vessels contribute towards reduced product loss if fitted with a cleaning system. If hot caustic soda solution is used as a cleaning agent, extreme care must be exercised to ensure the system is safe to operate. Safeguards must include instant automatic shutdown of the caustic feed if any attempt is made to open the vessel being cleaned. The problem of rapid air expansion within the vessel during the initial addition of hot cleaning solution can be countered by the provision of ducting equipped with expansion boxes and a drain facility.

The installation whose operation is described later in this paper comprises bulk pigment silos, ready use pigment hoppers, high speed mixers, a number of bead mills, over 30 thinning tanks, various sized weigh vessels, positive displacement metering pumps and liquid raw material pumps and pipelines.

The control system

A detailed knowledge of computers and their associated hardware and software is not necessary to understand how an automated system might work. A number of general principles are nevertheless useful to clarify the interrelationships between desired operation of the plant, various plant items and the computer. The computer equipment necessary to control a large number of plant items consists of:

1 Computer
1 Modular input/output switching device
1 Analogue to digital converter
1 Printer/console
8 Visual display units
Signal amplifiers

The equipment being arranged as shown in Figure 1.

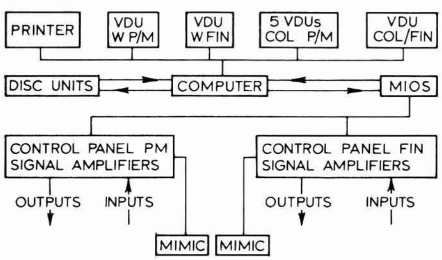


Figure 1. Diagrammatic arrangement of computer hardware

In the installation previously mentioned, the computer has a 1,000 K RAM with additional memory on two hard discs and this is the focal point of the control system. The system generally operates on the basis of computer "tasks" or "files" which control individual machines or sections of the plant together with associated valves and ancillary equipment. The computer memory also contains a formulation "file" into which can be entered all the information necessary to produce a particular product.

When manufacture of a batch of paint is commenced, the various files are all alerted and carry out the predetermined actions. In order for the computer to activate the various functions and receive information from the plant, a number of interface devices are required.

The most common means of computer to plant signalling is by a digital output which is equal to either 0 or 1. The signal is passed through the input/output switching device, which amplifies the signal before operating a driver unit. This driver unit is effectively a microswitch which activates a 24 volt control signal. At this stage, the 24 volt current is fed to the relevant plant area and is used to operate a solenoid valve which controls the air supply to a specific pneumatically operated valve or a motor contactor.

Dependent on the particular instruction, the 24 volt output may be a single supply or a number of different supplies which activate several actions at the same time.

In addition, the operation of one part of the plant can be used to initiate more 24 volt signals. These secondary signals can only be generated if the first operation has been completed successfully. Hence it is possible for the computer to deal with control operations in several different ways and to initiate quite complex action sequences by the use of a single output signal. It is therefore important to establish a clear understanding of the various relationships of hard electrical wiring and software control to optimise design of the total plant/computer system.

One example of the above principle is the multiplexing of various outputs in less intensely used parts of the plant such as the shades finishing tank area. In this case the outputs for several finishing tanks are "commoned" and a separate output is used for tank selection. Hence the total number of outputs can be significantly reduced without seriously limiting manufacturing potential.

In the reverse manner, the computer scans a series of input signals from the plant on an $a = 0$ or $a = 1$ basis. These signals represent the state of various plant operations such as agitator operation, pressure switch on or off, or valve open or closed. It should be noted that only certain items whose operation is vital to protect against serious malfunction are checked to ensure that the desired action has occurred. The majority of output signals are not verified by a confirmatory input signal.

Pulse inputs are also received by the computer from such plant items as positive displacement metering pumps, whose reciprocating motion allows operation of an electrical switch at each stroke. The computer counts the 24 volt pulses generated and calculates the weight added from the volume delivered by each stroke of the pump and the specific gravity of the material.

Analogue inputs from load cells are converted to digital signals which the computer can recognise.

In addition to the previously mentioned direct process interface connections, the computer also utilises internal plant status indices which are of relevance to physical plant operation.

The flag system can be used to indicate an $= 0$ or $= 1$ situation and hence show the state of a single operation, e.g.

Cleaning completed	yes = 0,	no = 1
Task required to operate	yes = 1,	no = 0

A system of integers is used when a whole number is required to be set for particular purposes. The majority of uses for integers are within the computers internal data handling system, but they are also used to supplement the flag and output facilities when a multiplicity of demands and situations arise. In a typical case, demand for a particular raw material may occur in several locations at the same time. The separate demands each increase the value of the integer from zero by one and when this is positive an output is activated.

With this system, a resin pump for example started by the first demand is not switched off until all demands are satisfied and the integer reset to zero, which cancels the output.

The visual display units (VDUs) are used for transmission and reception of process data by the plant operator, while the printer can provide hard copy of data relating to

Thinking of

GLOSS ?

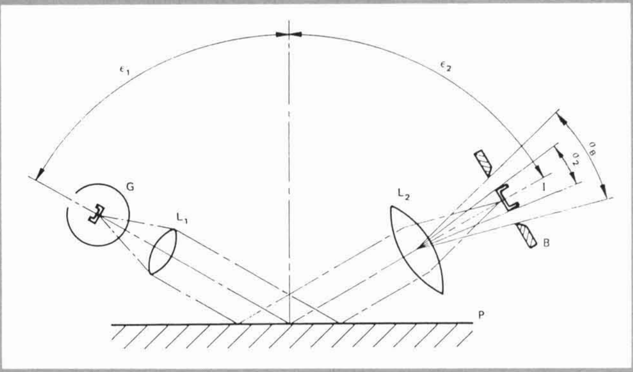
. . . think of SHEEN

THE SHEEN POCKET GLOSSMETER is a small precise instrument for the measurement of specular gloss of paints, plastics and similar materials. It has been specially designed for easy use in the field and to provide quick and accurate results in the laboratory and weighs no more than 0.9Kg (2lb). To give accurate measurement on a wide variety of surfaces, it is currently available in 20° and 60° angles.

GLOSS OR SPECULAR REFLECTANCE

The polish of any surface can be assessed by measuring its specular reflectance or gloss relative to a known standard. The assessment is made by shining a light at an angle onto the surface and measuring the fraction that is reflected off the surface at the same angle.

The fraction of light reflected depends on the surface finish—a perfect mirror would reflect all the incident light. However, it is normal to use polished black glass of refractive index 1.567 as the standard for a gloss reading of approximately 100. With most surfaces, some proportion of the light is scattered by the imperfections of the surface.



Light from a lamp of known brightness is focused in a parallel beam down the incident tube onto the surface, and the reflected beam is refocused onto a photodiode at the top of the opposite tube. The signal from the cell is amplified and recorded.

The instrument is first calibrated with the standard by setting the reading at the known value of the calibration tiles supplied. It is them transferred to the test surface and the reading obtained gives the gloss rating.

PRACTICAL APPLICATION

Wherever surface finish is important, be it for looks or for function, glossmeters are used to measure the standard of finish. Paints and protective finishes on cars and other machinery, protective plastic coatings, ceramics and many other materials can all be assessed by glossmeters. Such trials can be made either on samples in the laboratory, or with portable instruments such as the Sheen Pocket Glossmeter on the product anywhere in the field.

THE SHEEN POCKET GLOSSMETER

SHEEN

The Pocket Glossmeter has been designed as a lightweight, portable instrument that gives the accuracy and reliability of the larger instruments which have been available until now.

The instrument has a strong aluminium case with easy access to working parts.

Rechargeable batteries or easily obtained batteries (Type AA) make it suitable for field use anywhere.

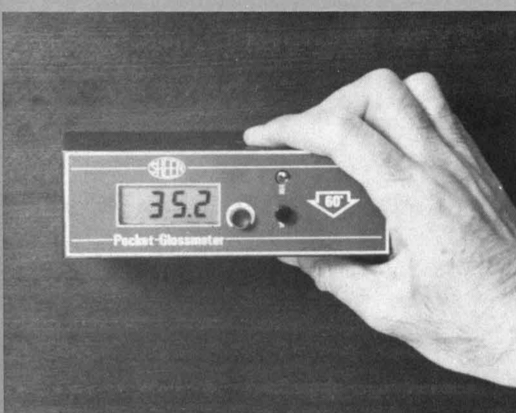
The readings of gloss from the photodiode are shown on a liquid crystal digital display, which reads the gloss units from 0 to 100 down to 0.1 unit. The lamp brightness is automatically controlled to compensate for ageing bulbs.

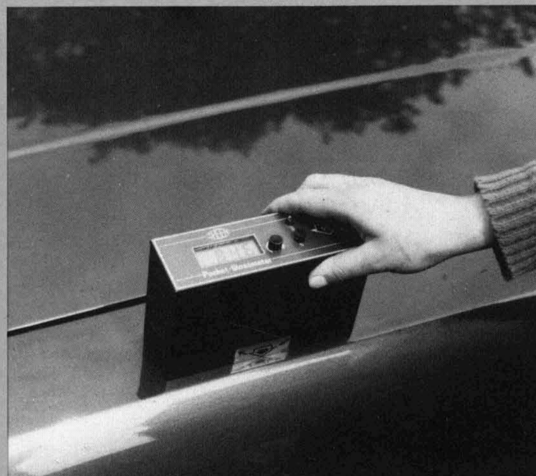
The instrument is currently available with two different angles:

60° For general use over the range from about 30 to 70 gloss units

20° For use with high gloss finishes from about 60 to 100 gloss units.
Other angles will be available in the near future.

The instrument is supplied complete with three calibration standards and strong leather carrying case.





THE OPERATION

The controls are simple. The upper button is an on/off switch. The lower press button is used to take readings: press down to obtain the reading, lift to hold the reading. The calibration control knob is used to set the instrument against the appropriate standard supplied.

The instrument is first calibrated with the appropriate standard by setting the control knob to read the value indicated by the standard supplied. It is then transferred to the surface to be tested, the reading obtained gives the value in gloss units of that surface. The reading remains on the display until the instrument is switched off.

SPECIFICATION

Dimensions

Length 150mm/6ins.
Width 50mm/2ins.
Height 100mm/4ins.

Weight

0.9kg/2lb.

Operating temperature

0 to 40°C/32 to 104°F
(Storage: -20 to 50°C/-4 to 122°F)

Batteries

6 × 1.2 Volt rechargeable or 6 × 1.5 volt Type AA dry cell
Recharge time 16 hours

DESIGN STANDARDS

The Pocket Glossmeter is designed to meet relevant testing standard: ISO 2813; BS 3900.D5; ASTM D523; DIN 67530.

Printed by Berfort Reproductions, 8 London Road, St. Leonards-on-Sea, East Sussex TN37 6AE

Other Glossmeters from SHEEN

DIGITAL SPECULAR GLOSSMETERS 124, 125, 126, 127

This range of precision instruments are for laboratory use and provide a high level of reproducible accuracy for the close control of surfaces ranging from matt to very high gloss. They meet the testing standards: ISO 2813; BS 3900.D5; ASTM D523; DIN 67530.

The angles available are:

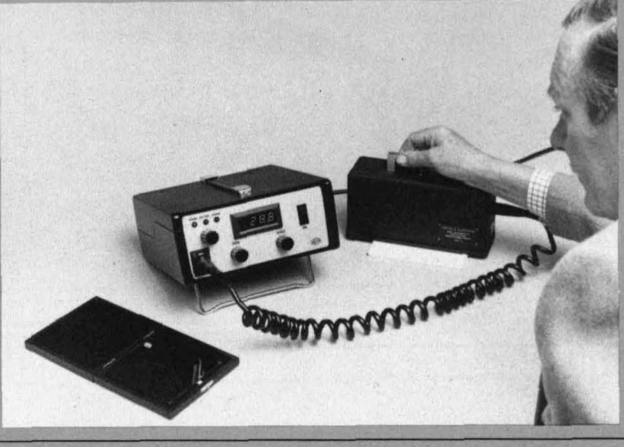
- 60° For general purposes
- 20° For high gloss finishes
- 85° For low gloss and matt finishes
- 75° For use in the paper industry

PORTABLE GLOSSMETER 150

This instrument is for use both in the field and in the laboratory. The meter unit can be used with interchangeable sensing heads of 20°/45°/60°/75°/85°.

It can be used either on mains electricity or with rechargeable batteries as an alternative power source for outdoor or production line use.

Conforms to standards: ISO 2813; BS 3900 D5; ASTM D523; DIN 67530



SHEEN INSTRUMENTS LIMITED
SHEENDALE ROAD, RICHMOND, SURREY, ENGLAND TW9 2JL
Telephone: 01-940 0233/1717 Telex: 268281

finished batches and raw materials consumed. Two types of VDU are utilised in the plant referred to, the first being assigned as master terminals, which have formulation and batch data entry facilities. The others being "slave" terminals sited adjacent to pre-mixers, which only allow process initiation and control.

Software development

When the plant design, raw material distribution network and desired operating procedure are established, software development can begin in earnest. At this stage the number of "service items" such as pumps, rotary valves, blowers, valves and weighing mechanisms should be known. This information allows the approximate number and complexity of operating tasks required to be determined. (An operating task is a computer program that controls the operation of a major plant item.) A knowledge of the number of tasks and formulae to be stored in the computer's memory enables a suitably sized computer to be selected. It is of paramount importance that the computer has sufficient memory to run virtually all the operating tasks at the same time. Failure to achieve this state may result in either slow response times or complete automatic shutdown of the computer with the loss of all in process data.

The first stage in software development is the preparation of process flow charts from which the operating tasks are ultimately derived. Figure 2 shows detail of one part of the plant and in this example the high speed mixer is considered to be the major plant item. Part of the mixer process flow chart is shown in Figure 3. Examination of the chart indicates that the mixer operating task would need to call on other tasks controlling the mixer-associated equipment. Operating tasks for the weigh tank, paste pump, holding tank and pigment delivery equipment are all required to service demands from the mixer task. The relatively crude flow charts are then re-written in a more sophisticated form with all necessary process interlocks included. An interlock is a device which only allows the process to proceed if specified conditions are satisfied. Examples include inhibition of batch start if signals from the mixer or weigh tank load cells indicate incomplete discharge from a previous operation, and prevention of pigment addition if the mixer agitator motor is not running. Both of these conditions would automatically stop the process to await investigation and corrective action by the operator. Thus a number of warning messages and operator prompts are required in the mixer task to indicate process interruption and the malfunction responsible. The completed flow chart for the mixer control task contains over 100 stages and an indication of the detail required at this point is illustrated in Figure 4, the first section of the chart.

Additional lists of signals to be generated from, or received by the computer are also prepared, each input/output signal being coded according to type. This information, essential for checking wiring and pneumatic connections during plant commissioning, consists of digital outputs, digital inputs, analogue inputs and pulse inputs. The function and source of each of these signals is shown in Table 1.

In addition to the plant control tasks, further software is necessary to facilitate operator/system and system/operator communication via the VDUs and printer.

The extent of this software depends on the amount of information interchange required at each communication

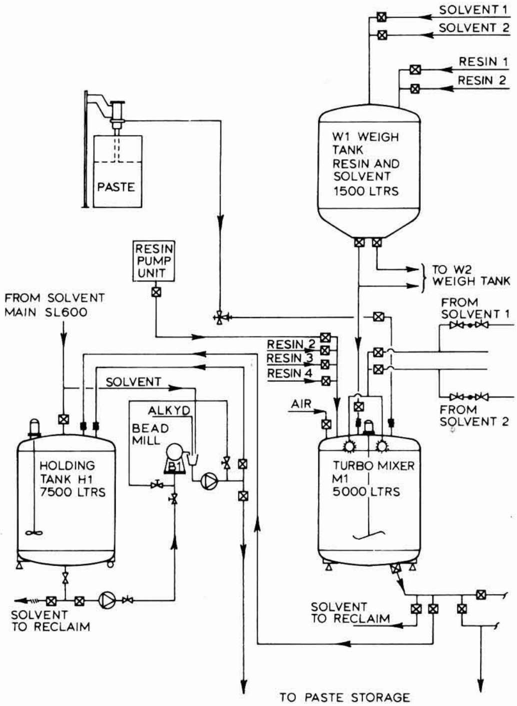


Figure 2. Mixer and associated equipment – white premix

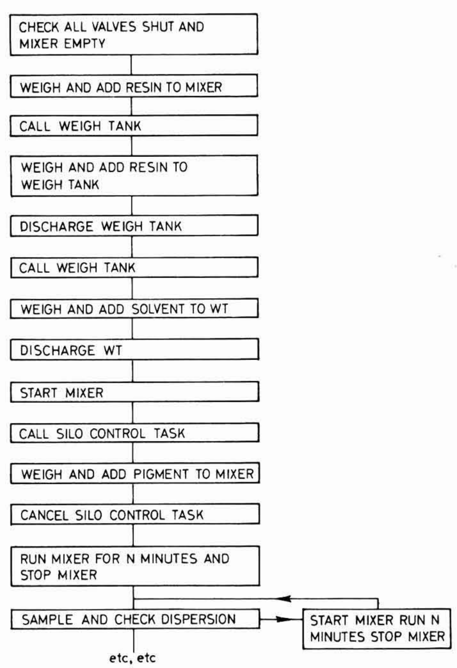


Figure 3. Process flow chart – mixer 1, white premix section

point, the "master" VDUs having more facilities and needing to call on more tasks than the slave terminals. In either case, during operation it is considered to be important that the operator has the ability to determine plant status on demand by the use of simple keyboard entries. Slave VDU terminals may be remote from the central control room, which may have the added benefit of a separate "mimic" panel showing valve and motor status as well as weight indication from the various process vessels. Operators at the in-plant VDU stations do not have this facility, but software can be provided which displays a line diagram of the relevant plant on each remote VDU screen. An index of a complete software set for control of the total plant is listed in Table 2.

Table 1
Input/output signals' function and source

Signal	Source	Function
Digital output	computer	operates valve etc.
Digital input	plant	confirms valve operation
Analogue input	plant	weight indication
Pulse input	plant	meter pump cycle counting

Table 2
Plant software control list

1	Application task summary
2	General system tasks
3	Bulk powders task flowsheets
4	Whites premix task flowsheets
5	Whites premix VDU displays
6	Whites finishing task flowsheets
7	Whites finishing VDU displays
8	Shades premix task flowsheets
9	Shades premix VDU displays
10	Shades finishing task flowsheets
11	Shades finishing VDU displays

When all the software is completed and entered into the computer's memory, commissioning of the total system of plant and control tasks can proceed.

System operation: data input

Formulation data must be entered into the computer's memory before any manufacturing operations can commence. In the case of this particular plant, software was included that only allows data of this nature (formulation details and batch details) to be entered via the appropriate "master terminal". A single point of sensitive data input gives the system some protection against accidental or deliberate misuse, and further protection is afforded by the use of an "access code". The data input facility can only be used after this code, secret to a few key personnel, has been entered through the terminal. A list of VDU displays or pages that the software provides is shown in Table 3, the pages marked with an asterisk being protected by the access code. This Table, which is in effect a directory of available displays, shows that page 7 has been allocated to "Premix formulation data entry". Access to the page is obtained by following the routine outlined in Figure 5.

Table 3
Page displays – whites production master terminal

Page	Display
0	INDEX
1	PLANT STATUS
2	SOFTWARE TASK STATUS AND ALARMS
3	BATCH START WHITES FINISHING
4	FORMULATION FILE
5	*PREMIX BATCH DATA ENTRY
6	*FINISHING BATCH DATA ENTRY
7	*PREMIX FORMULATION DATA ENTRY
8	*FINISHING FORMULATION DATA ENTRY
9	*MANUAL ADDITIONS
10	PLANT SHUT DOWN/START UP

*Protected by access code

Table 4
Typical manufacturing instructions

1	DISCHARGE MIXER
2	DISCHARGE WEIGH TANK
3	START MIXER
4	STOP MIXER
5	START SCRAPER
6	STOP SCRAPER
7	DELAY
8	SAMPLE

The final demand for confirmation that the intended page has in fact been selected allows the page to be rejected in cases of keyboard entry errors.

The data entry VDU display then demands information that will identify the particular formulation. This data includes product code number, laboratory reference number and a size code whose use allows the inclusion of a process interlock to prevent large batch sizes being allocated to small thinning tanks. On completion of the formulation identification procedure, the list of raw material codes, weights and process instructions which constitute the complete formula is demanded. All possible ingredients and instructions are filed in the computer memory at the software loading stage: the raw materials to ensure that the weigh point selected for the addition is served by the ingredient being specified and the instructions because of the precise word form that must be employed before the system can recognise any particular instruction. Because of this, manufacturing instructions are selected from a coded list displayed on the VDU screen and this procedure also speeds up the process of data entry. As data loading proceeds, each component or instruction must be confirmed as correct before the subsequent entry is commenced as this facility permits errors to be corrected with the minimum of effort.

Table 4 displays the manufacturing instructions available. Some of these are self explanatory but others, "Sample" for example, are more complex. Selection of "Sample" in practice initiates a software sub-routine which generates operator prompts, a question and answer routine and re-mix or tank discharge instructions. This format is necessary to ensure simplicity of operation on the shop floor.

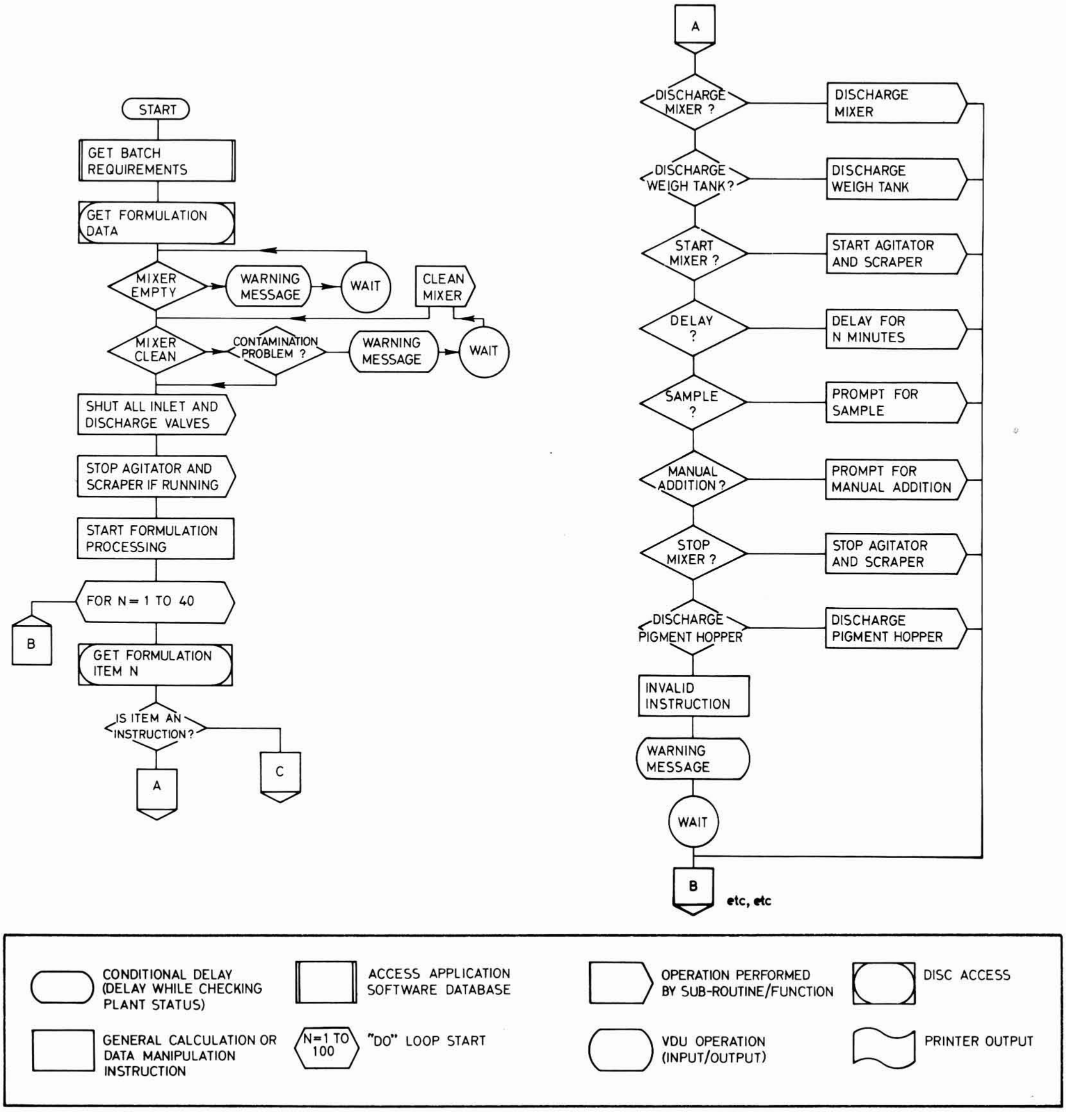


Figure 4. Control of mixer according to formulation – process flow section

Table 5

Page displays – white premix VDU terminal

0	DIRECTORY
1	PLANT STATUS
2	SOFTWARE TASK STATUS AND ALARMS
3	BATCH START
4	FORMULATION SUMMARY

VDU display	Keyboard entry
ENTER THE PAGE NUMBER TO BE DISPLAYED	7 (RETURN)
ENTER ACCESS CODE	1234 (RETURN)
CONFIRM CORRECT PAGE SELECTED (Y/N)	Y (RETURN)

Figure 5. Access procedure to protected VDU displays

It is during data entry that the technologist responsible can influence the accuracy of weighed additions, if more than one weigh point is available for a particular ingredient. For example, the weighing accuracy of a 300 kg addition is increased if added via a tank fitted with load cells of 0 – 1500 kg range compared with weighing directly into a mixer whose range is 0 – 8000 kg. Hence, to obtain the best possible in-service results from the plant,

PAGE 1 – WHITES PREMIX		PLANT STATUS		
VESSEL	PRODUCT CODE	BATCH NO.	STATUS	FORM STEP
M1	A 1001	A 36	In Use	18
M2			Available	0
H1			Available	
H2			Available	

VESSEL	WEIGHT (KG)
P1	25362
P2	33345
P3	18816
P4	42000

Figure 6. VDU display – plant status, whites premix

PAGE 3 – WHITES PREMIX BATCH START

MIXER STATUS	MIXER 1 AVAILABLE		MIXER 2 SHUTDOWN		
BATCH NO.	PRODUCT CODE	SIZE CODE	QUANTITY	MIXER	REMARKS
A 36	A 1001	45	8200	1	
A 37	A 1001	45	8200	1	
A 38	B 9119	45	8150	1	DO FIRST

ENTER A BATCH NUMBER FROM THE LIST ABOVE OR 0 FOR NO ACTION

Figure 7. VDU display – whites premix batch start

the data entry function should be entrusted to a technologist who appreciates its *modus operandi* and has a sound knowledge of paint manufacturing techniques.

On completion of the premix formulation entry, it is essential that the data is re-checked for accuracy and content either via a VDU display or as hard copy from the printer. The latter method being more convenient as the "works copy" of the formula can then be returned to the laboratory for approval. Entry of the corresponding finishing formulation gives the plant the potential to manufacture a complete paint. Batch data which control and identify the number of batches produced are entered into the system by the use of pages 5 (premix batch data entry) and 6 (finishing batch data entry), both pages being protected by the access code. The facilities on these pages allow entry of product code, batch number, size code and the assignment of specific batches to specific mixers or thinning tanks.

Paint manufacture – whites premix area

Manufacture of the pigment dispersion is controlled by use of a separate VDU sited in the production area. Although this station is not a master terminal, it needs more facilities than others sited in the premix area because it is used to control the whole of the white premix equipment.

The VDU pages available are displayed in Table 5. A study of the page displays available gives an indication of the information available to the operator.

Page 1 (Figure 6) presents a plant status report which identifies any batches in progress and the availability of manufacturing equipment. The formulation step number is a measure of the current state of production, which can be used to determine the progress of any in-process batch. A formulation step is either a raw material addition or a manufacturing instruction. The step number increases in value by 1 at each process stage, thus, by reference to the formula, the current addition or process can be determined.

Page 3 (white premix batch start) (Figure 7) indicates mixer status, lists outstanding production batches and prompts the operator to commence by entering a batch number. A question and answer sequence follows during which it is confirmed that the correct batch number has been selected and the formulation in the computer's memory tallies with the batch card.

On receipt of confirmation that these details are correct, the computer automatically initiates production of the selected batch.

Page 4 (Figure 8) simply allows either a VDU display or printout of any of the formulations manufactured in that part of the plant.

Page 2 (Figure 9), task status and alarm, is the operator/system and system/operator communication channel and is, along with page 3, the only VDU facility essential for operation of this part of the plant. Although the task step number (the software line number) is displayed, the operator's interest is restricted to the task state. This state is described by four terms:

shut down, run, hold and alarm.

PAGE 4 – WHITES PREMIX FORMULATION DISPLAY		
NO.	PRODUCT CODE	SIZE
1	A 1001	45
2	B 9119	45
3	A 1006	45

ENTER THE NUMBER (1 – 3) OF THE FORMULATION YOU WISH TO DISPLAY

Figure 8. VDU display – whites premix

PAGE 2 – WHITES PREMIX TASK STATUS AND ALARMS

NO.	TASK DESCRIPTION	STEP	STATE
1	Silo 1 Discharge	1	Run
2	Silo 2 "	1	"
3	Silo 3 "	1	"
4	Silo 4 "	0	"
5	Big Bag/Bag Slitter Discharge	1	"
6	Minor Powder Addition	1	"
7	Mixer 1	1	"
8	Mixer 2	1	Shut Down
9	Weigh Tank 1	1	Run
10	" " 2	1	"
11	Hold Tank 1	2	Shut Down
12	" " 2	2	" "
13	Bead Mill 1	2	Run
14	" " 2	2	"
15	Paste Tanks	5	"
16	Special Ingredient	1	"
17	Overfill Monitoring	1	"

ENTER TASK NUMBER (1 – 17) OR 0 FOR NO ACTION

Figure 9. VDU display – whites premix

"Shut down" means that the equipment referred to is not available and cannot be used. "Run" indicates that the task controlling operation is either in progress or that the equipment is available for use. "Hold" enables the current process to be suspended for any period and as such is only available after an alarm has been generated by the control system. "Alarm" is displayed on the VDU screen opposite the appropriate task each time the process requires operator intervention or when the task control software detects a plant fault. By responding to the alarm signal, the operator causes an alarm message and a choice of message responses to be displayed on the VDU screen. Some typical alarm messages and response alternatives are shown in Table 6.

Table 6

Typical alarm messages generated by control software

Message	Response option
No weight increase during resin addition	0 = hold 1 = re-try
Mixer requires cleaning	0 = hold 1 = clean 2 = continue
Overfill alarm	0 = hold 1 = continue
No weight decrease during weigh vessel discharge	0 = hold 1 = re-try

As stated earlier, the mixer control task exercises prime control during the premix operation. On commencement of a typical premix operation, the mixer task produces outputs to start a resin pump and open the appropriate valve to the mixer. The task then scans the changing voltage output from the mixer load cells and monitors the weight increase due to the resin addition. When the target weight is reached the pump and valve digital outputs are cancelled and the control task advances to the next stage of the process. However, if a weight increase is not detected during the resin addition an alarm will be generated. In this case the word "Alarm" would be displayed in the task state column (Figure 9) opposite whichever of the two mixer tasks was in use. By following the instructions at the bottom of the page display, a specific message is generated, e.g.

WPM1 MIXER1 NO WEIGHT INCREASE DURING RESIN ADDITION

ENTER 0 = HOLD, 1 = RETRY

The alarm indicates the area of plant failure and allows the process to be suspended by use of the "Hold" command while the cause of the malfunction is investigated.

In normal circumstances the task will add solvent on completion of the resin addition, start the mixer and then call the silo task which controls operation of the pigment addition. As in the case of the resin addition, the voltage output from mixer load cells is scanned and the silo control task outputs cancelled in sequence on reaching the target weight. This sequential operation allows the rotary valve feeding pigment into the transfer line to be stopped in advance of the pigment blower and thus facilitates an in-flight weighing correction.

The next mixer task step is delayed by a period determined during formulation data input while the dispersion process takes place. At the end of the mixing period the mixer is automatically stopped and an alarm generated which instructs the operator to sample the mix, determine the degree of dispersion and select the subsequent action from "Hold", "Remix" and "Continue". If the sample is satisfactory, selection of "Continue" restarts the mixer, adds any stabilising addition necessary and completes a further short mixing period before raising the final sample alarm. Hence the control system completes the whole of the premix operation with only two interventions by the operator.

From the mixer, the pigment dispersion is transferred to the associated holding tank prior to being further dispersed by a bead mill. At the same time the control system produces a printout listing raw material consumption for the completed batch. At this stage, control of events passes from the mixer task to the holding tank task, which in turn calls the bead mill task. The bead mill is started by the operator in response to an alarm message and initially product is passed through the bead mill back into the holding tank. This recirculation of product allows setting of the bead mill pump feed controls and ensures that unsatisfactorily dispersed pigment cannot be transferred into the bulk mill base store tank. A sample satisfactory response to an "Alarm" causes product to be routed to the paste store tanks, routing being determined by the formulation product code. Product transfer then continues until the hold tank load cells indicate that a preset minimum weight has been reached, at which point feed to the paste store tank is interrupted and product routed back into the hold tank.

This procedure prevents the mill from running dry and gives the operator a choice of further actions. The low level signal can be accepted and the equipment left running to await a further batch of the same material, or overriden to complete secondary dispersion and leave the hold tank empty. Completion of a bead mill cleaning procedure cancels the routing to the bulk paste store tank and ends the mill base manufacturing operation.

Paint manufacture – whites finishing

The operations necessary to produce a finished batch of white paint include weighing and blending of pre-finished mill base and resin, addition of driers etc. and viscosity adjustment. The process is started and controlled from a VDU in a manner similar to that described for the premix operation. Compared with the premix VDU, the finishing terminal has extra page displays available to facilitate data input and "Manual additions", which in this case refers to additions made under automatic control that are not included in standard formulae. The most commonly used items on this page (Figure 10) are the solvents used for viscosity adjustment. In addition, extra driers or antiskin can be added to any batch as required when the results of quality control tests are known. A choice of weighing or metering is available for these items to ensure that any necessary addition is completed with acceptable accuracy.

In practice, batch start is identical with batch start in the premix area but in this case subsequent operations are controlled by the finishing tank task. During the manufacture of a typical batch the resin component(s) is weighed into the weigh tank, the agitator automatically switched on and the mill base added from the paste store tank. The tank contents are stirred for a short period and then transferred to the selected thinning tank, the routing being cancelled at the end of the transfer.

Control of the finishing operation is then passed to the driers weigh tank control task, which starts delivery pumps, opens valves and weighs or dispenses driers in accord with the formulation instructions. This task permits complete flexibility of operation so that driers can be added to the batch either singly or in combination. Addition of driers can be followed by solvent to ensure complete transfer and leave the weigh tank and pipeline in a clean condition. After a fixed period of agitation the paint is thinned to the appropriate viscosity using the "Manual additions" page display facility. The whole sequence of operations associated with whites manufacture is completed in less than two hours.

Shades manufacture

In the plant described, automatic manufacture of white products is simplified by the presence of the mill base "accumulators", which remove the need to combine a specific premix batch with a specific finishing operation. It is not practicable to treat manufacture of shades in this way because of the large number of bases that would be required. Hence the premix and finishing operations are directly interrelated. The total operation is further complicated by essential process needs, for example certain premixed pigment dispersions will require more than a single pass through a bead mill before a satisfactory dispersion is obtained, and the flow properties of some resin/pigment mixes vary from batch to batch and require modification during manufacture. Process differences of this nature result in the automatic manufacture of shades being less of a continuous process that requires more interventions by the operator than in the case of whites.

Formulation data input for shades differs slightly from whites because the premix and finishing formulations are combined into one total formulation. Thus, a single batch data entry identifies the in-process material at each stage of manufacture. The manufacturing process is best illustrated by considering a hypothetical case whose process require-

PAGE 9 – WHITE FINISHING – MANUAL ADDITIONS				
FINISHING	DRIERS	WEIGHED	DRIERS METERED	DRIERS MANUAL
20 =Solvent 1	30	Solvent 1	40= Drier 1	50= Drier 1
21 =Solvent 2	31	Solvent 2	41= Drier 2	51= Drier 2
22 =Solvent 3	32	Solvent 3	42= Drier 3	52= Drier 3
	33		43= Drier 4	53= Drier 4
	34	Drier 1	44= Antiskin	54= Antiskin
	35	Drier 2		
	36	Drier 3		
			60=Discharge Driers Tank	
SELECT FINISHING TANK (1–6) OR 0 FOR NO ACTION				

Figure 10. VDU display – whites finishing

PREMIX			
COMPONENT/INSTRUCTION		WEIGHT	WEIGH POINT
1	RESIN A	200	WEIGH TANK 4
2	SOLVENT B	50	WEIGH TANK 4
3	DISCHARGE WEIGH TANK		
4	RESIN A	120	WEIGH TANK 4
5	SOLVENT B	130	WEIGH TANK 4
6	START MIXER		
7	PIGMENT C	600	PIGMENT HOPPER 4
8	DISCHARGE PIGMENT HOPPER 1		
9	DELAY 20 MINUTES		
10	STOP MIXER		
11	SAMPLE		
12	START MIXER		
13	DISCHARGE WEIGH TANK		
14	DELAY 3 MINUTES		
15	STOP MIXER		
16	SAMPLE		
17	DISCHARGE MIXER		
18	SECONDARY DISPERSE		

Figure 11A. Typical shade formula and manufacturing instructions

ments are detailed in Figure 11. On receipt of the batch start signal, the control system initiates the premix and finishing operations at the same time.

In the case of the premix, the process proceeds through the formulation with manual intervention as required. Steps 1 – 3 control the initial weighing and discharge of resin and solvent to the mixer. Steps 4 and 5 control the weighing of resin and solvent for subsequent stabilisation. Step 6 generates a prompt "Alarm" message for the operator to start the mixer. Step 7 controls the loading of pigment to the mixer, and Step 8 controls the addition of pigment to the mixer. This step can be interrupted by the operator in order to ensure correct pigment addition rates.

The remaining tasks control a series of timed dispersion periods, sample prompts and discharge of stabilising liquids from the weigh tank in the appropriate sequence.

In the case of stabilising liquids, the automatic control system can be overridden by manual control if extra quantities of liquid materials are required to modify mixes whose flow properties are not satisfactory.

The completed premix batch is transferred to a holding tank for subsequent bead milling.

The finishing tank and premix operations commence in parallel and steps 1 and 2 (Figure 11 B) control the weighing of resin and discharge to the finishing tank.

At this point, step 3, the finishing tank control task, is

FINISHING		
COMPONENT/INSTRUCTION	WEIGHT	WEIGH POINT
1 RESIN A	3000	WEIGH TANK 11
2 DISCHARGE W.T. 11		
3 AWAIT CONFIRMATION OF MILL BASE ADDITION (PASTE QUANTITY)		
4 DRIER 1	50	DRIER WEIGH TANK
5 DRIER 2	20	FLOW METER
6 DRIER 3	20	FLOW METER
7 DISCHARGE W.T. (DRIERS)		
8 ANTISKIN	8	FLOW METER
9 SOLVENT B	30	DRIERS WEIGH TANK
10 DISCHARGE DRIERS WEIGH TANK		
11 DELAY 10 MINUTES		
12 STOP STIRRER		
13 SAMPLE		
14 MANUAL ADS		
15 DISCHARGE THINNING TANK		

Figure 11B. Typical shade formula and manufacturing instructions

awaiting the paste charge manufactured in the premix operation. The task controls the routing of the premix batch from the bead mill to the finishing tank and bead milling cannot therefore commence until step 2 has been completed. On completion of bead milling the computer is instructed that the stage is complete (via a "Hold"/"Alarm" prompt which is available throughout the operation) and manufacture continues. Steps 4 – 11 then proceed to add the necessary driers and solvents according to the formulation, after which a sample prompt is displayed. Step 15 is the "Manual additions" facility, whose use permits extra additions as dictated by the quality control function.

In the case of portable pans, a similar procedure is followed but the material is not fed directly from the bead mill and it is not therefore necessary for the batches to commence simultaneously.

The plant described, installed and commissioned during the past year is complimented by a sophisticated packaging department. However, control and operation of this function is a separate subject outside the scope of this paper.

In conclusion, experience of running the total plant has shown that shop floor operatives and supervisors have rapidly adapted to the plant and quickly developed the new skills necessary for its efficient operation.

Acknowledgements

The authors would like to thank the directors of Crown Paints for permission to publish this paper and Mrs Annette Hartley for preparing the typescript.

[Received 23 March 1983

conference discussion

Discussion is encouraged at OCCA Conferences following the presentation of papers (excluding the keynote address). Those who put questions were asked to fill in discussion slips with the details of their questions. The answers given by the lecturers/authors were recorded on tape. Edited versions of the discussions that followed the papers published in this issue appear below: questions in ordinary roman type, answers in italic.

The efficient use of surface coatings

R. A. Fidler

As the keynote of the Conference, discussion did not follow the presentation of this paper.

Surface coatings in relation to external wall insulation

M. Wilkinson

D. A. KALWIG: I note that the fire resistance of fibreglass scrimmed polystyrene is satisfactory to BS476. You also comment that the reason for this is that whilst the polystyrene vaporises, the reinforced coating stays intact. My question relates to the internal use of such insulation systems – what fire risk is generated by their use?

M. WILKINSON: The fire risk of using expanded polystyrene insulation internally is not so much from the fire but from the toxic fumes that the fire produces. Even if you have a material on top of the polystyrene, for example plaster board, the heat may be sufficient to cause the polystyrene to produce toxic fumes.

E. L. FRENCH: Most of the external wall insulation systems evaluated are based on polystyrene bead board. Have other types of insulant such as wood wool, polyurethane and phenolic board been used or considered?

Digressing a little from your paper. A problem with external walls insulated by filling the cavity with an insulant is that this increases the surface temperature in the summer and reduces it during the winter months. This thermal cycling and the resultant freeze/thaw action has caused surface breakdown of old buildings constructed from sand-faced Fletton bricks, and adhesive failure in high build decorative coatings.

M. WILKINSON: Taking your last point – what you say is very true.

Regarding your first point, the industry uses most if not all the types of insulant you cite. There are of course advantages and disadvantages for every type of insulant. It is a matter of design and environment as to which should be used. In some instances it may be polystyrene, in others fibreglass. My main concern, though, was with the surface coatings that must be applied over these various types. Certainly all of the types you mentioned can be used, but they have their own problems which must be taken into account in the formulation of decorative protective coatings.

G. W. FOWKES: Can moisture vapour permeability expressed in perms be correlated with water vapour resistivity as used in your paper?

M. WILKINSON: Yes, there is an inverse relationship. It must be remembered that the permeability of the insulant is also important. With regard to this – expanded rather than extruded polystyrene is better.

The need for speed and accuracy in efficient production of coatings

R. J. McCausland

D. S. NEWTON: To what extent should the cost of training in the company or outside be added to the capital outlay of hardware?

R. J. MCCAUSLAND: The cost of training should be included but most computer companies or hardware suppliers will provide a fair degree of training inclusive in the cost. Anyone that has had brief experience working with computers or even typewriters can pick up very quickly the operation of these systems – they are not particularly complex, the complexity has already been taken care of in the package. In fact if you use a standard package it is quite possible to be in operation within a matter of a few days. In my experience the cost of training set against the total cost is virtually zero.

D. S. NEWTON: Does that include the time of the people concerned?

R. J. MCCAUSLAND: The main time involved is that of the hardware and software suppliers as they have to train the individual people in the company. But overall, training is surprisingly quick if the people concerned are interested.

M. SYMES: One thing you have not mentioned is the amount of time needed to build up the data base. If you were to include all of your formulations and your raw materials it would take literally thousands of man hours. We have done it in Copenhagen and it can take years with a large data base.

And who is going to build it up? In many cases the data that must be put in has to be evaluated by a chemist or an engineer, which takes time and makes it expensive.

R. J. MCCAUSLAND: It is undoubtedly true that the data must be put in. But the average company does change its formulations quite dramatically in the course of a year. You might find that annually you have already changed between 25-30 per cent of your products, for one reason or another. So that must be done anyway and at the same time you can carry out processes of rationalisation which you would normally not do: products which have been lying dormant for years, in the technical sense, can be revised as they are entered.

You are quite right it does take time. In my experience several months may be necessary. But once you've done it the ability to transfer and translate the information is immense. If you are setting up or buying a factory overseas, for example, with a computer system it is very much easier to transfer information because it is electronic, as opposed to masses of paper, some of which are wrong as I pointed out in my lecture. But I would turn the question and say that the sooner you start the better.

R. J. MCCAUSLAND: Mr Chairman, if I may be permitted to put a question to the audience that concerns EEC hazard labelling: has everyone solved their problems regarding this? It is quite a big problem and a lot of people I speak to seem to be sticking their heads in the sand hoping it will go away. It will not!

conference discussion

Session 1 – Paper 4

Automated paint manufacture

J. Boyden and W. Ollett

B. WRIGHTON: Could you comment on system reliability.

J. BOYDEN: So far failures have been remarkably limited in extent. However, we should differentiate to a degree between those failures which are central to the whole operation and those that affect a limited part of the plant.

After initial teething troubles we had virtually no trouble with the computer installation itself. We had a limited number of failures whereby the signal did not produce the desired effect for a number of reasons. The reliability of load cells and meters is quite satisfactory to date.

B. WRIGHTON: Does the system fail safe when it does fail?

J. BOYDEN: Yes. For example, if a no flow situation arises an alarm message will appear on the VDU and the plant can then be put into "hold" or into "re-try" but it always fails safe. In particular, great care has been taken in the software to prevent overfilling.

D. A. KALWIG: Is your installation designed on "inherently safe" electrical principles? And what protection do you have against power failure with respect to process control systems?

W. OLLETT: The plant is not used for products which require "inherently safe" equipment.

With regard to power failure, there is a battery back-up system that switches on if mains power is lost and that will give protection to the system for about four hours. It was considered that four hours would be sufficient to cover for a normal electrical supply failure and during this period the transient information on the state of every batch in progress is protected. After four hours all the basic information is held, but the transient information relating to particular batches is lost.

K. F. BAXTER: It is well understood that an automated paint plant can produce a one colour- one media-based coating. But how does the plant described handle a complete colour range, say the BS 4800 colour range? Are there a number of small plants within the main plant, segregated to accommodate groups of colours, for example reds, blues, dark shades, etc? How is the plant cleaned to accept the change in colour?

W. OLLETT: In shades manufacturing we looked at the likely production demand and tried to allocate mixers to ranges of shades, such that we had one mixer nominally assigned to tints and whites, one nominally assigned to yellow shades and so on. At the end of each batch the operator is prompted to either clean the mixer or continue. Every time he makes a choice it is recorded, so if there is a problem later with colour contamination it will perhaps be possible to work out why it occurred. The fact that we assigned colours to mixers means that in the majority of cases the cleaning problem is less severe than if you were trying to change from a red to a blue for example.

J. BOYDEN: The plant incorporates methods of handling coloured pigments but as yet the techniques are not fully proven.

B. F. GILLIAM: What degree of tolerance in raw materials variation do you find acceptable?

J. BOYDEN: It is only possible to design a plant to ensure accurate addition of raw materials and sequence of operations to produce a consistent product. We recognise, however, that variation in quality of incoming raw materials can cause a requirement for mixer adjustments and a facility is included to carry out these operations via the VDU.

R. J. MCCAUSLAND: Taking account of the savings in manpower, stock and handling losses, what is the return on investment?

J. BOYDEN: As with the majority of capital investments we would be looking for a minimum return of between 20 and 30 per cent and hopefully in excess of 30 per cent.

J. R. TAYLOR: Is there any undue hold up of the process during the colour control and tinting of the batches in this automatic paint manufacture?

W. OLLETT: No, colour correction does not cause any undue delay. On the contrary it is believed, but not yet confirmed, that the increased degree of control over ingredient additions and processing helps speed up the tinting process.

next month's issue

The Honorary Editor has accepted the following papers for publication. They are expected to appear in the September issue:

Linear polymonosulphide and polysulphide polymers – general survey, recent developments and applications*† *by J. Brossas and J. M. Catala*

Solving paint problems with computers* *by J. van der Stoep*

Introduction to computer technology* *by G. T. Eady*

Introduction of microprocessors in surface coatings* *by A. Carrick*

*Paper presented at the OCCA Conference, York, 15-18 June 1983. The relevant discussions that took place will also be published in this issue. †This paper was held over from publication in the August issue.

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

reviews

Published Data on European Industrial Markets

Industrial Aids Ltd, London
Price £35

This reference book identifies 1,873 market and technical reports on European industrial activities classified according to their publishers, and also names of those who have even more numerous surveys. There is also a section detailing the various European national statistical bureaux from which official information can be obtained.

Included in this wide ranging list of reports are 60 of direct interest to the paint, ink and related industries including media, pigments, solvents and additives. There are also a number dealing with application and colour.

Although this publication appears to be expensive, the time to be saved in having such a compendium to hand could well more than offset its cost.

Reader Enquiry Service No. 21

D. S. Newton

Handbook of Painting & Decorating Products

A. Beckley
Granada Publishing, London
pp. VII + 232, £12.50

This book contains a considerable amount of information on surfaces, materials, products and problems likely to be of interest to those concerned with, or practising, painting and decorating. There is easy access by means of a useful cross reference system and, from random checks made by this reader, the index is reliable. The information is fairly elementary and in general of little help to anyone interested in the technology of the products.

It is a soft-back publication and therefore not likely to survive the rigours of the workshop and this, taken with its rather high cost, suggests that it will not be so widely available as a ready reference as might be desirable.

The author is to be congratulated on his painstaking assembly and presentation of the data and students of the subjects covered will find it a useful addition to their bookshelves.

Reader Enquiry Service No. 22

A. T. S. Rudram

Gloss Emulsion Paints (2nd Edition)

H. Warson
Solihull Chemical Services, West Midlands, 1983
A4, pp. 69

This literature survey covers progress in the stated field from its beginning in the 1950s to 1982 and cites 158 references. Although a publication of this type can easily be disjointed in manner, this one is extremely readable.

Reader Enquiry Service No. 23

D. S. Newton

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

occa meetings

Newcastle Section

Paint! It will only cover flat surfaces

The third meeting of the 1982-83 session was held at the usual St. Mary's College venue in Durham City at 6.30 p.m. on Thursday 4 November 1982. It was attended by 21 members and one visitor. The lecture was presented by Mr L. F. Prior, the chief chemist of NEI Reyrolles Limited, and was entitled "Finishing in electrical engineering".

Mr Prior, who spoke with the quiet authority of one with long experience in the industry, outlined the NEI Reyrolles range of products from electric generators and switchgear to control panels, all capable of producing and controlling up to 3,000,000 volts. He described the problem of electric arcing as switches opened and closed and claimed that spark temperatures on the contact breakers of up to 10,000°C for a millisecond had been recorded. He then outlined the different types of switchgear that had been produced over the years to reduce sparking and increase the working life.

(a) Conventional switchgear: steel contacts in mica/glass.

(b) Vacuum switchgear: stainless steel contacts in a porcelain vacuum jar – no air, no arc.

(c) Air blast switchgear: as the contacts make or break a 350 psi, air blast disperses any arcing.

(d) Oil immersed switchgear: stainless steel contacts in porcelain jar filled with non-conducting oil.

(e) Sulphur hexafluoride switchgear: stainless steel contacts in the very stable heavier than air gas.

Mr Prior reported that silver plated contact breakers were used considerably in the industry because of the high conductivity of silver, but had the disadvantage of this metal being soft and degradable. The low voltage silver plating technique using silver thiosulphate solution was outlined in comparison with the previous technique using potassium argento cyanide and the expensive effluent plant required with this earlier system.

Tungsten copper tipped contact breakers were also used as they had the combined advantages of dissipating heat rapidly and being hard wearing.

Before reviewing the paint systems, Mr Prior mentioned that some of their products had vitreous enamel protective coatings, thereby indicating that paint was only a peripheral part of their work. With regard to paint he joked earnestly about the exaggerated claims made by paint companies that their product "will cover and protect anything". "Rubbish", he announced, "It will only cover flat plate", and then went on to describe how NEI Reyrolles had found the initial design stage to be very important to ensure that the shape of every type of equipment facilitated both pretreatment and painting of the metal. One particular design had been so poor that every item removed one pint from the treatment baths and took up primer and paint at a rate that gladdened the hearts of the suppliers. Subsequent redesign had given significant savings in both pretreatment and painting.

The various pretreatment systems employed by NEI were reviewed, with the most elaborate being a seven stage process beginning with shot blasted steel and ending in the application of a zinc primer prior to the application of the top coat. In their time NEI had evaluated the paints of most of the recognised companies, the paints based on every resin type and applied by every possible technique, to ensure that they achieved the desired effect most economically. Alkyd systems were used for panelling, epoxies where oil resistance was critical, and polyurethanes where electric arcing was a problem. They preferred not to use acrylics because of the smell, which surprised the reviewer because of the greater hazards they tolerated in their work, i.e. high voltages, acid tanks and washes, argento cyanide solutions, epoxies and urethanes.

The lecture was forthright and well presented and from the applause was obviously enjoyed by the audience, though some paint fanatics may have been disappointed at the general nature of the lecture and may have preferred a greater emphasis on the paint side of the NEI Reyrolles operation.

The evening was well rounded off with the usual excellent free buffet supplied by the staff of St. Mary's College.

I. Mim

Natal Section

Combating corrosion with protective coatings

A technical meeting of the Natal Section was held on 19 May 1983 at the Westville Hotel.

A detailed lecture entitled "Combating corrosion with protective coatings" was presented by Ed Cowie, technical director of Berger Paints, and the following salient points were highlighted.

The cost of corrosion in the Republic has been estimated at 1.5 billion rand, which represents 2.5 per cent of GNP. Atmospheric pollution plays a big part in the promotion of corrosion and it has been noted that the formation of ferrous salts on the surface of structural steel is virtually impossible to remove entirely. Therefore, surface preparation before coating is most important and it was felt that wet blasting is the most effective method for removing soluble salts. Special primers suitable for application on wet surfaces were detailed and also problems experienced with zinc silicate primers were highlighted.

When maintenance painting of established structures is needed and surface preparation is limited to wire brushing, the more conventional 1-pack primers and MIO type top coats are favoured over sophisticated 2-pack systems. Finally, the advantages of 1-pack and 2-pack top coat systems were detailed and future trends such as solventless, powder and water-based coatings were mentioned.

A short question time ensued in which the merits of zinc phosphate-based primers were lauded and the vote of thanks was proposed by Professor David Williams-Wynn.

Computer software for the coatings industry

On Thursday 16 June a large audience heard Mr Harry Peters of Chemtra (Pty) Ltd give a detailed lecture on "Computer software for the coatings industry". On offer was an ICL state of the art microcomputer combined with a complete software related data-based management system, specifically suitable for paint, adhesive and ink manufacturers. The package was organised as a main and inner menu, which is available as separate modules and is programmed for 2,250 entries. The unit has a floppy disc drive facility as well as the main data bank.

Mr Peters demonstrated various options primarily related to the formulation, production and stock control of paint products with the emphasis on removing the mundane tasks abhorred by most laboratory personnel, reflecting his own previous experiences as a bench chemist.

A most amusing vote of thanks was given by Mr Len Diedricks who thanked Chemtra for their generous sponsorship of the evening, to which the audience showed their enthusiastic approval.

The production and uses of aluminium pastes

On Tuesday 21 June Mr Alan Tarboton of Hulletts Aluminium gave a most interesting lecture on "The production and uses of aluminium pastes". Manufacture at the Pietermaritzburg plant is by a wet milling process in a ball mill with saturated fatty acid to the desired flake form. Air is passed through the mill to promote oxidation. After milling the slurry is screened and then filtered. The properties of leafing and non-leafing grades were detailed. It was noted that the non-leafing grades were more difficult to make and were prone to quality variations.

Hulletts Aluminium favour the chemical wet milling process over dry milling due to safety factors.

Developments in Japan on producing water-dispersible aluminium pastes were mentioned, but shelf stability was still a major problem area and work was continuing on this aspect.

After a lively question time the vote of thanks was given by Mr Dick Philbrick who thanked Hulletts Aluminium for sponsoring the evening, which was endorsed by the audience in the usual manner.

R. Philbrick

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

news

Ellis & Everard's US operation expands

American Industrial Chemicals Corporation, the Atlanta-based chemicals distribution subsidiary of Ellis & Everard PLC, has expanded into Tennessee by opening a branch in Chattanooga.

According to Ellis & Everard's managing director, David Walsh, the move is part of the UK company's determination to build on the experience and expertise of AICC, a company acquired in 1982, and expand in the industrial south-east of the United States.

Reader Enquiry Service No. 31

New HEC capacity

BP Chemicals Belgium has successfully commissioned additional production facilities for hydroxyethyl cellulose (HEC) at its Antwerp site.

The expansion will double BP Chemicals' capacity for this water-soluble polymer from 4,000 to 8,000 tonnes per year.

Reader Enquiry Service No. 32

Peter French (left), managing director of Glasurit Beck Ltd, hands over the keys of a Vauxhall Cavalier to Chris Moody at a recent Glasurit Trade Golf Day. The car is part of the company's sponsorship deal with Moody

Glasurit sponsors Chris Moody

Hollingbury Park (Brighton) Golf Club professional Chris Moody is being sponsored by Glasurit Beck Ltd, the Slinfold, Horsham-based manufacturer of industrial surface coatings and resins. The company, which is a wholly owned subsidiary of the BASF Group, is a major supplier of paint systems to the automotive industry.

Twenty-nine-year-old Moody, who turned professional in 1973, currently lies 35th in the European golfing order of merit but has finished in the top 25 in 15 international tournaments in the past two years. In 1981 he came 8th in the Dutch Open, and in last year's Sun City Classic he finished 9th.

This year has started well for Moody with an eight-under-par 64 in the South African ICL Tournament Players' Classic. This placed him 7th, just five strokes behind the winner Wayne Westner, and gave him the course record. Also this year he was 17th in the French Open and 20th in the Martini International.

Commenting on his new sponsor, Moody said: "I think the involvement with Glasurit has been a great help to me in a number of ways. Being responsible to Glasurit has made me more determined and more business conscious. The improvement in my form and current position of 35 in Europe speak for themselves."

Reader Enquiry Service No. 33

Graco acquisition

Graco and Soprea, two well-known and highly respected names in the field of industrial paint application, have joined forces by Graco's outright acquisition of the Soprea organisation.

This acquisition will dramatically enhance Graco's range of air spray, airless and conventional manual and automatic electrostatic finishing equipment.

Graco now claims to provide the most complete range of paint handling and application equipment available worldwide.

Reader Enquiry Service No. 34

Haeffner management buy-out

Agreement in principle has been reached for the sale by Wolstenholme Rink PLC of two of its subsidiary companies, H. Haeffner & Co. Ltd and Procter Johnson & Co. Ltd (Haeffner/Procter Johnson), to a new company called Haeffner Holdings Ltd. This company will be controlled by some of the existing management of Haeffner/Procter Johnson, with the backing of the Welsh Development Agency.

Over the years since Haeffner was acquired its business has moved away from the printing industry towards the building and paint industries. This move was accelerated by the acquisition of Procter Johnson. The business of other Wolstenholme Rink Group Companies is concentrated towards the printing industry and consequently Haeffner/Procter Johnson no longer has a logical position in the group structure.

Reader Enquiry Service No. 35

Blundell-Permoglaze's competition for paint users

The search is on to find Britain's Brightest Workplace 1983/84 and if you're smart, says the British Safety Council, you'll write off straight away to the Permoglaze Safety Education Trust for an entry kit.

The kit is full of goodies that could not only brighten up your life at work, but could win you enough paint to redecorate your home as well! The person who nominates the winning company will personally receive 25 litres of paint supplied by Blundell-Permoglaze, Britain's largest trade only manufacturer and sponsor of the Trust.

The object of the competition is to encourage businesses to use colour as a working asset.

"Paint is much much more than just a protective coating. It gives the opportunity of using colour for information, for pleasure, for warning and a host of other uses," says the official "Using Colour at Work" booklet, which is included free in every competition kit. The booklet explains legal requirements, how colour influences responses, and how colour schemes can become a vital and integral part of any work activity.

The winning company becomes the proud possessor for a year of a unique hand-crafted bronze trophy which is presented at a prestigious luncheon in London.

Reader Enquiry Service No. 36

International Paint for "Miracle" Maestro

International Paint has swept the board on the new Austin Rover "Miracle" Maestro in supplying the complete paint system for the original factory finish.

The complete paint system, from primer to finish, claimed to be the most advanced paint treatment in Europe, is supplied by the Automotive Division of International Paint based at Ladywood in Birmingham.

Heavy investment has been made in Austin Rover's new paint facility at Cowley, which is extensively equipped with robots and computer-controlled automated equipment and which employs the very latest paint technologies.

The high standards for product quality set by Austin Rover are well illustrated by the company's target of a 90 per cent first time "OK rate" for paint finish – according to International a level far higher than that achieved by the rest of the European car industry.

The complete paint system starts with

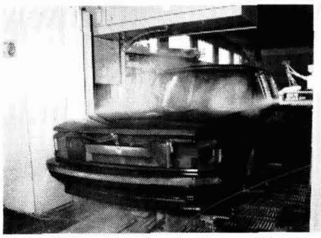
news

the International Cathodic Electropaint Primer, a total immersion process giving the body its high resistance to the corrosive effects of salt and condensation.

This is cured in a stoving oven ready for the next paint process, which is the application of International Minsand Surfacer to give the best possible substrate for the final colour.

The final finish is International Paint's high temperature stoving colour top coat, including the metallic finish which is a clear over base system.

The whole paint process adds up to a quality that means that Austin Rover can confidently give the Austin and MG Maestros a six-year corrosion warranty.
Reader Enquiry Service No. 37



One of the new Austin Rover Maestros receiving its final high temperature stoving colour top coat at the Cowley factory

products

Automatic powder paint system

Mindon Engineering Ltd recently completed the design and manufacture of a new type of powder paint spraying system for use with automated production lines.

Known as the New Four Gun Automatic Powder Paint System, this self-contained system with built in automatic gun control operates without the use of sophisticated robotics or gun traverse. A product detector or trigger fitted to the customers' existing conveyor activates the spray process as the product approaches the gun. Where required a simple photoelectric cell may be used for this purpose.

The guns are fixed in a static position for simplicity and are able to coat complex shapes to a very high standard without the need for complex robotics.

Each of the guns can be independently regulated for both pressure and powder flow by means of four individual powder pumps. In this way, an infinite number of spray patterns can be produced to harmonise with differing product characteristics.
Reader Enquiry Service No. 38

New from Polyvinyl Chemie

Polyvinyl Chemie has released the following information on three new products.

NeoCryl S-834: an all acrylic solution polymer in ethanol with good adhesion properties to various plastics, metals and foils. Formulations based on this polymer can be made completely water-tolerant. NeoCryl S-834 can be formulated into water- and solvent-based flexo and gravure inks and temporary coatings.

NeoRez U-325-E: an aromatic modified polyurethane resin with excellent adhesion properties on pretreated polyolefine films. NeoRez U-325-E is a colourless version of U-325 with improved viscosity stability in NC-based inks. NeoRez U-325-E can be used in gravure and flexo printing inks on pretreated polyolefines and as a plasticizer for NC coatings.

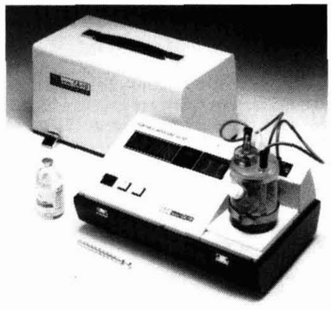
NeoCryl BT-44: a special modified polystyrene dispersion developed for coatings and inks. Additional properties of NeoCryl BT-44 are good reversability, colour strength, gloss, printability and adhesion. NeoCryl BT-44 can be used for overprint lacquers, alu coatings, pigment preparations etc. Its main feature is the high temperature and heat seal resistance.
Reader Enquiry Service No. 39

New UV absorber and stabilisers

Sanduvor 3206 is a new type of liquid UV absorber for the paint industry from Schweizerische Teerindustrie AG (STIA), an affiliate of Sandoz Ltd, Basle. The notable advantages of this product, which has been specially developed for application in two-coat metallic paints, are its ease of incorporation, the possibility of metering it volumetrically and its low volatility.

According to STIA its exceptionally inert structure ensures problem-free application over a wide range of uses; there are no undesirable reactions with acid catalysts, for example, no discoloration on contact with metals, etc. Sanduvor 3206 exhibits a pronouced pigment-protective effect, improves gloss retention and retards cracking. The product has already produced proven results in industrial practice.

In addition to Sanduvor 3206, STIA is presenting a series of new experimental products as UV stabilisers for the paint industry. Experimental product VP Sanduvor 3040 is a non-volatile UV absorber of the benzophenone type. VP Sanduvor 3045 and 3050 are sterically hindered amines (HALS) in liquid form, with VP Sanduvor 3045 additionally reinforced by being bound with a nickel quencher. VP Sanduvor 3212 and VP Sanduvor 3220 are presented as a complete UV stabilising system, also in liquid form. In addition to a UV absorber, these products contain balanced amounts of sterically hindered amines, and VP Sanduvor 3220 also has a built-in nickel quencher.
Reader Enquiry Service No. 40



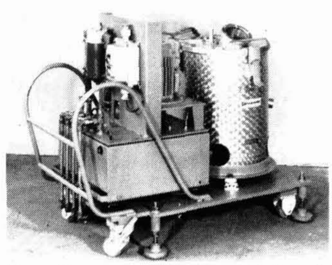
Model CA-10, battery or mains operated

Portable Karl Fischer titrator

A fully portable Karl Fischer titrator has now been released by Anachem.

This new instrument, the model CA-10, can be operated either from mains voltage or from rechargeable Ni-Cd batteries.

Detection sensitivity is down to 1μg H_2O and the five digit crystal display gives the results in μg H_2O, without the need to calibrate reagents.
Reader Enquiry Service No. 41



New Rousselet mobile vertical axis centrifuge

New mobile centrifuges

A new range of trolley-mounted vertical axis centrifuges from Rousselet is now available with a plain bowl, perforated basket, filtration bag and basket or sets of test tube buckets. As well as being mobile they have multi-use potential as driers, decanters or separators in laboratories and for temporary use for test runs and in pilot plants.

Special bowls are available for high pressure, vacuum or sterile processes.
Reader Enquiry Service No. 42

Asbestos replacement

Capricorn Chemicals Ltd has been appointed the agent in the United Kingdom for sales of Technocel Alpha Cellulose fibres to the surface coatings and welding rod industries.

Manufactured by CFF of West Germany, Technocel is available in a range of fibre lengths and is designed for use as an alternative to asbestos in a wide variety of applications.

Certain grades of Technocel are offered with a stearic acid coating, which improves the mixing characteristics in rubber compounds.
Reader Enquiry Service No. 43

Re-usable liquid sorbent badge

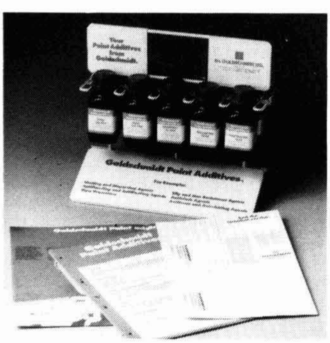
SKC has announced a new liquid sorbent air sampling badge that permits the sampling of many chemical hazards not previously possible by simple badge collection.

The liquid sorbent badge consists of a liquid-filled chamber closed by a bound-liquid membrance. The sample is brought into contact with the liquid through controlled diffusion at a pre-determined rate that is independent of wind velocity.

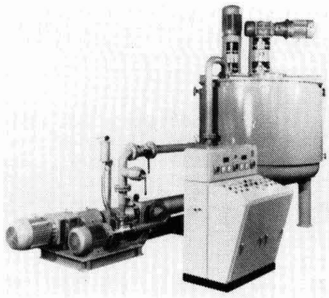
The badge housing is of a refillable, spill-proof design to accommodate the liquid of choice. A wide variety of chemical hazards can be collected including ammonia, methanol, formaldehyde, sulphur dioxide and many other acid gases. Sampling periods from a few hours up to 30 days are possible. After sampling, a number of analytical techniques can be utilised including direct injection into a GC, GC with purge and trap, colorimetric, specific ion electrodes or other methods.
Reader Enquiry Service No. 44

Th. Goldschmidt's paint additives

Th. Goldschmidt Ltd has assembled a range of paint additives intended to aid paint chemists. The range includes products designed to act as wetting and dispersing agents, flow promoters, anti-blocking agents and de-aerators.
Reader Enquiry Service No. 45



Paint additives to aid the paint chemist



The new enclosed, dust-free Pelletised Pigment Disperser from Ateliers Syssmeyer

Pelletised pigment dispenser

A new disperser for pelletised pigments has been introduced by Ateliers Sussmeyer which offers fully automatic, efficient and dust-free operation.

The operating principle of the disperser is different from traditional methods. It enables big-bags, silos or bunkers to be used for material storage.

The system is a completely closed vessel and the pigment and liquid components are dosed into the unit via connections on the lid. A measuring system ensures that correct quantities are introduced and the mixing process begins. A pneumatic valve under the vessel opens and the pre-dispersing unit and the pump come into operation. The material re-circulates via a pipeline into the vessel and after complete pre-dispersion has been attained the material is pumped into a second vessel through a three-way valve. The mixing process continues with the material being re-circulated in the second vessel until the required dispersion level has been achieved. The material is then pumped into a storage vessel.

Depending on the viscosity of the product being refined, hourly capacities of up to three tons can be achieved. If further refinement is required, the system can be linked to a horizontal mill for finer final dispersion.
Reader Enquiry Service No. 46

news

people

Vinyl Products Ltd has appointed **David Maltman** as technical representative covering the paints and building industries in the Midlands and north of England. Mr Maltman is a graduate of the Plastics and Rubber Institute, a member of the Institute of Sales and Marketing Management, and is currently Publications Secretary for the West Riding Section of OCCA.

He had been with Durham Chemicals Distributors Ltd for the last seven years involved with selling raw materials to the surface coatings industry. Before that he was a technologist in the Pigments Section of the Technical Service Department in ICI Ltd, Organics Division dealing with paints, plastics and rubber applications.

★ ★ ★

Mr Ion B. Bolam has been appointed sales manager – Resins. He will be responsible for sales to the surface coatings, printing ink and adhesive areas. Ion Bolam has previously held the posts of technical service manager and products development manager with Resinous Chemicals Ltd and has extensive experience in the coatings industry. This experience, in both paint and resin development, has been obtained in the UK, Denmark and Nigeria. Ion will report to **Norman Norris**, the commercial director of Resinous Chemicals Ltd.

Ion is the current Chairman of the Newcastle Section of OCCA.

★ ★ ★

Mebon Paints Ltd, the protective coatings manufacturer based in Sutton-in-Ashfield, Nottinghamshire, has recently re-organised its management format.

Stan Turner, the company secretary, has been promoted to the main board as financial director, while **Bill Thompson** (sales), **Ken Ormerod** (research) (OCCA member) and **Brian Adkins** (works) are elected to the newly formed Divisional Board of Directors.

The management team has also been strengthened by the addition of **Jonathan Bourne** (marketing) (Honorary Secretary of the Trent Valley Branch, OCCA), **Jim Neil** (technical sales office) and **Ian Baker** (production).

Mebon's activity to date relates mainly to the high performance segment of the paint industry, which has taken it into capital construction and North Sea oil.

★ ★ ★

Peter Holloway, aged 27, has been appointed marketing services executive for Glasurit Beck Ltd, manufacturer of industrial surface coatings and resins.

Peter joins the company after eight years with ICI, where he held a number of positions in the technical and sales departments of that company's Automotive Refinishing Division.

OCCA-35 Exhibition
1-3 May 1984
Cunard International Hotel

THE INTERNATIONAL FORUM FOR THE SURFACE COATINGS INDUSTRIES

Member of the
ABC
Audit Bureau of Circulation

Member of the Association
aeo
of Exhibition Organisers

The OCCA-35 Exhibition is to be held at the Cunard International Hotel in London from 1-3 May 1984.

Some important aspects of exhibiting at OCCA exhibitions are highlighted below.

OCCA Exhibitions are:

★ International forums:

According to the independently audited figures published in the Audit Bureau of Circulations' Exhibition Data Form, at the last OCCA Exhibition visitors came from over 30 overseas countries and exhibitors from 11 overseas countries.

★ Popular and cost effective:

Again using the figures from the ABC's Exhibition Data Form, the completed registration cards at the last OCCA Exhibition showed that 34 per cent of the visitors were of director/owner/management status and 31 per cent were engaged in paint and printing ink manufacture.

★ Competitively priced:

Not all exhibitions complete Exhibition Data Forms but where they do you could compare them with OCCA's, which shows that exhibiting at its exhibition in 1984 can cost as little as £550 (the same as in 1982) for a basic shell scheme unit with carpet tiles, walls, muslin ceiling, fascias, name and number boards. For those using rooms or the free standing display areas the highest charge is £50 per square metre (and remember that this is for a **full three day** exhibition).

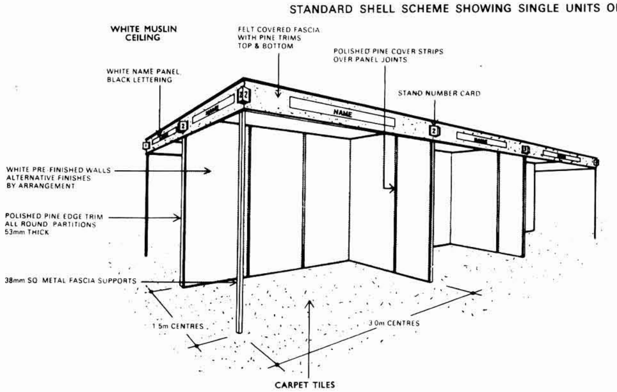
In addition, Exhibitors at OCCA-35 can:

★ Present lectures, show films, videos etc.:

OCCA-34, held in 1982, saw the introduction of a totally new idea, one of the larger rooms on the mezzanine floor normally used for exhibiting being reserved as a lecture theatre. Companies booking space at the exhibition were invited, as an extension of exhibition facilities, to present lectures or show films etc. to complement the information given on their stands. As these presentations proved so popular with both exhibitors and visitors, exhibitors at OCCA-35 will again be offered the same opportunity and, as before, the type of material presented is entirely the choice of the exhibitors. No attempt is being made to arrange a conference and any facet of exhibitors' activities can be utilised: commercial, technical, public relations, future plans etc. No charge will be made to the exhibitors for this facility and the sessions, which will be divided into periods not exceeding 30 minutes, will be allocated on a *first come/first served* basis.

The lectures, films etc. will be publicised well in advance in the *Journal* and also on a notice board in the entrance to the Exhibition Hall. Public address announcements will be made each day to remind visitors that they have to register for each lecture; the list of visitors for each lecture will be made available only to the exhibitor making the presentation. At OCCA-34, some lectures attracted attendances of 70 visitors and exhibitors should bear in mind that this is a first-class opportunity to put over a message, which can be further re-inforced by conversations on their stands.

STANDARD SHELL SCHEME SHOWING SINGLE UNITS ONLY



Note: In addition, a few complete rooms for exhibitors and "stand space only" in the Drake Suite (all without shell scheme) are available on the mezzanine, where the lecture hall is situated

★ Choose different styles of exhibiting:

Three types of exhibition space will be available at OCCA-35 and exhibitors can utilise more than one type, if they so wish.
- The traditional shell scheme units, which suit the requirements of many exhibitors.

- Rooms on the mezzanine floor around the lecture theatre, in which companies can create the atmosphere and image they wish to put across.
- Free standing space, which is being offered for the first time, in the Drake Suite, also on the mezzanine floor. This is a new concept at an OCCA Exhibition and will enable exhibitors to set up their stands to suit their particular needs.

It is stressed that the number of rooms on the mezzanine floor and the amount of space available in the Drake Suite for free standing displays is **limited** and will be allocated on receipt of applications.

Space has already been reserved for OCCA-35 and organisations wishing to participate in this prestigious event should send in their applications without delay.

Invitations to Exhibit together with a "question and answer" feature and application forms were despatched in mid-July but any organisation wishing to have further copies or copies of the ABC's Exhibition Data Form should contact the Director & Secretary, of the Association at Priory House, 967 Harrow Road, Wembley, Middlesex HA0 2SF, England (telex 922670, telephone (01) 908 1086).

bsi news

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

British Standards reviewed and confirmed

4756: 1971 PVC/28
Ready mixed aluminium priming paints for woodwork

Standards withdrawn

3900:
Methods of test for paints
3900: Part C4: 1965 Freedom from residual tack
3900: Part D3 1975 Assessment of sheen
Both obsolete

New work started

Solventless polymerizable resinous compounds used for electrical insulation. Part 2. Methods of test
Will amend BS 5664 in respect of Clause 15 'Pot life' and 20.2 'Total shrinkage'
GEL/16

Draft British Standards for public comment

*83/52420 DC BS 684. Methods of analysis of fats and fatty oils. Part 2. Other methods. Section 2.26. Determination of plastics polymers (ISO/DIS 6656)

*83/53234 DC BS 3900: Methods of test for paints. New Part. Falling weight test (ISO/DIS 6272)

Draft international standards available

83/52377 ISO/DIS 4895. Plastics. Liquid epoxide resins. Determination or tendency to crystalize (ISO/TC 61)

83/52427 ISO/DIS 1279. Essential oils. Determination of carbonyl value. Hydroxylammonium chloride method

New IEC publications

IEC 757: 1983 GEL/41
Code for designation of colours, 7 page
No equivalent BS

New ISO Standards

ISO 4597:
Plastics – Hardeners and accelerators for epoxide resins
ISO 4597/1: 1983 Designation, 2 page, B
No equivalent BS

ISO 6504:
Paints and varnishes – Determination of hiding power

ISO 6504/1: 1983 Kubelka-Munk method for white and light-coloured paints, 31 page, Q
To be implemented as a Part of BS 3900

Revised ISO Standards

ISO 3310:
Test sieves – Technical requirements and testing
ISO 3310/1: 1982 Test sieves of metal wire cloth, 5 page, D
ISO 1524: 1983
Paints and varnishes – Determination of fineness of grind, 8 page, E
To be implemented as a revision of BS 3900: Part C6

ISO 3681: 1983
Binders for paints and varnishes – Determination of saponification value – Titrimetric method, 3 page, C

ISO 3682: 1983
Binders for paints and varnishes – Determination of acid value – Titrimetric method, 2 page, B

occa news

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

Proceedings of the Annual General Meeting

The twenty-first Annual General Meeting of the Incorporated Association was held on 17 June 1983 at 4.30 p.m. at the Viking Hotel, York with the President (Mr D. J. Morris) in the chair.

There were 30 members present. The notice convening the meeting was read.

Apologies

Apologies for absence were received from Mr N. A. Bennett, Dr L. Valentine, Mr J. R. Bourne, Mr D. H. Vettewinkel, Mr D. J. Silsby, Mr A. J. Newbould, Dr T. A. Banfield, Mr B. A. Canterford and Mr R. Saunders.

Minutes

The President asked the meeting to take as read the minutes of the twentieth Annual General Meeting held on 16 June 1982, as printed and circulated in *JOCCA*, pp.334-336 inclusive, August 1982.

There being no comments, the adoption of the minutes was put to the meeting and carried unanimously.

Report of the auditors to the members

The report of the auditors to the members was read.

occa news

Annual Report of the Council for 1982

In the absence of Mr J. R. Bourne, Mr D. S. Newton (Honorary Editor and a former Honorary Secretary) moved the adoption of the Annual Report of the Council and the statement of accounts for 1982. The adoption was seconded by Mr B. F. Gilliam (Honorary Treasurer).

The President asked for comments and, there being none, the Annual Report of the Council and statement of accounts for 1982 were formally adopted by the meeting.

Election of President (1983-85)

The President stated that, as indicated on the agenda, Mr C. N. Finlay had been nominated by the Council and he now asked the Annual General Meeting to accept the nomination.

This was carried unanimously with acclamation.

Mr C. N. Finlay thanked the meeting for the trust placed in him and stated that he was looking forward to his term of office. He then asked Mr D. J. Morris to preside for the remainder of the Annual General Meeting and at the Conference Dinner later in the day.

Election of Vice-Presidents of the Association

Mr D. J. Morris read the nominations of the Council as printed on the agenda and asked the meeting to accept them *en bloc*. This was agreed. He pointed out that following the practice for many years one Vice-President was resident in South Africa and another in New Zealand, where divisions of the Association had been formed from the sections in those countries. The following were then elected as Vice-Presidents:

(i) Mr R. E. Rouse
(ii) Mr G. Willis
(iii) Mrs A. McA. Gibson
(iv) Mr C. Butler
(v) Dr T. A. Banfield
(vi) Dr H. R. Hamburg
(vii) Mr V. H. Furuhjelm

Election of Honorary Officers of the Association

Mr D. J. Morris stated that Mr J. R. Bourne had been forced to relinquish the position of Honorary Secretary, which he had held since 1980, owing to increased business commitments and Mr G. W. Fowkes (a former Chairman of the Bristol Section) had accepted the Council's nomination to serve in this capacity.

On being put to the meeting it was unanimously agreed to elect the honorary officers as follows:

Honorary Secretary	Mr G. W. Fowkes
Honorary Treasurer	Mr B. F. Gilliam
Honorary Editor	Mr D. S. Newton
Honorary Research & Development Officer	Mr J. R. Taylor
Honorary Technical Education Officer	Mr A. T. S. Rudram

A vote of thanks was recorded to Mr J. R. Bourne for his service as Honorary Secretary.

Announcement of election of Elective Members to Council 1983-85

Mr D. J. Morris stated that under Article 43(ii) of the Association, where the number of persons nominated for the three elective places did not exceed this number, then the persons so nominated were declared elected. At the closing date for nominations two members had been nominated (Mr B. A. Canterford and Mr F. Morpeth) and accordingly they were duly elected to serve on Council for the period 1983-85. The third place would be filled by the Council as its first act at its meeting on 13 July in accordance with Article 50.

Chairmen of sections for the coming session

The names of the section chairmen to serve on Council for the coming year were given as follows:

Bristol	Mr R. Saunders
Hull	Mr J. L. Taylor
London	Mr F. D. H. Sharp
Irish	Mr D. Pountain
Manchester	Mr G. R. Robson
Midlands	Mr D. D. Kimber
Newcastle	Mr I. B. Bolam
Scottish	Mrs A. McA. Gibson
Thames Valley	Mr R. H. Wright
West Riding	Mr H. Young
Ontario	Mr A. Gray
Cape	Mr P. Kretzel
Natal	Mr R. Gush
Transvaal	Mr G. H. Munro
Auckland	Mr R. Spargo
Wellington	Mr A. Thorburn

Membership Subscription Rates

Mr D. J. Morris asked the meeting if they would accept the items on membership subscriptions covered by agenda items 11(a), (b) and (c) *en bloc* and this was agreed.

Mr B. F. Gilliam (Honorary Treasurer) pointed out that, in accordance with Article 11, resolutions concerning subscriptions had been passed at two successive Council meetings on 23 February 1983 and 20 April 1983 and were now placed before the Annual General Meeting for confirmation. He proposed, Dr F. M. Smith seconded and it was agreed without dissent that:

(a) The 1983 Ordinary and Associate Membership subscriptions for those members attached to the three sections of the South African Division and the Ontario Section were SA Rands 36 and Canadian $38 respectively.

(b) The 1983 Ordinary and Associate Membership subscriptions for those members attached to the two sections of the New Zealand Division were NZ $27 and that this did not include receipt of the *Journal* by those members unless payment of an additional amount is made individually to the Association's offices.

(c) With effect from 1 January 1984 the annual membership subscription rates in the various categories of membership shall be as follows:

Ordinary or Associate Members	£27.00 per annum
Retired Members	£ 7.00 per annum
Registered Students (under 21)	£ 7.00 per annum
Registered Students (21-25)	£13.50 per annum

By resolution of Council, Value Added Tax will be applicable to membership subscriptions paid by members resident in the United Kingdom.

Reappointment of auditors and fixing the remuneration thereof

It was proposed by Mr A. C. Jolly that Coopers & Lybrand (Chartered Accountants) be reappointed auditors of the Association and that their fee for 1983 be £975. This was seconded by Mr J. E. Mitchell and carried unanimously.

Vote of thanks to retiring Council members

Mr A. McLean (President 1977-79) proposed a vote of thanks to those members who were retiring from Council and pointed out that a great deal of work was carried out by members both at Council and section level and this required a great deal of support from their companies which he felt sure was appreciated by the Association. He felt that the members present would like to show their gratitude for the service given to the Association by those who had served as vice presidents, elective members, section chairmen and section representatives and he proposed a vote of thanks to those members, which was carried with acclamation.

Vote of thanks to Honorary Officers of the Association

Dr H. R. Hamburg (a former Honorary Treasurer) proposed a vote of thanks to the Honorary Officers of the Association. He was sorry that Mr J. R. Bourne had had to relinquish the office of Honorary Secretary after three years through pressure of business commitments. He felt sure that the members understood the considerable work done to ensure the smooth working of the Association by Mr B. F. Gilliam (Honorary Treasurer), Mr D. S. Newton (Honorary Editor) for his work on the Journal, Mr J. R. Taylor (Honorary Research & Development Officer) who had admirably produced the technical programme for the Conference and Mr A. T. S. Rudram (Honorary Technical Education Officer) for his work in the field of technical education. He asked the Annual General Meeting to show their appreciation to the Honorary Officers of the Association and this vote of thanks was carried with acclamation.

Vote of thanks to retiring President

The Director & Secretary called upon Dr F. M. Smith (President 1979-81) to propose a vote of thanks to the retiring President.

Dr F. M. Smith stated that a great deal of progress had been made during Mr Morris's presidency and drew particular attention to the goodwill engendered by his visits abroad to the Ontario Section and the South African Division and to other organisations such as OCCA Australia, FATIPEC and the FSCT. A meeting had been held that morning which had seen the culmination of an idea for an OCCA International embracing both this Association and the Australian Association which had first been mooted by Past President Mr L. H. Silver, furthered by himself and brought to fruition by Mr Morris. During his presidency also it was agreed to hold the Exhibition on a biennial basis and to set the finances on sound lines.

He asked the meeting to show their appreciation and the vote of thanks was carried with acclamation.

Mr Morris thanked Dr Smith for the way in which he had proposed the vote of thanks and the members for its kind reception.

Any other competent business

Dr F. M. Smith stated that he wished to raise the question of Association finances, to which the initial reaction was that as Dr Smith was a member of Council and with due regard to Article 24, the matter could not be classed as other competent business.

Supported by Mr L. H. Silver the matter was pursued and Mr R. L. J. Morris felt that the matter could best be dealt with by a special item on the agenda for the 1984 Annual General Meeting.

Having reached this point, concern on behalf of the general membership at the differing opinions was expressed by Mr E. L. French, Mr M. H. Gamon, Mr H. Young, Mr C. Butler, Mr A. McLean, Dr H. R. Hamburg, Mr F. D. H. Sharp, Mr R. L. J. Morris and Dr K. Borer.

Mr C. Butler considered an independent view might be beneficial to the Association. The Director & Secretary pointed out that the accounts were audited by Coopers & Lybrand who had advised the Association in the past and that their advice could be sought again and the costs involved obtained.

After further discussion, the chairman suggested the proposal and the amendments from the meeting were that they would like the opinion of an outside financial adviser to be presented to Council within three months and this was Agreed.

The chairman then closed the meeting at 5.12 p.m.

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Reports of Council meetings

A meeting of the Council took place on 20 April 1983 at the Great Northern Hotel, London N1. The President (Mr D. J. Morris) was in the chair; there were 21 members present.

A welcome was extended to Mr T. Wright, the newly elected Representative of the West Riding Section.

The Agenda for the Annual General Meeting was finalised.

The Annual Accounts for 1982 and the Estimates for 1983 were adopted.

A report on the number of members whose subscriptions for 1983 had not been received was received.

First details of the Exhibition Committee's plans for the 1984 Exhibition were reported.

Members were asked to suggest names of retired members or others who would be willing to contribute to a series of monographs and anyone who was so willing was asked to write to the Director & Secretary giving a title and summary.

The new layout of the *Journal*, including company visits, was welcomed.

The Midlands Section undertook to arrange for a lecture to be given at the joint meeting of the Midlands Group of the Society of Leather Technologists and the Royal Society of Chemistry.

It was reported that Mr K. Lord would no longer be able to represent the Association on the Colour Group and the BSI Committee LGL/9 Artificial Daylight for Colour Matching.

Information was tabled on admissions to the Professional Grade, the York Conference and section activities.

Votes of thanks were recorded to the retiring President, retiring Hon. Secretary and other retiring members of Council. The President paid tribute to the support which he had received during his Presidency from the Director & Secretary.

The President thanked members for their attendance and declared the meeting closed at 3.57 p.m.

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A further meeting of Council, the first of the 1983-84 session, was held at 2 p.m. at the Great Northern Hotel, London N1 on 13 July. The President (Mr C. N. Finlay) was in the chair; there were 23 members present. In addition, Mr T. Slinn (Wellington Section) was present by invitation. In accordance with Article 50, as its first act, the Council filled the vacancy for an Elective Council Member, Mr A. J. Newbould being elected to serve. The President extended a welcome to all new members of Council. It was reported that, at the Annual General Meeting, Mr B. A. Canterford and Mr F. Morpeth had been elected as Elective Council Members and Mr G. W. Fowkes as Hon. Secretary.

The dates for the Council meetings for the session were agreed and the Manchester Section undertook the arrangements for the holding of the Annual General Meeting and Reunion Luncheon in June 1984.

The appointment of Council Committees for the forthcoming session and the Association's representatives on other organisations was agreed. It was agreed that the President's Advisory Committee would in future be known as the Executive Committee.

Details were given of the Reunion Dinner on 26 October 1983 at the Great Northern Hotel, London N1 and reports received on the York Conference, of the preliminary planning of the Edinburgh Conference in June 1985 and the final plans for the OCCA-35 Exhibition, 1-3 May 1984.

The SLF Conference would be held in Oslo, 2-4 September 1985 and a speaker from the Association was sought.

occa news

A further function would be a joint seminar with the Society of Dyers and Colourists and other organisations in early June 1984.

Information on admissions to the Professional Grade was tabled.

Council was pleased to learn of two meetings held during the York Conference – one to finalise details on OCCA International with the President of OCCA Australia and the other being the meeting of the International Coordinating Committee attended by representatives from OCCA, OCCAA, FSCT, FATIPEC and SLF.

Section Reports and other items of Association business were discussed. The President thanked members for their attendance and declared the meeting closed at 4.50 pm.

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The 1983 Committee of the Natal Section (left to right): Alec Wymer, Len Diedricks, Dick Philbrick, John Gush (Chairman), Terry Say, Ron Gough. Missing were: Ken Piggott and Kurt Engelbert

Natal Section

Annual general meeting

The annual general meeting of the Natal Section was held on Friday 25 March 1983 at the Westville Hotel. The outgoing Chairman, Mr Ken Piggott, was pleased to report that the Section was going from strength to strength and that the increased attendance at meetings was most encouraging. He thanked all the sponsors who generously supported the monthly meetings throughout the year and the outgoing Committee for their hard work and support. Mr Piggott then handed over to Mr John Gush as incoming Chairman and the new Committee for 1983 was then elected as follows:

Chairman	J. Gush
Vice-Chairman	K. Piggott
Hon. Secretary	T. Say
Hon. Treasurer	K. Engelbert
Hon. Publications Secretary	R. Philbrick
Committee members	A. Wymer L. Diedricks R. Gough

At the close of the meeting the members joined the ladies in the hotel garden for a braai and a most enjoyable social evening ensued.

R. Philbrick

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Scottish Section

Annual golf outing

The Scottish Section held its annual golf outing on 6 May 1983 at Aberdour, Fife.

During the early morning of the 6th the rain was extremely heavy, so much so that there were doubts in some minds as to whether or not the course would be playable. However, once again the elements were kind and everyone got round dry except for a shower lasting about 15-20 minutes. The rest of the time was sunshine.

The results of the competitions together with details of the prizes are as follows:

Prizes – members

Whittaker Trophy . . . Nett 61 – Nigel Baird
2nd prize . . . Nett 63 – Tom Kirkwood
3rd prize . . . Nett 65 – David Rawley
4th prize . . . Nett 66 – Graham Radin
5th prize . . . Nett 67 – Hugh Munro

Morris Ashby Quaich
(Best scratch score) . . . . Nett 71 – Tom Kirkwood
Next best . . Nett 79 – Bill Jack

Tioxide Tankard
(Most improved score) . . . . . Nett 4 – David Rawley

Booby . . . . Nett 117 – Alan Paterson

★ ★ ★

Prizes – visitors

Visitors Shield . . . . Nett 65 – Ian R. Webster
2nd prize . . . Nett 68 (out 44) Neil Wilkinson
3rd prize . . . Nett 68 (out 46) Jim Bunce
4th prize . . . Nett 69 (out 45) Bob Morrow
5th prize . . . Nett 69 (out 47) Fred T. McIntosh

(Best scratch score) . . . . Nett 72 – Ian R. Webster
Next best . . Nett 81 – Denis Gibson

(Most improved score) . . . . . Nett 5 – J. P. Watson
Booby . . . . Nett 100 – Paul Davies
Hidden hole (18th) . . . . Nett 11 – Paul Davies

★ ★ ★

Prizes were donated by:

Bill Warmsley – Esso Chemical
Brian Donaldson – T. & R. Chemicals
J. McLean – Barclay Bros.
Ian Webster – P. W. Hall
Alastair Hunter – Samuel Banner
Bob Morrow – Tioxide UK
Jim Boyd – A. G. Paterson
John Weston – Ciba-Geigy
J. D. R. Davidson – Shell Chemicals
David Rawley – Strathclyde Chemicals
Tom Kirkwood – Federated Paints
Anne Gibson – Alexander Ferguson & Co.
Alex McKendrick – Craig & Rose

to all of whom the Committee express their sincere thanks.

J. H. Coy

Manchester Section

1983 AGM

This year's meeting at the Leicester-Warren Masonic Hall, Knutsford, Cheshire was a new venue for the 59th AGM held on Friday 22 April 1983.

The meeting, under the chairmanship of Frank Redman, commenced with the formal activities, not associated with the new venue, which included acceptance of minutes, annual report of the Committee, and election of new officers, which included Gordon Robson as Chairman, Barry Windsor as Vice Chairman, Roger Handley as Publications Officer and John Calderbank as Hon. Technical Liaison Officer.

The four vacancies on Committee were filled by four nominations received from:

M. Aitken – Leyland Paints
M. Nixon – Wynnants Printing Inks
P. Jakobsen – Goodlass Wall
C. Williams – CVP

AOB was strictly non-eventful and was followed by a vote of thanks given to retiring Committee members Frank Redman, Eric Hurst, George Eastwood, Stan White and Norman Piper by B. Windsor.

The stampede to the bar was followed by an excellent meal, a period of silent respect to the sudden passing of one of our previous chairmen, Roy Touchin, and an interesting speech by Frank Redman and exchange of Ceremonial Regalia with the incoming Chairman, Gordon Robson.

The after dinner entertainment was surface coatings related in the shape of a genial Irish comedian, Pat Moriarty. In "real life" he is an area manager for a coated steel distributor. His repertoire of jokes inevitably contained a masochistic selection of Irish jokes and were noisily applauded before the traditional liar dice playing followed his performance to conclude an excellent meeting.

B. Windsor

Transvaal Section

34th AGM

Wednesday 20 April 1983 at 8 p.m. in the ballroom of the Sunnyside Park Hotel, Parktown, Johannesburg was the date, time and venue of the Transvaal Section's 34th annual general meeting. Nineteen members and 23 guests were present under the chairmanship of Mr Gordon Munro.

The meeting proceeded as follows:

1. Opening
2. Acceptance of apologies. The apologies of 18 members were noted.
3. Notice of the meeting
4. Minutes of the 33rd annual general meeting
5. Matters arising
6. Annual report of the Section Committee
   Before reviewing his report, which had been circulated to members before the meeting, the Chairman presented Mr M. S. Reynolds and Mrs Q. King, joint best students in the first year of the National Diploma Course in Paint Technology, with cheques of R100 each and free membership of the Transvaal Section of OCCA for the year 1983.
7. Presentation of the Financial Report
8. Election of the Committee for 1983-84:
   Mr Gordon Munro – Chairman
   Mrs Helen Gaynor – Vice Chairwoman
   Mr Eric Timm – Hon. Secretary
   Mr Peter Quorn – Hon. Treasurer
   Mr Ronald Cromarty – Hon. Publications Secretary
   Messrs Peter Gate, Clive Peddie, Edward Wright – Committee members
9. Following the completion of the formal business the members and their guests enjoyed a buffet supper before the band struck-up calling all to the floor for an enjoyable evening's dancing, where our new Vice Chairwoman and her husband David showed that their abilities were not limited to technology.

News of people

Members of the Transvaal Section who have recently suffered accidents and who have been ill are Mr Ben Bruwer, head of the Paint Section of the South African Bureau of Standards, who is recovering from a serious motor accident suffered on 14 December 1982. Mr Bruwer has returned to work after being hospitalized for three months.

Mr Peter Marples, the Section's Hon. Publications Secretary for 1982-83, is recovering from open heart surgery.

Mr Ted Wright is recovering from a long illness and is now back at work.

The Transvaal Section wishes these three members a speedy and complete recovery.

Mr Eric Timm, the Section's Hon. Secretary, attended the OCCA Conference in York from 15-18 June 1983, and Mr Ron Cromarty attended the Ninth International Conference on Organic Coatings Science and Technology in Athens from 11-15 July 1983.

R. Cromarty

● ● ●

A. J. Maddy, first holder of the Pearson Panke Golf Trophy (Conference Competition)

Pearson Panke Golf Trophy

As reported in the "Conference Diary" (July issue), Pearson Panke added to the social programme at this year's Conference by donating a golf trophy for a new competition. The competition will be a permanent feature at OCCA Conferences.

Appropriately the Pearson Panke Trophy features silver replicas of cross hatch cutters, used for the cross hatch adhesion test, as well as a golf ball.

Shown above is the present proud holder of the trophy, Mr A. J. Maddy, sales manager with Harco.

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Bristol Section

A rose by any other name...

Below is a rather amusing little story recounted recently by Grahame Fowkes. It formed part of an after dinner speech given a little while ago at a Bristol Section function by Mr Fowkes, who was then the Section's Chairman. Readers should draw their own conclusions as to the moral behind the tale.

Messrs Brush & Kettle to paint stockist:

"We wrote to you several weeks ago, complaining about the distemper purchased from you. Will you please arrrange to collect the material."

Paint stockist to distemper manufacturer:

"One of our best customers has complained about your distemper and has returned it. Please make arrangement to pick up our entire stock and pass credit."

Distemper manufacturer to paint stockist:

"We regret the tone of your letter and advise you that we are not prepared to take back the material. However our technical representative will call in due course."

Paint stockist to distemper manufacturer:

"Referring to the visit of your technical representative, please confirm in writing that we can sell the distemper as a knifing filler."

Director, distemper manufacturer to sales manager:

"I have examined the correspondence. You were right to refuse to take back the distemper, but I doubt the wisdom of sending our technical representative to handle the case. Now we must write and tell our stockist to sell his stocks of distemper as a ready-for-use-filler!
PS Fire the technical representative."

Paint stockist to distemper manufacturer:

"Orders are piling up for your ready-for-use-filler. Please rush through 100 × 4 lb tins."

Director, distemper manufacturer to sales manager:

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"The Board has decided to enter the filler market. Arrangements have been made for an all-out advertising campaign in the national press, television and on public transport. Please issue a sales bulletin listing the advantages of our filler – easily applied, fine texture, dries quickly, easy to rub down. Mention that it is the only filler on the market available in 24 colours."

Director, distemper manufacturer to sales manager:

"Arrangements for our ready-for-use-filler convention at the Grand Hotel are complete. Five hundred of our best customers and the press are coming, and the President of the Master Decorators Federation will take the chair."

Sales manager, distemper manufacturer to Mr P. Brush of Messrs Brush & Kettle:

"As a leading user of our ready-for-use-filler, we wonder whether you would do us the honour of being our guest at our convention at the Grand Hotel."

Mr P. Brush to sales manager, distemper manufacturer:

"Thank you for your kind invitation. I shall be delighted to attend. As you know we have purchased a great deal of this material in the last few months, and I would mention in passing that when thinned down with water it makes a really excellent washable distemper..."

Adapted from *The Decorator*

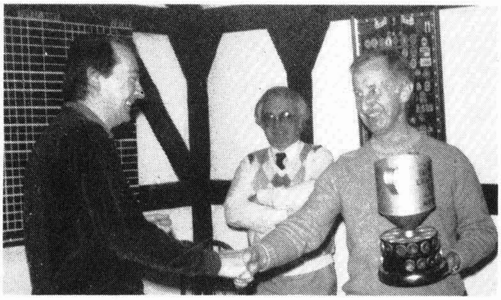
Annual skittles match with BPVLC

The annual skittles match was played at the Hob Nails, Little Washbourne on Friday 13 May. This did not turn out to be an unlucky day for the Bristol Section since, with the help of some members of the BPVLC who played for Bristol, we managed to win the Alkyd Cup for the first time for some considerable period, though by a very small number of points.

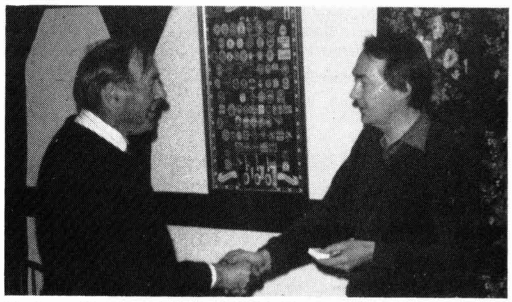
A pleasing number of members and their wives and friends made the journey to this very pleasant part of the Gloucestershire/Worcestershire border despite the weather.

The Alkyd Cup was presented to Roger Saunders, Chairman of the Bristol Section, by the President of the Birmingham Paint Varnish and Lacquer Club, Mr Ray Tennant. The occasion was also used by Roger Saunders to present Graham Fowkes, the past Chairman of Bristol Section, with his Past Chairman's Badge, since Graham Fowkes is also a member and previous officer holder of the BPVLC.

J. R. Taylor



Ray Tennant (BPVLC President) (right) hands the Alkyd Cup to the victorious Roger Saunders (Chairman of Bristol Section)



Grahame Fowkes (left) receives his Past Chairman's Badge from the present Chairman, Roger Saunders

professional grade

At the meeting of the Professional Grade Committee held on 13 July 1983 the Committee authorised the following (sections in italics):

Transfer from Licentiate to Associate

Jonathan Asiedu-Dompreh (*London*)

Admitted as Associate

Christopher Francis Woodhead (*Hull*)

Admitted as Licentiates

Abimbolu S. Babatunde (*General Overseas – Nigeria*)
Paul Anfinn Jakobsen (*Manchester*)

A list of colleges who are prepared to assist members in the preparation of material for their applications for admission to the licentiateship grade is available from the Association's offices.

new members

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

Ordinary Members

Beeston, S. P. (*Manchester*)
Botham, D., LRSC (*Manchester*)
Chaudhry, M. I., MSc (*General Overseas – Pakistan*)
Crosby, R. G. V., BSc (*Auckland*)
Davies-Coleman, M. T., BSc (*General Overseas – Zimbabwe Branch*)
Douglas, S. G., BSc (*London*)
Fairless, J. (*London*)
Farley, K. R. (*General Overseas – Zimbabwe Branch*)
Farooqui, A., MSc (*General Overseas – Pakistan*)
Gray, P. A., BSc (*Hull*)
Green, R. E. (*Transvaal*)
Houliston, L. A., BSc (*Wellington*)
Johnstone, D. I., BSc (*Manchester*)
Kennedy, L. A., BSc (*Auckland*)
Lazar, R. O., BSc (*Transvaal*)
Nancekivell, M. J., MSc (*Auckland*)
Patel, V., BSc (*General Overseas – Zimbabwe Branch*)
Pitt, D. A. (*General Overseas – Zimbabwe Branch*)
Pretorius, J., BSc (*Transvaal*)
Ramdeo, A. (*Natal*)
Redelinghuys, R. J. (*Transvaal*)
Rees, S. W., BSc (*London*)
Robinson, P. F., BSc, MSc (*Auckland*)
Saville, R. W. (*West Riding*)
Whitburn, W. A. (*Auckland*)
Wilcox, A. J. (*Transvaal*)
Wright, D. A., BA (*General Overseas – Bermuda*)

Associate Members

Boylan, P. D. (*Irish*)
Gemmell, W. (*Auckland*)
Greason, E. (*Ontario*)
Griffiths, C. J. H. (*Wellington*)
Marrin, E. W. (*Natal*)
Mitchell, F. J. (*Auckland*)
Pausina, J. (*Auckland*)

Registered Students

King, Q. F. (*Transvaal*)
Pillay, M. (*Natal*)
Reynolds, M. S. (*Transvaal*)

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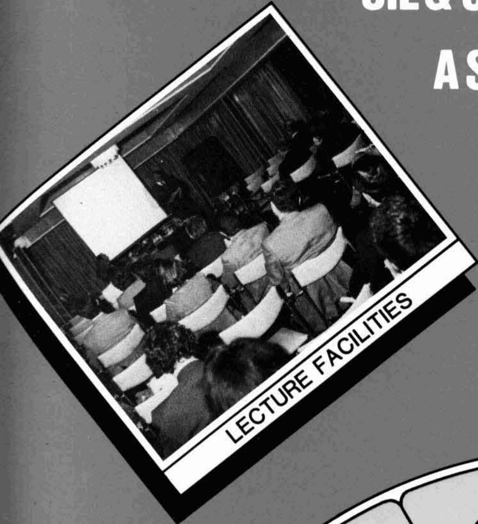

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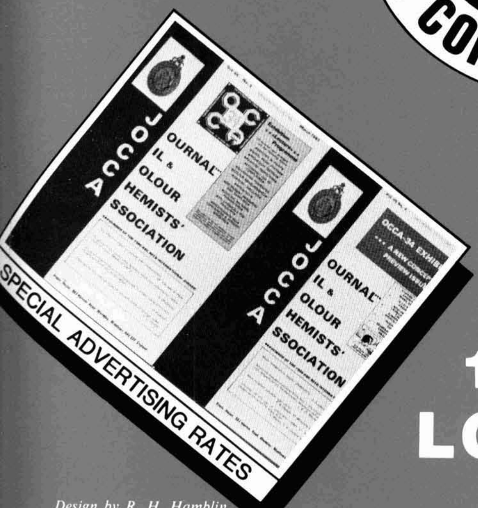

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