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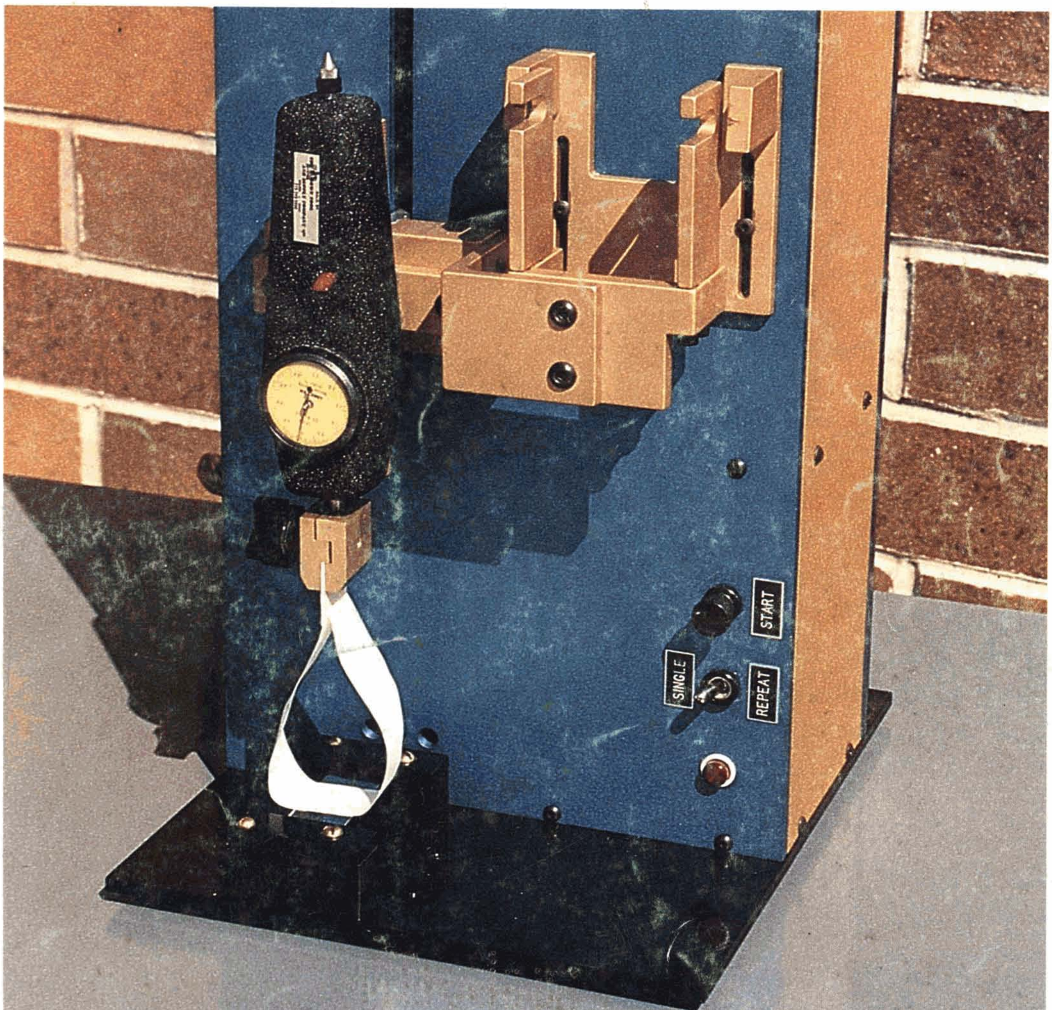
JOURNAL OF THE OIL AND COLOUR CHEMISTS' ASSOCIATION

JOCCA



- Adhesion
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Vol. 73 No. 3 MARCH 1990

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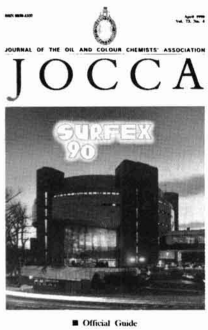
Next Month:



Contents

Cover: The Loop Tack Tester — see page 106 (Photo by courtesy of Pearson Panke Equipment Ltd).

Forthcoming Features: April — Polymers and Resins; PO, Metering Equipment, May — Can Coatings; PO, Storage & Handling, June—Pigments; PO, Milling. Contributions are welcomed at least five weeks prior to publication date;

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Cray Valley Products expands

Agreement has been reached whereby the Coates Brothers/ Orkem Group will purchase Hendricks & Sommer, a synthetic resin manufacturer based in West Germany, together with it's associated companies.

The present owners of Hendricks & Sommer are Tate & Lyle and Mr Heribert Sommer, one of it's founders. The consideration amounts to DM46.1 million — £16.5m. Hendricks & Sommer, located at Tonisvorst near Dusseldorf, produces resins and emulsions for the paint industry and through it's associates sells polymer emulsions for floor polishes and textile/leather processing. The group has 163 employees.

Coates Brothers Chairman, John Youngman, said "This is a very important strategic move for Orkem and Coates, taking our resin activity into West Germany which, with the opening up of Eastern Europe and the implications of 1992, presents significant opportunities."

Craynor and Sartomer to join Total

As part of a major restructuring programme which is taking place within the French Chemical Industry, the state owned Company Orkem will be divided between Total and Elf-Aquitaine. It is planned that the Radiation Curing Activities of the Orkem Group, which comprise Craynor SNC in Europe and Sartomer Company in the US join Total.

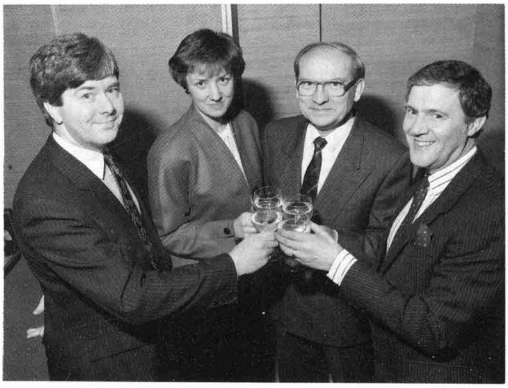
C-2-C success

After just 18 months co-operation on a consortium basis, the member companies of the C-2-C group can point to a number of installation successes in the Surface Coatings Industry.

New paint installations at Kalon and Buckingham Coatings feature mixer dispersers, let-down and tinting vessels from UCE Developments Ltd, and fully computerised process control systems from Datastor Ltd. Recent installations within the Mander Decorative Group also incorporate Datastor's computer technology.

Vessel washing plant from Gateway Technology Ltd continues to play an important role in the 'clean-up' of operations. Recent orders for their NSV 500 Vessel Washer have come from Sigma Coatings and the associated Buckingham Coatings, and similar plant is installed at Hunting Specialised Products, Sonneborn & Rieck and Crown Inks.

Floridienne (UK) in management buy-out



(Left to right): The management team of Floridienne (UK), Marketing Director, David Maltman, Managing Director, Ewald Kensbock and Export Director, Stanley Dray with Sue Hunter, investment controller at 3i's Watford office.

Watford-based company Floridienne (UK), large-scale suppliers of pigments, chemicals and additives for the paint and ink industries, has been bought by its management from the company's Belgian parent. The £1.2 million buy-out, supported by the UK's leading venture capital group 3i, also includes the Watford company's co-subsidiary in Belgium, Floridienne Polymers SA.

Announcing the buy-out, Floridienne (UK)'s Managing Director, Ewald Kensbock, said: "The buy-out puts us in a very strong position to exploit the opportunities which will exist in Europe after 1992. The company has been built up initially from its UK base and will now be in a position to expand rapidly through Europe."

Toshiba year of invention

The Design Council is launching the third year of this competition to stimulate and reward new inventions, new talent and bright ideas. There are entry categories for Individuals, Schools, Universities/Colleges and Small Businesses and prizes are awarded regionally and nationally. Call 01-691 9191 for your official Entry Form and Brochure.

Products

Lawrence microsphere fillers

Lawrence Industries have been appointed distributors of Dualite Hollow Composite Microsphere Fillers. These functional extenders of low density are being used to reduce cost, improve impact resistance and lower shrinkage in a wide variety of resin systems.

For further information Enter C101

BDH thermochromic printing ink

An eyecatching ink which changes colour as it reacts to temperature is now available from BDH Limited, the world's leading supplier of the thermochromic liquid crystals which give this ink it's dramatic effects. Licritherm thermochromic ink can be screen printed directly onto paper or plastics for a wide range of surface coating applications from stress monitors to temperature sensitive wine labels that show when the wine is ready for drinking.

BDH has encapsulated these liquid crystals in a gelatin shell 1 micron thick and about 10 microns in diameter. These are added to a binder resin to create an ink which can be printed directly on to paper. BDH manufactures a standard Licritherm ink showing colour changes through the temperature range 28 to 35°C. Due to the synthetic nature of BDH crystals, the company can also manufacture inks to react within any temperature range up to 100°C with a colour play width from as little as 1 to 20°C.

For further information Enter C102

New Sandoz yellow

Sandoz have introduced Sandorin Yellow 5GD which is a high hiding and high strength yellow pigment suitable for the production of lead-free finishes. Sandorin Yellow 5GD can be used in plastics as well as paints and printing inks but the principal use is expected to be in automotive top coats (solid shades), refinish, transport finishes and powder coatings. In addition, because of its bleed fastness, the new pigment can be used in printing PVC, paper for laminates and security applications.

For further information Enter C103

Equipment

Breakthrough in paint spray technology

In what is seen as a major breakthrough in paint spraying technology, Binks has launched a range of HVLP (High Volume Low Pressure) spray equipment, which dispenses with the need for cumbersome and costly turbines or air converters. Using the system, up to 50% savings in the applied material costs are claimed.

The revolution lies within the gun itself. Called a 'sonic venturi' which limits airflow by creating a Mach 1 shock wave. This converts high pressure, low volume air into low

Binks sonic venturi

pressure, high volume spraying utilising standard compressed airlines. Because this reduces bounce-back and overspray of material, a minimum transfer efficiency of 65% can be achieved, compared to the 35-40% of traditional spraying methods.

For further information Enter C104

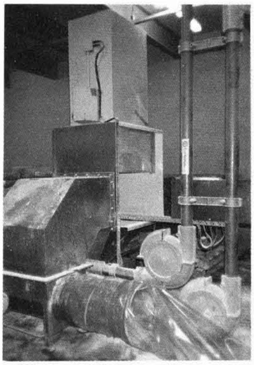
Ekato submerged agitators

A range of tripod-mounted agitators for submerged operation at the base of mixing tanks has been developed by Ekato using geared motor drives from Flender Motox. Submersible installation has a number of operational benefits say Ekato, including, most significantly, a more thorough agitation of the entire tank volume.

For further information Enter C105

New sack tip cabinet

Entecon have introduced a new design of sack tip cabinet, complete with fan-assisted dust suppression system and screw-type compactor for emptied bags. Mounted at a convenient working height within a sturdy support frame, the cabinet offers increased clear width of approximately 800mm to enable operators to present sacks either end-on or side-on for slitting and emptying. Contents pass down through a robust grill at the base of the cabinet into a feed hopper to which Entecon can, if required, fit its aero-mechanical or screw conveyor/elevators for totally enclosed onward movement of material.



Entecon dust-controlled sack emptying and disposal system

For further information Enter C106

New liquid feeders from K-Tron Soder

K-Tron Soder has added a new generation of liquid feeders to its range of weigh feeding equipment. Designed for stand-alone operation or for integration into a process system, the K-Tron Liquid Feeders can be used as traditional loss-in-weight feeders or be heated, cooled, or insulated to suit particular production requirements.

For further information Enter C107

New glossmeter for large sample testing

Surface coating instruments specialists, Sheen Instruments, have introduced a unique new glossmeter for the paper industry as a result of a special order received from their customer U.K. Paper.

Sheen Microgloss 156 in action

Conforming to the TAPPI-T480-m-51 specification which requires a 75 degree angle for testing the reflectance of coated paper, Sheen's new Microgloss 156 was specially designed to cope with high volume sampling of large sheets of material.

It is also available as a dual angle (20/60°) instrument for use in the surface coatings industry and is said to be an ideal product for testing large samples which may require both hands, e.g. Leathers, large test panels, packaging materials etc.

The Microgloss 156 is operated by a foot control leaving the hands free to manoeuvre large sheets of material under the measuring head and provides high, low and average gloss readings instantly.

For further information Enter C108

RAPRA curemeter

The Vibrating Needle Curemeter is a unique and simple instrument able to provide continuous cure profiles on all liquid and foaming systems. It can be used as a stand-alone system in the laboratory or used directly in the mould. In addition, data collection and analysis software allows the easy and convenient undertaking of everything from process optimisation through tó control of product quality.

For further information Enter C109

Meetings

Water pollution control

A conference on liquid effluent and legislation will be held on 5 April 1990 at Manchester Airport Hilton. For further information call 0925 830007.

Manchester Polytechnic short courses

The Department of Polymer, Metals and Dental Technology are running two short courses on Surface Coatings Technology on the basics of raw materials and formulations and is aimed at new entrants to the industry:
Easter — 9 to 12 April,
Autumn — 4 to 7 September. For further information call 061-228 6171.

Surface analysis

The Centre for Surface and Materials Analysis, Manchester will be holding a variety of meetings of interest to the surface and materials analysis community. For further information call Dr. A. J. Swift on 061 200 4441.

FSCT color symposium

A 2-day symposium on instrumentation for measuring color will be held on 25-26 April 1990 at the Cleveland Airport Mariott, Cleveland, Ohio. for further information call USA-215/545-1506.

Congress Exhibition

The first Congress Exhibition for the Coatings, Printing Inks, Adhesives and Sealants Industry in the German language area is being organised by the leading German technical journal farbe + lack. The event will be held from 19-21 March 1991 at the Nuremberg Exhibition Grounds. For further information call Germany (0511) 34 99944.

Literature

Revised HSC list

Revision No 1 to the Second Edition of the CPL Approved List (Information approved for the classification, packaging and labelling of dangerous substances for supply and conveyance by road) (Authorised and Approved List) is available from HMSO or booksellers, price £4, ISBN 0 11 885504 2.

New safety guide for coatings manufacturers

Paintmakers Association has recently published a guide to preventing and dealing with accidental spillages. The booklet, entitled 'Guide to Good Housekeeping', covers routine maintenance and cleaning, and, in addition, provides specific recommendations appropriate to different types of spillage. It will aid firms to comply with the requirements of the Health and Safety Act.

The 'Guide to Good Housekeeping' takes into account accident reports and statistics gathered by PA, the conclusions of official investigations into recent incidents within the industry and relevant legislative changes.

Copies are available from PA, at Alembic House, 93 Albert Embankment, London SE1 7TY, priced £5 for PA members and £10 for non-members (postage inclusive).

BSI News

British Standard BS 1133 Revision — Drafts for Comment

The BSI have published Drafts for Comment revisions of BS 1133 Section 6 — Protection of Metal Surfaces against Corrosion during Transport and Storage (BSI document references DC 90/36057 and DC 90/36059). These are intended to replace Sections A and B of the 1966 version. A new standard Specification will replace Section E of the older document.

A new proposed British Standard BS 7195 will give supplementary information regarding the prevention of corrosion of metals caused by vapours from organic materials, which will be additional to that given in BS 1133.

Although these Drafts are published as part of the Packaging Code, Subsection 6.1 gives advice which is widely applicable to the preparation of metal surfaces prior to protective treatment. Subsection 6.2 contains valuable guidance and advice on the properties, selection and use of temporary protective coatings. Eleven types of material are identified and codified.

Copies of the drafts are held at Priory House, and further copies may be obtained from: BSI (Sales Administration — Drafts), Linford Wood, Milton Keynes MK14 6LE.

P. Munn ■

BS 476: Part 32: 1989

"Guide to full scale fire tests within buildings". Provides guidance in relation to test rig design, specimens, ignition sources, data monitoring and recording. No current standard is superseded. Price £21.40 from BSI Sales, Linford Wood, Milton Keynes MK14 6LE.

US Focus

By Abel Banov
Co-publisher of the American Paint and Coatings Journal

Crosslinker cuts
Volatile organics

Two new acrylic-modified crosslinkers do their job through a radical-curing mechanism and reduce the need for solvents. They are expected to help efforts of coatings manufacturers to decrease volatile organic compounds (VOC's) and meet the ever toughening restraints sought by environmentalists and the government officials who listen to them.

Monsanto Chemical Co., whose chemists developed the crosslinker family, now have the two new members in commercial production after several years of development work.

Actually, the product-families are acrylated melamines, which have been around a while, but the two newcomers are improvements because they hasten curing and assure a better VOC balance when various unsaturated reactants are used.

When 15-30 percent of these new Santolinks (c) are used, for instance, with an air-dry alkyd, VOC's are reduced; used with stoving alkyds, greater hardness develops as the product comes out of the oven.

In forced-dry formulations, the company reports improved gloss retention and water and solvent resistance, plus higher film hardness.

Hypalon (c) takes over
for chlorinated rubber

Leave it to ingenious coatings chemists!! When the production of chlorinated rubber stopped here some time ago, the only supplies available were imported. Users didn't care where the resins originated as long as they served their purpose - in formulations for metal protection; for concrete finishes; swimming pool paints; and, most voluminously, for highway striping.

All was well for a while, but recently the British source was obliged to end shipments and announced this to the consternation of traffic-paint producers. Here they were with State and Federal highway specifications calling for chlorinated rubber, and it wasn't to be had.

But you can't stop paint chemists. Before long, they not only had traffic paint formulations based on duPont's Hypalon (c), but they also had the permission of a number of state highway authorities to change over to the tough polymer, which previously, was well-known only for roofing and sealants. Currently other states are joining the bandwagon, and before long, Federal highways are expected to be striped with Hypalon.

Traffic paintmakers
have added problems

Making traffic paints in the USA is beset with even more problems. Pressure is mounting to prohibit lead-containing pigments on highways, which is another way of saying that chrome yellow, the main pigment along with titanium dioxide, may be in trouble.

One British-owned company here has one of the answers. Cookson offers a silica-treated chrome yellow, on the grounds that the objection to lead is overcome because when the striping wears down and the lead-containing pigment is washed by rain and ends up in the water-table, the pigment is in a cocoon that won't do anyone any harm. Some states agree.

Organic yellows
to the rescue

Still other states are requiring combinations of one or another organic yellow and titanium dioxide. Several organic color firms are offering suitable formulations based on their organics. Nonetheless, the majority of the states are still permitting garden-variety chrome yellow.

In addition to the objectionable wash-off of lead into the water-table, some officials and environmentalists object to the practice of washing out large drums carrying the traffic paint to the application area; the waste water, containing lead also reaches the subsoil and may eventually contaminate drinking water. The way around that, some have proposed, is to have painters return drums to the paint manufacturer so that he can reclaim residues.

New unsaturated
Aliphatic isocyanate

Oligomers and polymers with vinyl (isopropenyl) functionality can now be made with a newly-available unsaturated aliphatic isocyanate (meta-isopropenyl dimethylbenzyl isocyanate). According to American Cyanamid Co., the new monomer can be reacted with numerous common monomers to tailor fuctionalized and/or reactive polymers. For vinyl functionality, a number of diols, triols, and polyols can be reacted with this isocyanate. The company has a technical data sheet with results of development work.

Mixed metal oxides
Introduced for coil

Mixed metal oxides of less than 2 microns have been introduced by the Engelhard Corp. for use in coil coatings and for metal furniture and metal building products. The 16 colors available in the new Meteor Plus series feature easy dispersibility and opacity.

NEWCASTLE STUDENT SEMINAR
PAINT MANUFACTURE 24 APRIL

People

New Managing Director at E+E Chemicals

Bradford-based Ellis + Everard Chemicals Ltd, the UK's leading chemical distributor, has appointed **Ray Duffin** as its new Managing Director. Mr Duffin, 37, formerly Sales Director at Sheffield Insulations Ltd where he worked for 15 years, succeeds Mr John Philpotts, 40, who has become Managing director of Ellis and Everard's European Operations. E+E Chemicals distributes commodity and speciality chemicals through its nationwide distribution network.

Croda Resins appointment

Croda Resins Ltd has appointed **Ian L Garbitt** as its Commercial Manager. Mr Garbitt has an established in-depth knowledge of the paint and resin industries, having previously worked as a factory Manager for Carson Hadfield and Bestobell Paints at Mitchum and more recently as Export Manager for the Decorative and Industrial Divisions at Kalon Plc.

ABB Robotics appointment

ABB Robotics Ltd, has appointed **Chris Lines** — a product specialist with over 12 years experience of robotic paint systems — to concentrate on ABB Trallfa robot sales and marketing in the United Kingdom. The new job function, to be based at Milton Keynes, will be closely co-ordinated with other ABB Trallfa Robot Centres, as the company further integrates its European robotic operations.

Mearl appointment

The Mearl Corporation, New York, has appointed **Lou Armanini,** Vice President to the position of Director, Henry L. Mattin Research and Development Laboratories in Ossining, New York. Mr Armanini's new appointment coincides with the retirement of Dr. Harold A. Miller.

HSE appoints new Director

The Health and Safety Executive (HSE) has appointed Dr **Bruce J. Thomson** to be Director of the Explosion and Flame Laboratory (EFL) at Buxton. Dr Thomson graduated in Chemistry at Queen's College, Dundee, in 1967 and was awarded a PhD by the University of Dundee in 1970 for work on organometallic chemistry.

ECC R&D appointment

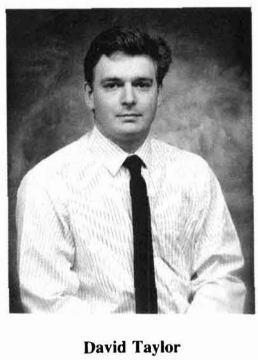
Professor **Barry Jennings** has joined ECC International as Director responsible for Research and Development. Barry Jennings has had an extensive career in London, Brunel and Reading Universities where he built up a research team developing a range of novel electro-optical and light scattering methods of studying colloids, minerals and pigments. This interest relates to those of ECCI who are Britain's largest producer of white industrial minerals for the paper, polymer and ceramics industries. Professor Jennings retains a visiting professorship with Reading University Physics Department.

New OBS Sales Engineer

OBS Machines Ltd of Milton Keynes, have appointed **Guy Green** as a new regional sales engineer for the Southern Counties and East Anglia areas. Mr Green has joined OBS from ICI Paints Division where he has carried both research and product development roles.

Beta appointments

Beta Chemicals, the Ellis & Everard owned chemical mixing, formulation and packing specialist, has confirmed its commitment to BS5750 with the appointment of two new quality personnel at its Burnley headquarters. **David Taylor,** 25, is promoted to Quality Assurance/Laboratory Supervisor, while his former post of Quality Control Chemist is taken by newly appointed **Simon Bailey,** 21.



David Taylor ■

Thames Valley French Visit — see Bulletin

SURFEX 90 UPDATE

16-17 May 1990

Harrogate International Centre, North Yorkshire, England.

An extended listing of products and equipment on show to that published in the SURFEX 90 Preview of February JOCCA is presented below. The Official Guide to SURFEX 90 will be published in the April issue of JOCCA.

WHAT'S ON SHOW

Akzo Chemicals Ltd will feature their full range of products for the Coatings Industry including Epilink epoxy curing agents, Siccatol paint driers, Perchem rheological additives and other ancillary products.

Allied Colloids will highlight their additives for emulsion paints; water based resins for inks, adhesives, industrial paints and lacquers.

ARCO Chemical Europe Inc. will be promoting Arcosolv, Arconate and propylene glycols product ranges as well as the Arcocomp solvents formulation computer programme.

Samuel Banner & Co Ltd – The complete range of Banner's activities will be exhibited covering Vegetable Oils, Chemicals, Hydrocarbon Solvents and Specialities. There will be particular emphasis on more environmentally acceptable products and their development.

BASF Plc will feature: A. Pigments: I. Heliogen Blue L698OF – A new phthalocyanine blue especially for metallic finishes. 2. Sicopal Yellow LIIIO/Paliogen Orange L318OHD – lead free shades in the yellow/orange area. B. Resins: I. Laroflex LR8229 – new low viscosity grade for higher solids coatings. 2. Laropal A8I – aldehyde resin for the production of pigment pastes with universal compatibility in solvent based systems. 3. Luhydran A84IS – resin for water based wood finishes with high chemical/solvent resistance.

Bayer UK Ltd – Bayers Inorganic and Pigments groups will provide information and graphics displays on Baysilone's high quality resins, paint additives, impregnating agents, Bayertitan titanium dioxide, Baylith dessicants and moisture absorbers and Bayferrox range of pigments.

BIP Chemicals is one of the leading European manufacturers of high quality melamine and urea resins used by major paint manufacturers throughout the world for the production of industrial surface coatings where quality and performance are of paramount importance. The "Beetle" range of amino resins has been developed for technically demanding applications.

Blythe Colours will display the Blythe "Kera Collection" featuring especially KERATRANS – Transparent Iron Oxides KERAFAST – Mixed Metal Oxides KERAFLECT – Camouflage Pigments and KERASPERSE – Pigment Dispersions.

Bohlin Reologi UK will be launching the expanded capabilities of the VISCO88 hand held viscometer using new measuring systems and software. This will enhance the application areas for both QA and Product Development. Also on show will be the Bohlin Controlled Stress Rheometer which is able to simulate manufacture and end use conditions in the Coatings Industry.

Boud Marketing Ltd will highlight Siokal Micronised Feldspar, Pigmented Quartz and Bauxite, Stra-Dolomite, Cellulose Fibres, Quartz Sands and Powders, and Glass Beads.

Bromhead & Denison Ltd are devoting their stand to K-WHITE a high performance, non toxic corrosion – inhibiting pigment. K-WHITE is produced by TAYCA CORPORATION of JAPAN, a leading Chemical Manufacturer better known for its production of Titanium Dioxide, Sulphuric Acid and a range of surfactants and speciality products. Also available will be a related aluminium – dihydrogen-tripolyphosphate called K-BOND which represents a new type of water glass hardener.

BYK Chemie GmbH: New defoamers for waterborne coatings BYK®-022, BYK®-023, BYK®-045; Wetting and dispersing additive for industrial tinters: Disperbyk®-163; Silicone flow additive for FDA approved coatings: BYK®-310; Testing equipment: gloss and colour.

C & W Specialist Equipment will display a selection of test cabinets from our range which includes Hot Salt Spray Cabinets to ASTM BII7, Composite Corrosion Cabinets, Mebon Prohesion Cabinets, Humidity Cabinets. These units are available in the following sizes: 2OO; 45O; 1OOO amd 2OOO litres. New products in our range include Water Soak Cabinets, Controlled Temperature/Controlled Humidity Cabinets, Environmental Cabinets and Deep Freeze Cabinets.

Capricorn Chemicals Ltd will be exhibiting Flare Daylight Fluorescent Pigments manufactured by Sterling Industrial Colours Ltd as well as the range of Waxes, Wax Dispersion and Additives produced by Messrs G. M. Langer & Co of Bremen, West Germany.

Carri-med will be exhibiting the computer controlled CSC Rheometer: an instrument which is ideal for characterizing the rheological properties of paints and coatings. Yield points can be measured directly and properties such as sagging can be readily simulated.

Cera Chemie BV will feature WAX-DISPERSIONS and WAXEMULSIONS as slip improvers in coatings and printing inks.

Chemapol UK Ltd will be exhibiting: Titanium Dioxide – Rutile and Anatase; JACOR – Anticorrosive Red Iron Oxide, Lithopone 30% Red Seal, Sokrat-OUv New Range of Acrylate Dispersion Coating Compounds, Dyestuff and Pigments for a wide range of applications.

Colourgen Ltd will feature the Entire Range of the Company's Colour Management Match Prediction Systems based around the CS-IIOO Spectrophotometer and IBM compatible computers and software. New products will include a Colour Visualiser and the latest ink and paint software.

Concept to Commissioning will be exhibiting: I. Solids/liquids mixing and dispersion from UCE Developments Ltd. 2. Small Media Bead Mills from Knight Process Engineering Ltd. 3. Vessel Washing/Solvent Recovery from Gateway Technology Ltd. 4. Process Control from DataStor Ltd. 5. Systems Project Engineering from AI Process Systems Ltd.

Cookson Laminox Ltd will feature their synthetic micaceous iron oxide. Two grades of pigment for protective coatings. LAMINOX S for weathering coats. LAMINOX F for anticorrosive primers. The pigment has an optimised lamellar particle structure which provides outstanding performance.

Cornelius Chemical Company Ltd – Mearl Range of Pearlescent Pigments Rohm Acrylic Resins, Cardolite Resins, Daniels Speciality Dispersions, BTL Speciality Resins.

Craynor SNC will feature EPOXY ACRYLATE, URETHANE ACRYLATE, WATER REDUCIBLE and other oligomers to meet the demands of the radiation curing industry. With the Sartomer acrylic multi functional monomers, Craynor SNC can offer the widest range of radiation curing products in the world.

Cray Valley Products will be showing the latest developments in THIXOTROPICS and TWO-PACK finishes for high performance INDUSTRIAL COATINGS. The CVP range in WOOD FINISHING will be featured, and POWDER COATINGS will also be shown. Additionally, recent advances in THIXOTROPY for DECORATIVE paints will be displayed.

Croda Colours Ltd will be showing SCOLOR amd FORTHBRITE pigments for inks, FORTHFAST pigments for inks, paints and plastics.

Croxton + Garry Ltd will feature BRITOMYA and SNOWCAL Chalk Whitings; OMYA Calcites; MIOX Micaceous Iron Oxide; CELLOSIZE; HEC COATEX Associative Thickeners and Dispersants; ESACURE Photoinitiators; PROMINDSA Red Iron Oxides; PERGOPAK Matting Agents; TRIHYDE Flame Retardants; COLOROL and FORBEST Dispersing Agents and Slip Additives.

Durham Chemicals will be exhibiting the complete range of products supplied to the Surface Coatings Industry, including Zinc Oxide, Zinc Dust, Paint Driers, Paint Additives, Biocides, and Talc.

ECC International is a major supplier of white minerals for the paint and allied industries. The HyPerformers range of products includes: Polestar calcined clays. Supreme and Speswhite fine china clays, Claytone organo-bentonites, as well as a comprehensive range of china clays and calcium carbonate extenders and other minerals.

Eiger Torrance will feature their range of Horizontal Bead Mills; Motormills (mini, laboratory, and production machines), high speed dispersers (laboratory and production machines), Batch Bead Mills and Batch Attrition Mills.

Elcometer Instruments Ltd of Manchester are displaying and demonstrating their range of instrumentation for testing and inspecting surface coatings. New products on the stand include the low cost, electronic, digital coating thickness gauge for steel substrates, the Elcometer 246, the Elcometer 135 High Voltage Holiday Detector and the powerful Elcometer 300 to PC Data Transfer Software package.

***Ellis + Everard Specialities Ltd* An established technical marketing company to the paint, plastic and ink industries, will be exhibiting their full range of Organic and Inorganic Pigments from ICI Colours & Fine Chemicals, Proxel & Densil Biocides from ICI Speciality Chemicals, Additives and Anti-Foam Agents from Bevaloid, a full range of Nitrocellulose damped in IPA, Meths, and Plasticizers.**

European Colour plc, the merged company of Ellis Jones and Horace Cory, will be exhibiting the latest developments in their comprehensive range of azo pigments. Also on display will be selected, specialised pigments for surface coatings and plastics.

Floridienne (UK) Ltd will exhibit a range of I) Pigments: MICROFAST organics, PFIZER iron oxides, HITOX buff titanium dioxide, HABICH chromates, MICROTINT Aqueous stainers, MICRODISPERSE alkyd stainers. 2) Polymers; REPOLEM emulsions, FLORPLAST polyester. 3) Additives: MICROPOWDERS micronised waxes, MICROCIDE biocides, FLORSTAB UV stabilisers plus UV additives.

FMJ International Publications Ltd will highlight: Polymers Paint Colour Journal, Paint & Ink International, European Adhesives & Sealants, The Resins & Pigments Exhibition.

Foscolor Ltd will feature a full range of Chip and Liquid Dispersions for the Printing Ink and Surface Coating Industries. Particular emphasis will be placed on our range of Dispersions for Water Based Systems.

John Godrich will exhibit: A selection from Liebisch Salt Spray Cabinets – Combines Corrosion and SO_2 Cabinets. Credit Humidity – Refrigeration – Environmental Cabinets. Credit Hegman Guages – Cross Hatch Cutters – Coater-Applicators-Impact-Abrasion Testers. Mixers Energy/Time Saving Rotostats – Credit HSD – Chemical Rotor/Stator. Laboratory to Production.

Grace UK will present a wide range of speciality chemicals for the Surface Coatings Industry. Their Technical Service Group will review latest developments on new and existing products within the Davison Product Line. SYLOID: Super efficient ED range of matting agents. SHIELDEX: New high performance non toxic anti corrosion pigment used in maintenance and general industrial primer systems working by the principal of ion exchange. SYLODEX BENTONITES and SYLOSIV: Moisture scavengers.

***The Haeffner Group of Companies* Personnel from The Haeffner Group will have details of their full range of raw materials for the surface coating, printing ink and plastics industries. Fillers, extenders, natural and synthetic iron oxides, mineral and cellulose fibres, organic pigments, machinery, pigment chips and dispersions.**

The Heubach Group will feature a wide range of pigments including: Heucotron, Heucotron "LD", Heucodur, Heucosin, Heucoplast, Heucoflow, Krolor, Heucorox, Zinc Phosphate ZPIO, Heucophog ZPA/ZMP/ZPO, Heucofex, Zinc Dust, Zinc Flakes, Zinc White Harzsiegel, Heucomin 5, Lead Oxide and Lead Salts, Decor Products.

Hoechst UK Ltd, Chemicals Division will exhibit raw materials for paints and printing inks, including biocides, fungicides, plasticisers, solvents, monomers, flame retardants, synthetic resins, after glow pigments and resin intermediates.

Huls Aktiengesellschaft will exhibit a wide range of binders, resins and additives including DYNAPOL® coating polyesters, LIPATON® aqueous dispersions, DYNASYLAN® and DYNASIL® , DYNAPOL® copolyesters, VESTAMELT® copolyamides, DYNACOLL® 7000 copolyesters and DYNACOLL® special purpose polyesters.

ICI Colours & Fine Chemicals will present the new 'X' range of high performance pigments, for all types of paint. The new range consists of phthalocyanine ('Monastral' blues and greens) and quinacridone ('Monolite' red) pigments, complementing the existing ICI range. Also on display is the 'Solsperse' range of hyperdispersants for paints.

Industrial Dispersions Ltd will be emphasising their custom dispersion facilities. By working closely with the customer utilising their wide ranging expertise in dispersion techniques together with their pigment and resin technology, they are able to provide an even wider choice for the end user.

K & K Greeff Ltd will be introducing products for High Solids/Low VOC Compliance which will include a new range of Polyols and Silica Gels from the USA. For high performance Coatings and Inks, Teflon PTFE and Dowanol Butylated Glycol Ethers will be featured. Full

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information will be available on the New Lead Free Drier combination from Van Locke and the Hilton Davis Range of Transparant Iron Oxides.

K & K Polymerics will be featuring Cellulose Ethers, Epoxy Resins, Latices, Surfactants, Paint Additives, Acid Catalysts and Polyester and Polyurethane Polyols.

Kemira Oy will present its pearlescent pigment line of Flonac® lustre colours. Colours of gold, silver, copper and interference shades will produce brilliance and texture demanded in the finest finishes. Flonac® pearlescent pigments are highly recommended for incorporation into both water based and solvent based paint systems.

Kirklees Chemicals Ltd will feature state of the art Viking Products for the Paint, Adhesives and Textile Industries.

KRONOS Ltd: Kronos TiO_2 Pigments featuring the Groups considerable resources and the measures taken to fully conform with environmental requirements worldwide. A number of TiO_2 Grades will be demonstrated in particular the High Quality Chloride Pigments KRONOS 2160 and KRONOS 2310.

Lakeland Laboratories Ltd will feature Wax Emulsions, Imidazolines, Amphoterics, Phosphate Esters – Speciality Surfactants.

Lawrence Industries will be exhibiting the full range of HALOX non-toxic Anticorrosive Pigments, and Tanning Stain Inhibitors along with Englehard ATTAGEL Thickeners, SATINTONE Calcined Clays, ASP Hydrous Clays. A new range of coloured pigments including METEOR PLUS for coatings, Cellulose fibres and Silicas.

Meta Scientific Ltd will show their Colour Measurement, Gloss, Coating Thickness and Microscopes. Software for Colour Library and Search Facilities will be on display.

3M United Kingdom Plc exhibit will include: Fluorad Fluorochemical surfactants for high performance applications in aqueous and non-aqueous systems. Fluorad Fluorochemical intermediates and Scotchlite Glass Bubbles.

Netzsch Mastermix Ltd will feature: LME 20-Agitator Mill for ultra fine grinding of dispersions. PMD VC Fixed Vessel Dispersor for liquid and paste systems.

Norwegian Talc UK Ltd exhibit will include: I. MIKRODOL/MIKRODOL H Grades – Pure White Dolomite, ultrafine powders to coarse granules. 2. MICROTALC AT/IT EXTRA – Ground and Micronised Talcs. 3. MICROMICA – Micronised Mica. 4. SILCELL Low Density Mineral Additives. 5. MICHEMLUBE Wax Emulsions.

OBS Machines Ltd will be exhibiting details of the latest equipment available to the paint, ink and allied industry manufacturer, including the latest technology in colour dispensing systems, both in-plant and in-store. The very successful high performance Supermill Horizontal Mill, Dispersers, Filling Equipment, Can Handling, Palletising and Vessel Cleaning.

Pearson Panke will exhibit: the latest Erichsen Glossmaster with statistical facilities and new cost effective viscometer equipment for testing gelation time of powder coatings; adhesive testing equipment dry film thickness gauges for any substrate.

The Q-Panel Company: The QUV Accelerated Weathering Tester will form the centre piece of the Q-Panel Company display. The QUV is a laboratory simulation of the damaging forces of the weather – exposing samples to alternating periods of ultra violet light of defined spectoral energy and to periods of wetness.

Resinous Chemicals will be featuring resins from their UK manufactured range namely thixotropic and general industrial products. From Hoechst AG product offer will be highlighted resins for powder coatings, SCA modified binders for stoving applications, and low free formaldehyde amino resins for automotive/industrial coatings.

RHEOX Inc., the newly formed company, a part of N L Industries Inc., is the world's largest producer of rheological additives for solvent-borne coatings systems. The exhibit will provide an overview of the new company organisation and its BENTONE, MPA, THIXATROL, RHEOLATE and other rheological additives, which are sold within the UK by their respective agents, Steetley Minerals Ltd and KRONOS Ltd.

Sandoz Products Ltd will exhibit: Sandorin & Graphtol pigments for paint and ink applications featuring the Graphtol 'Fast' series of mid-fastness organics for industrial applications, and Graphtol for process and UV inks, dyes and dye solutions for woodstains. Sandosperse multipurpose stainers for industrial paints. Sanduvor range of UV stabilisers.

Schering Industrial Chemicals will be featuring: EUREPOX epoxy resins for Paints, Coatings, Resin Mortars, 2 Component Adhesives. EUREDUR Curing Agents for Epoxy Resins. EURELON polyamide resins for Printing Inks, thixotropic alkyds. EURMELT polyamides for Hot Melt Adhesives. EURETEK Adhesion Promoters. EURECRYL cyanoacrylate super glues. Organotin components for wood preservatives and marine antifouling coatings.

Scientific & Medical Products Ltd will be exhibiting: Brookfield Viscometers including the following models – Rheoset DVII, DVI and DVII Cone and Plate. Also Cahn Instruments Dynamic Contact Angle Analyser for surface "Wettability" analysis.

SCM Chemicals, the world's second largest producer of titanium dioxide by the environmentally preferred chloride process, will be featuring information on the comprehensive range of TiONA pigments, in particular: RCL-628 a specialist grade of TiO_2 for high performance coatings, where outstanding durability, high opacity and exceptional gloss are demanded. RCL-535 a unique multipurpose grade of TiO_2 designed to meet the requirements of the plastic industry. SCM Chemicals will also be displaying information on its commitment to Total Quality Control.

The Scott Bader stand will feature two acrylate based emulsion polymers for Wood Coatings. Another feature will be the range of resins available for Powder Coating applications. Those two product types will be the main part of an environmental theme which will include other products of interest. Also featured will be saturated polyester reins and vinyl modified alkyds as some examples of the large range of products available from Scott Bader.

The Shear Company Ltd will be showing examples of our specialised range of High Performance Pigment Dispersions for the automotive paint industry and our new range of High Strength Transparent Iron Oxide Dispersions for wood decorating application. We will also be showing our complete range of Printing Ink Additives including our new High Rub-Resistance Wax Compounds for both heat-set and sheet-fed inks.

Shell Chemicals: A £10m investment in Shell UK's Epoxy manufacturing facilities which, using improved purity feedstocks, will produce consistent quality customer-tailored Epikote resins.

Silberline Ltd manufacturers of non-leafing Alu-Pigments for automotive finishes will be exhibiting its full range of the highly successful classical SPARKLE SILVER ALU-PIGMENTS™ as well as HYDROPASTES™ and AQUA-PASTES™ for waterborne systems. Also on display will be a range of granulated, solvent-free Masterbatches in various binders for printing inks, powder coatings and plastics.

Steetley Minerals Ltd will feature the BENTONE Range of Rheological Additives from RHEOX INC. LIGHT-WEIGHT and PERLITE Fillers from Grefco Inc. Lo-Vel Flatting Agents from PPG Industries Inc. The Steetley Ranges of Dolomite and Talc Extenders.

Sun Chemical Pigments Ltd will concentrate on three product areas: I) A presentation of High Performance Pigments for Automotive Coatings in multiple physical forms. These include

Sun Chemical's unique standardised High Solids Press Cakes and SUNSPERSE® dispersions. Flushed versions of these pigments will also be shown. 2) A New Perylene Red I79 which has created extensive interest in the US and Japan. 3) FLEXIVERSE® and SUNSPERSE® aqueous dispersions for aqueous printing inks.

Tego Chemie Service range of paint additives and silicone based binders will be featured. Several new developments are presented in the field of defoamers, flow and levelling agents and mar and slip resistance additives. As one of the leading silicone producers in Europe, Th. Goldschmidt AG., the parent company continues to direct a major part of its research and development through its specialist companies such as Tego Chemie Service. New products are featured in the extension of the established Tego print range of additives for the printing ink producer.

Charles Tennant (London) will exhibit amino crosslinking resins for Surface Coatings (Dyno Cyanamid), speciality alkyds polyester for paint industry (Dyno Industrier), Elveron functional resins, Elvacite Bead aqueous dispersions and water soluble resins and AB Dispersants (Du Pont) and Phenolic, Maleic and Esterified Rosin Esters for the adhesives and coating industries (Propinave).

Tennant-KVK will exhibit on behalf of its principal a number of new products and ranges, applications which include Industrial Paint Tionting Systems, Classical Organic and Fanal Pigments for Liquid Inks and Hyperdispersant Inks.

Troy Chemical Company BV will pay special attention to anti-cratering agents for both solvent and water dilutable systems, the wetting and dispersion agent Troysol 98C and the rheology agent Troythix 42BA – a liquid viscosity modifier for non-aqueous systems. Regarding Biocides, focus will be on the in-can preservative Troysan I74 and on Polyphase PIOO – the fungicide recently granted regulatory approval by the HSE authorities.

Union Camp Chemicals (UK) Ltd will feature resins for adhesives, giving good tack and stability in hot melts and pressure sensitives. Polyamides for flexographic printing, curing agents, and adhesives. Polymeric plasticisers for PVC and octyl dimerates for lubricants.

Wengain Ltd will highlight pigments and resins for printing inks, paints, plastics and adhesives. MAGRUDER COLOR – New pigments for newsinks and aqueous systems, WAARDAL – Non toxic pigments for speciality coatings, LEAD CHROME COLOURS – New products for plastics, CAFFARO – Chlorinated rubbers and paraffins. LEON FRENKEL – Hard resins for all applications.

Vinamul's advanced polymer emulsions for paints will be on show and will feature Vinamul 348O, a novel binder offering outstanding cost-performance benefits in high PVC matt paints and the Vinamul 36OO series of soft multipolymer emulsions including the latest binder designed specifically for solvent free paints.

Yorkshire Colour Systems Ltd – YCS the UK and Eire agents for Datacolor AG of Switzerland will be showing: "Pigmenta" the paint and plastics colour control match prediction system, also on show will be the Datacolor MMK metallics control system, this sytem is used by many European car manufacturers.

Also exhibiting at SURFEX 90 will be the following companies: BDH Ltd, Buckman Laboratories Ltd, Ciba-Geigy Plastics, Dominion Colour Company, DSM Resins, Elem Chemicals, Henkel-Nopco Ltd, Harlow Chemicals, Hoechst UK Pigments Division, Kronos, Magnesium Elektron, PA, PRA, Production Chemicals Ltd, Rhone Poulenc, Sawell Publications, Sheen Instruments Ltd, Stort Chemicals Ltd, Sud-Chemie AG, Thomas Swan & Co, Thor Chemicals (UK) Ltd.

Testing pressure sensitive adhesives

by M Gamon, Pearson Panke Equipment Ltd, 1-3 Halegrove Gardens, London NW7 3LR, UK

The test methods for pressure sensitive adhesives are specified by

PSTC (Pressure Sensitive Tape Council)

FINAT (Federation International des Fabricants et Transformateurs d'Adhesifs et Thermo Collants sur Papiers et Autres Supports)

AFERA (Association des Fabricants Europeens de Rubans Auto-adhesifs)

Methods are also specified by BS, ASTM, DIN etc. All these methods are similar and generally the PSTC or FINAT methods are referred to.

The following article summarises some of the methods and the test equipment available.

Viscosity

Spindle-type instruments are commonly used in the industry. These are usually from Brookfield[14] or from Viscometers (UK).

This type of instrument has been available for many years. The viscosity is usually quoted in terms of a specific spindle and speed. The V(UK) instruments have the advantage of a direct digital display in centipoise or Pascal seconds. The more advanced versions e.g. the Viscolog[1] are supplied with free software which gives a display of viscosity against time or temperature.

Application of adhesive

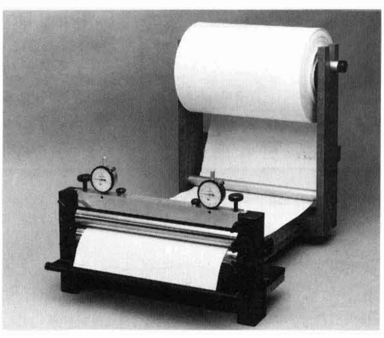
Adhesives are usually applied by spiral rods (wire wound) to give a coating of uniform thickness. The substrate should be laid on a flexible substrate in order to maintain an even pressure across the width of the coating. The thickness is usually quoted in grammes per square metre (gsm).

Ideally the application should be carried out automatically in order to maintain a constant rate of shear. In many cases the substrate is held flat using a vacuum plate. Automatic applicators can be obtained for a variety of sizes of substrate and application speeds [10].

The above methods are suitable for single sheets. Laboratory Drawdown Coaters[2] can also be obtained for producing any length of coated substrate (see Figure 1). In this case, the substrate is passed between two bars set to give the required gap. Adhesive is placed upstream of the bars and the substrate pulled through at a constant rate to give a coating of uniform thickness. An alternative spiral rod can be supplied as the top bar.

A heated version can be supplied for hot melts[3].

Figure 1
Laboratory drawdown coater



Shear and peel tests

These tests are usually performed on the coated sample adhering to a standard substrate. The substrate is usually a metal test panel of standard roughness or a glass plate.

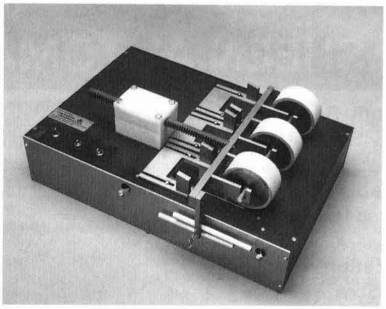
Application of test sample

The application of the sample e.g. adhesive tape to the test substrate is generally considered to be the greatest source of error in Shear and Peel Tests.

Rubber faced rollers often referred to as FINAT Rollers are used to roll the sample onto the substrate under constant pressure. The weight[4] of the roller is usually 2kg. Five reciprocations are specified.

Ideally the rolling down should be carried out using an Automatic Roll-down machine[5]. This ensures the application is carried out at the specified speed (PSTC specify 12 inches/min).

Figure 2
Roll-down machine



Shear tests

The sample is applied to a standard substrate so that a tag is left hanging from the test panel. The sample is cut to give a specified area, usually 1 square inch adhering to the panel.

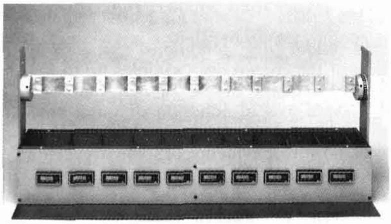
The test panel and sample are then placed on a Shear Tester so that the panel and sample are inclined at 2 degrees to the vertical. A specified weight is hung from the tag and the time taken for the adhesive to fail i.e. slide off the test panel. The specified weight is usually from 250kg to 2kg although in some cases up to 5kg is used.

The Shear Tester is equipped with timers for each sample and a suitable device for stopping the clock when the weight falls i.e. when the adhesive fails.

Shear Testers are available for both ambient testing (Figure 3) and oven testing (up to 200 deg. C.)[6].

Some Shear Tests require the Shear Adhesion Failure Temperature (SAFT). In this case, the test temperature is increased until the sample fails.

Figure 3
10 Bank oven shear tester



Peel tests

Both 90 degree and 180 degree Peel strengths can be carried out on a tensile tester[11].

The 90 degree Peel test must be so arranged that the peel remains at 90 degrees during the test i.e. the sample must travel horizontally in order to maintain the peel under the top jaw of the tensile testing machine.

A frictionless table[7] is necessary to maintain the peel at 90 degrees. This table holds the test panel (substrate) and clamps in the bottom jaw of the tensile tester).

High speed Peel Tests are necessary for some applications e.g. the removal of excess around the edge of pressure sensitive labels. The Adhesion Release Tester [8] (Figure 4) is capable of up to 1200 inches/min. The test panel and sample are mounted on a high speed carriage and the tag of the sample is attached to a dial gauge or electronic force gauge. The electronic gauge can be interfaced with a plotter. 90 and 180 degree peels can be carried out and the speed can be varied.

Figure 4
Adhesion/release tester

Quick stick test

Quick stick is the instant adhesion of a pressure sensitive tape. The adhesive coated sample is held parallel to and just above a standard test panel. One end of the sample is carefully lowered onto the panel and the remainder allowed to drape smoothly on to the panel.

A 90 deg. Peel Test is then immediately carried out on the sample.

Tack

There are many ways of measuring tack.

The simplest method is the rolling Ball Tack Test. For the PSTC test, a 7/16 inch diameter ball is allowed to roll down a standard shute onto the tacky surface. The distance the ball travels from the end of the shute is noted.

The ST Tack Tester[12] is in effect a sophisticated rolling ball tester. The sample is wrapped around a revolving drum. A steel ball attached to a load cell rests on the adhesive so that the ball revolves at a fixed position in the opposite direction to the drum. As the shear force at this point is proportional to the force retaining the ball at the fixed position, it is detected by the load cell as initial tack. The value is displayed digitally.

Initial tack and decrease in tack can be measured using the Polyken Probe Tack Tester[13]. A probe is lowered onto the sample to give a fixed contact pressure which can be varied. The dwell time can be increased from 0.2 to 100 secs. Thus the change in tack can be plotted. The load and speed of contact of the probe on the sample are all variable.

Loop tack

Loop Tack is the force to remove a loop of adhesive coated sample from an area of 2 square inches.

The adhesive coated sample is formed into a loop and automatically lowered to make contact with a 2 square inch test panel. The force is then measured to remove the loop.

The test can be carried out on a tensile tester or alternatively some manufacturers supply dual purpose instruments. Figure 5 shows a Roll-down machine[9] suitably adapted. The loop test sample can be clearly seen.

Figure 5
Loop tack tester

References (manufacturers)

1	Viscometers (UK)
2, 3, 4, 5, 6, 7, 8, 9	Chemsultants International
10	Pearson Panke
11	Erichsen GmbH, Wuppertal
12	Toyoseiki
13	Testing Machines Incorporated
14	Obtainable from Fullbrook Systems ■

Effect of ageing of alkyd-TiO_2 paints on adhesion to mild steel: Role of Pigment Volume Concentration

by M. V. K. Kannan, M. N. Sathyanarayana, P. S. Sampathkumaran and M. A. Sivasamban, Surface Coatings Division, Regional Research Laboratory, Hyderabad 500007, India

Summary

Alkyd based paints are being widely used for the protection of metals on account of their versatile properties. When the objects painted with them are exposed to different environments, the destructive forces, affect the paint film resulting in their premature failure. Thus the performance of the coatings over a period of time is difficult to predict from their properties initially measured according to standard specifications, as the paint films do not retain these properties during ageing. It has been observed that even for a system consisting of the same binder and pigment, the properties are affected to different degrees during ageing depending upon the level of the pigmentation. In the present work, the effect of ageing of alkyd-TiO_2 paint films of different PVC's on their adhesion, tensile strength and percent elongation has been studied when exposed to ambient indoor and outdoor environments.

Introduction

The protective aspects of a paint are governed by their many important properties such as adhesion, tensile strength, flexibility, hardness, permeability to ions, oxygen and water, etc., of which adhesion is the most important one.

An important factor in achieving maximum adhesion of particular paint systems to the substrate lies in the proper preparation of the substrate prior to the application of paint. If the value of adhesion obtained initially is quite satisfactory, it cannot be concluded that the paint system will continue to protect the substrate indefinitely because this property along with others change due to the effect of the environment.

The effect of the changes which take place during film formation and to the environment are reflected in the changes in the physico-chemical properties of the coating. Measurement of these properties would help in understanding as to how ageing affects the coating material.

Among the earlier workers who studied the effect of ageing on various properties of resins and paints, only a few have evaluated the effect of ageing on adhesion of the coatings.

Wright[1] found that durability of coatings can be predicted on the basis of selected tests conducted on fresh unexposed and exposed films. Walker[2-4] carried out adhesion measurements on a range of organic coatings using 'torque spanner technique' monthly over a period of four years and found that adhesion of the systems varied considerably over a wide range of values due to changing humidity. Further, continuation of the studies over a period of nine years indicated that no major loss of adhesion had occurred and in several cases the adhesion values were greater than those obtained before exposure. In a separate study on adhesion of organic coatings to passivated cadmium plates he found that coatings containing vegetable oils or oil residues had poor initial adhesion and lost adhesion rapidly on ageing because of the attack on the substrate by decomposition products arising from oils. On the other hand, he found chemically cured systems such as epoxides and blocked urethanes retained good adhesion over the entire period of exposure. The use of a two-pack etch primer minimised the loss of adhesion, but chromate passivation of the cadmium surface did nothing to reduce the loss of adhesion but accelerated it.

Bullett[5] studied the effect of moisture on adhesion of alkyds using the 'pull-off' technique. The tests were performed under dry conditions immediately after the immersion of the coated discs samples up to four hours and also after subsequent drying of the samples. The results showed a rapid loss in adhesion of water soaked samples which they regained to a large extent on sufficient air drying. There was, however, evidence of some irreversible deterioration over a long period or repeated cycles of soaking.

Raju and Yaseen[6] studied the effect of weathering on adhesion, tensile and other properties of TiO_2 alkyd paints in which TiO_2 was partly replaced by barytes. They found no adverse effect on the properties of paints of 30% PVC in which TiO_2 was replaced by barytes up to 10% PVC.

Sathyanarayana et al[7] while studying the effect of ageing during indoor exposure on alkyd-TiO_2 and alkyd-ZnO paint systems at two PVC levels in relation to their adhesion as well as cohesive properties, found that at the lower PVC levels, the initial adhesion was less as compared to that of the higher PVC paint, but as the film aged the adhesive strength of the lower PVC paint approached the adhesion value of higher PVC paint.

In the present study, the effect of ageing on the adhesion of alkyd-TiO_2 paint to mild steel substrate has been investigated at different levels of pigmentation (0 to 50 PVC) of the paint covering pigmentation both below and just over CPVC. The tensile strength and percentage elongation have also been measured periodically to find correlation with adhesion properties. The ageing has been carried out under ambient conditions of indoor and outdoor environments for a period of Ca. five months.

Experimental

Materials

Medium: A 66% oil length alkyd prepared in the laboratory by the standard monoglyceride process using linseed oil, glycerine and phthalic anhydride had an acid value 10.1 and hydroxyl value 41.6.

Pigment: Titanium dioxide (anatase), Travancore Titanium Products, India, specific gravity 3.84 and identified as TiO_2 (anatase) by X-ray diffraction.

Solvents: Rectified xylene (BDH), b.p. 138°C, distilled white spirit, bp. range 150-200°C, methyl ethyl ketone (E.Merck), bp. 79.6°C.

Driers: Cobalt naphthenate (6% Co metal) and lead naphthenate (24% Pb metal).

Emery paper: Emery paper of grade numbers 180, 220, 320 and 400, silicon carbide waterproof paper of Carborandum Universal Ltd, India.

Substrate: Discs of mild steel 32 mm diameter and 0.9 mm thickness abraded with emery paper of increasing fineness and degreased in a soxhlet extractor with methy ethyl ketone for two hours. After removing the residual solvents in a vacuum desiccator, the paints were immediately applied.

Tinfoils: 204 mm x 102 mm x 0.025 mm tin foils, cleaned by swabbing successively with xylene.

Paints: Binder and seven paints were formulated at 10, 20, 25, 30, 35, 40 and 50% PVC's. The paints were ground to Hegmann gauge 7-8 in a laboratory ball mill. The consistency was maintained at 60 seconds (Ford cup 4) for free films preparation and 40 seconds (Ford cup 4) for spin coat application on mild steel discs. Driers were added (0.05% Co and 0.5% Pb as metals on the weight of binder).

Methods

For adhesion measurements mild steel discs were coated with each paint system by the spinning method and allowed to dry for a week under indoor ambient conditions. For the study of tensile properties, tin foils were coated for obtaining free films. These were also dried under indoor ambient conditions for a week. One set of coated discs and tin foil were exposed indoor and the other exposed to outdoor conditions by mounting them on metal sheet/glass sheets respectively. These were fixed on racks at an angle of 45° facing south. Necessary protection was given to the uncoated surface of the discs against corrosion. During the period of exposure the maximum temperature ranged from 30 to 42°C and the minimum temperature ranged from 20 to 25°C and relative humidity ranged from 16 to 80% (Figure 1).

Sufficient number of discs and supported films were taken out from both the sites periodically for measurement.

The measurement of adhesion by Sandwich pull-off technique

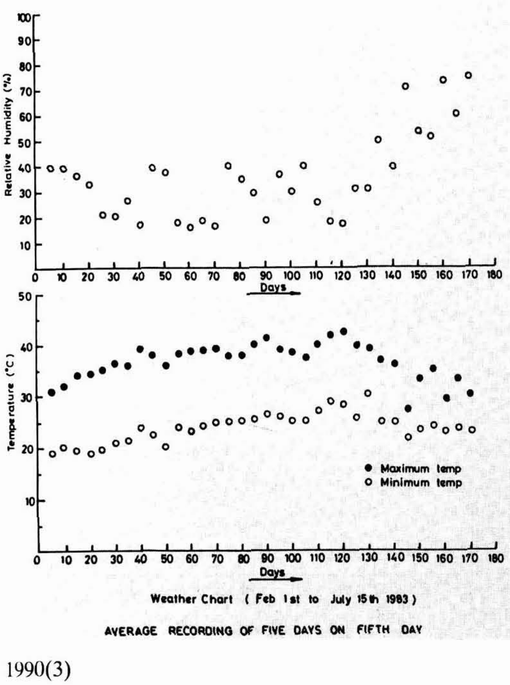
The practical adhesion (bond strength values) were determined by sandwich pull-off technique using a Hounsfield tensometer[8-10].

The test specimens were selected having a dry film thickness of about 1-1.5 mil. (25-37μm). The average adhesion value was calculated from the results of 8 to 10 test specimens (Figures 2 to 9).

The measurement of tensile strength and per cent elongation

Coatings on tin foils were removed from the test racks 48

Figure 1
Weather Chart.



hours before testing; the free films obtained after amalgamation with mercury were left for 24 hours for the underside to dry. Then they were cut into strips of 5 x 1 cm and their thickness was measured before testing. The tensile and percentage elongation were determined by using an instron tensile tester (UK) according to ASTM methods[11]. The results are given in Figures 2 to 9.

Discussion and Conclusions

The results have led to some interesting inferences regarding the effect of ageing of alkyd-TiO_2 paints on the adhesion behaviour of pigmented alkyd resins to mild steel substrates.

In discussing the results, it may be noted that the critical pigment volume concentration (CPVC) of the alkyd-TiO_2 paints is about 40.84 arrived at from the alkyd absorption method[12]. The tenth day reading was the first reading for all systems exposed to indoor as well as outdoor weather conditions.

The following observations are made on the tenth day for all the systems, before placing half of the sets for outdoor exposures:

□ Adhesion was lowest for the binders alone and highest for the 35% PVC system.
□ Tensile strength was highest for 40% PVC and least for the binder.
□ Percentage elongation was highest for binder and least for the 50% PVC system.

The pattern of ageing of the coatings was obtained by comparing the data over a period of about 5 months. From the pattern observed in adhesion of the coatings to mild steel substrate, tensile strength and per cent elongation measured on free films, the paint systems were classified into four major categories, viz. (i) under pigmented systems (binder and 10% PVC), (ii) medium PVC (20, 25 and 30% PVC), (iii) systems around CPVC (35 and 40% PVC), and (iv) over pigmented systems (50% PVC).

From the effect of ageing on adhesion behaviour it is seen that whereas with unpigmented films (i.e. only medium), there is a gradual increase in adhesion on ageing for up to 40 days, more in the outdoor compared to indoor conditions, after which it starts decreasing and levels off, but the decrease in adhesion is more rapid with the binder exposed outdoor. The 10% PVC system, though has a higher initial value, follows the same trend. This observation in the case of the binder could be related to the rapidity with which the tensile strength is built up in films exposed outdoors which is also evident from the rapid decrease in its per cent elongation. The quick build up of tensile strength more than that of 10% PVC system has led the binder especially in the outdoor conditions to attain brittleness at a fast rate. Brittleness in the film is reflected in the fall in adhesion value after attaining a maximum (Figures 2 and 3).

During the earlier stages of film formation, low molecular weight and polar species are formed which are likely to accumulate at the interfacial layer, leading to mostly adhesive failures and lower values of adhesion. Later on as higher molecular weight species are formed, they may replace the lower ones from the interfacial region resulting in increased adhesion with cohesive type of failure. Such a situation is clearly noticed in the indoor conditions but in those of the outdoor conditions, this is not noticeable as film formation is rapid. This was confirmed by the GPC examination of the extracts of the scrapings from the interfacial layer between alkyd and the substrate, after the bond was broken during the adhesion measurement by sandwich pull-off method[13]. Detail study on interfaces is being communicated separately.

When 20, 25 and 30% PVC systems (Figures 4, 5 and 6) are considered, a few changes have occurred under both indoor

Figure 2

Effect of ageing on adhesion, tensile strength and per cent elongation.

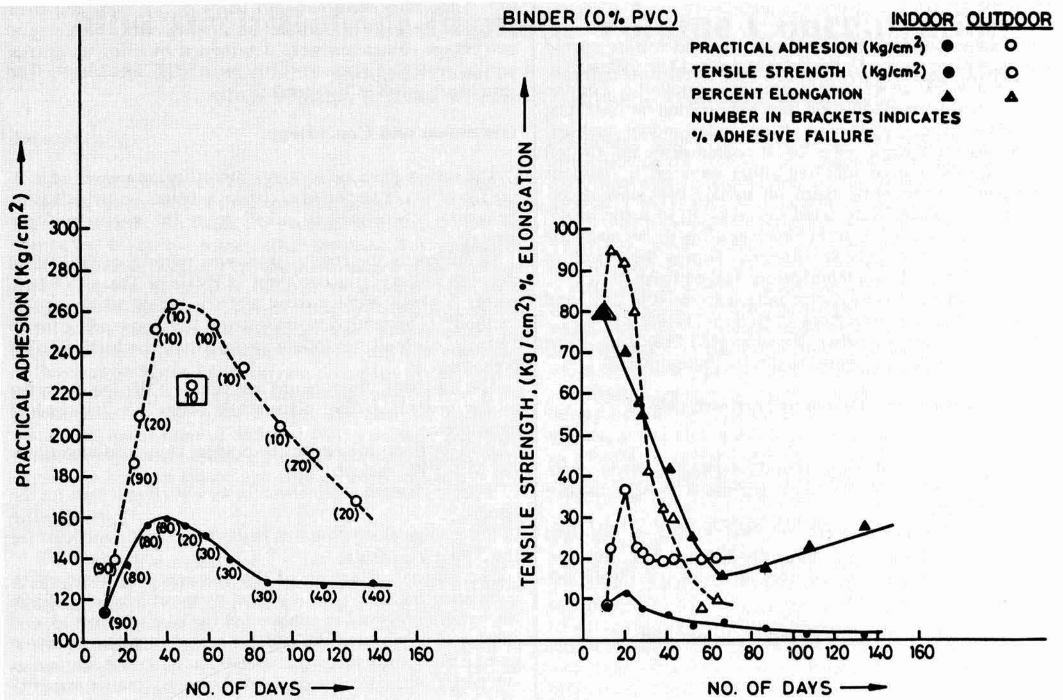


Figure 3

Effect of ageing on adhesion, tensile strength and per cent elongation.

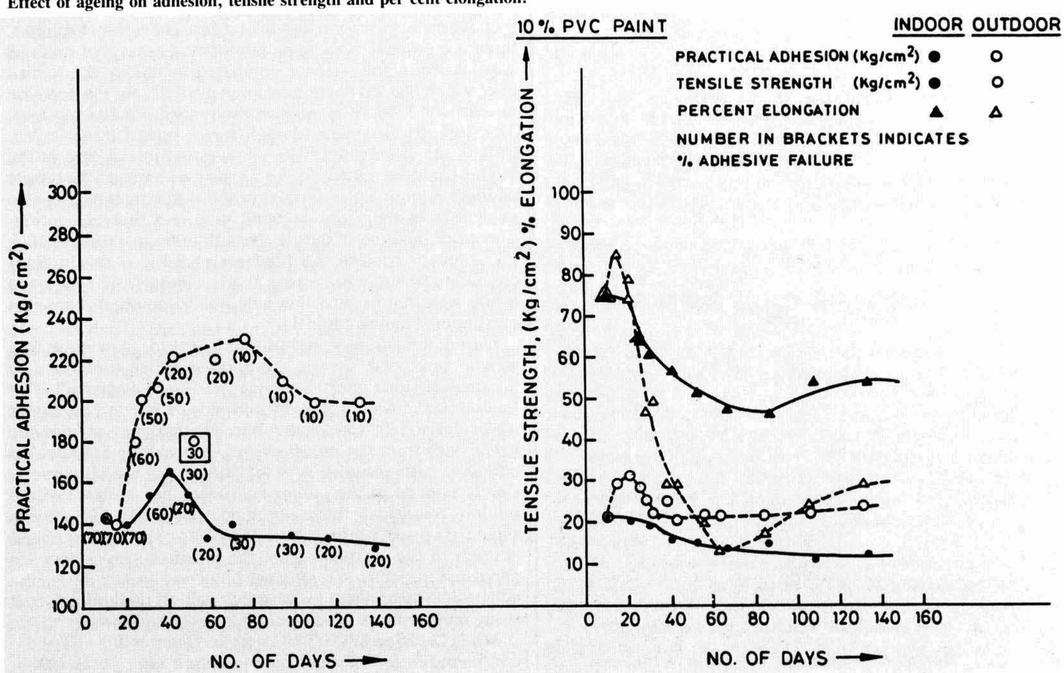


Figure 4
Effect of ageing on adhesion, tensile strength and per cent elongation.

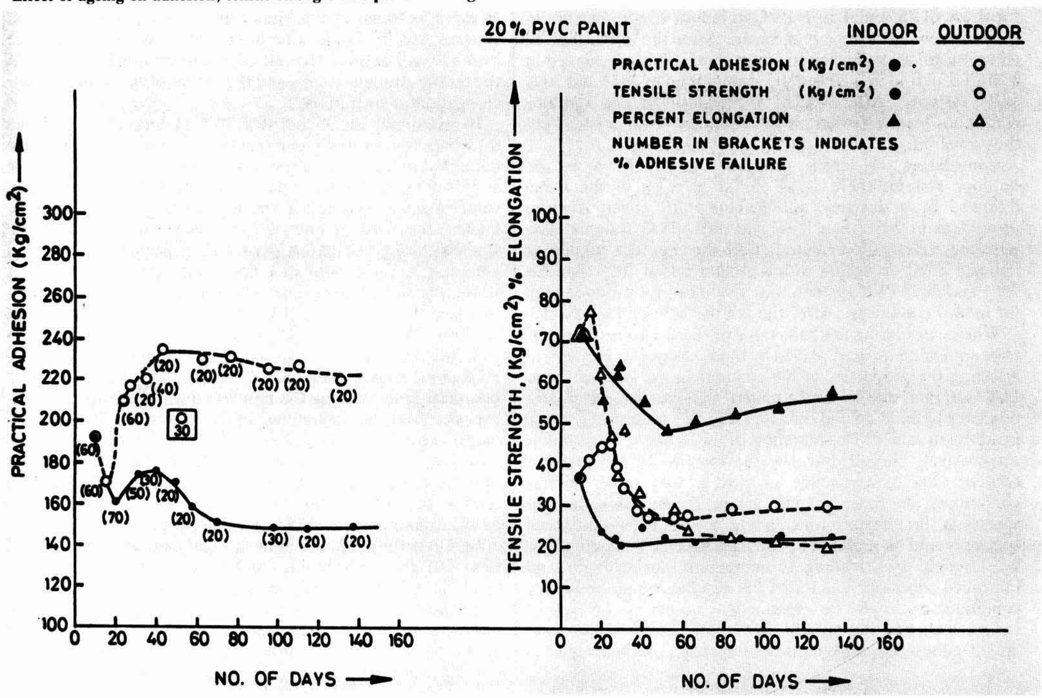
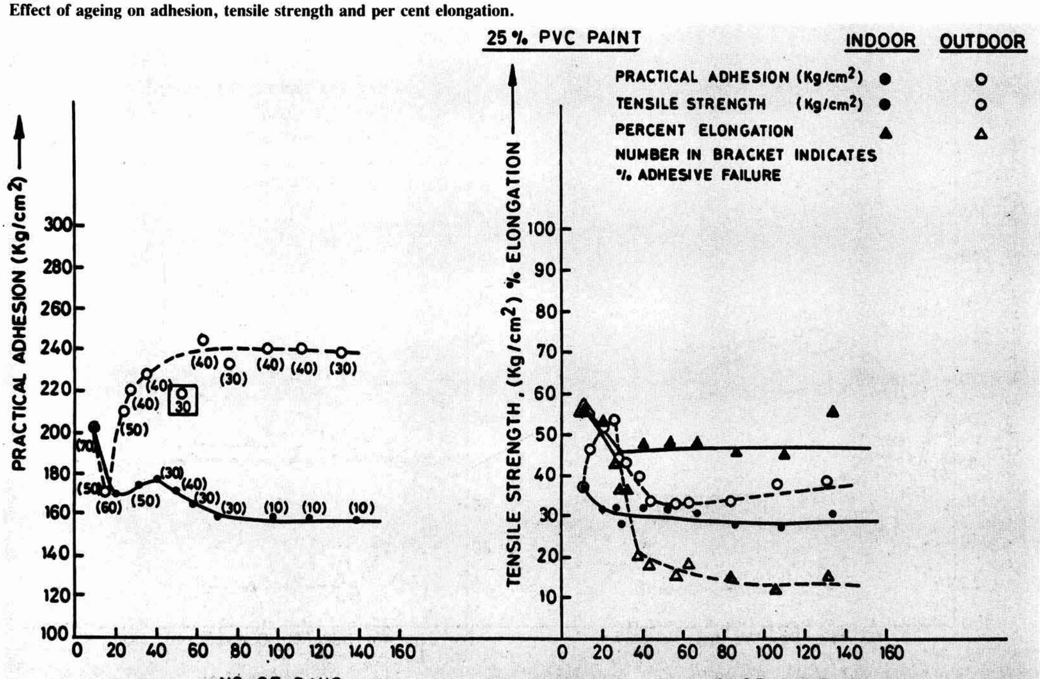


Figure 5
Effect of ageing on adhesion, tensile strength and per cent elongation.



and outdoor exposure conditions. There is an initial decrease in adhesion, which is greater for the 20% PVC system than for those of 25% and 30% PVC in indoor conditions and in the outdoor the reverse is the case. After the initial dip, all adhesion values increased to a maximum. This is achieved in a shorter period in a 20% PVC system than in 25% and 30% PVC systems. After which, the values in the outdoor conditions level off whereas in the indoor after a slight fall they level off.

Considering the tensile properties of the films, in the outdoor system, there is an initial increase in the value followed by a decrease and levelling off, which is more prominent in 20% than 25% and 30% PVC systems. The percentage elongation values in both the exposure conditions indicate a fall on ageing with a greater fall at 20% than for 25% and 30% PVC systems and also more for outdoor than for indoor conditions. After the fall the adhesion level off.

When considering the behaviour of these systems, one has to bear in mind the part played by binder as well as pigment in affecting the properties of the coating. In the case of lower PVC systems, due to larger binder content, and its greater tendency to build up and crosslink it results in initial decrease in adhesion values. This readiness of the binder to cross link is progressively slowed down by the increase in the pigment content. The consequence of this is that under indoor conditions, the systems would retain low molecular weight species at the interface for a longer period, eventually these species would be replaced by the high molecular weight ones, as the film ages leading to increased film strength and improved adhesion. The initial fall in adhesion in the indoor conditions could also be explained by observing the type of failure occurring during adhesion experiments. These were largely adhesive failures in the earlier stages of film formation giving place to cohesive failure at a later period. The rates of film increase and fall in adhesion in outdoor exposure are not as rapid as found in the binder alone and in the 10% PVC systems, and the fall in adhesion is not abrupt but takes place over a longer period. The rate of film formation is also seen in the tensile strength results and the extent of fall of percentage elongation in such films.

By examining the 35 and 40% PVC systems (Figures 7 and 8), where the level of pigmentation is around the CPVC, the initial fall in adhesion in the indoor experiment is noticeable at 35% PVC and is not apparent at 40% PVC. The adhesion values reach a maximum in the 40% PVC system which is the highest recorded in any of the systems which have been studied during the entire period of exposure. The rate of adhesion increase both in indoor and outdoor exposure is slow and takes a longer time. The tensile values follow similar trends in the case of 35% PVC paints but a change is noticed at 40% PVC with a fall in the value recorded at both conditions of exposure. The effect of the binder in the lower PVC paint is not evident as it is insufficient to form the weak boundary layer causing the type of failure occurring which is cohesive from the beginning. In the case of outdoor experiments the levelling of adhesion and tensile strength values both indicate that the blanketing effect of the pigment not only slows down the rate of formation of the film but also reduces the deterioration of the film.

By examining the 50% PVC system (Figure 9), the adhesion pattern initially shows a slight increase followed by a slow fall for both indoor and outdoor exposures finally levelling off. The tensile strength values for both type of exposures do not change greatly but maintain lower values than the 40% PVC paint and the film becomes fragile at about 55 days in the outdoor exposure. The percentage

Figure 6
Effect of ageing on adhesion, tensile strength and per cent elongation

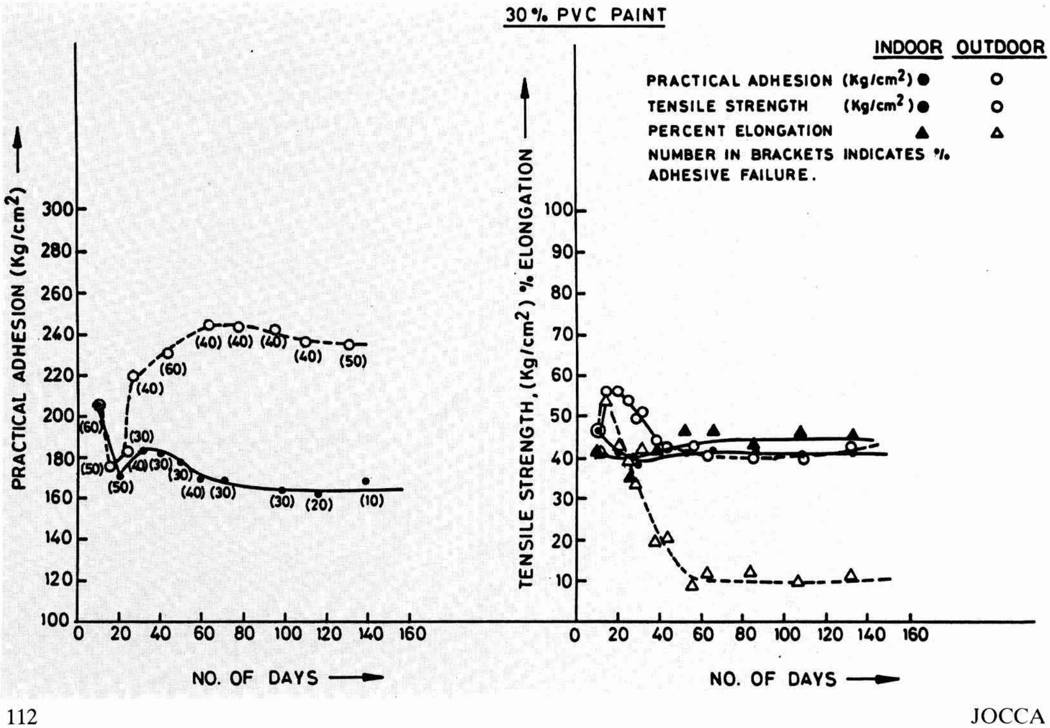


Figure 7
Effect of ageing on adhesion, tensile strength and per cent elongation

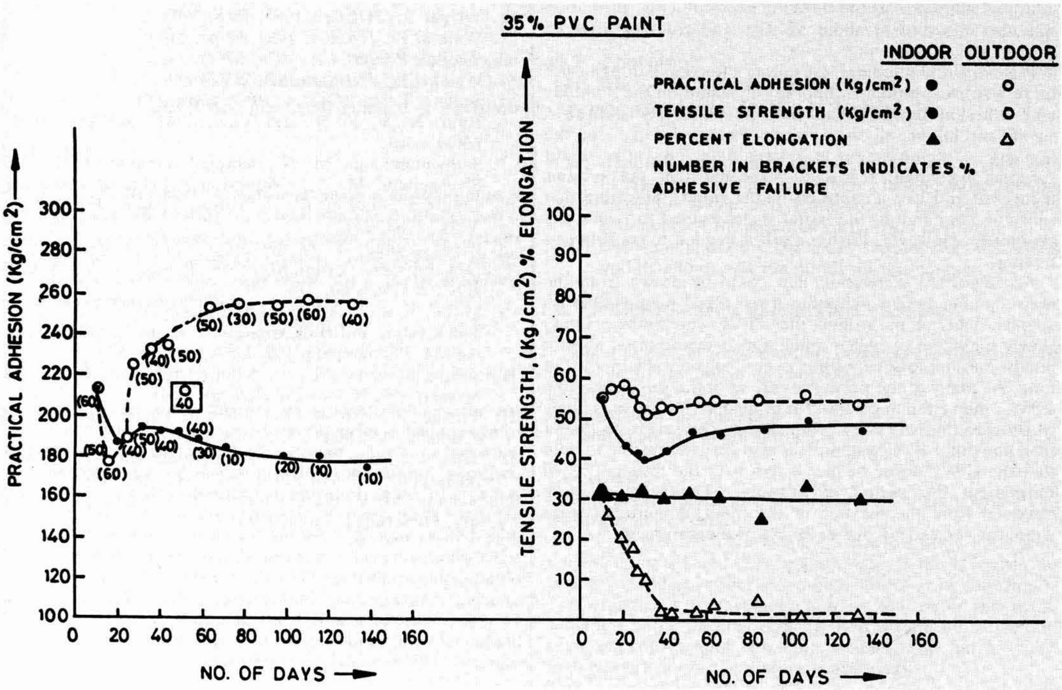
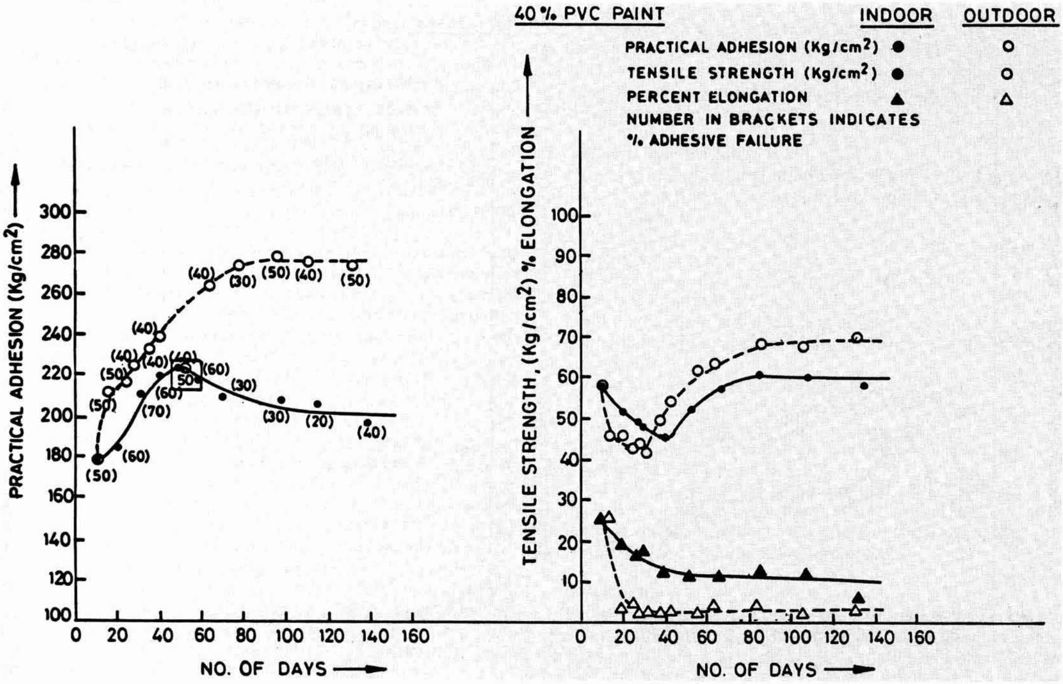


Figure 8
Effect of ageing on adhesion, tensile strength and per cent elongation



elongation remains low and shows very little change. Being an overpigmented system, this system has low tensile strength and low adhesion. In the outdoor exposure, rust formation was also observed at about 52 days and chalking after 65 days.

It is worth mentioning that during the course of exposure there was an appreciable amount of rainfall on the 50th day and adhesion measurements on the 52nd day showed a significant fall in all the systems (shown by "□" in the figures). A measurement at a later date, i.e., after bright sunshine for about ten days, indicated that the systems recovered and had conformed to the trend, indicating that sunshine after rain in the initial stages helped to regain the properties. However, further work is needed to confirm this finding.

An important conclusion that could be drawn from the above studies is that adhesion of the alkyd pigmented with anatase TiO_2 at or around the CPVC (preferably below) slowly builds up to higher value and is maintained, both in indoor and outdoor exposures over a considerable period of time. As many of the properties are at optimum value at the CPVC, the system pigmented at or near CPVC value is likely to provide the necessary protection of the substrate longer than any other PVC system. It is also very interesting to note that the CPVC value of the system is in the range of 35-40 throughout the period of exposure. These values were obtained from the maxima of the plots, Adhesion/Tensile strengths versus PVC for each day of measurement.

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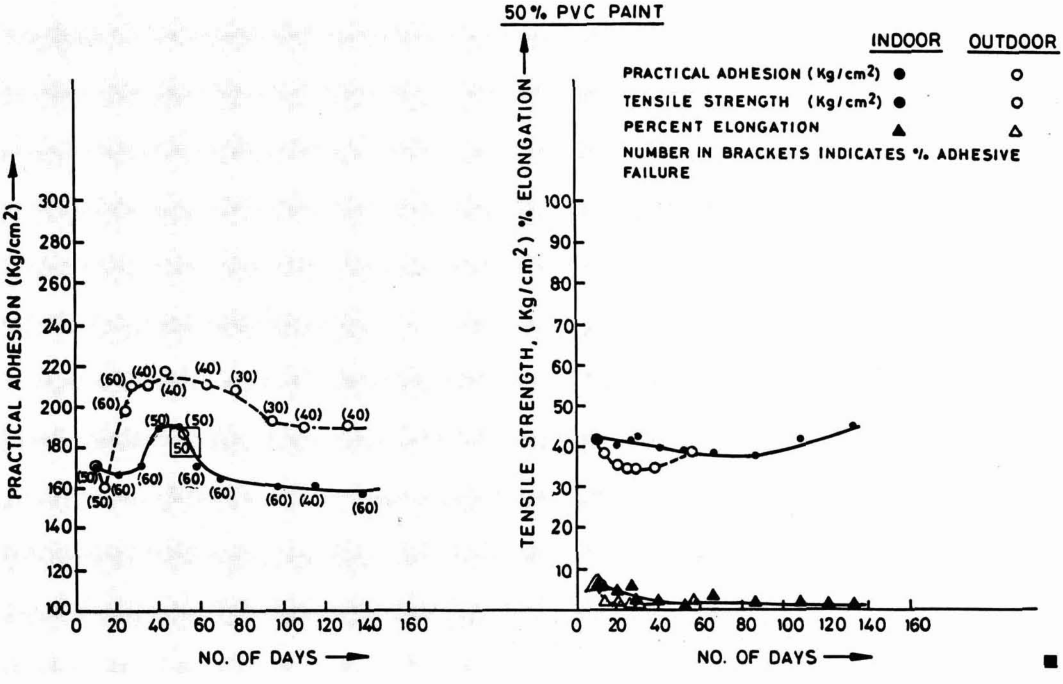
Figure 9
Effect of aging on practical adhesion, tensile strength and per cent elongation



Long-life coatings for Aluminium

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Abstract

The paper deals with the various types of coatings applied to aluminium in coil coating, in production line finishing, and in small series craftsmanship. Production costs and service performance are estimated together with reviews of the aluminium alloy types met in practice, and of the pretreatment options currently available.

Introduction

Over recent years the use of organic coatings for the protection and decoration of aluminium for a wide range of applications has shown a sharp increase. This has often been at the expense of bright, satin and colour anodised aluminium, which dominated the market up to 10-15 years ago. In 1986 for example, two out of every three extruded aluminium windows installed in the UK was coated with either powder or wet paint, while in Germany every third window was powder coated. In 1987 the total powder coated extrusions and cladding used in building and construction in France, Germany, Italy and the UK was approximately 47 million m^2 or 135,000 tons, and the growth for powder coated aluminium extrusions alone is expected to be 10-20% over the next few years.

Almost without exception, these coatings are expected to perform as Long Life Systems by virtue of the fact that they are applied over aluminium, irrespective of whether they are used for architectural purposes, vehicle bodies, electromotor houses, maritime parts, domestic appliances or any of the wide range of products for which they are currently used.

Although a highly electropositive metal aluminium can itself be a very durable material, even in relatively hostile conditions. For example, uncoated aluminium roof cladding on a church in Rome dates from 1896, the statue of Eros in Piccadilly Circus in London dates from 1893, and, being in Germany, not to forget the roof of the large Westfahlen Halle in Dortmund, which is now around 40 years of age and mostly undamaged.

When selecting coatings for aluminium therefore, it is essential that they are as durable as possible, consistent with the long life expected from the substrate material itself. In accordance with this fluor olefins, polyester enamels, polyester powder coatings, and two pack polyurethane enamels are widely used. However, irrespective of the quality of the paint systems themselves, their service performance is to a large degree, not to say fully, dependent on the way in which the aluminium is pretreated.

To obtain high performance coatings the interface between the metal and the coating must be modified, on most industrial products by a surface conversion process. The goal is to stabilize the interface to be fully resistant against corrosion, i.e. attack by moisture in particular. Otherwise the road to blistering, undercutting and flaking is very short.

This paper deals with three main topics:

A) Representative examples of products and goods in paint coated aluminium with expected high durability and long lifetime. The examples at the same time illustrate the three main production systems for paint finishing.

B) Important aluminium alloy types we have to deal with in practice, the main stress being laid on those alloying elements which are troublesome for the faultless formation of the essential conversion coatings.

C) Conversion coating processes suitable for aluminium and its alloys, and the pitfalls in this context.

A. Finishing systems and product examples

The three main paint finishing production systems can be described by the following concepts:

- □ Coil coating
- □ Production line finishing
- □ Craftsmanship, small series

Coil coating

Rolled aluminium sheet is coil coated, mainly with PVF_2 and polyester enamel.

PVF_2, Kynar 500, consisting of approximately 80% polyvinylidenfluoride and 20% polyacrylate, is the favourite for building cladding, either as profiled sheets or as coffering.

A significant requirement here is that both the paint/substrate bond, and the coating itself should be capable of surviving roll forming, pressing, bending etc., all of which may be part of post coating manufacturing.

The coating procedure is:

a) Chromate conversion coating
b) 1 coat epoxy primer, 5 microns
c) 1 coat PVF_2/polyacrylate, 20 microns
d) Curing at 255°C peak temperature

Sheets coil coated with polyester/melamine enamels are used as covering on caravans. In this case the polar polyester is applied directly on the conversion coating. The total coating thickness is 20 microns.

Production line finishing

Extruded and painted aluminium profiles are used either as window frames and casements or as the bearing framework in large glass facades.

The dominating coating procedure is:

a) Chromate conversion coating
b) EPS polyester powder coating, 80-100 microns
c) Curing 10 minutes at 200°C

Another example is welded frames to be mounted as a rain shelter for wooden window frames. In this case the coating procedure is:

a) Chromate conversion coating
b) 1 coat two pack polyurethane primer, 30-40 microns.

After appropriate drying:

c) 1 coat two pack polyurethane enamel, 30-40 microns
d) Curing, 45 minutes at 80°C

Total coating thickness: 60-80 microns.

An artistic composed colour symphony makes all the difference on an otherwise dull concrete building. After 10 years service the coating is undamaged.

Craftsmanship

This group includes a wide range of products. Contrary to industrial finishing one must normally rely on blast cleaning or grinding/sanding as pretreatment and the application of conversion coatings is rare, although brush applied chromate conversion processes for site application are available. Notice here, that blast cleaning must be done very carefully as aluminium sheets and profiles otherwise easily deform.

Craftsmanship is really very different from the other finishing systems. Nevertheless examples from this group are shown as the paint coatings aspire to the same universal goal: High performance.

Bus bodies is the first example. Bodies used to be joined by welding. Nowadays they are bolted together, probably for ease of repair. This also saves grinding and most of the subsequent filling.

The coating procedure is:
a) Solvent degrease and sanding
b) 1 coat two pack wash primer, an acetobutyral/phosphoric acid system, 20 microns
c) 1 coat primer filler (to fill scratches etc.), 30-40 microns
d) 1 coat two pack polyurethane enamel, i.e. polyacrylate/isocyanate, 40 microns
e) Air drying.

Total coating thickness: 90-100 microns.

The coating is (almost) fully moisture resistant. But the body in this respect has a weak point at the windows. Water is picked up below the rubber moulding and from here it attacks the coating, gradually causing blistering and undercutting.

Another example is hospital movable containers used for internal transport of meals and linen.

The coating procedure is:
a) Blast cleaning with quartz sand, 5 microns roughness
b) 1 coat two pack epoxy primer, 40 microns
c) 2 coats two pack high build epoxy intermediate, each 60 microns
d) 1 coat two pack polyurethane enamel, aliphatic isocyanate, 30 microns
e) Air drying between the application of each coat and of the total coating.

Total coating thickness: Min. 180 microns.

The containers are sterilized daily by a spray rinse with 80-90°C water and detergent. After 10 years service the coating is partly discoloured and mechanically damaged and it needs repair.

The final example is a submarine propeller house containing the power transmission system. The house is made from sea water resistant aluminium, a 5% magnesium alloy.

The coating procedure is:
a) Grinding and blast cleaning using quartz sand, 5 microns roughness
b) 3 coats two pack epoxy intermediate, each 30-40 microns
c) 1 coat two pack polyurethane enamel, aliphatic isocyanate, 40 microns
d) Air drying of each coat and of the total coating.

Total coating thickness: Min. 140 microns.

The transmission house must be electrically insulated from the propeller made from aluminium bronze. Otherwise the coating will be lost by undercut corrosion within a few months. Additionally the house and the coating is protected by zinc anodes. At these condition the coating lifetime is at least 7 years.

Finishing systems, comparative figures

Estimated comparative figures for productivity and production costs are shown in the Tables 1 and 2.

From these figures one could easily be seduced to hasty conclusions: That low coating thickness is equal to long lifetime and at low production costs. The comparison is unfair of course (and irrelevant?), but it indicates why so many manufacturing industries are constantly reconsidering their production processes, in order to shift to or expand the attractive use of coil coated materials.

Table 1
Applied amount and productivity

Process	Coating thickness (microns)	Productivity m^2/hour'
Coil coating	20-30	3000-8000
Prod.line finishing	70-100	200-300
Craftsmanship	60-180	5-20

Table 2
Costs and lifetime

Process	Production costs ECU/m^2 (Index)	Expected lifetime (years)
Coil coating	100	20+
Prod.line finishing	300-500	5-15
Craftsmanship	800-1200	5-10

B. Important aluminium alloys

Pure aluminium possess relatively low strength but by appropriate alloying its strength and workability can be improved considerably. Typical and widely used alloying elements are manganese, magnesium, copper, zinc and silicon.

Among these, copper, silicon and manganese are real troublemakers for the proper formation of conversion coatings, as will be dealt with in Part C.

Important alloys from practice are divided into 6 groups and it is usual to distinguish between alloys for rolling, alloys for extrusion and alloys for die casting.

Alloys for rolling

Aluminium-manganese alloys normally contain approx. *1% manganese.* Compared with pure aluminium they possess increased strength and improved durability against atmospheric corrosion. Due to their good workability this group of alloys is the most commonly applied for sheets, and manganese alloys are widely used as cladding, vehicle bodies, containers etc.

Aluminium-magnesium alloys containing *2-5% magnesium* are often called sea water resistant aluminium due to their improved corrosion resistance against the chloride ion. The main application is for freeboard parts on boats and vessels. Alloys with up to 5% magnesium are weldable.

Aluminium-copper alloys are primarily used for airplanes due to high strength. The copper content is often 5-6% causing low corrosion resistance.

Alloys containing both copper, magnesium, manganese and silicon are called duraluminium and these alloys can by tempering obtain very considerable strength and hardness. They generally have low weldability and joining is done by the use of rivets or adhesives.

Aluminium-zinc-magnesium alloys contain 4.5-7.5% zinc, 0.5-3.0% magnesium and 0.5-2.5% copper. Due to very high strength these materials are used for parts in airplanes and for civil engineering purposes, for instance towers for high voltage electricity transmission lines.

Alloys without copper are weldable.

Alloys for extrusion

Aluminium-magnesium-silicon alloys containing approx. 1% of each alloying element are widely used in extruded profiles for window frames and casements. They can obtain considerable strength due to formation of (the chemical compound) magnesium silicide. Good weldability and workability.

Aluminium-manganese alloys are also to some extend used for the extrusion of tubes and profiles. Good weldability as mentioned previously.

Alloys for castings

Aluminium-silicon alloys containing 11-13.5% silicon is the dominating material for aluminium die castings. The alloys are called silumin. Copper silumin additionally contains approx. 1% copper, giving higher strength but lower corrosion resistance.

So to summarize it will be clear from this brief description of important aluminium alloys, that the troublesome alloying elements, copper, silicon and manganese, may be present in all of the main groups of workpieces: Sheets, profiles and castings.

C. Conversion coatings

This part of the paper discusses the following subjects:

□ The natural oxide film
□ Anodising
□ Design of chemical pretreatment process sequences
□ Cleaners and alkaline etch cleaners
□ Conversion coatings:
zinc phosphate
yellow chromate
green chromate

The natural oxide film

When clean aluminium is exposed to the atmosphere, it is immediately covered with a thin oxide film, which is protective in many environments, i.e. if pH is within the range 4-8.5 and chloride and copper are absent.

This natural film is generally in the order of 0.01 microns thick and is composed of hydrated aluminium oxide. Unfortunately, while the artificially grown oxide layers produced by anodising are suitable as bases for painting, the natural film, because of its discontinuous nature and poor bond strength, becomes a problem rather than an ally when introduced into a coating process.

In fact, even though many publications dealing with anodising describe the process as building on or increasing the natural oxide layer, it must be removed before the application of all treatment processes, including anodising itself. Where conversion coating processes are used, the presence of the natural oxide inhibits the formation of the coatings, resulting in poor performance of the paints subsequently applied.

Anodising

Before passing on to the conversion coating processes used to pretreat aluminium before painting, it is perhaps useful to say a little more about anodising in this context. While anodised coatings form excellent foundations for paint, mainly because of their porous cellular structure and their inert character, the anodising process is not widely used as a pretreatment. This is because of the high capital cost and complexity of suitable installations compared to those used for chemical conversion processes. Anodising is an electrochemical process, and the appropriate expensive equipment like rectifiers, conductors, control instrumentation and cathodes must be in place.

Nevertheless, anodic coatings have been and are still used as bases for painting aluminium, usually in circumstances where the facilities already exist and the user wishes to avoid the additional cost and space requirements of a conversion coating line, or where special characteristics such as a high level of abrasion resistance is required.

The 10-20% Sulphuric Acid process, used at 1-2 amp/dm^2 and 10-20 volts at 20-30°C for 5 minutes is perhaps most commonly used as a paint pretreatment. It produces hard protective coatings, and depending on the pretreatment, can produce mirror bright smooth finishes, or matt textured coatings.

Design of chemical pretreatment process sequences

The general design of pretreatment process sequences to produce chemical conversion coatings are shown in Box 1. They are multistep processes, and the number of steps can be as high as 8 or 10.

Box 1

General design of a chemical pretreatment process sequence

Stages in a process sequence are:

1. Acidic cleaner, or
alkaline cleaner, or
alkaline etch cleaner
2. Running Water Rinse
3. 10% Nitric Acid Dip.
4. Running Water Rinse
5. Conversion Coating
6. Rinse
7. Rinse
8. Dry

Notes:

Stage 1: Operated at typically 40-60°C

Stage 3: This stage deals with smut produced by the alkaline etching process. If the smut is produced by silicon containing alloys a 75/25 Nitric Acid/Hydrofluoric Acid dip is required.

Stage 5: Can be:
zinc phosphate in mixed production plants, or
chromate-oxide (yellow chromate), or
chromate-phosphate (green chromate)

Cleaners and alkaline etch cleaners

The first step in the process sequence attracts special attention and will be dealt with extensively.

The vast bulk of aluminium pretreated by these processes is prepared by alkaline etching. Most alkaline etch cleaners are based on caustic soda with various additives. The formulation given in Table 3 will for example produce a general purpose matt etch. While it will have significant degreasing capacity, the addition of further wetting agents, sequestrants etc. will considerably enhance this function.

Table 3

Alkaline Etch-Cleaner, general formulation

Caustic Soda	10%
Sodium Fluoride	2%
Sodium Polyphosphate	0.2%
Wetting Agent	0.2%
1-10 minutes at 60-80°C	

For most applications etch cleaners have the merit of being able to remove light organic contamination, and at the same time remove natural oxide layers which tend to inhibit conversion coating formation.

Extrusions and heavy oxide films

Extruded aluminium is particularly vulnerable in this respect because the material emerges from its extruding die at approximately 500°C, and the surface oxides form rapidly on exposure to the atmosphere. Regretably, many a well formulated high performance coating system has foundered on the assumption that the material is substantially heavy oxide free.

Failures can be as dramatic as total detachment of the paint film, even before exposure to service conditions, or at best, gradual undercutting of the paint in service due to the absence of a properly formed conversion coating.

Non-etching cleaners

In circumstances where etching of the aluminium is not desirable, a range of non-etching inhibited alkaline cleaners are available. Furthermore, low pH baths based on mixed acids with proprietary additives can be used to remove oxide layers without significant etching of the aluminium.

However, under opaque paint films, where the appearance of the substrate is not a concern, etching of the substrate is of considerable benefit for obvious reasons, and these, together with the low cost of the process and the associated saving of space, make the combined process (i.e. the etch cleaner) a very attractive proposition.

Copper alloys

There are potential traps here of course and they can be just as serious as not taking any steps to deal with oxides. Copper containing alloys, for example, produce a dark smut on the surface following alkaline etch cleaning, and in high performance systems this must be removed by dipping in 10% nitric acid before conversion coating. While many aluminium alloys do not give rise to this problem to any significant degree it should always be assumed that the various alloying elements present in aluminium are exposed by etching, and these constitute contaminants which downgrade the effectiveness of the conversion coating.

Silicon and manganese alloys

Alloys containing more than 1% silicon, such as those commonly used for die castings present more serious problems after etching. A silicon based smut is produced in these circumstances, and the nitric acid dip will not remove it, a 75:25 nitric acid hydrofluoric acid mix being required. Manganese alloys give rise to similar problems.

Mixtures of alloys

It will be clear from this that even before reaching the stage of applying conversion coatings to aluminium, some information on the nature of the material being treated is required. The appropriate conversion processes themselves are relatively tolerant of a wide range of alloys, although the use of several alloys in the manufacture of a single item may cause unacceptable variations in appearance of the final product, if for example clear coatings are being used.

Conversion coatings:

Properties of conversion coatings for aluminium are shown in Table 4.

Zinc phosphate

The Zinc Phosphate conversion process is of course primarily used for steel, and zinc based or coated products. It is not an optimum process for aluminium and is never used if a purpose-built plant is being installed to treat aluminium only. Aluminium is a poison in conventionally formulated phosphating baths, and since substrate dissolution is part of the conversion coating formation chemistry, both the quality of the coating and its rate of formation are adversely affected. It has a role, however, in circumstances where mixed metals are being processed and where aluminium is not more than say 10% of the surface area being treated. While the process will continue to function in these circumstances, the user should ultimately expect some lowering of the performance levels, particularly from the phosphate on the steel.

Table 4

Conversion Coatings for aluminium

Process	Composition	Operating Conditions	Coating Weight (g/m^2)
Zinc Phosphate	Zinc Phosphate	1-2 minutes spray at 40-50°C 3-5 minutes immersion at 50-60°C	1.5-4.5
Chromate-oxide (yellow)	Acid Chromate/ Fluoride	2-5 minutes spray or immersion at 18-27°C	0.3-2
Chromate-phosphate (green)	Chromate/ H_3PO_4/ Fluoride	1-10 minutes spray or immersion at 18-50°C	0.5-2

Chromate processes

The remaining proprietary processes are broadly described as being of the chromate-oxide or chromate-phosphate types. The coatings formed range in appearance from colourless to yellow to yellow/brown to blue/green depending on the chemistry, the process and to some extent the alloy being treated. Leaving aside the question of colour, and despite much hot air which appears in the technical press from time to time concerning the relative merits of the two processes, they are by and large interchangeable for most applications where the main consideration is to ensure that the paint film is firmly bonded to the substrate, and that in the event of porosity in, or damage to, the paint system, undercutting and film detachment will not occur.

Yellow chromate (chromate-oxide process): The chromate-oxide processes typified by products such as Bonderite 711, Alocrom 1200 (Alodine), tend to form deep yellow/golden colours on aluminium and its alloys. The colour achieved depends on processing time and temperature, and therefore on coating weight as shown in Table 4. However, just to confuse matters, single step chromate-oxide processes are available which will deposit conversion coatings without significantly changing the appearance of the aluminium surface, e.g. Dip Alocrom 1000. The chemical composition of the yellow chromate conversion coating has been shown to be a mixture of aluminium oxide, chromate acid and chromic hydroxide.

Green chromate (chromate-phosphate process): The chromate-phosphate processes typified by processes such as Alocrom 100, Alocrom 407-47 produce green to blue-green type films. They can be formulated so that the film is free of hexavalent chrome and can therefore be used under suitable paints or lacquers in contact with foodstuffs. The composition of the coating has been shown to be a mixture of aluminium oxide and chromic phosphate.

Continued on p.120

Pigments for colour copiers and colour laser printers

by H-T. Macholdt, Farbenforschung, Hoechst AG, 6230 Frankfurt/Main 80, West Germany

Photocopies have so far generally been black and white. It is now becoming increasingly possible to copy in colour, and with excellent quality too! Many individual steps in the process have to be precisely coordinated in order to achieve this. It is also essential for the organic coloured pigments responsible for giving the colour to satisfy the demands of modern coloured copying.

The technique of photocopying, known to insiders as electrophotography, has undergone enormous development over the last 50 years: it was in 1938 that the American patent attorney Chester F. Carlson patented his idea of photocopying. The process was commercially developed by the American firm of Haloid in 1948. This firm later changed its name to Xerox. Photocopying finally found favour worldwide in the sixties and seventies. Photocopying became ever faster, more reliable and cheaper.

Laser printers developed alongside copiers. The method by which they operate is essentially the same. Instead of a copying original, electronically stored data are transmitted using a laser beam. At first, high-volume machines were produced with up to 200 or more prints per minute. Recently, even the smallest desk-top laser printers have gained acceptance. They provide a very high-quality print-out of data stored on personal computers (PCs), e.g. for letters, graphics, illustrations, etc. Colour is also increasingly making its entrance with laser printers. The same demands are made of the organic pigments for this process as the pigments used for colour copies.

Toner, the electronic ink

The image both in photocopiers and laser printers is generated with what are known as toners. Electrophotographic toners, also referred to as "electronic ink" are very fine powder particles with a size of approx 10 µm (0.01 mm). A powder toner typically consists of 90% resin and wax, 5% pigment, 1-3% charge control agents and a number of other ingredients. Each copier or laser printer has a toner especially formulated for the particular type, with a specific composition. Liquid toners and other special toners (e.g. single-component magnetic toners) are in practical use alongside powder toners.

It is necessary to learn about the colour copying process in order to be able to gauge the special demands to which coloured pigments are subject.

The electrophotographic process

Under heavy light radiation, the coloured parts of an original absorb the light in relation to wavelength, whilst the white areas reflect the light almost completely. The reflected light is guided via a system of mirrors onto the photoconductor, the surface of which receives a high voltage charge. The photoconductor is discharged on the areas which are now illuminated.

The forces of attraction between the non-discharged areas and toner particles of opposite electrostatic charge ensure that toner particles jump over into the photoconductor (Figure 1). The previously "latent electrostatic image" is made visible.

In the last stage of the copying process the toner is transferred onto paper by applying a counter-voltage and fixed by pressure and/or heat (Figure 2). The photoconductor is then cleaned and is ready for another work cycle. This process is repeated three times for a colour copy with the yellow, cyan and magenta toners or four times if black is additionally used. Laser printers operate in a very similar way to copiers. The source of light in this case is an electronically modulated laser beam instead of the reflected light of the original.

Figure 1

Toner and carrier are brought into contact by the rotating magnetic brush and receive opposite electrostatic charges. At the same time the magnetic brush brings the toner onto the photoconductor in the manner of a turbine-wheel.

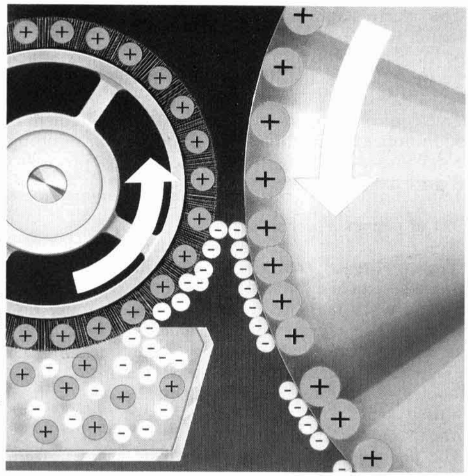

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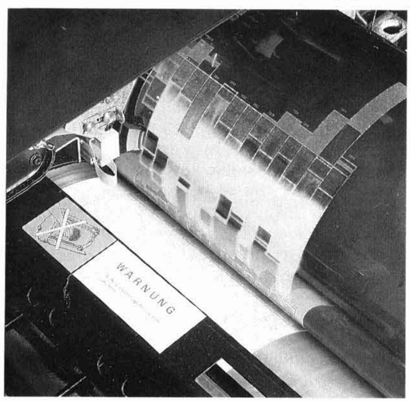
Figure 2

The latent electrostatic image on the photoconductor drum is made visible by the toner. The toner is then transfered onto paper.



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Laser printers operate by the reverse process. Toner particles and photoconductors are charged in the same direction, and the toner particles are drawn over onto the areas of the photoconductor discharged by the laser beam by a specifically applied voltage.

Electrostatic charging of toner powder

The toner in photocopiers is charged utilising the laws of frictional electricity (triboelecticity): the toner receives the necessary charge by swirling with a selected friction partner, known as the carrier (generally iron or magnetite particles). In simplified form, the laws of frictional electricity state that the object with the lower electronic work function gives off its electrons to the friction partner with the higher electronic work function, and thus receives a positive electrostatic charge. Triboelectric voltage series can be set up from which it can be found how two friction partners are electrostatically charged in relation to each other.

The electrostatic charging of the toner powder is the essential feature of the copying process; depending on the type of equipment and method, either toners which are negatively electrostatically charged or those charged or those which are positively electrostatically charged are needed. The charge control agents mentioned above, an ingredient of any modern toner formulation, are responsible for ensuring that the sign and level of the triboelectrical charge precisely meet the particular requirements.

Effect of pigments on charge

Tests on organic coloured pigments have shown that they exercise a sustained influence on the electrostatic charging of the toner when they are incorporated into a toner resin for colouring. The effect of some pigments is indeed so great that, although only making up 5% of the toner, they change the sign of the toner charge. It can be seen from this that the triboelectric voltage series set up become completely confused again for toner resins if these organic coloured pigments are incorporated into the toner resins.

The pigments accordingly have to be characterized with regard to their triboelectric effect as well as their coloristic suitability for use in toners. It is necessary to find out what implications the different organic pigments have for the triboelectric charge of toners and how these effects can be influenced.

It has been found that the triboelectric effect of a pigment is partly determined by the class of substances to which it belongs. Triphenylmethane pigments for example, generally shift the chargeability of toners in the positive direction, whilst azo pigments and above all azo pigments in the form of lakes generally endow toners with negative chargeability. Other classes of pigments such as the copper phthalocyanines and the perylenes exhibit less marked effects. Chemical substituent effects can also be demonstrated; substituents with electron donor properties typically change the triboelectric effect of a pigment more in the positive direction, whilst substituents with electron acceptor properties typically influence the effect in the opposite direction.

The solid-state physical properties of the pigment are another major factor determining the triboelectric effect. Pigments are characterized in terms of solid-state physics by parameters such as pigment particle size and shape, crystallinity and crystal modification, zeta potential and specific resistance.

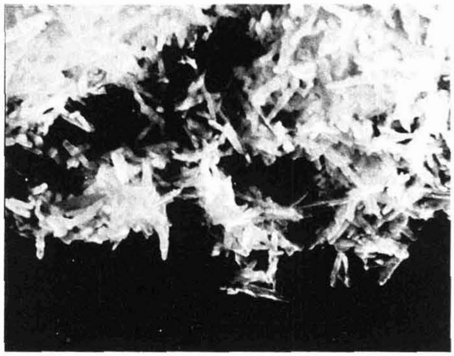
Depending on its class and type, the triboelectric effect of a pigment can be controlled over wide ranges by changing its solid-state physical characteristics. The solid-state properties of a pigment are obviously also very largely responsible for the coloristic and fastness properties (therma stability, lightfastness etc).

Solving problems with tailor-made pigments

In order to colour a toner resin, the pigments, fine powders, are homogeneously incorporated into the resin by dispersion. The pigments are not dissolved in the resin, but are present as very small particles, embedded in the resin. Their particle size is typically in the range from 100 to 500 nm, i.e. 0.0001 to 0.0005 mm. As well as the effects on shade of colour, the very fine particle size is responsible for the high colour intensity and excellent transparency of a colour toner.

Figure 3

Rod-shaped crystals of the magenta pigment® Hostaperm Pink E. Electron microscope magnification 1:40,000.



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In order to obtain a colour copy, the yellow, cyan and magenta colour toners are transferred one after the other in a selected order, according to the principle of subtractive colour mixing. All shades of colour can be tailored using these three primary colours. It is absolutely essential that the colour shades of these three primary colours are precisely coordinated with each other. If magenta, for example, changes its colour shade towards the slightly bluer or more yellow side, the shade of the colours yellow and cyan also has to be changed.

In addition to the three primary colours, black can also be used to give better contrast and fine adjustment of the grey shades.

There is an extensive range of powder pigments including those based on azo, copper phthalocyanine or quinacridone dyes (Figure 3). These pigments, as described above, have to firstly be precisely coordinated in colour and secondly fit the particular toner system with regard to their triboelectric effect.

All these requirements can be met by using tailored pigments and by optimum incorporation of the pigments into the toner resin. The excellent quality of colour prints from laser printers and of colour copies is the result. ■

Continued from p.118

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Profitable product development

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Summary

Profitable product development embraces the appraisal and development of all products and markets, both existing and new. All products have life cycles and it is equally important to monitor the growth, maturity and decline of existing products as to develop new products.

Optimisation of the range, mix and profitablity of existing products can often be more rewarding than the introduction of a new product. But there is a need for new product development to refresh the product range.

A typical pattern for the product development process is as follows:

1. Analyse existing products in terms of sales and profit contribution.
2. Identify areas for cost and profit improvement, including the stages of design, formulation and process.
3. Analyse existing markets and determine to what extent profitable market shares can be improved.
4. Identify customer needs and market niches through market research, field intelligence, competitor/activities and other market sources.
5. Prepare the corporate product strategy, objectives and plans, related to total corporate strategy.
6. Generate ideas for products from all sources.
7. Screen and evaluate ideas. The ideas thrown up in the exploratory phase must be sifted on the basis of facts and opinions that can be quickly gathered. Many of the reasons for rejecting an idea will be technical or financial, but some will be due to marketing considerations.
8. Carry out the feasibility study, involving such considerations as:
▷ market size and users
▷ competition
▷ methods of distribution
▷ competitive price structures
▷ desirable characteristics of product
▷ technical considerations
9. Develop the proposed product. This stage is mainly in the hands of R&D with necessary inputs from marketing.
10. Test market the approved product.
11. Full scale marketing of the new product.

The commitment and involvement of top management is important to the successful development of products and the organisation required must be designed to include the contributing functions. There are several ways of organising product development and the choice will depend on management style, culture and the commercial situation.

Introduction

The future of the UK as a successful industrialised country depends largely on the competitiveness of our manufacturing industry. The strengthening of this and the development of newer industries depends on reinforcing what we can do well, and concentrating on the profitable development of existing and new products. Applied research and development is a key area in this scenario, but success is achieved by careful recognition of, and application to, market needs.

Successful R&D begins with clearly thought out selection of the correct projects and reliable funding. Progression to a well marketed product also requires long term vision, effective liaison between R&D and the rest of the company, plus a structure for eliminating obstacles.

An international investigation over 5 years to 1988, involving 180 industrial companies (124 American and 56 European) was carried out by American consultant Robert Szakoni to study improving the co-ordination between an R&D organisation and the rest of the company. Through discussions with 1,200 R&D managers and non R&D managers, co-ordination problems were found to exist in all 180 companies, although a small minority have made significant progress with co-ordination. The basic reason for progress is that managers of these companies manage their resources (including technology) more effectively by planning and taking corrective action during implementation.

Four kinds of problems were identified:

▷ No link between corporate strategic planning and the technical objectives of R&D
▷ Selection of R&D projects carried out poorly
▷ Guidelines for carrying R&D to commercialisation were lacking
▷ Arrangements for funding R&D were uncertain.

Often companies do not have effective strategic planning. Poor selection of R&D projects results from lack of dialogue between general managers and the director of R&D. Lack of guidelines to carry R&D to commercialisation is due to insufficient co-ordinated inputs from the functions of R&D, marketing, manufacture, strategic planning and top management. Funding is often affected by variations in budgets to meet immediate cost and profit pressures.

There are four things that successful companies have:

▷ A commitment to a long term market perspective
▷ A corporate culture that encourages management problems to be faced
▷ Continuing efforts to ensure the potency of the R&D constituency.
▷ Leadership at the top.

The nature of research and development

The three main areas of R&D are :

1. Fundamental Research

Usually carried out by universities. Most of this work is contained in learned papers. The fundamental reactions/processes have often been known for many years. Some companies have links with universities to maintain leads over competitors.

2. Applied Research

Refers to fundamental research being applied to operational/commercial applications.

3. Development

This aspect of developing the product is the key to getting the product to market.

In the UK we are usually good in the first two stages but often lag in the development area compared to our international competitors. Often this is due to inadequate funding, but also due to inadequate organisational and co-ordination arrangements with other functions to achieve identified objectives. A major objective of R&D is its contribution to profitable products both existing and new.

Product development

A product is only of commercial value if it is marketed profitably. Many a good technical product is perfected only to find that it has limited commercial application. There can even be situations where products are made, to find that customers do not really want them. The areas for product development are contained in a product/market matrix (Figure 1).

Figure 1
Product/Market matrix

Market / Product	Existing	New
Existing	(1)	(2)
New	(3)	(4)

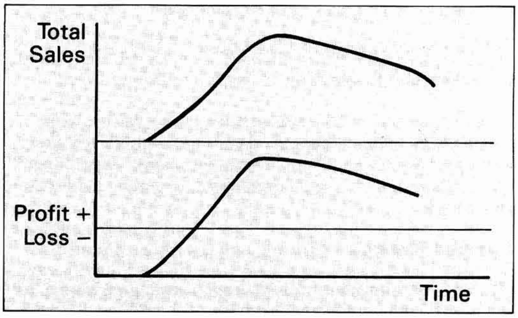
Thus there are many possibilities for product development ranging from known products and known markets (1) to the "unknown and speculative" area of new products/markets shown in (4). Careful research into the options presented in the early stages of development can strengthen the likelihood of later success.

A key area within existing product development is effecting improvement in the process by which the product is made.

Also simplification of the design/formulation of the product can yield substantial cost improvements. I have carried out corporate assignments in the UK, USA and Europe where major differences in productivity have been attributable to this simplification process.

Each product has a life cycle varying from say 1-2 years to 100 years (for example pharmaceuticals to steam locomotives and profitability varies within the cycle as shown in Figure 2.

Figure 2
Product sales and profit life cycles



Thus product development should initially encompass all product/market postures with particular reference to sales and profit life curves.

There are two extremes in a company's product portfolio:

▷ Adherence to an existing product range and markets irrespective of ageing and profitability

▷ Constantly identifying and introducing new products irrespective of other considerations

Each business situation is different. Successful companies pay detailed attention to their product/market postures and portfolios, and these figure substantially in their corporate strategies.

Existing situations

Sometimes in a competitive climate more attention is paid to new products. It is often prudent, as a priority, to examine carefully the existing product/market situation (Box (1) product/market matrix) in such areas as:

▷ Product range in terms of number of products, sales of these, and their gross contribution to profit

▷ The effect of increasing sales of profitable products and diminishing sales of unprofitable products (maybe eliminating some of these)

▷ The effect of selective price increases

▷ The possibility of introducing "add-on" products to the existing profitable range

▷ The nature and potential of existing markets in terms of share captured and potential increase available, penetration and profitability

▷ The effect of competition on product range and markets, and the possibility of eliminating this.

Such researches have often revealed considerable improvements in profitability, for example by concentrating on profitable products and markets and reducing the efforts in others.

New products/markets

Having examined carefully situation (1), which in business terms is a potentially low risk, high return area, work should proceed on areas (2), (3) and (4) shown in Figure 1. The highest risk area is "new product and new market".

The mix of new product introductions can be summarised as follows:

▷ *New-To-The-World Products:* new products that create an entirely new market.

▷ *New Product Lines:* new products that, for the first time, allow a company to enter an established market.

▷ *Additions To Existing Product Lines:* new products that supplement a company's established product lines.

▷ *Improvements in/revisions to existing products:* new products that provide improved performance or greater perceived value, and replace existing products.

▷ *Repositionings:* existing products that are targeted to new markets or market segments.

▷ *Cost Reductions:* new products that provide similar performance at a lower cost.

Companies that have successfully launched new products—a success being a product which met or exceeded its objectives—are more likely to have had a formal new product process in place for a longer period of time. They are also more likely to have a strategic plan, and be committed to growth through internally developed new products.

In a business strategy resulting in commercialised products, there are seven basic steps as follows:

BUSINESS STRATEGY

▷ New Product Strategy Development
▷ Idea Generation
▷ Screening and Evaluation
▷ Business Analysis
▷ Development
▷ Testing
▷ Commercialisation

COMMERCIALISED PRODUCTS

The new product strategy links corporate objectives to the new product effort, and provides direction for the new product process. The step identifies the strategic roles to be played by new products—roles that depend on the type of product itself and the industry. It also helps set the formal financial criteria to be used in measuring new product performance and in screening and evaluating new product ideas.

Change has altered the mortality curve for new product ideas dramatically. An American survey of new product practices showed that in the 60s it took 58 new products ideas or concepts to generate one successful new product. Today greater understanding of the importance of the marketplace has reduced concept mortality to an average of seven ideas per successful new product as indicated in Figure 3.

The survey does not suggest that the fundamentals of success in new product management have changed. The factors contributing to success remain much the same as in the past. Products must meet market needs. Some innovation often requires identification of as yet unarticulated market needs. Products must be based on technological superiority and they need support from top management.

Interestingly, comparing product development in the United States and Japan, a major difference is the extent to which the Japanese invest in up-front analysis—defining new products prior to extensive new investment. While the Americans have improved in that area of new product management, the Japanese are still ahead.

New product managers should define specific new product roles. Some roles are clearly market driven. Others are internally driven. In many cases these roles fill multiple needs as indicated in Figure 4.

Figure 3
Mortality of new product ideas (by stage of evolution)

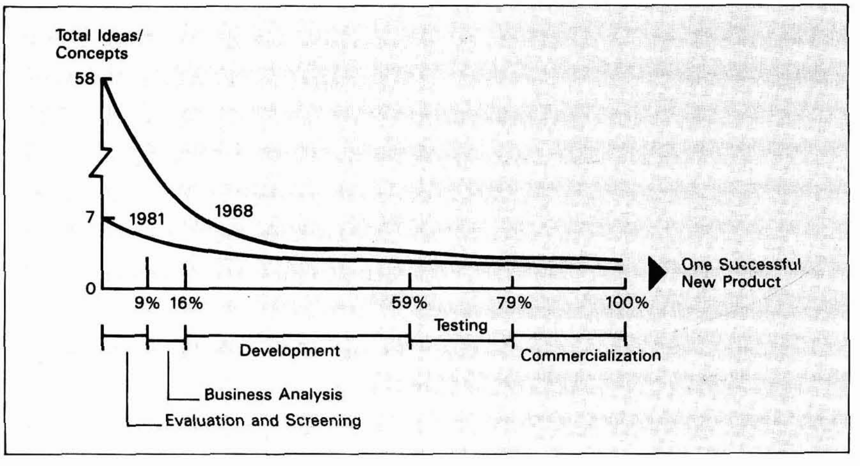
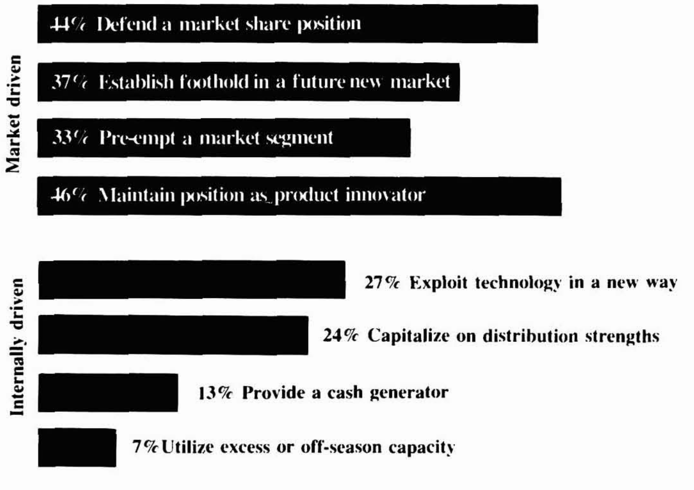


Figure 4
Strategic roles for successful new products



Today companies usually have some kind of financial measurement system for detailed new product analysis. Measurement usually includes such approaches as calculating internal rates of return and present value, in addition to the criteria of sales volume, contribution to profit and length of payback period. These financial criteria should be disciplines to thinking rather than impredinents to risk taking.

Organisation

Organising for profitable product development is the key to achieving optimum results. Organisation should cover both existing and new products and markets and the first requirement is a commitment by top management to pursue a systematic approach to product development, the main facets of which are:

▷ make the long term commitment to support innovation and new product development.

▷ implement an approach tailored to the company and driven by corporate objectives and strategies with a well-defined product strategy at its core.

▷ capitalise on accumulated experience to achieve and maintain competitive advantage.

▷ while searching for new products and markets, do not neglect exploitation of existing products and markets and maintain a commercial balance between these.

▷ establish an environment—a management, organisational structure, and degree of top management support conducive to achieving "company-specific" new products and corporate objectives.

Companies use three basic organisational approaches and relate them and their organisational elements to the requirements for differing product types.

The first is the *entrepreneurial approach,* typically used for developing new-to-the-world products. The structure requires an interdisciplinary venture team and a manager with the ability to integrate diverse functional skills. Typically, the process, the measurement structure and the requirements for formal business planning are less rigid than in other approaches.

The second is the *collegial approach,* typically used to enter new business or add substantially different products to existing lines. It requires strong senior management support and participation in decision making, a commitment to risk taking, and a formal new products process to guide the effort and ensure discipline.

The third is the *managerial approach,* this is the standard process used for existing business management. It involves strong planning and heavy emphasis on financial leadership to drive new products in manufacturing, distribution and marketing.

These three organisational approaches are illustrated in Figure 5.

The approach most frequently used is the managerial approach and a simplified organisation structure is shown in Figure 6.

This involves the role of a Product Development Manager supported by a Product Development Committee consisting of the MD, and managers of Marketing, Manufacturing and R&D. The Managing Director has the product development function reporting directly to him, and role of the Product Development Manager is mainly concerned with the co-ordination of the inputs of top management, R&D Marketing and Manufacture. Terms of reference for Product Development need to be established, the areas of product development defined and priorities assigned. Management job descriptions specifically relating to product development should be prepared for the role of Product Development Manager and the other functions.

A typical example for the job of the R&D Manager is shown in Figure 7.

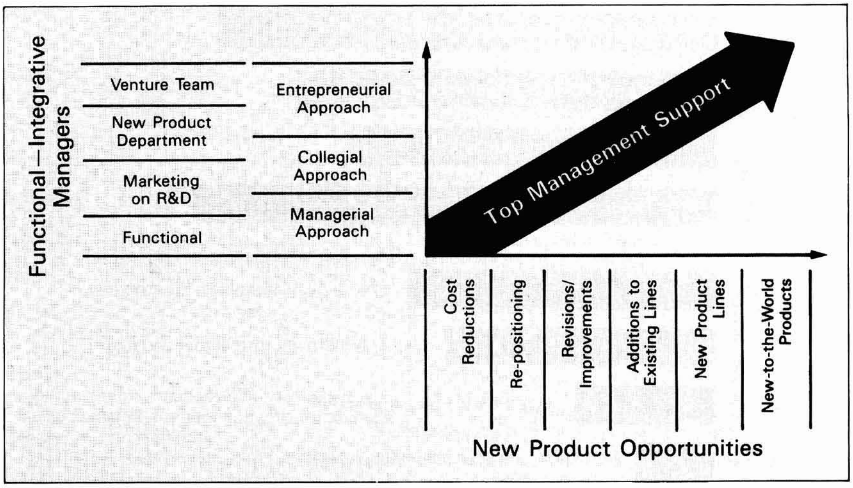
The role holder for Product Development Manager could be a permanent appointment, occupied part-time by the MD, R&D Manager of Marketing Manager, or staffed on a rota basis.

Example of diversification through new products

1. Background

Mono-product chemical company selling to several large customers in automobile business in UK. Good reserves. Part

Figure 5
New product organization approaches



of larger international group with Central R&D with 400 qualified personnel, located in US mainly engaged on process research and some ad hoc new product development. Market investigations done by consultants when required. Sum of £20 million to invest in UK or Europe. Wanted consultants to investigate fields for new products, initially in the whole chemical industry. Narrowed down to petrochemical field (similar background, facilities and technical know-how).

2. Problem

"To determine a short list of suitable growth products with a profit potential" and *"to advise on the feasibility of making and selling, or buying a project or merging or linking with an existing business"*. (Assistance from their R&D—Technical—Sales Departments.)

3. Consultant Team

▷ A marketing consultant
▷ An economist
▷ A chemical technologist

4. Approach

A. To define product coverage in UK and Europe.

Figure 6
Management organization structure for product development

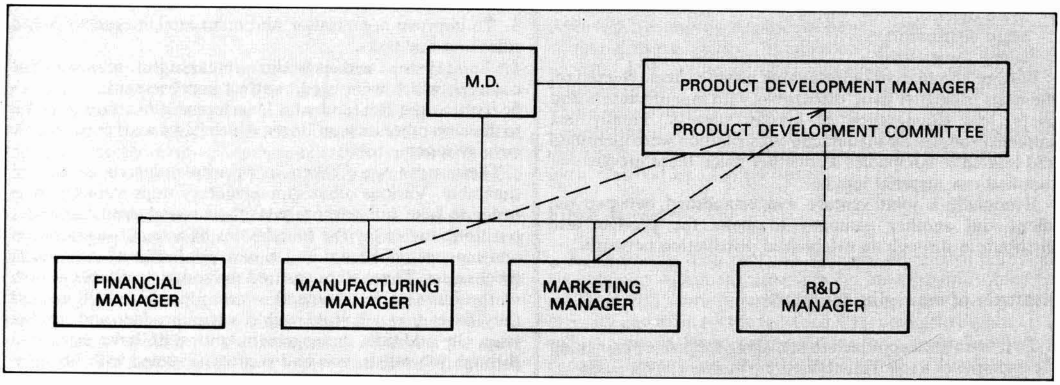


Figure 7
Key tasks of research manager

Key tasks of Research Manager as agreed between Managing Director and A. L. Brown (Research Manager) September 1985. To be reviewed September 1986.

Description of Key Tasks	*Level of Performance*	*Controls used to measure*	*Suggestions*
(1) **New Products** (offensive research)			
1.1 To collect all ideas for new products from all possible sources. To segregate the good from the bad and to align the good with company objectives.	No idea eliminated at this stage and later found to be providing profitable business for a competitor (unless idea was rejected through non-alignment with objectives—see 1.2 below).	Register of all ideas and decisions. List of competitors' new products.	
1.2 To recognise competitors' technological strategy and to advise M.D. when objectives should be modified.	Company's marketing and operating programmes never require "crash" changes due to failure to recognise competitors' technological strategy.	No record needed. Any such occurrence will be recognised by all.	Our methods of collecting news of competitors' technological strategy need improving. (See improvement plan for first half of 1986.)
1.3 To submit to New Product Committee recommendations for undertaking R and D or seeking licences for new products or improved quality of existing products. Cases to be fully documented with estimated share of market, profitability, *etc.*	No case ever to be referred back for more information. New Product Committee to accept at least 80% of the recommendations as feasible for eventual implementation.	Record of cases submitted, referred back, accepted and rejected (maintained by secretary of committee). Current selection criterion is that present value of future gross trading profits shall be greater than twice present value of anticipated investment.	Close liaison with Marketing must be maintained. M.D. to discuss with Marketing Manager the need to second a full-time marketing officer to R and D. Chairman of new products committee should watch the "success ratio."
1.4 To submit to New Product Committee recommendations for ceasing R and D on projects that no longer appear commercially viable.	No project to be carried on more than one month beyond the time when re-evaluation reveals unsuitability.	Cost returns. All major projects to be re-evaluated every six months.	

B. To establish sources of information.
C. To search for appropriate products.
D. To sift for short list of three/four products.
E. To identify companies interested in these products.

5. Outline of investigation

Initially a total of 200 organic chemical products were identified. These were examined by the client who reduced the list to 100, which were examined in further detail under these main headings:

▷ Product description
▷ Quantity produced per year
▷ Plant capacity
▷ Market size (where available)
▷ Main manufacturers
▷ Main users
▷ Main distributors
▷ Scope for growth

Further elimination of unsuitable products was effected on the basis of factual data, discussions with manufacturers and users, and examination of market surveys. Finally, six suitable products for manufacture/distribution were identified and related to companies who either made these products or supplied raw material inputs.

Eventually a joint venture was established between the client and another company to make the product and distribute it through an established distribution network.

Example of managing for profit

To illustrate an approach to managing for profit I am taking the example of a small manufacturing business. This business, the ABC Company, was established in 1870 and was engaged in iron founding and engineering, with a variety of products, mainly for textile machinery and general engineering. Some years ago the proprietor developed a novel form of solid fuel domestic heating, but this product was also being produced among other varied products. Nevertheless, the order book for the new domestic heating product grew, so much so that delivery to customers was six months, and it was decided to retain management consultants to help with the delivery problem. At that time the manufacturer employed one hundred people and had limited management, facilities and technology, but they had one good product. They had recognised a consumer need.

The problem was tackled by:

A. *The determination of strengths and weaknesses*
The main strengths were:
1. A good product and available market, at a profitable price.
2. They were good businessmen—entrepreneurs who had recognised a consumer need.
3. Potentially good general management.

B. *Identification of Key Result Areas and Action Plans*
These were:
1. To concentrate on profitable products. This was based on marketing profitability analyses, which identified product profitability. Unprofitable products, and those with limited or no market potential, were run down or eliminated.
2. To improve production facilities and the output of the profitable products.
3. To improve organisation and management, and to define roles and key tasks.
4. To develop and introduce meaningful management controls, which were used to effect improvement.
5. To set up a Research and Development function in order to develop other new products, which had a market potential, on a systematic basis.

These steps were taken in priority order to an agreed timetable. Various other supplementary steps were taken in order to take full advantage of their sound product/market position, and to lay the foundations of a sound organisation and management team and a new product/market research mechanism. These steps ensured the sound profitable growth of the business to command a strong market position, and they have grown tenfold with a wider product and market base. In addition, management and staff have benefited through job satisfaction and security, coupled with financial rewards.

Conclusion

The product development process and the organisation and co-ordination required are described above. The principles involved apply to any company which manufacturers and distributes a product, irrespective of size. Strengthening of the product development function will greatly help to improve corporate performance and competitiveness. It is essentially a team approach led by top management, requiring commitment and input from functions and personnel at all levels involved. ■

Filtration

Literature on filtration has been received from the following companies:

R Cadisch & Sons — Filter Cloths/Bags.
For further information Enter C401

Charlestown Engineering — Tube Press Filtration Equipment.
For further information Enter C402

Hollingsworth & Vose Co Ltd — Post lip filter papers for oils.
For further information Enter C403

Netzsch Mastermix Ltd — Filter Presses.
For further information Enter C404

Pall Process Filtration — Absolute Filters
For further information Enter C405

Sartorious — 2nd Generation Filter.
For further information Enter C406

Schumacher Filters Ltd — Cartridge Filters.
For further information Enter C407

Sparkler Filters Ltd — Bag Filters.
For further information Enter C408

Vokes Ltd — Microfilter Cartridges.
For further information Enter C409

World Filtration Congress — 8 June 1990, Nice.
For further information Enter C410

Absolute filters for surface coatings

by K. Haines, Pall Process Filtration Ltd, Europa House, Havant Street, Portsmouth, PO1 3PD, UK.

As surface coatings users strive toward higher quality finishes on their products and lower re-work rates during manufacture, so there is a trend towards the use of absolute rated filters both in the manufacture of surface coatings and during the coating process. This trend is seen in ink jet printing where reliable fine filtration is required to ensure maximum printer availability. Similarly in the motor car industry manufacturers are increasingly using absolute rated filters in the paint mix room and at the spray booth to ensure a consistently high paint quality at the point-of-use.

Filter ratings

There is no universally accepted system to determine the removal ratings of filters and the majority of filter manufacturers assign a nominal value in micrometers. The method by which such nominal ratings are determined are seldom published and sometimes seem quite arbitrary. There is often no assurance of consistent filtrate quality throughout the life of the filter.

An early definition of an absolute rating was "the diameter of the largest hard spherical particle that will pass through a filter under specified test conditions. It is an indication of the largest opening in the filter element". It was determined by challenging a filter with spherical glass beads and measuring, under the microscope, the diameter of the largest bead to pass through the filter. Absolute ratings based on the early definition are clearly more informative and more useful than nominal ratings. A more recent and realistic system for expressing filter ratings is the assignment of Beta ratio values. These are determined using the Oklahoma State University "OSU F−2 Filter Performance Test" developed originally for use on hydraulic and lubricating oil filters and adapted by Pall for the testing of filters with other fluids. The Beta rating system[1] is simple in concept and can be used to measure and predict the performance of a wide variety of filters. A Beta rating value is the ratio of the number of particles, of a given size and larger, in the influent to those of the same size and larger in the effluent under specified conditions. If the total particle count is measured at several different particle sizes in both the influent and effluent streams and the Beta ratio plotted against particle size, a profile of removal efficiency emerges for the test filter. The particle size at which the Beta ratio is greater than 5000 can be used as an operational definition of an absolute rating for industrial filters. This provides a clearly defined and reproducible particulate removal efficiency and equates to a removal efficiency of greater than 99.98% at the stated micrometre rating.

In order that a filter can be absolute rated it is inherent that (a) it must not release downstream material from the filter medium (b) it must not unload previously intercepted particles under increasing or fluctuating pressure loads and (c) it must have a tightly controlled and stable pore structure. Also these characteristics must be maintained throughout the useful life of the filter to ensure a consistent and reliable performance.

The advantage of absolute rated filters in the clarification of homogeneous solutions is immediately apparent in providing filtrates of a known and consistent quality. For pigmented surface coatings however, the special requirement is for particle size classification by filtration. This means the removal of oversize pigments and other contaminants while allowing the desired pigment to pass through. It is the stable and tightly controlled pores of absolute rated filters that ensure a good cut-off between the removal of oversize material and the free passage of the required coating constituents.

Filter economics

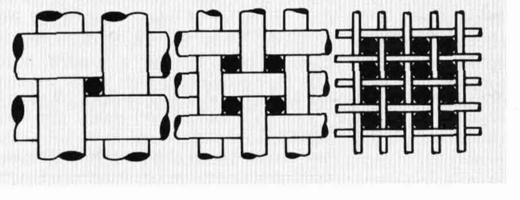
The quality of the filtrate is not the only criterion in selecting a filter for a particular duty. The filter must also contribute to the overall process economics either directly through low overall filtration costs or indirectly through increased process efficiency and productivity. These can be achieved by improved process flows, increased plant and equipment availability, elimination of a preconditioning recycle, less frequent filter changes, less maintenance, reduced product losses and reduced waste disposal charges. These particular benefits of good filter design can be demonstrated on a case by case basis. The following discussion of fibre diameters illustrates the benefits of this particular feature of good design.

Fibre diameter

For a fibrous filter medium a greater number of pores can be obtained within the structure by utilising thin fibres. A medium with more pores will provide a higher dirt holding capacity and a longer life between filter changes (Figure 1). It will also give a lower pressure drop for a given flow (lower energy consumption) or a higher flow for a fixed pressure source. This principle of utilising thin fibres for a fibrous filter structure applies to both depth and 'surface', i.e. thin media, filter constructions and to polymeric disposable and stainless steel cleanable types.

Figure 1

Voids volume versus fibre diameter.



The limitation on the thinness of the fibres which can be used is the resultant strength of the filter structure. This has led to two principal features for the construction of high capacity depth filter media. A graded pore construction in which there are coarser layers upstream of a final or 'absolute' layer. This provides pre-filtration and greater utilisation of the depth of the filter media. A new principle for the construction of graded pores utilises continuous fibres in which the fibre diameter changes. The fibre diameter is optimised for the pore size within the graded pore structure, thin fibre where there are small pores and thicker fibres for coarse pores. This ensures a uniform high voids volume throughout the filter medium while also ensuring a strong and robust structure.

These various principles of filter construction are embodied in the wide range of filter media manufactured by Pall. Two absolute rated media in particular are being increasingly used by the surface coatings industry.

Table
Filter data and typical applications

Filter Type	Medium	Absolute Removal Ratings Available	Differential Pressure Limits	Applications
'Profile II' range	Continuous tapered polypropylene fibres	0.5µm to 120µm	4.1 bar at 30°C 3.4 bar at 50°C	Water, aqueous paints and solutions, high solids solvent based paints
Nylon 'Profile II' range	Continuous tapered nylon fibres	5.0µm to 90µm	4.1 bar up to 95°C	Organic solvents and solvent based coatings
'Profile II' Plus range	High positive charge polypropylene	0.5µm to 15µm	4.1 bar to 30°C 3.4 bar at 50°C	Removal of bacteria and submicron particles from water and aqueous solutions
'Rigimesh' range	Sintered woven stainless steel mesh	15µm to 450µm	9 bar up to 200°C	Solvents and solvent based paints but especially metallic and mica paints

Cleanable filters

The 'Rigimesh'[2,3] range of cleanable filters is made of woven stainless steel wires bonded at their points of contact by a proprietary sintering process. This produces an extremely strong mesh which resists distortion of the pores. This strengthening through sinter bonding allows the use of finer diameter wires to give more pores per unit area than non bonded meshes. As a result 'Rigimesh' filters provide a higher dirt holding capacity and a lower resistance to flow than other cartridges of similar shape and size. These combine to give a long on-stream life between cleanings. While there are grades of 'Rigimesh' to suit most types of surface coating, the coarser grades are particularly suited to the filtration of coatings containing metallic or mica flake materials.

Disposable filters

'Profile' II[4] is the only absolute rated depth filter medium available today. Computer controlled equipment is used in the manufacturing process to produce continuous polymer fibres in which the fibre diameter changes. The fibres are effectively conical in form. Thus the fibre diameter is optimised to the required pore size in a graded pore construction (Figure 2). This provides a high voids volume throughout the depth of the filter. Not only does this provide a high dirt holding capacity but also gives excellent flow and differential pressure characteristics. These frequently enable a smaller filter unit to be used with resultant savings on the installed cost and replacement filter costs. Reductions are also made in product losses during a filter change and in spent filter disposal costs. 'Profile II is available in polypropylene[4] or nylon[5], one or other of which is compatible with the solvent mixtures used in modern surface coatings.

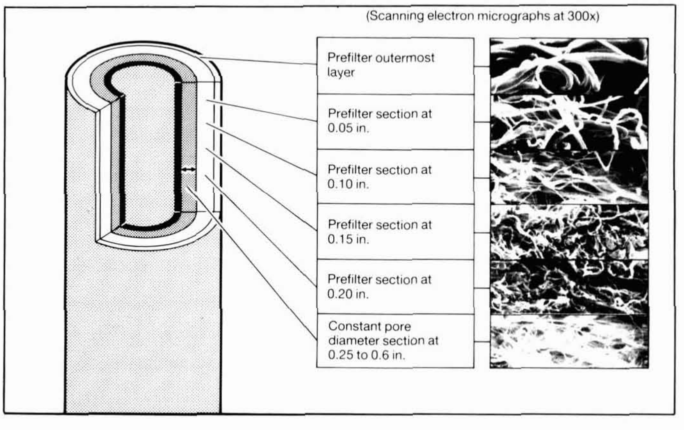
For the needs of the surface coating industry bag filter designs are now being developed and tested by Pall, which include the stable construction, graded pore structure, high voids volume and absolute removal rating which are characteristic of 'Profile II'. These bag filters will be available during 1990.

References

1. Principles of Filtration – Pall Publication STR1016.
2. Rigimesh – Pall Publication SD821.
3. Rigimesh and Supramesh – Pall Publication SD982.
4. Profile Filter Guide – Pall Publication SD1020.
5. Nylon Profile Filters – Pall Publication SD1092.

Pall, Profile II, Rigimesh and Supramesh are registered trade marks of Pall Corporation.

Figure 2
Pore diameter in an absolute rated cartridge filter element.



■

Considerable Response

Dear Honorary Editor

You may be interested to know that the recent publication by you of 'Developments in Fire Protective Coatings . . .' authored by me which appeared in November, 1988 issue elicited a considerable response as well as information and offers by large international companies. One of the offers has been to participate in a project to fire retard areas of military equipment not presently protected, e.g. cable trays in ships. As such, I believe that this publication may eventually prove to be beneficial to myself as well as, hopefully, readers of JOCCA.

Yours faithfully,
Lindsay Wake

Materials Research Laboratory,
Defence Science and Technology Organisation,
Department of Defence,
PO Box 50,
Ascot Vale,
Victoria,
Australia 3032

2nd November 1989

Honorary Editor: I am pleased that the paper published in JOCCA has provided further avenues for research and this appropriately shows the benefits of publicizing new R&D in the journal.

Underfilm Corrosion

Dear Honorary Editor,

An interesting report in January JOCCA on the further work carried out by Morcillo, et al, on underfilm corrosion and blistering caused by soluble salts.

May I take this opportunity to point out two practical points that have an important bearing on this subject.

1. The pattern and onset of corrosion from ferrous salts seeded onto test panel is different from that experienced in practice. In that case, ferrous sulphates and chlorides tend to move inwards to the anodic areas which are likely to be in crevices, bottom of pits etc. Such salts are then almost always encapsulated to varying degrees by layers of 'iron oxides'. In heavily corroded and pitted steel this can actually delay the visible onset of corrosion. For example, surfaces blast cleaned to a high standard of visual cleanliness can show visible corrosion earlier than those blasted to a poorer standard. Fortunately for those of us in the 'business' the latter eventually deteriorates into a worse condition. Incidentally chloride contamination arising from sea spray etc, is of course likely to be on the surface.

2. Test panels prepared in the laboratory by applying paint by the 'roll down' method gives reproducible thickness but films different from that produced by spray, particularly airless spray application, due to the presence of micro-fissures, etc. Even with thick films of coatings such as coal tar epoxy or chlorinated rubber it can be demonstrated (see Bayliss. D. A. and Bray H., Permeability Tests on Modern Coatings. Materials Performance Nov. 81. 29-33) that there is transport of ions to the substrate within hours of immersion of the paint system.

Yours faithfully
D. A. Bayliss

ITI Anti-Corrosion Ltd,
Griffin Chambers,
13 High Street,
Leighton Buzzard,
Bedfordshire LU7 7DN

2 February 1990 ■

Chester Conference Discussions

The Role of a Research Association: Industry Sponsored Research Projects at the Paint Research Association

by Mr D. J. Walbridge, PRA, UK

Published in December 89 JOCCA

Mr R. Tully-Turner: Why not distribute a questionnaire to members of OCCA and companies to ascertain possible projects?

Mr D. Walbridge: In past years, questionnaires were distributed to PRA members to discover which of a number of research proposals was the most generally supported. Unfortunately, the responses were not a good indication of real commitment to a project. The present policy is to have a small number of large projects, each of which is discussed in depth at PRA Board of Management and Council meetings and at meetings of potential industry sponsors. In this way each project is considered in-depth before finally being adopted and many PRA members are involved. On the whole this procedure seems quite effective, but we recognise that the search for good research ideas is not easy and we must always be ready to explore new ways to generate projects.

Mr J. R. Taylor, JOCCA: This is a very interesting project and one which the Surface Coatings Industry has thought about for years, but we do have the worst of all aspects in self-stratifying paints due to incompatibility of resins in the system giving stresses in the dried film – Will the systems give gloss cf (pigments moving to the surface in ceiling paints perhaps!) when applied to ceilings, etc?

Mr D. Walbridge: It seems unlikely that the incompatibility of resins will give stresses as suggested. On the contrary, it is probable that statification will not be complete and that the boundary between phases will consist of a gradual change from one resin to another. We may therefore observe better intercoat adhesion than in the case of separately applied films.

In answer to the second question, calculations suggest that gravity will not be a major factor in films of conventional thickness and rheology. The distribution and state of dispersion of pigments is more likely to be determined by colloid and surface forces. It is too early to say whether good pigment dispersion can be maintained during statification, but I would expect it to be very dependent on whether the pigment remains in the continuous phase or is trapped within a separating phase. ■

Organic Luminescent Materials

by B. M. Krasovitskii and B. M. Bolotin, translated by V. G. Voplan
1988, 340 pages with 52 figures and 15 tables, hardback.
DM,198.00 ISBN 3-527-26319-26200-8
Published in English by: VCH, D-6940 Weinheim, West Germany

*T*his translation of the second Russian edition published in 1984 is a much updated version of the original published in Russian in 1976. It is divided into three parts: The introduction, outlining the basic concepts of luminescence and tying these down with definitions, Part 1, a systematic description of the chemical composition and properties of organic luminophors, and Part 2, a summary of some of the applications which rely on the process of luminescence.

It is the reviewer's observation that some confusion exists within the non-specialist surface coatings industry about the precise meaning of and difference between fluorescence, phosphorescence and general luminescence. Perhaps it would have been helpful therefore if this work had included fuller explanations in the introduction. For example, the distinction between fluorescent and phosphorescent emission is mentioned only very briefly almost as an afterthought at the end of the introduction, despite this being crucial in any practical application. Similarly there is little explanation of the reason for the "Stokes shift", whereby emission is virtually always at a longer wavelength than absorption. It seems that the authors assume that their readers will be thoroughly conversant with these basics already and concentrate their efforts on Part 1 which is, after all, the main purpose of the exercise.

Each group of luminophors is described comprehensively by chemical structure, with diagrams where appropriate, and notes are given on methods of preparation and chemical properties. Some emphasis is placed on the physical chemistry of luminescence. Luminophors most commonly used in surface coatings are covered including heterocyclic dyes such as rhodamines and other xanthene types, and the coumarins. It should be noted that, as the title suggests, no mention is made of inorganic fluors or phosphors such as doped zinc sulphides, nor of their use in conjunction with organic luminorphors. Overall, it is clear that Part 1 has been complied deliberately and stands on its own as an easy to use reference work.

Probably JOCCA readers will be most interested in chapters 9, 10 and 11 at the beginning of Part 2 dealing with daylight fluorescent pigments and dyes for paints, plastics, textiles and, very briefly, inks. The use of optical brighteners is also covered, as is the use of luminophors in non-destructive testing such as crack detection. Information on dyed resin type daylight fluorescent pigments, which are used in the majority of fluorescent applications encountered by the general public, is rather dated, most references having been taken from patents filed in the 'sixties, although it could be said that this is when the basic technology was developed and that later improvements have largely been fine tuning operations. It is also noted that most references are to Soviet sources whereas it is well known that the leaders in this field were working in the USA and in Japan at the time. There is scant consideration of the most significant disadvantages of organic luminophors in the more common applications: comparatively poor lightfastness and poor migration resistance, and what can be done to alleviate these problems.

In chapter 10 the authors concern themselves with the use of luminescent dyes in plastics and synthetic fibres, but make no mention of the increasingly sophisticated use of dyed resin type fluorescent pigments in extrusion and blow/injection moulding, apart from one sentence at the end of chapter 9. However, they do draw attention to the interesting fact that yellow and red can be mixed to achieve an orange, the shade of which depends on the ratio of the dyes used! Apart from this revelation reference is made to Soviet reports suggesting that the addition of luminophors to some plastics may actually delay polymer ageing by the absorption of the destructive higher energy incident ultraviolet light. This may be relevant where engineering polymers are employed in some highly demanding rôle, however I suspect that the user of a fluorescent plastic surfboard may be concerned more by the degradation of its colour before that of the polymer itself.

Translations of academic works into scientifically correct yet readable English are not common, but in this case the task has been accomplished, provided the reader can accept American spellings: color, sulfite, etc. This is an academically competent reference book the reviewer would be pleased to include on his library shelves, but, as with some other works from Soviet sources, it must be said that the practical side of it is weak. This is more a reference for chemical engineers, and non-specialist surface coatings formulators searching for guidance here might find their path to the wood blocked by dead trees.

M. G. Martindill ■

Around the Council Chamber

*T*hursday 15 February was the occasion for the quarterly meeting of Council, Executive, Professional Grade and Technical Committees. All four Committees considered policy papers and debated resolutions of importance to the development of the Association. As with many items that come to committee for initial consideration, items are then remitted to working parties or to Sections for detailed discussion, before again being debated by Council. This can lead to a protracted decision-making process, but it is the only correct way for a democratic organisation to proceed with its business.

One proposal which met with universal approval and was accepted without prolonged debate has already been featured in this column and I am very pleased to report that Council has decided to accord special treatment to those members with very long service. Members who are retired from full time employment are already able to claim a special retired subscription rate, which currently stands at £14.00, compared with the full subscription of £40.00. Council has now resolved that members on the retired rate who have completed forty or more years' service will receive a further reduction in their subscription from £14.00 to £7.00. Ninety-four members with forty or more years' service by 31 December 1989 will benefit from this further reduction in their subscription requirements. Those members who have already paid their 1990 subscription, will be credited against their 1991 subscription requirements.

Council also decided that those members with fifty or more years' service should be granted free membership. Those members who have already paid their subscription for 1989 will be issued with a refund. At 31 December 1989, eighteen members were in this category and are shown below, including their Section and date on which they joined the Association:

H. J. Stern	(LON)	1/1/25
H. A. Idle	(LON)	1/10/25
A. W. Hall	(TVA)	1/1/27
C. W. A. Mundy	(LON)	1/1/27
F. Schollick	(LON)	1/1/29
H. Lomas	(ONT)	1/1/31
H. Diamond	(MID)	1/1/31
D. E. Roe	(LON)	1/1/34
J. H. W. Turner	(MAN)	1/1/36
J. G. Gillan	(MAN)	1/10/37
A. C. Healey	(LON)	1/10/37
F. W. Stoyle	(IRE)	1/1/38
K. D. C. Bruce	(LON)	1/1/38
A. G. Collings	(LON)	1/1/38
E. F. Parker	(LON)	1/1/38
R. H. Leach	(LON)	17/2/38
P. F. M. Coverdale	(MID)	1/1/39
W. F. Wilson	(LON)	1/1/39

It has also been decided that these members with fifty years' or more service shall receive a letter of congratulations from the President and a Certificate and will be encouraged to submit biographical details for publication in JOCCA.

Council considered, but remitted back for further discussion, proposals from Tony Jolly to award long service ties/scarves to members with twenty-five and fifty years' service. Your comments on this proposal, or indeed the Association's overall policy for the recognition of long service, will be welcomed.

OCCA International

*R*eaders will recollect that the Secretariat for OCCA International transferred to the Association during 1989. Former President Frank Redman was appointed the International Co-ordinating Secretary and liaises with Tom Backous and Mike Newton of the Australian and New Zealand Associations respectively.

OCCA International has an important co-ordinating role to perform in connection with the Professional Grade and discussions are currently in progress between the three Associations to ensure that the register of Professional Grade is truly international and, perhaps more importantly, is recognised within the three countries as a mark of professional competence in surface coating practice.

The Association fully supports the aims of OCCA International and JOCCA will carry occasional items under the title "Focus on OCCA International". The first of these, which reviews the New Zealand Association, appears on the following page. ■

CALL FOR PAPERS

*J*OCCA is seeking technical papers for possible publication in the October 1990 issue on the feature **Renewable Resources and Additives.**

The possibility of obtaining raw materials from renewable resources in the Surface Coatings industry will become increasingly important with the projected depletion of petrochemical reserves. Papers are sought which will discuss methods by which natural replenishable resources can be harnessed to produce raw materials for surface coatings, for example, vegetable oil biotechnology and monomer recycling of plastic waste.

Academic and technological papers are also sought on additives for surface coatings — adhesion promoters, UV absorbers, wetting agents, eco-friendly biocides, fire retardants etc.

Papers should be a maximum of ten pages (in double-spaced lines) and may include up to ten tables and graphs (combined total). To be considered, please send a 50-word abstract or brief outline by 1 June 1990 to John Taylor, Honorary Editor, JOCCA, The Wolds, 51A Porth-y-Castell, Barry, South Glamorgan, CF6 8QD. Deadline for the September issue is 15 July 1990.

For further information contact Dr Peter Fyne Tel: 01-908 1086; Fax: 01-908 1219.

The Oil & Colour Chemists' Association New Zealand

The origins of learned society activities for the surface coating industry of New Zealand goes back to 1951 with the formation, in Wellington, of an overseas Section of OCCA. Within two years another Section was formed in Auckland and on 1 January 1987 the Oil & Colour Chemists' Association New Zealand (OCCANZ) became an independent organisation incorporated in New Zealand. The Auckland Section has 200 members and Wellington 100. Each Section has its own Organising Committee which meet on a monthly basis.

The overall ruling body is the New Zealand Management Committee to which each Section elects six members. The New Zealand President acts as Chairman of the Management Committee. The New Zealand President and Section Chairmen are elected for a two year period. The current President is Alan Thorburn, the Chairman of the Auckland Section is Don MacDonald and of the Wellington Section Andy Provan. Each Section Committee has sub-committees covering education, technical programmes, convention-symposium, publications, membership and social. There are two categories of membership, General and Retired.

In conjunction with the Auckland Technical Institute, OCCANZ accredits a two year part-time (six hours per week) Diploma Course in Surface Coatings Technology. The Course is open to all students who are OCCANZ members with the required basic chemistry knowledge. Entry to the Course requires students to have a BSc or the New Zealand Certificate of Science or an equivalent qualification. This effectively makes the Diploma a post graduate award. Students are set semester examinations and a thesis that is based on a minimum of 400 hours work. These papers are submitted to the Chairman of the New Zealand Universities Chemistry Departments for approval. Since its inception in 1980 the Course has an average of twenty students per year and the Diploma has been awarded to fifteen.

Each Section has at least one technical meeting each month, in which local or overseas speakers present papers with a theme of relevance to the surface coating industries. OCCANZ has an annual convention continuing a tradition from 1962 and are organised by each Section Committee in alternate years. The average attendance for the last eight years has been 250 delegates, and have included people from the UK, USA, Japan, Australia and Europe. The conventions are organised around a central theme and there are usually thirteen technical papers presented as well as two papers on social issues.

The Association does not produce a monthly Journal, but now relies on quarterly newsletters and press notices in relevant local and overseas publications to promote the Association's aims and objectives.

The Association organises a comprehensive programme of social activities, including a golf day, ladies nights, fishing trips and convention social events.

In recent years the New Zealand Forest Research Institute undertook a long term project on behalf of the Association. The project sought to look at the effect of timber preservatives on subsequent coatings, with particular reference to the exterior exposure of Pinus Radiata. Two year test results were presented at a recent convention.

OCCANZ is the latest surface coating society to join ICCATCI, (International Committee to Co-ordinate Activities of Technical Groups in the Coatings Industries) and is a founder member of OCCA International.

OCCA members visiting New Zealand who wish to make contact with the Association should contact:

Mr L. Hall, Hon. Secretary, OCCA New Zealand Inc, PO Box 5192, Auckland, New Zealand. ■

Hull Section

Colour

The section held its ladies' evening at the Duke of Cumberland Hotel, Cottingham on Monday, 4 December starting at 7.00 pm. The evening was based on a talk entitled "Miscellany of Colour" given by Mr Brian Robson of Akzo Coatings and was attended by 22 members and guests.

Accurately reflecting the title of his talk, Mr Robson covered, in a non-technical way, the many different aspects of colour, particularly those which affect our daily lives. Using slides freely throughout he touched on the enjoyment we derive from paintings and such aspects of nature as flowers, sunsets and the changing seasons. Examples were given of the use of colour in the art and architecture of different cultures and the importance of colour associations which could affect both our ability to recognise familiar objects and even our appetite! Anyone for a blue banana or a green steak?

Colour has a substantial effect on the psyche, the warm reds/oranges being recognised as exciting and the cool greens/blues relaxing. Our perception of shapes, say in buildings or clothes, was much affected by the interaction of colour and pattern. Mr Robson showed how colour should be suited to particular activities by reference to schemes in a reception area and in a gymnasium and how townscapes could be made more interesting by applied colour and a "block and line" approach.

Colour and light reflection was important in many areas, in particular the work environment. In medical examination subjective assessment of appearance could be erroneous due to, say, reflected blues (cyanose) or yellows (jaundiced). High reflectance on work surfaces generally led to eye strain and subdued colours were preferred from this point of view.

The speaker went on to discuss colour as a language in terms of safety in the work place, and presented a number of slides demonstrating this. Yellow represents danger, blue mandatory action, red prohibition and green safe condition. Other examples given were pipe-line identification and colour coding of tanks.

On a slightly more technical note Mr Robson showed how the attributes of colour could be represented by a 3D model; hue (its position in the spectrum), saturation (strength of colour) and lightness (reflective value).

Finally, the speaker demonstrated the phenomenon of "after image", a red bird on the projector screen turning into a green one but it must be admitted not everyone got the green bird!

After a period of questioning during which automobile colour, fashion and colour harmony were discussed, a vote of thanks was proposed by Mike Gamon and endorsed by the audience.

The evening concluded with a buffet and a raffle with prizes donated by SCM, Bevaloid and J. L. Seaton.

D Robinson ■

London Section

Radiation curing

On Thursday, 18 January a paper entitled "Radiation curing — the current state of the art" was given by Mr Graham Steven, Technical Service Executive — Radcure of Cray Valley Products.

Mr Steven firstly described the characteristics of UV and electron beam curing. UV curing is a non-ionising reaction requiring an initiator to crosslink unsaturated components. It has the disadvantage of being air inhibited requiring precautions to be taken to overcome this. On the other hand electron beam curing is an ionising reaction and does not require photocatalyst on account of the much higher intensity of radiation used.

Radiation cured systems are one pack with 100% solids. They have fast cure, low conversion costs, good gloss and performance and can be used to coat thermally sensitive substrates. Disadvantages are the high capital costs involved, problems with thick films and the formation of ozone from UV curing and X-rays from electron beam. In addition objects to be coated need to be flat, adhesion to non-porous substrates is bad and an inert gas blanket is required.

The polymeric systems used are poly-unsaturated acrylic oligomers of relatively low molecular weight and unsaturated low viscosity monomers to control viscosity. Many low viscosity monomers are skin irritants and care has to be taken to ensure that those used are safe eg. tetraethylene glycol diacrylate. Monomers of higher functionality tend to be of higher viscosity and give brittle films.

Applications for radiation curing include fillers, sealers and lacquers for wood, litho and silkscreen inks, overprint varnishes for paper and board, vacuum metalising coatings for plastics and metal, pressure sensitive adhesives and solvent resist inks in the electronics industry. Coatings required for CDs and record sleeves are also substantial.

New products under development include water based systems, either in solution or as emulsions, and cationic systems containing vinyl ether or epoxy groups. Some of these systems may require thermal post curing.

The European market for radiation curing systems was said to be 20,000 tonnes in 1989, having shown 10-15% annual growth. The overall graphics arts market comprised 70% of this total.

In an interesting period for questions it was said that pigmented coating of up to 500μ could be cured by electron beam and up to 50μ by UV. It was said that whereas after curing there were unreacted acrylate groups present the level of free monomers remaining was very low. The meeting concluded with a vote of thanks from Dr Banfield for a very well presented an illustrated lecture.

K Arbuckle ■

Newcastle Section

Offshore protective coatings

Sixty-nine members and guests attended the fourth meeting of the 1989/90 Session at St Mary's College, University of Durham to hear Mr Fred Palmer of BP talk on "Protective Coatings — Offshore Maintanance".

Mr Palmer began by announcing that after almost 20 years with a large paint manufacturer followed by almost 20 years with a major paint specifier, during which time he had often spoken publicly on paint, tonight was his "swan song"; this being the case, he could let his hair down and give his own personal views, some of which might be contentious.

In setting specifications for offshore structures, one must first consider what is being painted and then decide on painting systems. Above all, his own experience told him, that the only way to obtain first-class results is by painting onshore, before the structures are sent offshore. The painting spec. should divide the job into zones, each with specific needs.

One area which consistently gives problems, especially with maintenance painting, is the Splash Zone, which in the case of the North Sea might be defined, almost, as anything below the deck down to sea level. For most of the past 20 years he had strongly pressed epoxy/coal tar for this area, but he now considered that he might have been wrong. He now felt that the thick cladding used by some companies — Monel Metal, Cupronickel or Neoprene, or very thick reinforced organic coatings, is a better specification. In the past he had worked on a principle "corrosion allowance plus paint", which might result in a spec. of 600µm dft epoxy/coal tar. The aim would be to try and obtain at least 10 years to first maintenance. Now, in the light of experience, he would first look at the geologist's estimate of field life and try to specify a system which would approach this, thus eliminating any major maintenance needs, e.g. for a 25 year life platform he would aim for at least 20 years from the protection system by using more than 1mm of a cladding, and avoid repainting before the field was depleted. His reason for such a statement is the practical impossibility of painting North Sea splash zones, which are continually wet and make successful painting out of the question. As a further precaution, taking the lowest astronomical tide (LAT), the region representing ½ LAT could be cathodically protected. Above the splash zone epoxy/coal tar has an excellent record of protection, adhesion and maintenance.

Next, Mr Palmer discussed zinc silicates, which in his opinion are better than zinc-rich epoxies. The silicates have been very widely used in the North Sea, despite problems of mud cracking, adhesion and salt formation. BP specify 60µm dft followed by an epoxy tie-coat within 7 days. Experience showed this to be a permanent base for overpainting, which need never be blasted off. West Sole 1973 was the only occasion when blasting off was called for and the price quotations obtained were horrendous. For topsides, zinc silicate/vinyl systems are typical for the Middle East, while zinc silicate/chlorinated rubber are typical of the North Sea e.g. the Forties field. Both types of spec. meet all requirements except cleanability and cosmetic appearance after extended weathering. Currently, BP specify acrylic/isocyanates, which have a pleasing gloss and good cleanability/cosmetic finish; a five coat system is now specified. Experience with straight polyurethanes showed poor intercoat adhesion after maintenance. The first repaint of the Forties was after 14 years. Field lives (Magnus 15 years, Miller 20 years and Magnus 30 years) suggest that paint specs. giving 12-15 years to first maintenance would need only one repaint. If platform operatives were encouraged to carry out regular painting touch-ups a total repaint would never be required.

Non-skid deck paints originally presented severe problems. The first products were standard Marine "suede" finishes but, unfortunately, these did not even last the construction period and needed repainting during the first year after application. With large platforms, rather more heavy-duty coatings were destroyed by equipment such as fork lift trucks. Very heavy (thick) applications, of sprayed splash zone composition cracked off like crazy paving in 2-5 years. Platform operators prefer very rough finishes such as multi-coat epoxy/coal tar with coarse aggregates broadcast into the wet film; these have proved very successful and nowadays such finishes are produced in tile form. Tiles are easily laid like carpet strips down walkways, thus avoiding the necessity to close off essential areas during the process.

Fire resistance protection of steel is normally provided by intumescent epoxies over zinc silicate, with epoxy-acrylic or acrylic/isocyanate topcoats. Galvanized steel still presents paint adhesion problems, despite regular 5-yearly claims by the paint industry that the galvanizing problem has been solved. Typical treatments of wash primer or T-wash before painting are not consistently successful and his preference is to blast clean the galvanizing using fine abrasive and then apply epoxy primer and finish. Unfortunately blasting hand rails in situ is very wasteful of abrasive (and causes severe contamination of the platform). Items such as galvanized gratings are easily replaced, where necessary.

The practicalities of painting offshore militate against good results; because of this, good access and good lighting demand particular attention. The very narrow time window of accessibility dictates that one good thick coat is as important as good, experienced, inspection. The latter aspect is still rarely managed properly and, frequently, the situation resolves into conflict between inspector and contractor, when mutual respect and co-operation is really the need.

Mr Palmer concluded by reiterating that oil companies will spend more on initial painting and protection work, in order to avoid very high offshore maintenance costs which give debatable effectiveness. He then showed the few slides he had brought, which he had almost forgotten to show — this had also gone unnoticed by his attentive audience.

Question time afterwards raised points on T-wash for galvanizing, internal steel treatment (Mr Palmer does not like separate internal/external specs), comparative effectiveness of US zinc silicate formulations in the North Sea as against the Gulf of Mexico, and the relative failure of wet abrasive blasting to gain any foothold offshore.

Mr D Neal, Chairman of Newcastle Section gave the vote of thanks for a very entertaining and informative talk, after which everyone enjoyed the excellent buffet and refreshments provided by Crown-Berger Paints.

J. Bravey ■

Scottish Section

Emulstion polymers

The December lecture was given by Mr Brian Widdop, Laboratory Manager of Kirklees Chemicals Ltd. His topic was the application of emulsion Polymers in Surface coatings. He started by outlining the various components required in the make-up of Emulsion Polymers and showed how these were put together in a typical process to produce the final polymer.

The various types of monomer and the type of resultant polymer were examined and explained along with the physical characteristics of the polymers. The properties of the polymer films and the factors influencing their performance were also highlighted, along with their end use.

The lecture then moved on to examine the consumption of emulsion polymers throughout Europe showing that paint is still by far the largest user of this material throughout a variety of industries. In the UK, the most common type of Emulsion Polymer is Vinyl Acetate based.

The new high binding polymers were discussed in comparison to conventional vinyl acetate based polymers and their many advantages shown, particularly with regard to scrub resistance and washability. The future developments within industry were then discussed including solvent free systems and aqueous eggshell paints.

Several of the questions afterwards dealt with the environmental aspects of emulsion paints against solvent based paint, indicating, perhaps, an even greater awareness of this area within the industry.

A vote of thanks was accorded to Mr Widdop and to his company who sponsored the evenings buffet.

H. Jess ■

Newspaper printing

The first Scottish Section lecture of the new decade was given by Mr Gerry Burdall of Usher Walker Ltd., entitled "The Challenge of Newspaper Printing to Ink Makers in the 1990's".

Mr Burdall began with a brief history of the production of newspapers. He then led on to a description of current newspaper titles with circulation figures and trends.

He then dealt in some detail with the unique demands that the production of newspapers placed on the ink maker.

With the aid of some splendid slides, Mr Burdall illustrated the development of printing processes, from early times up to and including modern printing presses capable of printing 65,000 copies per hour.

The implication of low rub inks, and some predictions for the future, completed what was a highly entertaining, and often amusing, talk.

Judging by the number of questions the audience were highly appreciative of Mr Burdall's expertise.

The committee of the Scottish Section were grateful that so many visitors from the printing ink industry, turned out on what was one of the worst nights of the winter, and to Usher-Walker for sponsoring a buffet.

Mr Ron Barrett proposed the vote of thanks on behalf of the Section.

R. Hill ■

NEWCASTLE STUDENT SEMINAR
PAINT MANUFACTURE
24 APRIL 1990, DURHAM

OCCA News

New members

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

Ordinary members

Arnold, D. J., BSc *(Manchester)*

Banov, A. *(General Overseas — USA)*

Bechan, A. *(Natal)*

Cleaver, D., BSc, PhD *(Manchester)*

Ellson, J. C. *(Midlands)*

Hubbard, S. A., BSc *(London)*

James, P. *(Manchester)*

Leslie, P., BSc *(Newcastle)*

McKay, J., BSc, MSc *(Midlands)*

Miller, M. J., BSc *(Ontario)*

Price, J. *(Midlands — Trent Valley)*

Smith, N. P. F., BSc *(Manchester)*

Taylor, P. J. M., BSc, PhD *(Hull)*

Turnock, A. *(Manchester)*

Whitehead, H. C. C. *(Scotland)*

Williams, S. S. *(Manchester)*

Associate member

Stephenson, B. M. *(Natal)*

Registered student

Kensbock, U. S. *(London)* ■

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Paint/Materials Technology

The Association for Consumer Research through its Which? magazine, provides independent well researched buying advice on a wide range of products and services. The majority of the product testing and research is carried out at our Consumer Research Laboratory.

We are planning to increase the depth of the research knowledge in our DIY team and are seeking a Technologist who has at least five years previous laboratory/research experience in the technology of building materials, particularly paint and other maintenance products. You will be responsible for developing and planning the long-term testing and evaluation reporting in these areas. As well as providing the main technical input into the test work you will also represent the laboratory on Standards Committees.

Ideally you will hold a degree or equivalent in materials technology related to paint/building materials and be able to demonstrate your ability in respect of long-term planning, setting and achieving objectives. You must be enthusiastic, have first class organising and communication skills together with experience of writing reports and evaluation summaries.

Starting salary will be up to £17,200 depending on experience and we offer 28 days holiday, 35 hour week, free life assurance and contributory pension scheme.

If you are interested in this challenging role then write for an application form to: Assistant Personnel Officer, Consumer Research Laboratory, Harpenden Rise, Harpenden, Herts AL5 3BJ.

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