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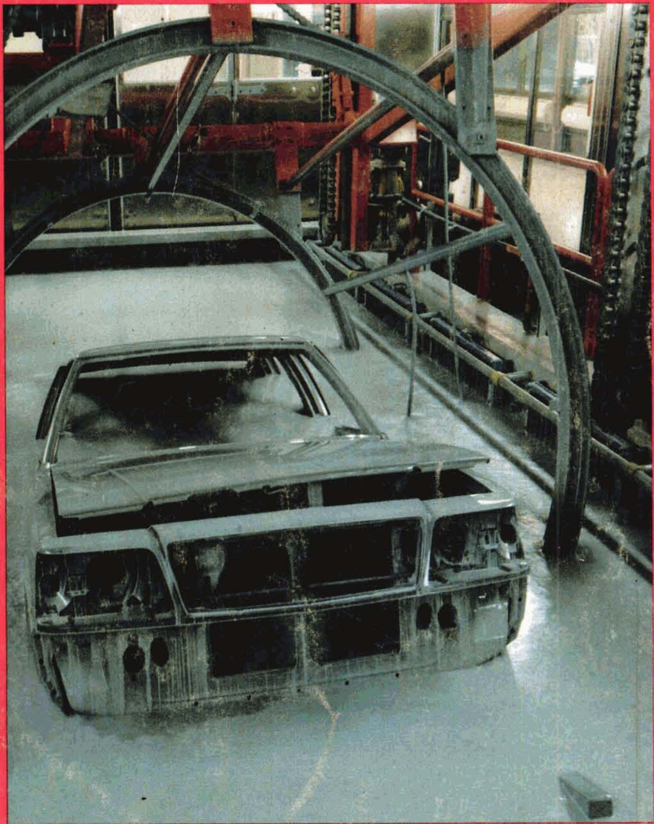
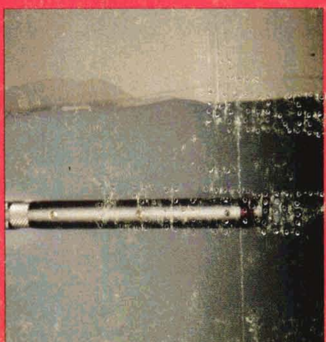
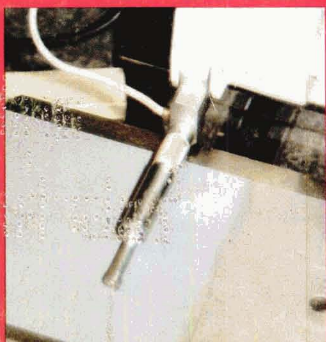
March 1990

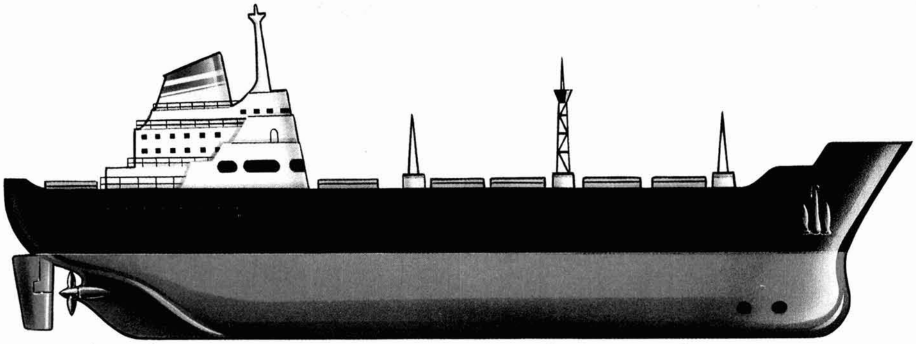
jct JOURNAL OF COATINGS TECHNOLOGY



Performance Capabilities of Intermediate Film Build Electrocoat vs High Film Build Electrocoat.







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MARCH 1990

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VOLUME 62 NUMBER 782

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Comment

Have We Got a Deal for You!

Act now and you could be the recipient of a valuable "bonus" package — specially-designed programs tailored to meet your professional needs!

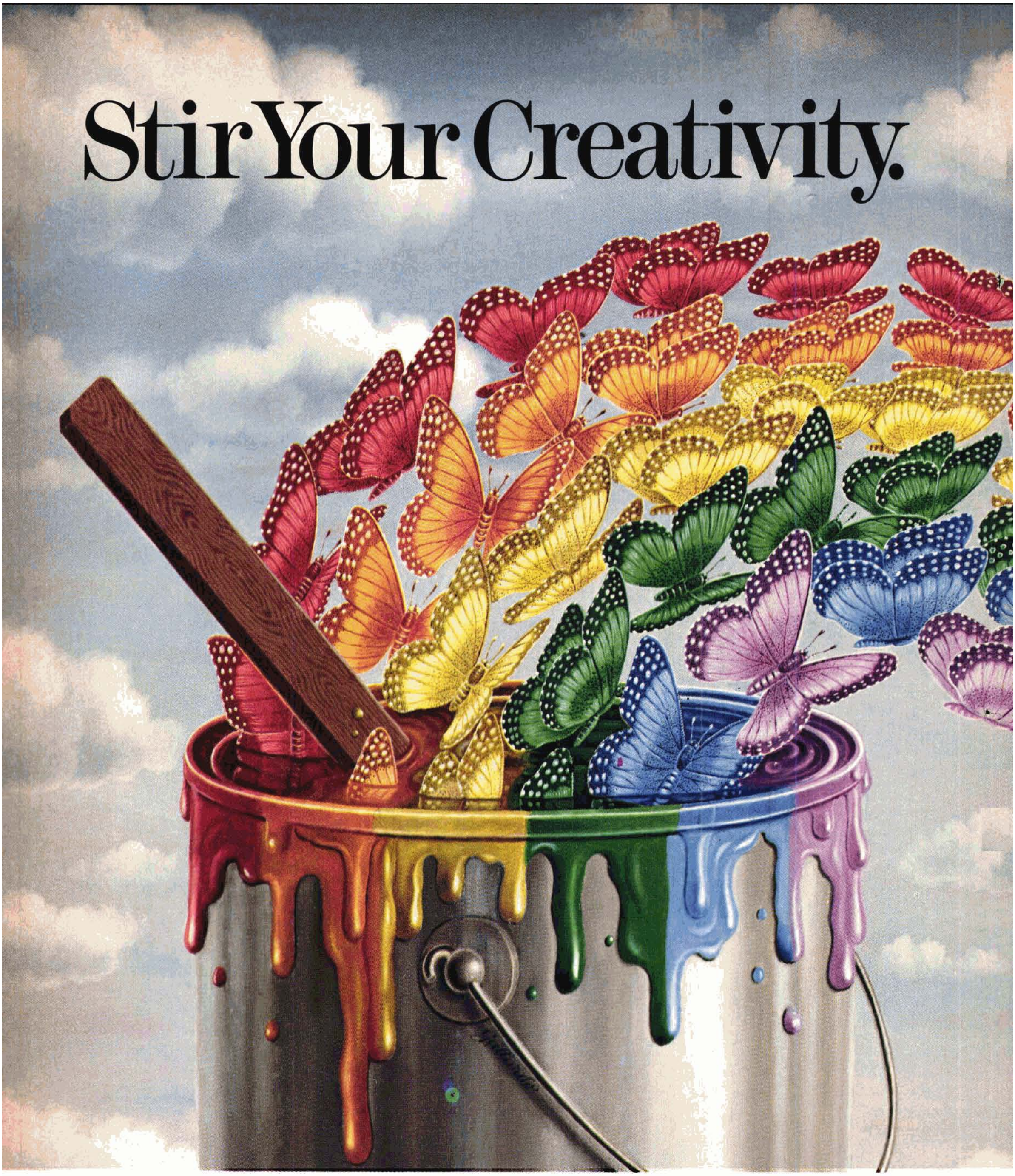
What do you have to do? No purchase is necessary. Simply fill out and return the FSCT Professional Development Survey which will be mailed to all members this month. Your responses will enable the Professional Development Committee to compile information on the FSCT memberships' individual demographics, professional experience, and educational background. In addition to contributing to the existing database describing FSCT makeup, this information will be used to assist in the development of continuing education programs designed to meet your professional career needs.

You may already have been a winner! From the results of the initial PDC mail survey conducted in 1986, the Committee learned of the memberships' desire for self-improvement through continuing education activities. Within a year, the PDC set up the highly successful Statistical Process Control seminars which have been offered in various sites in the United States, Canada and Mexico.

Other results include the "Modern Analytical Resources" seminar given during Spring Week in 1989 and the profitable sessions on "Advanced Topics in Coatings Research" offered at the 1988 and 1989 FSCT Annual Meetings.

These and many other benefits can be yours! By returning the survey to Federation headquarters, you too can have the opportunity to contribute to the development of programs which benefit the coatings industry. There's nothing to lose and so much to gain!

Patricia D. Viola,
Editor



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Abstracts of Papers in This Issue

PERFORMANCE CAPABILITIES OF INTERMEDIATE FILM BUILD ELECTROCOAT VS HIGH FILM BUILD ELECTROCOAT—J.A. Gilbert

Journal of Coatings Technology, 62, No. 782, 29 (Mar. 1990)

The use of a new 0.8-1.0 mil cathodic electrodeposition primer can provide automotive quality appearance and corrosion protection on metal surfaces. 'High build," or 1.2 -1.4 mil film build materials are popular in many electrocoat applications today due to their ability to provide smooth, corrosion resistant films without the use of a primer surfacer. Results of salt spray, scab corrosion, and chip corrosion experiments indicate that equivalent protection can be provided using a new "intermediate build," or 0.8-1.0 mil film build electrocoat primer. When substituted for a high build primer, this intermediate build primer represents a substantial reduction in material usage (and therefore cost) to the end user.

A comparison of the abilities of the new intermediate film build electrocoat primer and some standard high build electrocoat primers to fill metal finishing marks on test panels and on production auto parts will be shown. Ra, Rz, and R3z surface parameter measurements for the two types of electrocoat primers will be described. In addition, for each surface parameter R, the "filling factor," or $(R_{substrate}-R_{paint})/(R_{substrate})$ will be shown for each type of electrocoat paint, The data show that the new intermediate film build electrocoat primer can provide filling properties equal to or better than a high build electrocoat primer.

DEVELOPMENT OF TEST METHODS FOR ASSESSING ENCAPSULANTS FOR FRIABLE ASBESTOS INSULATION PRODUCTS—S.K. Brown

Journal of Coatings Technology, 62, No. 782, 35 (Mar. 1990)

Methods for assessing asbestos encapsulants have been developed according to the effect on the strength, fire performance, and erosion resistance properties of synthetic mineral fiber insulations. The performances of a range of commercial encapsulants have been assessed and criteria proposed to ensure encapsulated insulations resist damage during general conditions of building usage.

MECHANISM OF ALUMINUM FLAKE ORIENTATION IN METALLIC TOPCOATS—K. Tachi, C. Okuda, and S. Suzuki

Journal of Coatings Technology, 62, No. 782, 43 (Mar. 1990)

Variation of aluminum flake orientation in wet metallic films with time has been determined using a newly-developed noncontact-type colorimeter equipped with a light source and two detectors at properly selected angles. In spray application, aluminum flakes are oriented parallel to the film surface during spraying and drying. During spraying, the flakes are oriented by the paint droplet flow only when the droplet containing the flakes is large enough to penetrate the wet film as a buffer layer and spread out on the substrate surface. During drying, the flakes are oriented by the shrinkage of the film thickness caused by the evaporation of volatiles.

Papers to Be Featured In April Issue

"Glass Transition Temperature (T_g) as an Index of Chemical Conversion for a High-T_g Amine/Epoxy System: Chemical & Diffusion Controlled Reaction Kinetics"—Guy Wisanrakkit and John K. Gillham, Princeton University *(This paper was awarded First Prize in the 1989 Roon Awards Competition)*

"AC Impedance in Predicting the Corrosion Behavior of Metallic Spots Contained in Polymer Films"—A. Al-Hashem and D. Thomas, Kuwait Institute for Scientific Research

"CPCV of Water-Soluble Paint by Thickness Measurement of Electrodeposited Coatings"—T.R. Guruprasad, P.S. Sampathkumaran, and P.H. Gedam, Indian Institute of Chemical Technology

"Simulation of Diffusion in Pigmented Coatings on Metals Using Monte-Carlo Methods"—Dale P. Bentz and Tinh Nguyen, National Institute of Standards and Technology

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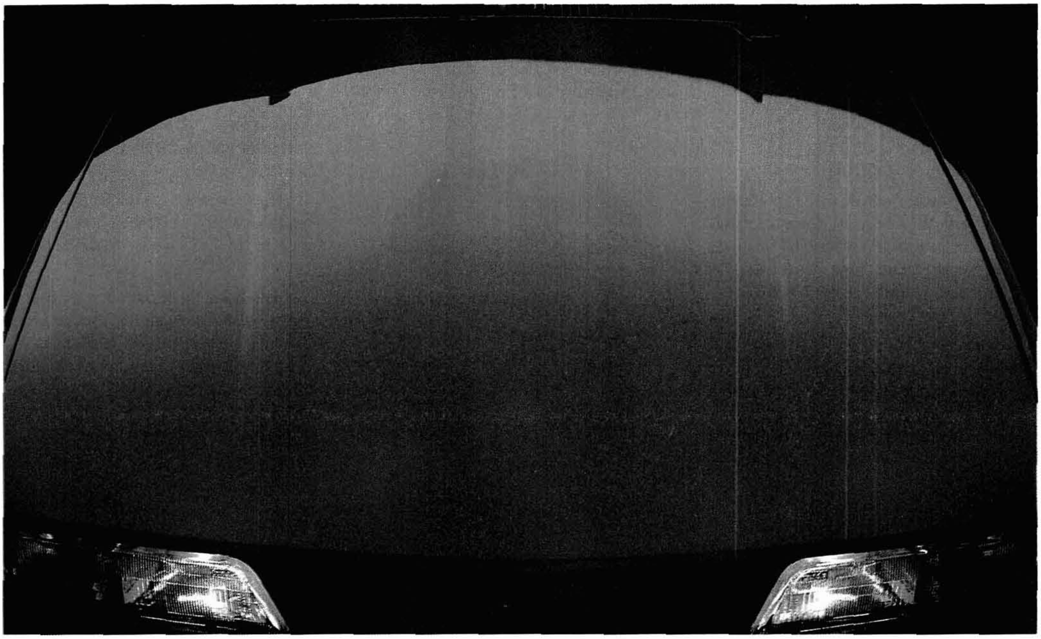

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Coatings Technology in the Nineties will Be Subject Of FSCT Spring Seminar in Louisville, May 16 & 17

"Coatings Technology in the 1990s" will be the topic of discussion at the 1990 Federation Spring Seminar, to be held May 16-17, at The Galt House, in Louisville, KY.

Programming for the 1 1/2 day event will explore the impact of new developments on the coatings industry, with presentations by well-known industry speakers focusing on raw materials, emerging technologies, and regulatory compliance.

Program

The Keynote Address will be presented by Dr. Zeno W. Wicks, Jr., Consultant and Professor Emeritus, Polymers and Coatings Dept., North Dakota State University. He will speak on "Performance Prediction—Problem or Opportunity?"

In his presentation, Dr. Wicks notes that most coatings tests do not do an adequate job of predicting performance of coatings in actual field use, and thus hamper research and development. However, correlation of data banks of actual field performance of coatings as functions of composition and application variables can be a powerful tool. A broader understanding of the underlying scientific principles controlling the performance of coatings and their relationships to composition is increasingly permitting prediction of performance.

Other program speakers and their topics are:

"Resin Advances in the Next Decade"—Dr. Edward G. Bozzi, Director, Coatings Business, CIBA-GEIGY Corp., Hawthorne, NY

"The Effect of a Novel Class of Thixotropic Agents on the Rheological Properties of Low VOC Coatings"—Benjamin J. Dent, King Industries, Norwalk, CT

"Advances in Water-Borne Coatings for the 90s"—Dr. Andrew Mercurio, Rohm and Haas Co., Research Laboratories, Spring House, PA

"Clean Air Act Reauthorization—Its Impact on the Coatings Industry"—Robert J. Nelson, Director, Environmental Affairs, National Paint and Coatings Association, Washington, D.C.

"The Evolution of Corporate Environmentalism"—Paul Brooks, Corporate Manager, Environmental, Health and Engineering Services, Reliance Universal, Inc., Louisville, KY

"Spray Equipment for Environmental Compliance"—Jack Adams, Binks Manufacturing Co., Greenwood, IN

"Color Measurement of Specialty Coatings"—Malcolm Lloyd, Marketing Manager, Applied Color Systems, Inc., Princeton, NJ

"Supercritical Fluid Spray Application Technology: A Pollution Prevention Technology for the Future"—Dr. Charles W. Glancy, Research and Development Dept., Union Carbide Chemicals & Plastics Co., Inc., South Charleston, WV

"Overview of Radiation Curing Chemistry and Applications"—Ronald Golden and John Guarino, Radcure Specialties, Inc., Louisville, KY

"Polyurethane Coatings Developments for Changing Markets"—Dr. Gerhard Ruttman and Richard Hergenrother, Coatings Div., Mobay Corp., Pittsburgh, PA

"Powder Coatings—The North American Market and Materials"—Champ Bowden, Jr., Product Manager, Powder Coatings, The Glidden Co., Charlotte, NC (Sponsored by The Powder Coating Institute)

Several open forum sessions will be featured, at which speakers will assemble as a panel to field questions from attendees.

Programming has been arranged by a committee of members of the Louisville Society for Coatings Technology, under the direction of Chairman Raymond L. Mudd, Technical Director, Porter International. Serving on the committee are: Lloyd Browning, Kelley Technical Coatings, Inc.; Kris Grauer, Kurfees Coatings, Inc.; James Hoeck, Reliance Universal, Inc.; Louis Holzknecht, Devoe Coatings Co.; and Larry Pitchford, Reynolds Metals Co.

Registration

To register, fill out the form on page 13 and return with payment to Federation headquarters.

Registration fee is $160 for FSCT members, and $190 for non-members. (Payment must be in U.S. funds, payable in U.S. banks.)

Included in the registration fee is continental breakfast, luncheon, coffee breaks, and copies of papers presented, as well as bus transportation to the Louisville airport (Standiford Field) at conclusion of seminar. *Please note reference to bus on registration form, and check appropriate box.*

Note: If cancellations are received less than five days prior to the seminar, a $50 charge (per registration) will apply.

Housing

Requests for seminar room accommodations at The Galt House must be made on the accompanying housing form and returned to FSCT headquarters.

Special seminar room rate is $80, single, and $90, double (per night). Note that reservations must be received no later than April 15 to assure availability and rates.

The Galt House is located on the Ohio riverfront in downtown Louisville, which is served by three major expressways (I-64, I-65, and I-71).

Ground transportation to and from the Louisville airport (a 15-minute ride) is available on a regular schedule. Registered guests at The Galt House are accorded complimentary parking.

To obtain complete program information, contact Federation of Societies for Coatings Technology, 1315 Walnut St., Suite 832, Philadelphia, PA 19107 [Telephone: (215) 545-1506; FAX: (215) 545-7703].

COATINGS TECHNOLOGY IN THE 1990s SEMINAR
REGISTRATION FORM

Registration fees: $160 (FSCT members); $190 (non-members)

Check must accompany registration form. Make checks payable to Federation of Societies for Coatings Technology. (Payment must be made in U.S. funds payable on U.S. banks.)

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Of Which You Are a Member ____________________

I will ☐ will not ☐ use the Federation bus to the Louisville Airport at conclusion of seminar.

Return form and check to: Federation of Societies for Coatings Technology
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*Reservations will be held until 6:00 pm. If arrival is after 6:00 pm, hotel requires deposit for one night's lodging to guarantee availability. Make check payable to "The Galt House."

Note: Reservations must be made no later than April 15 to guarantee availability and rates.

Return this form to: Federation of Societies for Coatings Technology
1315 Walnut Street, Suite 832, Philadelphia, PA 19107

Annual Meeting Theme Looks to 21st Century; Paint Show Exhibit Space Nears Record 'Sell Out'

The 1990 Annual Meeting of the Federation of Societies for Coatings Technology will be held on October 29-31, at the Washington Convention Center, in Washington, D.C. The theme of the meeting is "A Decade of Decision: Preparing for the Year 2000." The theme emphasizes that more so than in decades past, the 1990s will demand decisions on coatings technologies, substrates, and application methods which will influence the product, markets, and profitability of the industry as it enters the 21st Century.

Washington Convention Center
Washington, D.C.
October 29-30-31, 1990

Programming will focus on discussions of these areas as they relate to current state-of-the-art and future demands, as well as environmental considerations.

Also included in the program will be the Mattiello Memorial Lecture by one of the technical leaders in coatings research, Roon Awards Competition Papers, presentations from Federation Constituent Societies, and Seminars on new manufacturing technologies, anti-corrosion coatings, and advanced topics in coatings research.

Program Chairman Gary W. Gardner, of Tnemec Co., Inc., N. Kansas City, MO, and his committee are developing a schedule of presentations. Serving on his committee are: Gerry Parsons (Vice-Chairman), DeSoto Coatings Ltd., Mississauga, Ont., Canada; Robert F. Brady, Jr., U.S. Naval Research Laboratory, Washington, D.C.; Mary G. Brodie, The Sherwin-Williams Co., Cleveland, OH; Richard M. Hille, General Paint & Chemical Co., Cary, IL; Richard J. Himics, Daniel Products Co., Jersey City, NJ; Terryl F. Johnson, Cook Paint & Varnish Co., Kansas City, MO; and George M. Pilcher, Hanna Coatings Corp., Columbus, OH.

Hotels and Reservations

Nine hotels have reserved blocks of rooms for the Federation, with the Washington Sheraton serving as headquarters hotel. Other hotels include the Omni Shoreham, Washington Hilton, Captial Hilton, Ramada Renaissance Techworld, Grand Hyatt Washington, Holiday Inn Grand Plaza—Metro Center, J.W. Marriott, and Days Inn/Downtown Convention Center. All housing will be processed through the Washington, D.C. Convention and Visitors Bureau. Housing information will be mailed to all members in April.

Special Airline Fares

Delta Airlines and US Air, in cooperation with the Federation, are offering special discounted airline fares which afford passengers a 40% minimum savings off their round trip, and undiscounted day coach fares for travel to the FSCT Annual Meeting and Paint Industries' Show on the airlines' domestic systems. The discount from Canada is 35%.

To take advantage of these discounts, you must travel to Washington, D.C. between October 24 and November 4, 1990; purchase tickets at least seven (7) days in advance; and telephone the following numbers for reservations, giving the applicable FSCT File Number: for Delta—1-800-241-6760 (File #U0235); for US Air—1-800-334-8644 in the U.S., or 1-800-428-4322 in Canada (File #719568). These special fares are available only through these numbers.

Discounts are good for both direct and connecting flights to Washington, D.C. If you use a travel agent, have your reservations placed through the toll-free numbers to obtain the same fare advantages. Both Delta and US Air have a variety of other promotional fares, some of which may represent even greater savings. When phoning for reservations, ask for the best discount applicable to your itinerary.

Registration Fees

Advance registration forms and information will be sent to all members in April. Advance fees are $65 for members and $80 for non-members. The fee for spouses' activities is $50 in advance. Retired members and their spouses may register for the special advance fee of $25 each.

On-site registration will be $75 for full-time and $55 for one-day for members. Non-member fees will be $95 for full-time and $65 for one-day. Spouses' activities will be $60 on-site.

Host Committee

The Baltimore Society will serve as the Host for the Annual Meeting. General Chairman of the 1990 Annual Meeting is Richard C. Chodnicki, of Van Horn, Metz & Co., Inc. Assisting him are the following sub-committee chairpersons: Information Services—Mitch Dudnikov, of Genstar Stone Products Co.; Program Operations—Tom Mitchell, of Hüls America, Inc.; Registration Area—Mel Hammel, of Fein Container Corp.; Federation Exhibit—Bob Hopkins, of SCM Chemicals, Inc.; Hospitality—Richard DiMarcantonio, of Steeltin Can Corp.; and Spouses' Activities—Mrs. Richard (Carolyn) Chodnicki and Mrs. Tom (Carolyn) Mitchell.

NPCA To Meet Same Week

The National Paint & Coatings Association will hold its annual meeting on October 31 to November 2 at the Washington Hilton Hotel. Persons wearing the NPCA badge and who register at the special FSCT desk at the Convention Center will be admitted to the Paint Show on Tuesday, October 30, only, with the compliments of the Federation.

Paint Industries' Show

To be held in conjunction with the 68th Annual Meeting, the 55th Paint Show will feature the products and services of the suppliers to the international coatings industry. Currently, 224 companies have reserved over 77,000 net square feet of exhibit space, or 95% of the booth space available at the Convention Center. (See list of exhibitors accompanying story.—Ed).

Exhibit hours will be 11:00 a.m. to 5:30 p.m. on Monday, October 29; 9:00 a.m. to 5:30 p.m. on Tuesday, October 30; and 9:00 a.m. to 3:00 p.m. on Wednesday, October 31.

1990 Membership Directory Available From Federation

The 1990 Annual Membership Directory (Year Book) of the Federation of Societies for Coatings Technology has been published.

Listed in the 340-page directory are the names, companies, addresses, and telephone numbers of the 7000 Federation members by Society affiliation. The publication also provides an alphabetical index of members and includes informative details on FSCT Officers, the Board of Directors, Committee Members, and By-Laws.

The Year Book, included with membership in the Federation, is available to non-members for $20.00 per copy. To place an order, contact Ms. Meryl Cohen, Federation of Societies for Coatings Technology, 1315 Walnut Street, Suite 832, Philadelphia, PA 19107, or call (215) 545-1506.

1990 Paint Industries' Show

Current List of Exhibitors

Aceto Corp.
Advanced Coating Technologies
Advanced Software Designs
Air Products & Chemicals, Inc.
Alcan-Toyo America, Inc.
Alpha Minerals
American Cyanamid Co.
American Institute of Chemists
Amoco Chemical Co.
ANGUS Chemical Co.
Anker USA, Inc.
Applied Color Systems, Inc.
Aries Software Corp.
Ashland Chemical Co.
Atlas Electric Devices Co.
Atochem North America, Lucidol

B&P Environmental Resources
BASF Corp.
T.J. Bell, Inc.
Berol Nobel Inc.
Blackmer Pump Div.
Bohlin Reologi, Inc.
Brookfield Engineering Labs., Inc.
Buckman Laboratories, Inc.
Buhler, Inc.
Bulk Connection, Inc.
Bulk Lift International, Inc.
Burgess Pigment Co.
Byk-Chemie USA
Byk-Gardner, Inc.

CB Mills, Inc.
CPI Purchasing
Cabot Corp.-Special Blacks Div.
Calgon Corp., Div. of Merck Co., Inc.
The Carborundum Co.
Cardolite Corp.
Cargill, Inc.
Caschem, Inc.
Catalyst Resources, Inc.
Chemical & Engineering News
Chemical Week
Chemolimpex
CIBA-GEIGY Corp.
Clawson Tank Co.
Coatings Magazine
Color Corp. of America
Colores Hispania, S.A.
Colorgen, Inc.
Colorwright, Inc.
Contraves Industrial Products
Cook Resins & Additives
Cookson Pigments, Inc.
Coulter Electronics, Inc.
Cray Valley Products International
Crosfield Chemicals, Inc.
Cuno Process Filtration Prods.
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DSA Consulting, Inc.
DSET Laboratories, Inc.
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Elektro-Physik USA, Inc.
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Epworth Manufacturing Co., Inc.
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Etna Products Inc.
European Coatings Journal
Expancel, Nobel Industries Sweden
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FMJ International Publications Ltd., Paint & Chemical Div.
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Freeman Chemical Co.
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GAF Chemicals Corp.
Paul N. Gardner Co., Inc.
Georgia Kaolin Co., Inc.
Goodyear Chemical Division
Grace/Davison Chemical Div.
Guer-tin Brothers Polymers

Haake/Fisons Instruments
Halogenated Solvents Industry
Halox Pigments
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Hitox Corp. of America
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Universal Color Dispersions
Unocal Chemicals Div.

Van Water & Rogers
R.T. Vanderbilt Co., Inc.
Velsicol Chemical Corp.
Versa-Matic Tool, Inc.
Viking Pump, Inc.

Wacker Silicones Corp.
Warren-Rupp, Inc.
Wilden Pump & Engineering Co.
Witco Chemical Corp.

X-Rite, Incorporated

Zeelan Industries, Inc.

FSCT Educational Commitment Grows in 1990; Scholarship Program, Cal Poly Donation Top List

Funding of educational endeavors by the Federation of Societies for Coatings Technology was increased dramatically in 1990 in both grants and scholarship monies to academic institutions with programs in coatings technology.

The FSCT Scholarship Program includes six universities with coatings curricula: University of Detroit, Detroit MI; Eastern Michigan University, Ypsilanti, MI; Kent State University, Kent, OH; University of Missouri-Rolla, Rolla, MO; North Dakota State University, Fargo, ND; and University of Southern Mississippi, Hattiesburg, MS. A total of $43,000 will be donated to the scholarship programs of these schools through the Federation's Educational Committee.

A new coatings program, which should benefit the West Coast, is being established at the California Polytechnic State University at San Luis Obispo. The program, sponsored by our West Coast Societies, will develop graduates having a concentration in coatings technology with a B.S. Degree in Chemistry. The Federation has made a grant of $20,000 to the program through the West Coast/Cal Poly Foundation, a non-profit funding mechanism founded by the Los Angeles and Golden Gate Societies, and administered by the California Community Foundation (See letter accompanying story.—Ed.)

In addition, the FSCT's Coatings Industry Education Fund has approved a $5,000 donation to the Cal Poly program. These funds, together with the CIEF's Joseph A. Vasta Memorial Scholarship of $2,500, raises the FSCT/CIEF educational funding for 1990 to $70,500, the highest total in Federation history.

Dear Reader,

We are sure that you are aware that our industry was saddened this Autumn by the unexpected and premature deaths of two of its young leaders, Robert Abrams, President of Major Paint Company, and Dave Kittredge, Sales Executive with E.T. Horn Company. In their memory, the Paint Industry, with our sponsorship, is establishing the Abrams/Kittredge Cal Poly Fund.

Both of these men were key to a project being worked out with California Polytechnic State University at San Luis Obispo. This project will develop graduates having a concentration in coatings technology within the Bachelor of Science Degree in Chemistry.

Our industry is sorely in need of qualified technical people. We can't rely any longer on our ability to train in-house and keep up with our collective needs. This program is geared toward inner-city high school graduates in Northern and Southern California who normally would have limited opportunity to participate in higher education.

Monies collected for the Abrams/Kittredge Cal Poly Fund will go for scholarships and professorial chairs in the names of Robert M. Abrams and David R. Kittredge. It will also assist in the purchase of equipment for a laboratory outfitted for "Paint Making" as well as supplies and other incidentals. The Abrams/Kittredge Cal Poly Fund has been established as a "philanthropic fund" at the California Community Foundation. This insures that donations will be treated as a current charitable deduction even though the fund will be making distributions over a period of time.

This effort is supported by the Los Angeles Society for Coatings Technology as well as the Southern California Paint and Coatings Association, the Golden Gate Paint and Coatings Association, the Golden Gate Society for Coatings Technology, and the Federation of Societies for Coatings Technology and the National Paint and Coatings Association.

Please join with us in this most important project. We know that both individual and corporate contributors will enjoy great satisfaction in the coming years as Cal Poly's newly talented coatings focused graduates enter our industry and are successful.

Make your contributions to:

Abrams/Kittredge Cal Poly Fund
California Community Foundation
3580 Wilshire Boulevard
Suite 1660
Los Angeles, CA 90010

Thanks in advance for your help.

Kenneth N. Edwards
Corporate Secretary
DUNN-EDWARDS CORPORATION

M.M. Nilsson
Executive Vice President
SINCLAIR PAINT COMPANY

M.S. Wager
Vice-Chairman
STANDARD BRANDS PAINT COMPANY

FSCT Professional Development Committee To Survey Membership on Career Needs

The Federation's Professional Development Committee will conduct its second survey to assess the career development needs and demographics of Federation members. The results of the survey, to be conducted in March, will update the data from the committee's initial 1986 survey.

The survey will seek information in two areas: Society Membership and Professional Development. Members will be requested to respond, anonymously, to demographic questions relating to Society experience, age, level of education, and employment background. Career development questions will relate to the individual's job experience and professional capacity. The responses will be used to determine the various areas in which the committee and the Federation may assist the member in his/her career.

The four-page questionnaire will be sent to all members in March. The completed survey will be returned to the Federation Headquarters for tabulation and analysis and the results will be reported in the JOURNAL OF COATINGS TECHNOLOGY.

Regulatory UPDATE

This digest of current regulatory activity pertinent to the coatings industry is published to inform readers of actions which could affect them and their firms, and is designed to provide sufficient data to enable those interested to seek additional information. Material is supplied by Roy F. Weston, Inc., Washington, D.C.

OSHA Promulgates Final Rule on Occupational Exposure to Hazardous Chemicals in Laboratories—Effective May 1, 1990, OSHA has developed regulations controlling occupational exposure to hazardous chemicals in laboratories. Based on a determination that laboratories typically use hazardous chemicals differently than industrial operations, OSHA has developed regulations that specifically apply to all employers engaged in laboratory use of hazardous chemicals. See 55 Federal Register 3300 (January 31, 1990).

The applicability of these regulations is based on definitions of "laboratory use" and "laboratory scale" as defined by the 29 CFR Section 191.1450 (see 55 Federal Register 3327), and may not include all laboratories. "Laboratory use of hazardous chemicals" is defined as "handling or use of such chemicals in which all of the following conditions are met:

1. Chemical manipulations are carried out on a 'laboratory scale';
2. Multiple chemical procedures or chemicals are used;
3. The procedures involved are not part of a production process, nor in any way simulate a production process; and
4. 'Protective laboratory practices and equipment' are available and in common use to minimize the potential for employee exposure to hazardous chemicals."

"Laboratory Scale" is defined as working "with substances in which the container used for reactions, transfers, and other handling of substances is designed to be easily and safely manipulated by one person. 'Laboratory Scale' excludes those workplaces whose function is to produce commercial quantities of materials."

Hazardous chemicals have "statistically significant evidence, based on at least one study conducted in accordance with established scientific principles, that acute or chronic health effects may occur in exposed employees."

The regulations require that employers develop a Chemical Hygiene Plan that describes work practices and procedures to protect employees from potentially hazardous chemicals. This Chemical Hygiene Plan must be developed and implemented by January 31, 1991.

For further information, contact James F. Foster, Office of Information and Consumer Affairs, OSHA, 200 Constitution Avenue, N.W., Room N3649, Washington, D.C. 20210, (202) 523-8151.

EPA Announces TSCA Premanufacture Notices and Exemption Requests—On January 12, 1990, EPA announced the Agency's monthly status reports on Premanufacture Notices (PMNs) and exemption requests as required by the Toxic Substances Control Act Section 5(d)(3). The monthly reports cover the months of August, September, and October 1989. See 55 Federal Register, pages 1334, 1338, and 1442.

For more information, contact Michael M. Stahl, Director, Environmental Assistance Division, (TS-799), Office of Toxic Substances, U.S. EPA, Room EB-44, 401 M Street, S.W., Washington, D.C. 20460, (202) 382-3725.

OSHA Approves Maryland State Standards—On January 24, 1990, OSHA announced approval of Maryland State Standards including Air Contaminants Standards for General Industry and Hazardous Waste Operations and Emergency Response for General Industry. OSHA reviewed the State standards and found them identical to Federal standards. See 55 Federal Register 3427 (January 24, 1990).

OSHA Requests Comments on "Safety in the Use of Chemicals at Work," Developed by the International Labor Organization—In the January 22, 1990 Federal Register, OSHA published proposed conclusions of the International Labor Organization (ILO) concerning the safe use of chemicals in the work place. See 55 Federal Register 2166. These conclusions address evaluating chemicals to determine their hazards, providing employers with information on chemical hazards, providing workers with information on chemicals in their workplaces and protective measures for safe use of these chemicals, and establishing programs to ensure that chemicals are safely used.

OSHA is requesting comments on these proposed conclusions and the potential impact of adopting these standards in the United States. Comments are due by March 23, 1990, and should be submitted to the Docket Office, Docket H-022H, OSHA, Room N2625, 200 Constitution Avenue, N.W., Washington, D.C. 20210. For more information, contact James F. Foster, Office of Information and Consumer Affairs, OSHA, Room 3647, 200 Constitution Avenue, N.W., Washington, D.C. 20210, (202) 523-8151.

EPA Denies Petition to Exempt Chrome Antimony Titanium Buff Rutile from Emergency Planning and Community Right-to-Know Act Reporting Requirements—On January 8, 1990, EPA announced its denial of a petition to exclude chrome antimony titanium buff rutile (CATBR) from the reporting requirements of the Emergency Planning and Community Right-to-Know Act (EPCRA), Section 313. See 55 Federal Register 650.

The Dry Color Manufacturers' Association submitted the petition, which was based on the claim that CATBR is not toxic and does not meet EPCRA Section 313(d)(2) criteria. In reviewing toxicity information, EPA determined that CATBR is a potential carcinogen, based on the carcinogenicity of chromium and chromium compounds and because CATBR can be retained in the lung and taken up in the cells. Denial of this petition means that facilities that manufacture or use CATBR must continue to report releases in accordance with EPCRA Section 313.

For further information, contact Robert Isreal, Petition Coordinator, Emergency Planning and Community Right-to-Know Information Hotline, U.S. EPA, Mail Stop OS-120, 401 M Street, S.W., Washington, D.C. 20460, (800) 535-0202, or in Washington, D.C. or Alaska, (202) 479-2449.

EPA Clarifies Bevill Exclusion Under RCRA for 20 Mineral Processing Wastes—The Bevill exclusion provides a statutory exclusion for certain mining wastes from regulation as a hazardous waste under RCRA. The EPA has conducted numerous rulemakings to clarify this exclusion with regard to mineral processing wastes. On January 23, 1990, EPA removed five mineral processing wastes from the Bevill exclusion. See 55 Federal Register 2322. In this same rulemaking, EPA has retained the Bevill exclusion for 15 mineral processing wastes pending additional investigation.

The five wastes that EPA is removing form the exclusion, and making potentially subject to regulation under RCRA, include certain wastes from elemental phosphorous production, primary lead processing, and titanium dioxide production. The effective date for this regulation is July 23, 1990.

For technical information, contact Dan Derkics or Bob Hall, U.S. EPA, 401 M Street, S.W., Washington, D.C. 20460, (202) 382-3608 or (202) 475-8814, respectively, or call the RCRA/Superfund Hotline at (800) 424-9346, in Washington, D.C. (202) 382-3000.

FDA Takes Action on FD&C Red No. 3 for Use in Cosmetics and Externally Applied Drugs and Lakes of FD&C Red No. 3 for All Uses—FDA has announced the expiration of the provisional listing of FD&C Red No. 3 for use in coloring cosmetics and externally applied drugs and lakes of FD&C Red No. 3 for all uses (added to food, drugs, or cosmetics) because it has not been shown to be safe, and causes a carcinogenic response in rats. See 55 Federal Register 3516 (February 1, 1990).

In a related action, FDA has denied a color additive petition that requests the permanent listing of FD&C Red No. 3 as a color additive for use in cosmetics and externally applied drugs. See 55 Federal Register 3520 (February 1, 1990).

For further information on either action, contact Catherine J. Bailey, Center for Food Safety and Applied Nutrition, (HFF-334), Food and Drug Administration, 200 C Street, S.W., Washington, D.C. 20204, (202) 472-5690.

OSHA Responds to Court Remand Concerning Exposure to Asbestos, Tremolite, Anthophyllite, and Actinolite with Response to Second Group of Remand Issues—On June 20, 1986, OSHA revised regulations on occupational exposure to asbestos. See 51 Federal Register 22612. In response to a suit filed on these regulations by the AFL-CIO, the Building and Construction Trades Department (BCTD), and the Asbestos Information Association, the U.S. Court of Appeals for the District of Columbia upheld most of the challenged regulations. (*Building and Construction Trades Department v. Broch*, 838 F. 2d 1258 (D.C. Cir. 1988).) However, the Court remanded certain issues of the case to OSHA with specific deadlines for action for three categories of issues. OSHA responded to the first group of issues in the Federal Register on December 20, 1989. See 54 Federal Register 52024, and the February 1990 issue of the FSCT *Regulatory Update*.

The Court stipulated that by January 28, 1990, OSHA must resolve the second set of issues. It is this second set of issues that OSHA is responding to in the February 5, 1990 Federal Register. See 55 Federal Register 3724.

This second set of issues is described below:

1. "The possibility of further regulations governing employee smoking controls";
2. "The effectiveness levels of various respirators and OSHA's policy of requiring respirators to protect workers only at the PEL level"; and
3. "The possibility of bilingual warnings and labels for employers with significant numbers of non-English speaking employees."

To resolve the first issue, concerning smoking in the workplace, OSHA is expanding its ban on smoking in the workplace and adding training requirements covering the availability of smoking control programs. With respect to the effectiveness levels of various respirators and OSHA's policy of requiring respirators to protect workers only at the PEL level, the second issue above, OSHA is not changing its position. However, in the February Federal Register (55 Federal Register 3728) OSHA explains its current position more fully, and notes that the general respirator standard will be revised. The third issue identified above, that of bilingual warnings and labels for employers with significant numbers of non-English speaking employees, has been resolved by adding a new requirement to ensure that employees comprehend warning signs. This requirement does not imply that warning signs must be in languages other than English.

OSHA intends to resolve the third group of issues, identified in the December 20, 1989 Federal Register (see 54 Federal Register 52024), by February 27, 1990.

The effective date of these regulations is May 7, 1990. For further information on this subject, contact James Foster, OSHA, U.S. Department of Labor, Office of Public Affairs, Room N-3647, 200 Constitution Avenue, N.W., Washington, D.C. 20210, (202) 523-8152.

FDA Approves Use of Sodium Poly(isopropenylphosphonate)—In response to a petition filed by Betz Laboratories, FDA has amended food additive regulations to allow for safe use of sodium poly(isopropenylphosphonate) in paper mill boilers, used to manufacture paper and paperboard products for food-contact use. See 55 Federal Register 1672.

For more information, contact Marvin D. Mack, Center for Food Safety and Applied Nutrition, (HFF-335), Food and Drug Administration, 200 C Street, S.W., Washington, D.C. 20204 (202) 472-5690.

NPCA Requests Federal Regulation of Solvent Emissions

The National Paint and Coatings Association, Washington, D.C., has asked Congress to consider Federal legislation that would strictly regulate the permissible solvent content of architectural surface coatings on a nationwide basis. NPCA's recommendations were included in a report, "Clean Air Act Reauthorization to Control Lower Atmospheric Ozone," which was distributed to interested members of Congress and Federal agencies.

According to NPCA Executive Director J. Andrew Doyle, the proposed regulations could result in a 25% reduction in volatile organic compound (VOC) emissions from architectural coatings within five years. (VOC emissions contribute to the formation of atmospheric ozone.)

The association asked Congress for legislative language that would provide for Federal pre-emption of state authority to regulate VOC emissions from architectural surface coatings, unless the state could show that areawide emissions in the state exceeded a specified level. Federal pre-emption, NPCA contended, would provide for faster and less costly implementation. At the same time, it would relieve coatings manufacturers of the need to formulate, label, and market their products to comply with what the association termed "a patchwork of local rules."

VOC emissions are currently regulated in five states (Arizona, California, New Jersey, New York, and Texas) with regulations pending in several other states. Mr. Doyle stated that regulation of VOC emissions on a state-by-state basis "not only hampers management and marketing in the paint industry, but actually prevents a consistent, effective approach" to reducing the industry's contribution to atmospheric ozone.

The formula suggested by NPCA is based on suggested control measures developed by the California Air Resources Board, which are among the most stringent in the country. The industry also developed information on actual emission levels of various categories of paints, sales data within those categories, costs, and implementation time required—information that would have cost the government many hundreds of thousands of dollars to generate. According to J. Craig Potter, former Assistant Administrator for Air and Radiation at the U.S. Environmental Protection Agency, EPA estimates of costs to review product formulations and establish certification procedures alone are in the neighborhood of $750,000, with 15 work-months required to oversee the project.

In its report, NPCA urged that Congress include in the final version of a Clean Air Reauthorization Act an explicit, pre-emptive Federal scheme for regulating emissions from architectural surface coatings. Further Congressional action on clean air reauthorization was expected when Congress reconvened in January.

Radcure Specialties Plans New Facility in Southern U.S.

Radcure Specialties, Inc., Atlanta, GA, has announced plans to build a new plant in the southern United States for the manufacture of specialty multifunctional monomers and oligomers which are used in radiation curable applications. The location of the facility will be announced in several months, pending completion of a site location study. Construction will begin in the spring with completion scheduled for late 1991.

The new plant will supplement existing facilities in Pampa, TX and Louisville, KY, and will increase Radcure's capacity by 11 million pounds per year in the U.S.

Georgia Kaolin Purchases Lime Assets and Technology

Georgia Kaolin Company, Inc., Union, NJ, a subsidiary of Combustion Engineering, Inc., has acquired the assets and technologies of Continental Lime Ltd. and Continental Lime Inc. for the production of precipitated calcium carbonate.

The new company, to be called GK Carbonate, will provide technical paper application and acid-to-alkaline conversion services. The acquisition was completed through affiliates of Georgia Kaolin. Continental Lime Ltd. and Continental Lime Inc. were owned by Graymont Ltd., Canada, and Bricom Group Ltd., United Kingdom.

Wisconsin Paint & Coatings Association Wins 1989 Clark Award for Community Service Efforts

The Wisconsin Paint & Coatings Association (WPCA) is the recipient of the 1989 Allen W. Clark Award sponsored by the National Paint & Coatings Association (NPCA), Washington, D.C. The award is presented annually by NPCA to recognize one of its affiliates for outstanding community-improvement projects sponsored as part of the industry's nine-year-old "Picture It Painted" program.

WPCA was honored for its many community-improvment contributions to the city of Milwaukee. The association's first effort helped transform a vacant three-story building into an apartment complex for homeless women and their children. The building is owned by the local YWCA and now operates as a transitional housing facility. Over 100 volunteers including WPCA members, community youths, YWCA staff members, and the Mayor of Milwaukee completed an interior facelift and painted the interior and exterior trim in the one-day effort. Second, the association sponsored an anti-graffiti project with the city whereby teens painted over graffiti throughout the city as part of a summer youth employment program. And finally, the association undertook an anti-graffiti retail project to erase gang-type messages and paint murals over boarded up storefronts.

The winner was selected from more than 30 entries by an independent panel of judges, who rated on the basis of four criteria: benefit to the community; showcasing of paint and coatings products; local association involvement; and project publicity and exposure.

The Allen W. Clark Award is named in honor of Allen W. Clark , the founder of the *American Paint and Coatings Journal*, who launched the "Paint Up, Clean Up, Fix Up" community improvement campaign.

Battelle Forecasts $138.7 Billion in R&D Expenditures for 1990

Expenditures in calendar year 1990 for research and development (R&D) in the United States are expected to reach $138.7 billion, according to the annual Battelle forecast. This represents an increase of $6.3 billion (4.8%) over the $132.4 billion the National Science Foundation estimates actually was to be spent for R&D in 1989.

While part of the increase will be absorbed by continued inflation as it affects the R&D industry (estimated to be 2.6% for 1990), Battelle forecasts a real increase in R&D expenditures of approximately 2.1%. This is somewhat lower than the 10-year average of 3.1% in real R&D effort experienced since 1979.

Sources of Funds: Industrial funding for R&D will account for almost 49% of the total. Industrial support is forecast to be $67.7 billion, up 5.8% from 1989. Battelle sees an increase of 3.5% in federal support for R&D, with funding expected to be $64.9 billion. This is 46.8% of total expenditures for 1990. Funding by academic institutions is expected to be slightly over $4 billion (2.9% of the total), and other nonprofit organizations will provide nearly $1.9 billion (1.34%).

Over the past few years, industry and government have switched roles as the primary source of R&D support. Government was the principal funder before 1980; since then, industrial support has been dominant, except for 1986-88, and that trend is expected to continue in 1990.

Performers of Research: According to the Battelle report, industry will remain the dominant performer of R&D, as it has been since detailed records have been kept. In 1990, performance by industry is expected to rise to just over $100 billion, or 72.2% of all research performed. This compares with $15.2 billion (11%) by federal government laboratories, nearly $19.7 billion (14.2%) by academic institutions, and $3.7 billion (2.7%) by other nonprofit organizations.

Federal funding supports research performance in all four sectors. Currently, almost one-fourth goes to support R&D conducted by the government itself; slightly more than half goes to industry; one-fifth goes to colleges and universities; and the rest, about one twenty-fifth, goes to other nonprofits.

Industry absorbs almost all of its own funds, either performing the R&D itself or contracting with other industrial performers. Its contracts and grants to nonprofit organizations are a little more than one-half as large as those to colleges and universities, although this figure does not include the support of long-range "endowed research" programs in academia. The nonprofit organizations finance both themselves and the academic institutions about equally, and colleges and universities consume all of the funds they originate.

Government Support: Four government agencies dominate the federal R&D scene and account for 92.3% of total federal R&D funding authority in 1990, compared to 91.6% of funding in 1989 and 1988. They are the Department of Defense, Health and Human Services, Department of Energy, and National Aeronautics and Space Administration. The makeup of this funding will not change significantly in 1990, although some decreases may occur in support of selected health-related research programs, and some relative expansion of space-related efforts can be anticipated.

The forecast notes that increases in defense spending primarily are directed toward tactical programs and advanced technology development, as well as manufacturing technology. The R&D budget authority for strategic programs and the expansion of the technology base show small decreases. Furthermore, with changing events on a world scale and continued concern over the budget deficit, a slowing rate of growth in both defense and total government R&D, as had been forecast in earlier Battelle studies, is expected to continue.

Energy funds will continue to decline for research on basic energy supply and conservation, but not for programs in direct support of national defense and waste treatment, and for general science. Energy projects involving short-term or low-risk R&D have been largely financed by industry, and federal involvement in fossil or alternate energy sources will not be a high-priority issue. The small growth in energy research which relates to defense programs will be partially offset by the overall decrease in all other energy R&D.

The report also anticipates that R&D dollars will continue to support the biological and health sciences areas, with the most significant percentage increases in research related to AIDS.

Industrial Support: Industrial support of research is growing in fields related to electronics, communications, sensors, and advanced machinery, and in those fields most directly influenced by the need for more energy-efficient products and processes.

R&D will be heavily self-funded in manufacturing industries, where, on the average, approximately 31% of the total will be supported by the federal government. The nonmanufacturing industries do relatively little R&D, yet approximately 63.6% of support of this activity will be provided by the federal government.

As part of the forecast, Battelle also estimates industrial versus federal support for R&D performed by several broad industrial sectors. In 1990, Battelle expects the aerospace industry to retain leadership in total R&D, with performance of approximately $24.3 billion. Of that, almost 72% will be funded by the government.

The electrical machinery and communications industry will have the second largest total R&D support, with $16.1 billion. Of that, 62.4% will be industrially funded.

Other industrial sectors Battelle estimates will spend more than $1.5 billion in R&D funds include:

Chemicals—$10.8 billion, 98% of which will be industrially funded;

Machinery—$14.9 billion, 87.3% to be industrially funded;

Autos, Trucks and Parts, and Other Transportation Equipment—$10.9 billion, 86% to be industrially funded;

Professional and Scientific Instruments—$4.24 billion, 84.4% to be industrially funded;

Petroleum Products—Almost $1.9 billion, nearly all to be industrially funded; and

Food and Beverage Products—$1.5 billion, practically all of which will be industrially funded.

The report cautions against ascribing too much significance to the distribution of performance among the major industrial sectors. The classifications, based upon NSF procedures, do not take into account that many of the largest research-intensive companies have a wide spectrum of interests; thus, the figures do not truly represent the line-of-business distribution of R&D performance.

The Battelle forecast indicates that industry continues to support short-term R&D projects and is reacting to the pressure from foreign technological competition. While industrial support for R&D had been growing substantially in recent years, a shift in patterns has been developing. Earlier, increases in industrial expenditures resulted from an improved business climate, higher sales and profits, and tax policies. However, the industrial expansion has been—and will continue to be—affected by "mergermania" and a concentration on investments and actions that lead more toward short-term payoff rather than long-term survival.

While there are no data available for analyses, the forecast notes that there is—and will continue to be—an increasing emphasis on the interactions between industry and other facilities, especially those associated with the federal laboratories. State and local governments have been taking steps to enhance the environment within which industry can become more competitive; and federal laboratories are undertak-

(Continued on page 22.)

APPLICATIONS: APPLIANCES AUTO/OEM AUTO REFINISHING COIL CAN MAINTENANCE TRANSPORTATION AIRCRAFT

• BALTIMORE, MD ASHTABULA, OH STALLINGBOROUGH, UK BUNBURY, AUST •

Chemical Sales Surged to New Highs in 1989; Chemical Manufacturers Association Survey Reports

A survey conducted by the Chemical Manufacturers Association (CMA), Washington, D.C., indicates that chemical industry sales surged to new highs in 1989 based on strong demand here and abroad and profits are likely to equal or slightly exceed last year's $23.7 billion record.

Industry shipments are projected to grow 6% to $225 billion this year, the third consecutive year of record sales. Despite a recent moderation in industry indicators, an annual survey of CMA member companies points to a generally optimistic view of 1990.

Leading the way in 1989 was an explosive growth in demand for industry goods abroad. Exports are expected to soar to $37 billion, 22.4% above 1988 levels. Imports also have risen and will reach a record $21 billion, but the industry will achieve an unprecedented trade surplus of $16 billion—a $3.6 billion gain over 1988's own record performance. In addition, income from direct investments abroad plus royalties, licensing fees, rentals, and other service charges should parallel the $4 billion surplus these transactions made to the U.S. international trade accounts in 1988, raising the chemical industry's positive contributions to the nation's international accounts to around $20 billion in 1989.

In addition to strong international demand for chemicals, a modest continuing recovery in U.S. manufacturing—the largest outlet for the chemical industry—helped chemical manufacturers to record their fourth consecutive year of higher shipments. Volume increases and firmer prices both contributed to the 6% rise in the value of goods shipped.

Other findings in the annual survey indicate that capital expenditures for new plants and equipment in 1989 will reach a record $21.3 billion, 10.6% above 1988 and up from a 1982 low of $12.7 billion. The survey shows that companies expect to increase capital outlays by an additional 8-10% in 1990.

Research and development spending is estimated to have reached an all-time high of $11.7 billion in 1989, up 10.4% from last year and nearly triple the amount spent in 1979. It was also noted that R&D spending is expected to increase by 5-7% in 1990.

Chemical industry employment posted a small gain in 1989, averaging 1,094,000 jobs for the year, and the survey projected a further modest hike for 1990.

Battelle Forecasts . . .

(Continued)

ing a more serious implementation of the provisions of various technology transfer Acts.

LONG-TERM OUTLOOK: As has been noted in earlier forecasts, the rate of growth of R&D has been slowing and is expected to continue in a period of uncertainty. The combined influences of federal budget-cutting and negotiations on defense and the major political changes that have been occurring in Eastern Europe will surely alter government priorities and postures.

Industrial support will continue to be affected by conflicting and complex factors. Decreases in defense procurement, and the profits that result therefrom, are certain to affect the availability of funds for R&D support. The trade imbalance and efforts to correct it, as well as efforts to expand markets in response to shifts in government priorities, could spur expanded R&D. However, the environment that permits greater rewards for short-term financial results, rather than technical innovation, will continue to have an adverse effect on R&D investment.

The forecast for calendar year 1990 was prepared by Dr. Jules J. Duga, with assistance from Dr. Halder Fisher of Battelle. Parts of the data were drawn from many sources, including the National Science Foundation reports, the McGraw-Hill Annual Survey of Business Plans for R&D Expenditures, and other similar sources.

Dexter Packaging Products Enlarges Birmingham Plant

The Dexter Packaging Products Div., Waukegan, IL, will construct a 10,000 square foot warehouse addition at its principal U.S. manufacturing facility located in Birmingham, AL. The $550,000 project is scheduled for completion during thie spring of 1990..

The new structure, which will measure 100 x 100 feet, will enable existing warehouse space to be used for raw materials storage. It will also reduce Dexter's reliance on supplemental rented space located away from the main facility. The company is planning to build additional capacity and research laboratories at its Tournus, France site during 1990.

Dexter Packaging Products manufacturers protective interior and exterior coatings and end sealants for beer, soft drink, and food cans; coatings for closures and flexible packaging, and adhesives for construction materials and microwavable packaging.

Lilly Industrial Coatings Purchases Ram Chemicals

Lilly Industrial Coatings, Inc., Indianapolis, IN, has purchased Ram Chemicals from Whittaker Corp., and in a separate transaction, Lilly acquired Foura Enterprises of Elkhart, IN.

The new company, Lilly-Ram Industries, will comprise Ram Chemicals with plants in Gardena, CA and West Alexandria, OH operating as the Ram Division, Foura Enterprises as the Foura Division, and the Thomson Company, a division of Ram Chemicals, will operate as the Thomson Division of Lilly-Ram Industries.

In addition, the Erickson Industries Division of Lilly Industrial Coatings of Davie, FL was merged into Lilly-Ram Industries and will operate as the Erickson Division of the firm.

Lilly-Ram Industries is a manufacturer of polyester gel coats, pigment dispersions, mold releases, bonding putties, and specialty chemicals.

Akzo to Establish Joint Venture in Hungary

Akzo, a Dutch-based international chemical company, has signed an agreement in principle with Hungary's Tiszai Vejyi Kombinat (TVK) for a joint venture in coatings in Leninvaros, Hungary. The project, in which Akzo will hold a 51% interest, is scheduled to begin activities by mid-1990.

The joint venture will be operated under the name of Akzo/TVK rt. It will supply the Hungarian market with a full range of coatings and finishes including resins. Coatings for industrial applications and for the automotive industry will occupy a prominent position in this product range. Akzo/TVK also will serve export markets, especially those in Eastern Europe.

This venture has been established as a result of the privatization policy adopted by the Hungarian government.

Employing over 70,000 people worldwide, Akzo has operations in over 50 countries where it manufactures and markets chemicals, fibers, coatings, and health care products.

TVK is a chemical company which specializes in high-performance plastics and fertilizers. It has over 7,000 people in employment.

Here's the Answer –
The Freedom Fighters...
Foamaster®
Defoamers
Protect coatings, latex adhesives and inks from the evils of foam!
Call on the Henkel Freedom Fighters to solve your foam problems. They will put the versatile Foamaster Defoamers to work with their full line of dispersable and non-dispersable products that conquer foam.
Foamaster
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helps formulators relax, making their job calm, serene and "bubble-free"...
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GE Plastics Opens New Concepts House

GE Plastics, Pittsfield, MA, recently opened its 3,000 square-foot concept house which showcases design and building methods, processes, and materials of the future.

The living environments concept house, located about one-half mile from GE's world headquarters in Pittsfield, will serve as a laboratory to explore the feasibility of widespread use of engineering polymers and systemized manufacturing in construction markets. Most of the company's polymers are used in the project.

The project has over 50 partner companies including building and construction suppliers, component manufacturers, and academia. The house consists of two main floors and is furnished to reflect a modern lifestyle and daily living environment of a family of four.

Approximately 30% of the house consists of plastic. In all, more than 45,000 pounds of plastics are used in the house in such areas as the roof, windows, siding, plumbing systems, foundation, and electrical and mechanical systems. The remainder of the house is made of traditional materials.

For more information, contact GE Plastics, Inquiry Handling Service, PR #182-89, One Plastics Ave., Pittsfield, MA 01201.

Waste Disposal Crackdown Affects Australian Companies

The New South Wales Parliament prosecuted Berger Paint, an Australian paint manufacturer, for using an unlicensed transporter to dispose of paint waste in a landfill depot in Mulgoa, New South Wales.

The prosecution came as part of the crackdown on waste disposal. Under existing laws, the company is liable for a $1,000 fine.

Also, Taubmans Paints will be asked tc explain why it cannot account for 120,000 liters of waste paint.

The New South Wales environmental minister told Parliament that there were "serious inadequacies" in the waste disposal practices of a number of Australian paint companies.

The crackdown follows the discovery of two paint spills in North Head last year. The slicks were caused when paint was dumped through the sewer system. The environmental minister said that no link has been found with any company.

Dexter Packaging Consolidates European Operations

The Packaging Products Division of Dexter Corporation, Waukegan, IL, has restructured its European and United Kingdom staffs into a single operating unit. The new organization, called Packaging Europe, is headquartered at Brussels, Belgium.

Vice President and General Manager Eddy van Hecke heads the new Packaging Europe Division. He was promoted from Business Manager of the former European group, Dexter Midland. John B. Askew, former Business Director of the United Kingdom Unit, has been named Director—Sales and Marketing.

The Dexter Packaging manufacturing plants which supply the United Kingdom, continental Europe, and the Middle East are located in Deeside, Wales, and Tournus, France. The Tournus facility is slated to undergo major changes this year which includes construction of a new paint plant and resin reactor, both of which are scheduled to be operational in 1991, and a new research laboratory. Research at the new lab will be keyed to specific priorities of the United Kingdom, Europe, and the Middle East.

Mexican Coatings Producer Purchased by BASF Corp.

BASF Corporation, St. Louis, MO, has announced the acquisition of Aurolin, a Mexican coatings manufacturer. Aurolin produces automotive finishes and container and industrial coatings.

Aurolin, founded in 1934, is one of the largest coatings manufacturers in Mexico with total production capacity of about 17,000 tons per year. The operation has four production sites.

During the past fiscal year, Aurolin had more than 400 employees and sales of approximately $22 million. BASF plans to retain the entire Aurolin management and technical team.

Aurolin and BASF Lacke + Farben AG, Federal Republic of Germany, have had a license agreement for automotive finishes for decades.

Eastman Chemical Company Formed Effective Jan. 1; Eastman Chemicals Division Units Part of New Co.

The Eastman Chemicals Division, Kingsport, TN, of Eastman Kodak Company became the Eastman Chemical Company, effective January 1.

All the current manufacturing and marketing units of the Eastman Chemicals Division continue to be part of the new Eastman Chemical Company. These units include Arkansas Eastman Company, Batesville, AR; Carolina Eastman Company, Columbia, SC; Texas Eastman Company, Longview, TX; and Tennessee Eastman Company, Kingsport.

Also continuing as Eastman Chemical Company units are the Kodak marketing subsidiaries, Eastman Chemical Products, Inc.; Eastman Chemical International Ltd.; Eastman Chemical International A.G.; and other related marketing subsidiaries. Holston Defense Corporation, Ectona Fibres Ltd., Distillation Products Industries, and all Eastman Chemicals Division business units also are units of Eastman Chemical Company.

No changes in titles or responsibilities of personnel in Eastman Chemicals Division units were made as result of the change to Eastman Chemical Company.

Hüls America to Construct New Plant in Theodore, AL

Hüls America, Inc., Piscataway, NJ, is planning to build a new facility at the company's 160-acre site in Theodore, AL, which will provide a U.S. source for isophorone diamine, isophorone diisocyanate, and derivatives.

Engineering on the project is underway and the plan start-up is scheduled for the second half of 1991.

Kerr-McGee Chemical Corp. Plans New TiO_2 Facility

Kerr-McGee Chemical Corp., Oklahoma City, OK, has announced plans for a new 60,000 ton-per-year titanium dioxide production facility. The company currently produces 106,000 tons per year of this industrial chemical that is used in the manufacture of paint, paper, plastic, rubber, and ink.

Preliminary engineering and design for the facility will begin in the first quarter of 1990. State-of-the-art safety and environmental control, energy conservation, and process technology will be incorporated in the facility's design and engineering. Site evaluation is underway for the plant, which is scheduled for initial production in late 1992 early 1993.

The new production facility is projected to create 450 jobs during construction and long-term plant operation employment for 220 people.

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Performance Capabilities of Intermediate Film Build Electrocoat vs High Film Build Electrocoat

John A. Gilbert
BASF Corporation*

The use of a new 0.8 - 1.0 mil cathodic electrodeposition primer can provide automotive quality appearance and corrosion protection on metal surfaces. "High build," or 1.2 - 1.4 mil film build materials are popular in many electrocoat applications today due to their ability to provide smooth, corrosion resistant films without the use of a primer surfacer. Results of salt spray, scab corrosion, and chip corrosion experiments indicate that equivalent protection can be provided using a new "intermediate build," or 0.8-1.0 mil film build electrocoat primer. When substituted for a high build primer, this intermediate build primer represents a substantial reduction in material usage (and therefore cost) to the end user.

A comparison of the abilities of the new intermediate film build electrocoat primer and some standard high build electrocoat primers to fill metal finishing marks on test panels and on production auto parts will be shown. Ra, Rz, and R3z surface parameter measurements for the two types of electrocoat primers will be described. In addition, for each surface parameter R, the "filling factor," or $(R_{substrate}-R_{paint})/(R_{substrate})$ will be shown for each type of electrocoat paint. The data show that the new intermediate film build electrocoat primer can provide filling properties equal to or better than a high build electrocoat primer.

INTRODUCTION

There are a wide variety of cathodic electrodeposition paints used in the automotive industry today as corrosion resistant primers. These materials are particularly useful because of their ability to provide a smooth, chip resistant, overcoatable film on a non-uniform metal substrate.[1]

The choice of what cathodic electrodeposition primer to use in a given production facility is often influenced by factors such as paint usage costs, whether or not a "primer surfacer" layer is used between the electrocoat and the topcoat, and the quality and uniformity of the metal to be coated. Although the original automotive cathodic electrodeposition primers were "low build," or 0.6 - 0.8 mil film build materials, today the end user can also choose to use an "intermediate film build" (0.8 - 1.0) or "high film build" (1.1 - 1.4 mil)

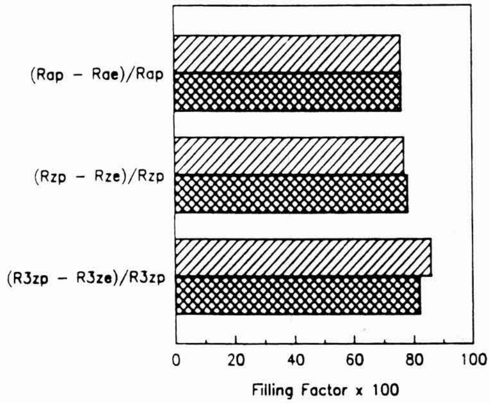

Figure 1—Average filling factors for the Ra, Rz, and R3z surface profile parameters for the high film build and the intermediate film build primer. ▨: intermediate build product; ▩: high build product. Note: e = electrocoated surface and p = phosphated surface (before electrocoating)

Presented at the 67th Annual Meeting of the Federation of Societies for Coatings Technology, in New Orleans, LA, on November 8, 1989.
*Coatings and Colorants Division, P.O. Box 5009, Southfield, MI 48086-5009.

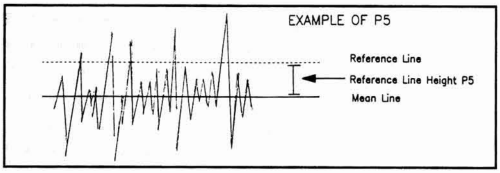

Figure 2—An example of "P5" or the height of a reference line drawn above the mean line which is crossed by only five peaks

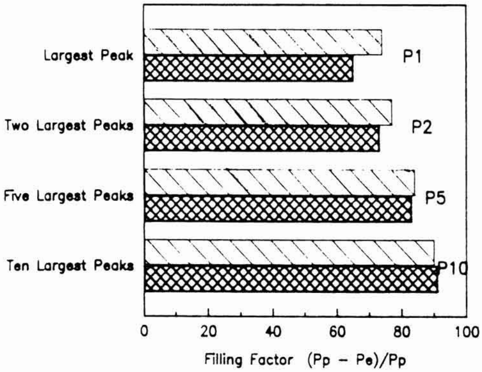

Figure 3—Filling factors for reference line heights which give 1, 2, 5, and 10 peaks above the reference line. [hatched]: intermediate build product; [cross-hatched]: high build product. Pp = reference line height on substrate and Pe = reference line height on electrocoat

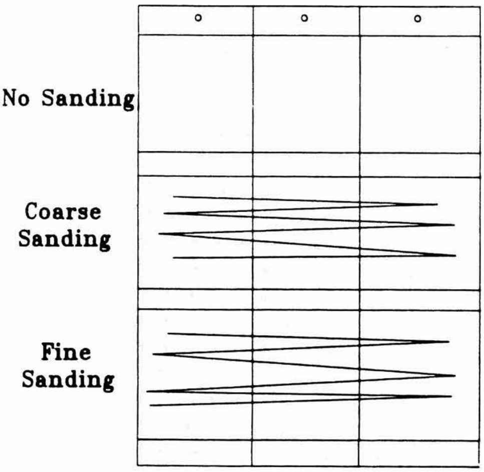

Figure 4—36-in. x 36-in. production metal panels for filling study. Samples of production metal were sanded and cut into 12-in. square panels. The panels were phosphated and electrocoated

electrocoat. Obviously, the thicker film electrocoats will result in higher paint usage, and thus greater material cost. Therefore, it is critical that the cost conscious user define exactly what advantages, if any, are gained by using a high film build electrocoat system.

A common, yet unsubstantiated belief among formulators and users of electrocoat is that high film build electrodeposition primers have better "metal filling" properties. Metal filling refers to the ability of a paint to cover or hide the sanding and filing marks made in the finishing process (as well as defects which were originally present in the metal).

This paper will examine the metal filling capabilities of a variety of electrocoat products. Three types of experiments aimed at quantifying this property were carried out. They are: (1) a comparison of the ability of a high film build and an intermediate film build electrocoat product to cover metal finish marks on deck lids from an automotive production facility; (2) a comparison of the ability of a high film build and a low film build primer to cover metal finish marks on three types of production metals from a truck assembly plant; and (3) a comparison of the abilities of six electrocoat products to cover single "grooves" or "scribes" made in lab panels using a mechanical scribing instrument.

The results suggest that the metal filling capability of an electrocoat primer is not necessarily a property of the inherent film build of the primer. The metal filling data, combined with the physical property data, indicate that the best, most cost efficient choice is an intermediate film build electrocoat primer.

RESULTS AND DISCUSSION

Metal Filling on Production Deck Lids

In the first experiment, two decks lids were obtained from an automotive production facility. Both deck lids had similar metal finish marks covering about 30% of the surface. One was coated with a high build gray electrocoat primer. The other was coated with a new intermediate film build electrocoat primer. The parts were coated under identical conditions from a 2000 gallon electrocoat tank in the BASF Applications Research Center in Southfield, MI.

The deck lids were analyzed before and after electrocoating using a Surtronic instrument equipped with a "parameter module." Four of the sanded areas on each of the deck lids were examined. The simplest method of analyzing the surfaces is the direct comparison of surface profile parameters such as Ra, Rz, and R3z.[2,*] Of course, a major problem with this comparative approach is that the production substrates are assumed to be of equal roughness. A more useful analysis of the ability of electrocoat primers to fill sanded metal can be carried out by defining a "filling factor," representing the percentage of the sand marks filled in by the paint [equation (1)].

$$\text{Filling Factor} = \frac{R(\text{uncoated}) - R(\text{coated})}{R(\text{uncoated})} \qquad (1)$$

*Note the definitions of the commonly used parameters Ra, Rz, and R3z: Ra is the arithmetic mean of the absolute values of all of the departures of the roughness profile from the mean line. Rz, as measured on a Taylor Hobson profilometer, is the average height difference between the five highest peaks and the five lowest valleys; Rz, as measured on a Perthometer, is calculated differently. The roughness profile is divided into five sample lengths. The mean of the highest peak to valley in each sample lengths is calculated. R3z, on both the Perthometer and the Taylor Hobson profilometer, is measured as the average of the third highest peak to valley in each of the five sample lengths.

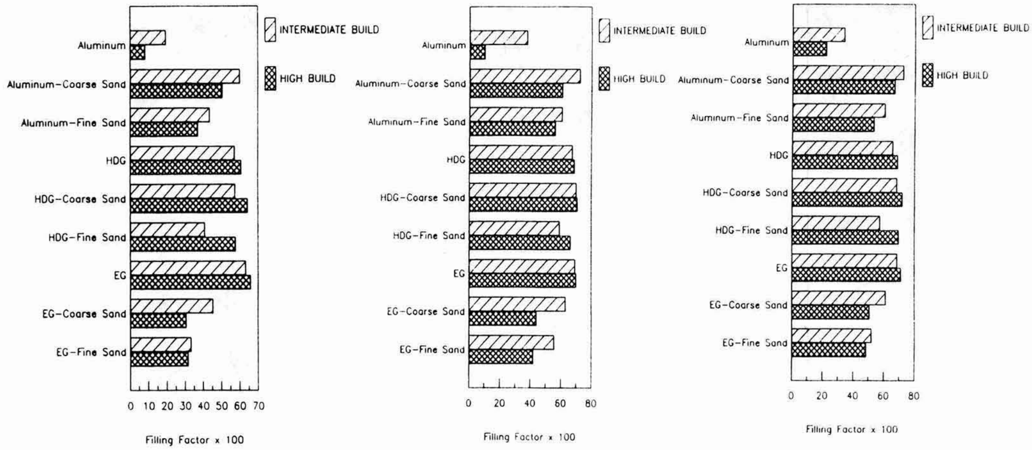

Figure 5—Filling factors for the Ra, Rz, and R3z surface profile parameters on unsanded, coarse sanded, and fine sanded aluminum, hot dipped galvanized steel, and electrogalvanized steel. A: average filling factors for Ra; B: average filling factors for Rz; and C: average filling factors for R3z

A higher filling factor represents a greater ability of the coating to "fill in" grooves left by metal files or sandpaper during the finishing process. For example, if the surface of the coating were "perfectly smooth," then R(coated) would be zero and the filling factor would be 1.

Figure 1 compares the average filling factors for the Ra, Rz, and R3z surface parameters for the high build and the intermediate build electrocoat products. Each factor is an average from four different areas of the deck lid. From each area, three to five surface profile readings of Ra, Rz, and R3z were taken. The data indicate that the intermediate build primer and the high build primer are very similar in their abilities to cover or fill the metal finish marks.

Another way to analyze surface profiles is to measure reference line heights. A reference line height represents the minimum height from the mean line of the surface profile at which a line can be drawn that is crossed by only a given number of peaks. An example of a reference line at a height crossed by five peaks, or "P5" is illustrated in *Figure* 2.

A filling factor can be defined for the peak count/reference line height data similar to the previously defined filling factor. For instance, the filling factor for the reference line height which gives a peak count of five is shown in equation (2):

$$\text{Filling Factor} = \frac{\text{P5(uncoated)} - \text{P5(coated)}}{\text{P5(uncoated)}} \qquad (2)$$

Figure 3 shows the filling factors for reference line heights P1, P2, P5, and P10 for the intermediate film build and the high film build electrocoat primers. Again, it is apparent that the abilities of the two primers to fill the metal finish marks are very similar.

Metal Filling on Sanded Production Metals

In an attempt to quantify further the similar behavior of high and intermediate film build electrocoat, the following experiment was set up. Three types of production metal (aluminum, hot dip galvanized steel, and electrogalvanized steel) were obtained from a truck assembly plant. The metal was received as large 36-in. square panels. The panels were divided into nine sections as shown in *Figure* 4.

The top three sections were left unfinished. The center sections were sanded with an 80 grit sandpaper, and the bottom sections were sanded with 120 grit sandpaper using a rotary sander (as used in many production facilities). The panels were then cut into nine 12-in. square sections. From each 36-in. square panel, one unsanded, one 80 grit sanded, and one 120 grit sanded section were left uncoated. The remaining six sections were phosphated and coated with either the high film build or the intermediate film build electrocoat primers. For each type of metal, five of the 36-in. square panels were used. Thus, for each electrocoat/metal/sandpaper combination, five repetitions were done.

Surface profiles were run using a Perthometer S6P instrument on at least four different areas of each panel before and after electrocoating. From each area, four surface profiles were measured. This gives 20 (4 areas x 5 panels) readings of surface profile for every electrocoat/metal/sandpaper combination. *Figures* 5A, B, and C show the average filling factors for the Ra, Rz, and R3z surface profile parameters for the two electrocoat systems. As shown in the graphs, the ex-

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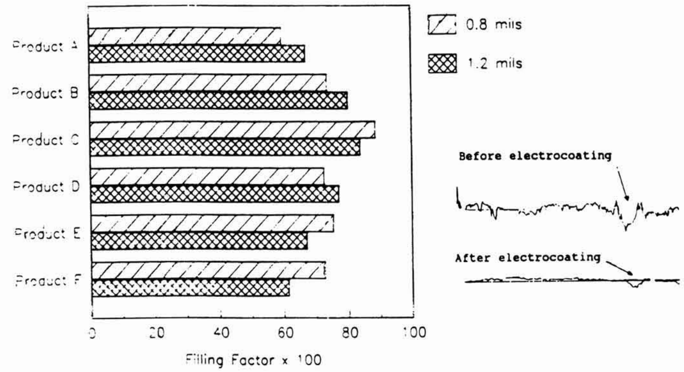

Figure 6—Filling factors calculated from surface profiles of scribe cross section taken before and after electrocoating. Inset: typical before and after profile of a scribe cross section

periment confirms the previous finding: the high build electrocoat primer has no advantage in metal filling over the intermediate build electrocoat primer. In fact, for each of the parameters Ra, Rz, and R3z, the intermediate film build primer had a higher filling factor in five out of the nine metal/sanding combinations.

Filling of Scribes on Lab Panels

The third type of experiment which was carried out to define the metal filling capabilities of intermediate film build electrocoat was performed on laboratory panels. Phosphated steel panels were "grooved" or "scribed" using a Balanced Beam Mar Tester (Pacific Instruments model SG-8101) with a 10 kg weight load. Sixty panels were scribed with two eight inch scribes. The panels were used to test the metal filling capabilities of six different electrocoat systems:

(a) Low build black cathodic electrocoat
(b) Intermediate film build gray electrocoat
(c) Low VOC intermediate film build gray electrocoat
(d) High film build gray electrocoat
(e) Low VOC high film build gray electrocoat
(f) Low VOC high film build gray electrocoat.

Products B and D were those used in the previous studies described in this paper. The others were included in this experiment to obtain information about a broader variety of products. In order to control as many variables as possible, each electrocoat was tested at 0.8 and 1.2 mils film build. Thus, the behavior of the intermediate build systems at a higher than normal film build and the behavior of the high build systems at a lower than normal film build was included.

Each electrocoat was used to coat five of the scribed panels at 0.8 mils and five at 1.2 mils film build. A Surtronic P3 profilometer (Taylor Hobson) interfaced to a computer was used to measure the surface profile in a path perpendicular to the scribes at three different places along the scribe lengths before and after electrocoating. Hard copies of each surface profile were printed out. The area of each scribe cross section at the three specified places along the scribe was estimated by triangulating the area and calculating (base x height)/2. For each electrocoat at each film build, 30 readings (5 panels x 2 scribe lines x 3 readings) of the surface profile were obtained. The inset to *Figure* 6 shows a typical "before" and "after" surface profile measurement.

Again, a filling factor for each individual scribe cross section was calculated [equation (3)].

$$\text{Filling Factor} = \frac{\text{Area (uncoated)} - \text{Area (coated)}}{\text{Area (uncoated)}} \quad (3)$$

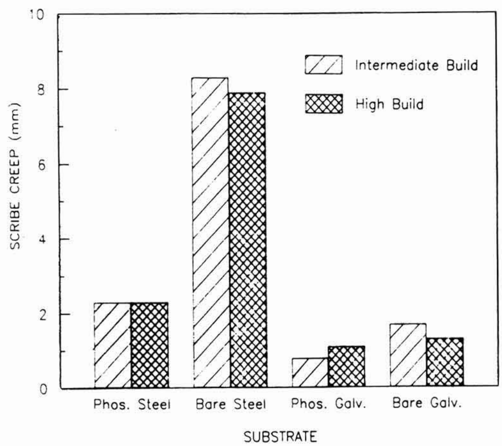

Figure 7—Scribe creep results for the 20 cycle scab test on four substrates

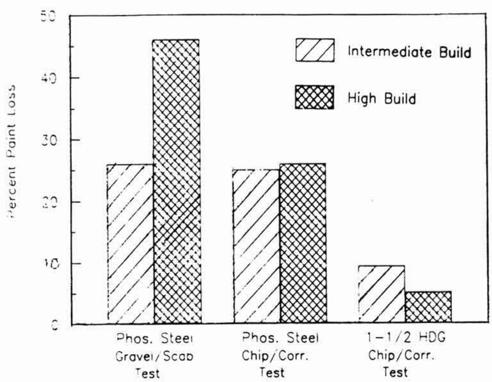

Figure 8 — Percent paint loss results from the gravelometer/20 cycle scab test and the chipping corrosion test

Figure 6 shows the filling data obtained for all of the electrocoat products.

The data on the lab panels substantiates the experiments done on the production car parts and the production metal panels. The intermediate film build electrodeposition primers can provide metal filling properties which are as good as or better than those provided by the high film build primers.

Corrosion Resistance of High and Intermediate Build Electrocoat Primers

One of the main purposes of electrocoat primers is to inhibit corrosion of the metal substrate. A primer that provides good metal filling but poor corrosion resistance would not be useful for automotive applications. *Figure* 7 shows the performance of the intermediate film build primer vs the high build primer in the 20 cycle scab test.[3] *Figure* 8 shows the performance of the primers in the gravelometer/scab test[4] and the chipping corrosion test.[5]

These results indicate that an intermediate film build electrocoat system can provide the corrosion resistance and chipping corrosion resistance normally associated with high film build electrocoat systems.

SUMMARY

Intermediate film build electrodeposition primers were shown to have metal filling properties equivalent to or better than high film build electrodeposition primers. When viewed in combination with the corrosion properties, it is clear that intermediate film build electrocoat systems can provide the advantages of high film build electrocoat systems with a significant reduction in material usage.

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(2) Dagnall, H., "Exploring Surface Texture," Rank Taylor Hobson, Leicester, England, 1988.
(3) Test Method 54-26. General Motors Corp., Fisher Body Division, Material Development and Testing Laboratory, 1982.
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Development of Test Methods For Assessing Encapsulants for Friable Asbestos Insulation Products

Stephen K. Brown
*CSIRO Division of Building, Construction, and Engineering**

Methods for assessing asbestos encapsulants have been developed according to the effect on the strength, fire performance, and erosion resistance properties of synthetic mineral fiber insulations. The performances of a range of commercial encapsulants have been assessed and criteria proposed to ensure encapsulated insulations resist damage during general conditions of building usage.

INTRODUCTION

Asbestos insulation products have been widely used as fire, thermal, and acoustic insulations in buildings, ships, and industrial plants for many decades. This practice has now ceased due to the ill-health effects caused by inhalation of airborne asbestos when working with these products. Current concern is focused on the potential of installed products to release fiber, since many are low in strength and friable, easily breaking down to dust under light pressure. This concern is heightened by the wide occurrence of the products and the magnitude of the cost of remedial action, e.g., the U.S. Environmental Protection Agency (EPA) has estimated that the cost to abate (remove or encapsulate) friable asbestos products in 733,000 public and commercial buildings would be $51,000 million.[1]

In response to this situation, a wide range of commercial "asbestos encapsulants" has become available, but whether these prevent damage and fiber release and how they affect essential insulation properties are largely unknown. The U.S. EPA sponsored a project at Battelle Columbus Laboratories[2] to evaluate commercial products and to determine methods for evaluating their effectiveness. Also, the American Society for Testing and Materials (ASTM) was called on to develop a standard specification for asbestos encapsulants[3] which resulted in Committee E6 Proposal P 189 "Proposed Specification for Encapsulants for Friable Asbestos-Containing Building Materials."[4]

In Australia, the National Occupational Health and Safety Commission (NOHSC) has recommended a detailed asbestos management strategy, with encapsulation being one possible control method.[5] The NOHSC also has provided funding support to CSIRO to evaluate test methods for assessing encapsulants. This report describes the results of the evaluation.

EXPERIMENTAL

The experimental program was designed to allow for the wide variability inherent in the properties of insulations, the types and amounts of encapsulants applied, and the range of available test methods.

Sprayed Insulation Substrates

Since the spraying of asbestos insulation is a prohibited process in Australia and many other countries, three different (asbestos-free) sprayed insulations developed by manufacturers to replace asbestos insulations were used as substrates for encapsulants, as summarized in *Table* 1. These were based on rockwool-cement, rockwool-ceramic fiber-cement, and vermiculite-plaster (with a small fraction of cellulose fiber) and were selected since they exhibited similar densities to past asbestos-based products. The latter two complied with the requirements of ASTM P 189. Also, in a separate study, the rockwool-

*P.O. Box 56, Highett, 3190, Australia.

Table 1—Sprayed Insulation Substrates

Description	Composition	Density (kg/m³) Nominal	Measured[a]
Rockwool-cement	rockwool/fiberglass/ cement/plaster	240-280	230±30
Rockwool-ceramic fiber-cement	rockwool/alumina silicate fiber/ inorganic binder	290-350	210±30
Vermiculite-plaster	cellulose fiber/ vermiculite/ plaster	275-350	300±20

(a) Average ± standard deviation for all specimens.

cement insulation was found to exhibit similar water penetration behavior to amosite-based insulations prepared in the laboratory.[6]

All insulations were applied to test specimens by commercial contractors using typical spray equipment. Two sizes of specimen design were used. "Small" specimens were fabricated from 600 × 450 mm sheets of 7.5 mm thick cellulose-cement sheeting with a 40 mm high steel C-section edging. "Large" specimens consisted of 770 × 770 mm panels of 1 mm thick, rigidly braced galvanized steel decking, also with a 40 mm high steel C-section edging. Insulations were sprayed level to the C-section edging to provide a thickness of 40 mm for both specimen sizes. Specimens were dried under ambient conditions for several weeks and were conditioned for five days at 23°C and 50% RH before testing.

Encapsulants

Fourteen encapsulants were selected for investigation, as summarized in *Table* 2. Most were commercial products designed for asbestos encapsulation. Others were domestic coatings and low-cost resins considered to be potentially useful in this application. All but one were water-based, and bridging encapsulants were pigmented (white) while penetrants were not. They were applied by airless spray to test specimens held overhead with successive applications at right angles to the previous. The application rate was either according to manufacturers' recommendations, generally in two coats, or for some penetrating encapsulants, by a one-coat "flood spraying" technique,[7] whereby the encapsulant was applied until its absorption stopped or became markedly slow.

Test Methods

The test methods evaluated included several based on ASTM P 189 methods and additional methods considered necessary or appropriate to the Australian situation. Methods used were as follows:

Depth of Penetration: Determined after sampling a 20 mm diameter plug of insulation across its full thickness using a hand-held cork boring tool. The depth to which insulation formed a bound, nonfriable mass was measured by: manually handling the plug in a dry condition; manually handling the plug after soaking it in water for four hours as specified in P189; or measuring the length of plug intact after tumbling for 30 min in a small sand mill designed to remove char from combusted plastics (Arapahoe Chemicals, Colorado).

Cohesive Strength: Carried out according to ASTM E 736-80, "Standard Test Methods for Cohesion/Adhesion of Sprayed Fire Resistive Materials Applied to Structural Members," using small specimens divided into four 280 × 205 mm test areas. A metal dish 83 mm in diameter and attached to a hook was bonded to the center of each test area and weights were hung from the hook until failure occurred.

Impact Resistance: Using a Gardner Variable Impact Tester similar to that described in ASTM D 4226-85, "Standard Test Methods for Impact Resistance of Rigid Poly (Vinyl Chloride) (PVC) Building Products," but using a 7.5 mm radius impactor with the support anvil removed. Specific failure criteria were employed—cracking or puncture of encapsulant or dislodgment of any material at the impact site. Also, an up-and-down method of load selection was employed with the construction of a running probability curve by computer analysis of results to determine loading levels to best define low (10%) failure rates. For each measurement, loads were applied to the center of 40 randomly selected 70 mm square grids across on the surface of each small specimen.

Table 2—Composition and Recommended Application Details for Encapsulants Investigated

Encapsulant System	Binder Resin	Recommended Application Details: Dilution[a] (% v/v)	Solids Content[b] (% w/w)	Applic. Rate[c] (L/m²)
Bridging				
B1	vinyl acrylic copolymer	17	58	1.3
B2	vinyl alcohol/vinyl chloride terpolymer	20	55	3.0
B3	vinyl chloride acrylic copolymer	0	63	2.0
B4	acrylic—first coat	33	36	3.7
	—second coat	0	54	1.2
B5	alkyd—first coat	20	65	1.2
	acrylic—second coat	0	54	0.6
B6	cellulose fiber/ sodium silicate	—	—	—
Penetrating				
P1	sodium silicate	0	31	18[d]
P2	sodium silicate	0	23	1.7
P3	sodium silicate	0	29	1.7
P4	acrylic latex	50	20/18[d]	
P5	styrenated acrylic	50	24	18[d]
P6	styrene acrylic acid copolymer	50	17	18[d]
P7	acrylic copolymer	0	12	8.0
P8	vinyl acrylic copolymer	55	31	2.6

(a) Dilution (%) = 100 × volume of diluent added/volume of diluted encapsulant.
(b) Solids content as applied (i.e., after dilution).
(c) Volume (L) of diluted encapsulant applied per square meter of sprayed insulation (40 mm thick).
(d) Application rate required to saturate full 40 mm thickness of sprayed insulation.

AIR EROSION: An air erosion chamber was constructed to meet specifications of ASTM E 859-82, "Standard Test Method for Air Erosion of Sprayed Fire Resistive Materials Applied to Structural Members," except that a chamber opening of 0.48 m^2 was used to accommodate large specimens. The chamber supplied a uniform tangential airstream at 6 m/sec across the specimen surface for 48 hr and dislodged insulation was captured in a polypropylene mesh filter (200 μm opening size) at the chamber outlet.

FIRE PERFORMANCE: In Australia, the fire performance of building materials is assessed according to Australian Standard AS 1530.3-1982, "Test for Early Fire Hazard Properties of Materials." In this test, a small specimen held vertically is exposed to a source of increasing radiant energy in the presence of a pilot flame until ignition occurs. Four fire performance indexes are obtained from the test output: ignition (0-20), heat evolution (0-10), flame spread (0-10), and smoke development (0-10), with the higher indexes indicating higher hazard and Australian regulations usually specifying limits for the last two. Average results were determined from three specimens of each encapsulated insulation.

FIRE RESISTANCE. This was assessed using a "model" floor/ceiling furnace with a 540 mm square opening on which large specimens were tested. Test duration was three hours, during which the furnace temperature was controlled to Australian Standard AS 1530.4-1985, "Fire Resistance Tests on Elements of Building Construction." Specimens were inspected throughout testing for loss of insulation material, integrity, and temperature transfer to the steel deck. The latter was measured at five locations at which 1.2 mm gauge chromel-alumel thermocouples were spot-welded to the deck and covered with 30 mm square pads of a 13 mm thick ceramic fiber blanket (density 96 kg/m^3).

Table 4—Cohesive Strengths of Encapsulated Insulations

Encapsulant[a]	Cohesive Strength (kPa)[b] Rockwool Cement	Rockwool-Ceramic Fiber-Cement	Vermiculite-Plaster
None	4.2±2.7	3.5±1.0	25.3±1.1
B1	7.0±1.5	4.0±1.7[c]	—
B2	18.2±3.6[c]	6.3±1.1[c]	5.9±1.1
B3	10.1±1.7[c]	4.9±1.0[c]	16.7±3.4
B4	17.1±26.1	12.6±2.3[c]	>47.2
B5	7.1±3.6	11.6±1.0[c]	15.1±1.7
B6	29.5±18.0	16.9±22.8	16.1±12.3
P1	>47.2	>47.2	>47.2
P4	>47.2	—	—
P5	>47.2	—	—
P6	18.2±3.9	—	—
P7	17.5±3.3	16.7±5.5	—
P8	5.0±1.2	3.2±0.9	—

(a) Refer to *Table* 2.
(b) Average ± standard deviation from four test results.
(c) Strength determined using area of adhered disk when flexible membrane peeled from insulation.

Table 3—Penetration Results for Encapsulated Sprayed Insulations

Insulation	Encapsulant[a]	Depth Penetrated (mm)	Bound Depth (mm) Dry	Wet	Milled
Rockwool-cement	B1	7	3	—	6
	B4	10	10	10	10
	B5	3	3	3	5
	P1	40	25	35	40
	P2	15	15	10	15
	P3	40	22	25	30
	P4	35	30	38	15
	P5	30	30	25	20
	P6	32	30	32	14
	P7	40	30	22	25
	P8	17	7	—	26
Rockwool-ceramic fiber-cement	B1	3	3	—	5
	B4	7	7	10	8
	B5	4	4	4	5
	P1	35	28	15	9
	P2	30	15	30	20
	P3	20	10	5	10
	P7	25	4	35	9
	P8	30	5	—	5
Vermiculite-plaster	B4	4	4	10	5
	B5	2	2	2	4
	P1	12	10	10	8
	P2	8	8	8	10
	P3	10	9	7	10

(a) Refer to *Table* 2.

RESULTS AND DISCUSSION

Depth of Penetration

It was observed that many penetrating encapsulants did not firmly bind insulation over the full depth to which they penetrated. Generally, binding became progressively weaker with depth into the insulation until it became indistinguishable from that of the original insulation. ASTM P 189 proposed a method to determine "bound" depth by soaking a plug from the full thickness of insulation in water before measuring the depth to which it remained "still intact, that is, held together by encapsulant." This method of measurement and others where the plugs were handled manually were found to be very subjective because of the progression in binding with depth. On the other hand, mill treatment appeared to remove all loose insulation, leaving a cohesive plug of bound insulation, resistant to breakdown by further milling and the length of which was easily measured. The mill method was considered to yield a more reliable and objective measure of bound depth than other methods (*Table* 3) and is the preferred procedure.

ASTM P 189 required the "intact depth" of insulation to be 10 mm or more for encapsulants to be classified as penetrating. *Table* 3 shows that some encapsulants marketed as penetrants failed to provide bound depths (milled) to this level, specifically P7 and P8 applied to rockwool-ceramic fiber-cement. Both encapsulants penetrated deep into the insulation but exhibited weak binding due to low solids content (P7) or low application rate (P8). However, most penetrants achieved 10 mm bound depth while most bridging encapsulants did not, indicating that this test discriminates between the two types of behavior.

Cohesive Strength

Cohesive strength results are summarized in *Table* 4. Encapsulants usually enhanced the cohesive strengths of the fibrous insulations, but decreased those of the virtually nonfibrous vermiculite-plaster. This may have resulted from reinforcement of encapsulants by the fibrous components of the former insulations. ASTM P 189 required that insulation substrates exhibit cohesive strengths above 2.4 kPa and that encapsulation not reduce cohesive strengths. While all insulation/encapsulants exceed this strength requirement, the latter appears unreasonable for insulations such as vermiculite-plaster.

Table 5—Impact Energies for Encapsulated Insulations

Insulation	Encapsulant[a]	Impact Energy (J)[b] I_{50}	SD	I_{10}	Failure Mode[c]
Rockwool-cement	B1	0.49	0.73	n.d.[d]	1
	B2	0.66	0.15	0.47	1
	B3	3.52	2.93	n.d	1
	B3	3.44	1.30	1.78	1
	B4	0.51	0.26	0.17	1
	B5	0.37	0.32	n.d.	1
	B5	0.25	0.22	n.d.	1
	B6	4.58	0.84	3.50	2,3
	P1	0.29	0.16	0.08	3
	P2	0.49	0.10	0.36	3
	P3	0.24	0.15	0.05	3
	P4	24.5	8.7	13.3	3
	P5	36.4	26.9	2.00	3
	P6	2.63	0.28	2.27	3
	P7	4.41	1.26	2.80	2,3
	P8	0.09	0.10	n.d.	2
Rockwool-ceramic fiber-cement	B1	0.68	0.50	0.03	1
	B2	0.62	0.18	0.39	1
	B3	3.09	1.00	1.80	1
	B4	0.53	0.39	0.04	1
	B5	0.54	0.06	0.46	1
	B6	5.15	1.84	2.80	2,3
	P1	0.25	0.13	0.09	3
	P2	0.16	0.11	0.02	3
	P3	0.23	0.24	n.d.	3
	P7	0.82	0.61	0.03	2,3
	P8	0.62	0.04	0.57	2,3
Vermiculite-cement	B2	0.24	0.05	0.18	1
	B3	4.25	0.85	3.17	1
	B4	0.32	0.05	0.25	1
	B5	0.09	0.04	0.03	1
	B6	3.83	0.37	3.36	2,3

(a) Refer to *Table* 2.
(b) I_{50} = impact energy leading to 50% probability of failure.
SD = standard deviation for impact energy/failure probability distribution.
I_{10} = impact energy leading to 10% probability of failure.
(c) 1 = cracking or puncturing of bridging encapsulant at or near impact site.
2 = cracking or puncture of encapsulated insulation sufficient to expose nonencapsulated insulation on close visual inspection.
3 = dislodgment of any material at or near the impact site.
(d) n.d. = not determinable due to high standard deviation of impact distribution.

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Encapsulated insulations generally exhibited cohesive strengths much in excess of 2.4 kPa. This was considered a low strength limit for encapsulated insulation since both rockwool-cement and rockwool-ceramic fiber-cement much exceeded it without encapsulation and, yet, were susceptible to damage by light hand contact. Conversely, several encapsulated insulations were resistant to damage even by heavy hand contact. In comparison, the U.S. General Service Administration[8] specified the following minimum requirements for (nonencapsulated) sprayed fireproofing insulation:

Concealed	(density 252 kg/m^3)	3.8 kPa
Exposed	(density 370 kg/m^3)	19.2 kPa
Exposed	(density 655 kg/m^3)	19.2 kPa

It is suggested from the previous observations and the measurements presented in *Table* 4 that encapsulated insulations should exhibit the following cohesive strength requirements: cohesive strength to be no less than 5 kPa where direct contact is not possible, and cohesive strength to be no less than 15 kPa where direct contact is possible.

Impact Resistance

Table 5 presents impact results according to energies leading to 50% (I_{50}) and 10% (I_{10}) rates of failure by the criteria and the data treatment method described earlier. Essentially, I_{50} represents the average impact energy for the encapsulant system, while I_{10} is the impact energy at which failure rates will be low.

Encapsulant systems exhibited considerable differences in impact properties with little effect according to the type of insulation substrate used. Also, for many insulation/encapsulant systems, impact energies exhibited high standard deviations, particularly for the rockwool-based insulations which exhibited rough irregular surfaces compared to the trowelled surface of vermiculite-plaster. As a result, I_{10} results were, generally, significantly lower than I_{50} results for the former insulations, unless encapsulants offered sufficient reinforcement to bridge irregularities.

It was considered that an encapsulated insulation should offer sufficient impact resistance to withstand knocks commonly encountered in practice. Assuming such to be a 600 g hammer dropped 450 mm (an energy input of 3.0J), it was considered that an encapsulated insulation had sufficient impact resistance if it exhibited I_{50} of 3.0J and I_{10} of 1.5J, the latter figure being proposed to ensure encapsulants also protect at surface irregularities.

Table 5 shows that many encapsulants fail to meet these requirements, including several which exhibited good cohesive strengths, notably the sodium silicate-based encapsulants (P1, P2, and P3). The latter exhibited low impact resistances since they were highly brittle and were crushed easily with light impact, dislodging insulation. Greatest impact resistances were exhibited by P4 and P5, which also exhibited greatest cohesive strengths. Insulations encapsulated with these systems were highly resistant to damage and could probably be classified as vandal resistant. Their far superior performance to other encapsulants may be associated with the significantly higher quantity of resin employed in their application (*Table* 2).

Air Erosion

ASTM P189 requires that the air erosion chamber employ high efficiency particulate air (HEPA) filters up- and downstream of test specimens and that encapsulated insulations meet an erosion limit of 0.003 g/m^2 (a weight gain of 0.001 g by the downstream filter). In the present study, 200 μm opening polypropylene mesh filters were employed. Repeated operation of the chamber without a test panel for nine 48-hr periods found that the downstream filter exhibited a weight gain of 0.030 ± 0.014 g for each period, apparently due to retention of fine ambient dust within the filter. Consequently, air erosion was considered to occur only when weight gains greater than 0.058 g were recorded. However, this was found only in one case and without visible material in the collection filter. Use of HEPA filters may have resulted in better discrimination, although it is considered unlikely that weight changes as little as 0.001 g would be measurable.

It is suggested that a better method of assessing erosion resistance be developed using a (more sensitive) measure of fiber release rather than mass increase. It has been reported that a "sonic pulse generator" was evaluated several years ago to be a successful technique but has not been further developed (M.J. Heinzsch, Magnum Technical Consultants, private communication).

Early Fire Hazard Performance

Early fire hazard performance was assessed with encapsulants applied to insulations or to fiber-cement sheeting, the latter practice being commonly employed by manufacturers when assessing products. However, results in *Table* 6 show that encapsulants perform considerably differently in the latter case, with fire hazard being underestimated due to the greater thermal conductivity of the substrate.[9] It is apparent that fire performance must be measured on insulation substrates for realistic assessment.

Australian building regulations[10] restrict the use of materials according to their spread-of-flame (SF) and smoke-developed (SD) indexes, and none of the systems described in *Table* 6 would face limitation on general use (if SF>5, SD<9), but several could face restriction on use in building zones associated with escape from fire (SF = 0, SD ≯ 2).

Fire Resistance

ASTM P 189 proposed the following failure criteria for fire resistance of encapsulated insulations:

Table 6—Early Fire Hazard Performance of Encapsulated Insulations

		Test Indexes			
Encapsulant	Substrate[a]	Ignition	Heat Evolution	Spread of Flame	Smoke Development
None	insulation	0	0	0	1
B1	insulation	17	3	8	5
B2	insulation	12	1	0	4
B2	fiber-cement sheet	0	0	0	3
B3	insulation	14	1	0	5
B4	insulation	16	8	8	4
B4	fiber-cement sheet	12	5	8	3
B5	insulation	16	6	8	5
B5	fiber-cement sheet	11	2	0	2
B6	insulation	0	0	0	1
P1	insulation	0	0	0	2
P4	insulation	17	6	8	1
P5	insulation	18	6	8	3
P6	insulation	17	5	0	3
P7	insulation	17	5	9	4
P8	insulation	17	2	0	5

(a) Insulation — results average from test results for all insulations.
Fiber-cement sheets — encapsulants applied to 6 mm thick fiber-cement sheets.

(a) sprayed insulation falling from the specimen into the furnace during testing in greater amounts than without encapsulation, or

(b) temperature transfer through the specimen at test completion more than 10% greater than without encapsulation.

Experience during testing showed that criteria (a) was inappropriate. No material fell from any unencapsulated insulation during the three-hour test, yet some loss occurred from several encapsulated insulations but in insufficient quantities to influence temperature transfer. Only in two cases (B6 applied to rockwool-based insulations) did significant quantities of insulation drop from specimens during testing, and in both, pronounced increases in temperature transfer quickly resulted in specimen failure. As a result, it is suggested that only a criterion based on temperature transfer be employed.

Also, it was found that temperature transfer varied with the density of each unencapsulated insulation. As shown in *Table* 1, specimens of each sprayed insulation varied in density by ±7 to ±14% even though specimens were produced at the same time and under identical conditions. It was estimated that due to this variability, the three-hour temperature elevation of encapsulated insulations should be 9-13% greater than for unencapsulated insulations in order to be significant. Consequently, it is proposed that criterion (b) should be based on a 15% increase in temperature transfer and this factor was used in the present investigation.

In general, temperature transfer was significantly increased only in the case of B6 applied to rockwool-cement and rockwool-ceramic fiber-cement. B6 was a 5-10 mm thick fire protective insulation of cellulose fibers bound with sodium silicate and it severely cracked and warped during drying, damaging the insulation substrates. During fire resistance tests, these specimens lost substantial quantities of insulation due to the damage caused by drying. No other specimen exhibited a significant increase in temperature transfer. After testing, encapsulated insulation specimens usually appeared similar to unencapsulated specimens, encapsulants having slowly combusted during the first 30 min of test without disruption of insulation. Many exhibited less temperature transfer than unencapsulated insulation, especially when a white layer of pigment was retained on insulation surfaces after encapsulant combustion.

SUMMARY

The influence of encapsulants on the strength and fire properties of sprayed insulations can be assessed by available test methods and those developed in this investigation, but tests for erosion resistance require further development. Encapsulants alter the strength of sprayed insulations and this should be assessed by both tests for cohesive strength and impact resistance. Greatest strength enhancement was found with some penetrating encapsulants which rendered the insulations highly damage resistant. Encapsulants increased the fire hazard ratings of sprayed insulations but usually not sufficiently to restrict usage in general areas of buildings. Also, unless application of the encapsulant caused physical damage to insulations, there was no significant effect on the fire resistance behavior of sprayed insulations.

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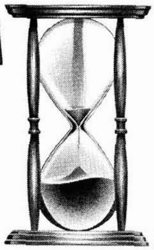
ENHANCE DRY TIME.



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Mechanism of Aluminum Flake Orientation In Metallic Topcoats

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Toyota Central Research & Development Laboratories*

Variation of aluminum flake orientation in wet metallic films with time has been determined using a newly-developed noncontact-type colorimeter equipped with a light source and two detectors at properly selected angles. In spray application, aluminum flakes are oriented parallel to the film surface during spraying and drying. During spraying, the flakes are oriented by the paint droplet flow only when the droplet containing the flakes is large enough to penetrate the wet film as a buffer layer and spread out on the substrate surface. During drying, the flakes are oriented by the shrinkage of the film thickness caused by the evaporation of volatiles.

INTRODUCTION

Metallic topcoats are widely used for automotive applications. These paints owe their attractive appearance to the reflection of light by aluminum flake pigment. Automotive metallic topcoats are usually applied in a basecoat/clearcoat painting process; the basecoat containing the aluminum flake pigment and the clearcoat in turn are sprayed onto the substrate.

The color, especially the lightness of the topcoats, is dependent on spraying parameters, even if the same basecoat and clearcoat are used. This color variation makes the quality control of coating appearance troublesome in the automotive painting process. For example, it causes color differences between automobile bodies, and between a body and off-line-coated plastic parts. In addition, it makes the repair of damaged coatings difficult.

Though the orientation of aluminum flakes in the basecoat is known to be one of the causes of the color variation, the mechanism of aluminum flake orientation has not been elucidated. This is because there has been no method for quantitatively determining the flake orientation in wet films.

This paper describes a rapid method for evaluation of the changes in the orientation distribution of aluminum flakes in a wet metallic film with time, and suggests a mechanism of aluminum flake orientation for spray application.

METHOD FOR DETERMINING ALUMINUM FLAKE ORIENTATION DISTRIBUTION

Aluminum Flake Orientation and Dependence Of L-Value on Viewing Angle

The orientation distribution of aluminum flakes in metallic film is reflected by the dependence of psychometric lightness (L-value) on the viewing angle or the illuminating angle, because the aluminum flakes act as a large number of minute mirrors lying at various directions.

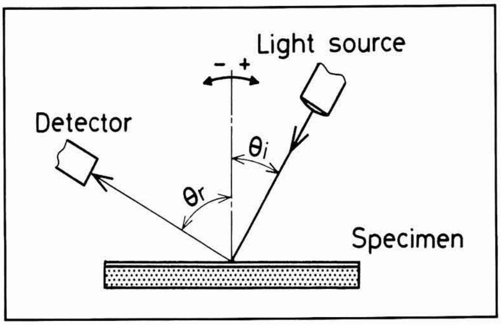

Figure 1—Nomenclature of angles for L-value measurement with spectrogoniophotometer

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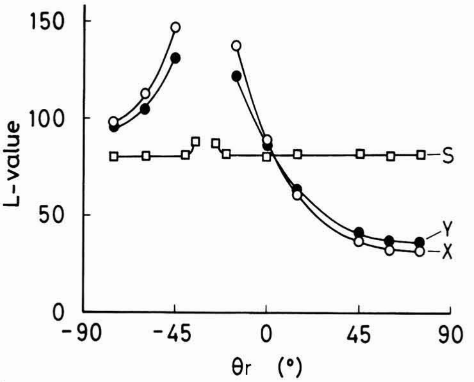


Figure 2—Dependence of spectrogoniophotometer L-value on viewing angle θ_r at an illuminating angle of 30°. X and Y are prepared using the same silver basecoat, but by varying spraying parameters, of highest and lowest in lightness among six specimens on visual examination, respectively. S is prepared using a white nonmetallic topcoat

Therefore, a rapid method for determining the dependence of L-value on the viewing angle was studied using six dry metallic topcoat specimens.

The panels were prepared by spraying the same silver thermosetting acrylic melamine basecoat for an automotive basecoat/clearcoat painting process onto an undercoated steel substrate. By varying spraying parameters, panels differing in lightness on visual examination were obtained. Among all the panels, panel X and panel Y were highest and lowest in lightness, respectively.

At first, the dependences of L-value of all the panels on the viewing angle at illuminating angles of 0, 30, and 60° were measured with a Hitachi 607 spectrogoniophotometer. (Nomenclature of the angles for this measurement is shown in *Figure* 1.) The dependences of L-value of X and Y on the viewing angle θ_r at an illuminating angle θ_i of 30° are illustrated in *Figure* 2 and are compared with that of a white nonmetallic topcoat film. Though L-values of both X and Y increase as the viewing angle approaches the specular angle ($\theta_r = -\theta_i$), the L-value of X depends more on the viewing angle than does that of Y. Such a result also was obtained when the illuminating angles were 0 and 60°. These results suggest that the angle of inclination of the aluminum flake from the horizontal distributed in a narrower range around 0° in X than it did in Y. That is, the aluminum flakes in X lie more parallel to the film surface than do the ones in Y. This was confirmed by the cross-sectional microscopic examination of X and Y using a metallograph, as shown in *Figure* 3.

The L-value of the nonmetallic film is independent of the viewing angle except when $-\theta_i + 10 > \theta_r > -\theta_i - 10°$, as shown in *Figure* 2. This confirms that the dependence of the L-value of metallic film on the viewing angle (except in the range $-\theta_i + 10 > \theta_r > -\theta_i - 10°$) results only from the orientation distribution of aluminum flakes.

The inclination angle of the aluminum flake from the horizontal was estimated from the spectrogoniophotometer L-value at an illuminating angle of 30° using geometrical optics. As the refractive index of the polymer composing the metallic topcoat was 1.5, L-values at $\theta_r = -60$ and $+60°$ were dependent on the amounts of aluminum flakes which made angles of about -8 and 27° with the horizontal, respectively.

The ratio R of L-value at $\theta_r = -60°$ to L-value at $\theta_r = +60°$ was calculated for X and Y. R values of X and Y were 3.43 and 2.81, respectively. Furthermore, on all the specimens, R increased as the dependence of L-value on the viewing angle increased. Thus, R indicates how parallel the flakes lie to the film surface.

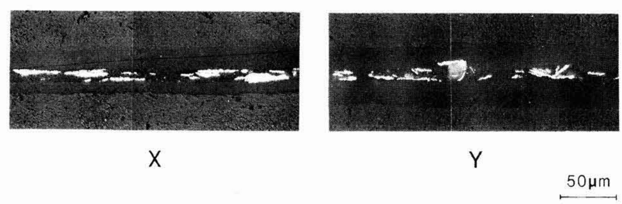
A ratio of L-values measured at two viewing angles approximately can represent the orientation distribution of aluminum flakes, if the viewing angles are selected properly. One viewing angle should be close to the specular angle, but sufficiently different from the specular angle to prevent L-value from being influenced by the specular reflection from the film surface. The other viewing angle may be much different from the specular angle.

Determination of Aluminum Flake Orientation with New Colorimeter

A newly-developed noncontact-type colorimeter was employed for determining the variation of R of the wet metallic film with time. The colorimeter required only one second for each measurement. The colorimeter is shown in *Figure* 4; it consists of a measuring unit and two control units. The measuring unit is equipped with a light source and two detectors. They are assembled in a case (about 0.4 × 0.9 × 0.6 m), whose front window is open to prevent temperature and air flow for volatile evaporation from differing substantially from that in the spray booth when the specimen is wet. The illuminating angle and viewing angles are variable except that $\theta_i + 15 > \theta_r > \theta_i - 15°$. A beam diameter is selected from 5, 12, and 30 mm. The control units receive the signals from the detectors at a set interval for a predetermined time, calculate L-, a-, and b-values, and print out the results.

When the illuminating angle, the two viewing angles, and the beam diameter of the colorimeter were set at 30, -60, $+60°$, and 30 mm, as shown in *Figure* 5, the R

Figure 3—Cross sections of X and Y



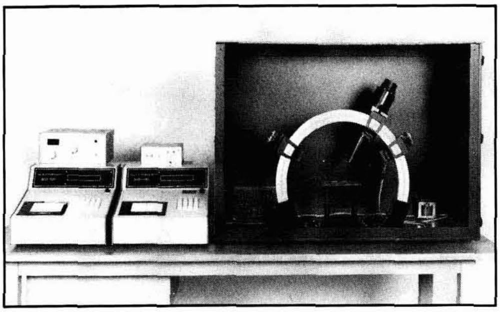


Figure 4—Newly-developed noncontact-type colorimeter. The colorimeter is equipped with a light source and two detectors at properly selected angles

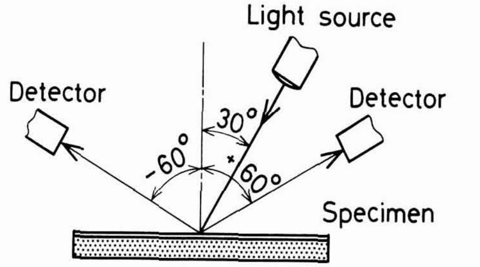


Figure 5—Schematic diagram of newly-developed colorimeter for L-value measurement

values of X and Y were 3.13 and 2.48, respectively. Though the ratios are different from those measured with the spectrogoniophotometer, the R value obtained using the colorimeter also represents the difference in the dependence of L-value on the viewing angle, namely, the difference in the orientation distribution of aluminum flakes. The difference in R values obtained using the two measuring instruments may be attributed to differences in the field of view or the spread of viewing angle.

Variations of L-values at $\theta_r = -60$ and $+60°$ with time after spraying were measured during the drying process of a wet silver metallic film using the same colorimeter. The L-value at $\theta_r = -60°$ increases with time, but the L-value at $\theta_r = +60°$ decreases, as shown in *Figure* 6. As a result, R increases with time as shown in *Figure* 7. These results indicate that the flakes in the wet metallic film are gradually oriented parallel to the film surface in the drying process.

On the other hand, in the case of a wet, white nonmetallic film, L-values at $\theta_r = -60$ and $+60°$, and consequently, R did not vary in the drying process. This fact provides evidence that the time dependence of R of the wet metallic film is caused only by changes in aluminum flake orientation.

The colorimeter that has been developed in this work is demonstrated to be a useful means for evaluating the variation in the orientation distribution of aluminum flakes in the wet metallic film simultaneously with the variation in color during the film drying process.

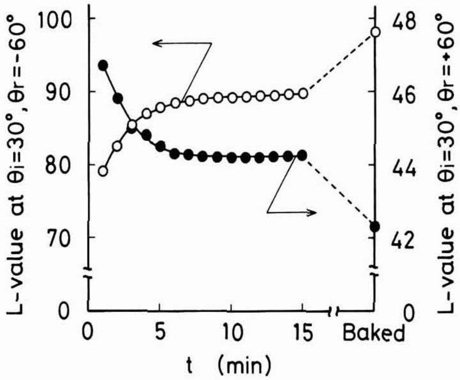


Figure 6—Variations of L-value at $\theta_i=30°$ and $\theta_r=60°$, and L-value at $\theta_i=30°$ and $\theta_r=+60°$ with time t after spraying

MECHANISM OF ALUMINUM FLAKE ORIENTATION

Method for Determining Variations Of Ratio R, Thickness and Nonvolatile Concentration with Time

Three types of silver metallic paints were applied in one coat to an undercoated panel and seven stainless-steel strips arranged, as shown in *Figure* 8. The undercoated panel consisted of a gray surfacer, a cathodic electrodeposition coating, and a zinc phosphate coating on a cold-rolled steel sheet, which were available for automotive applications. The panel had been subjected to wet sanding with AA-400 waterproof abrasive paper. Each

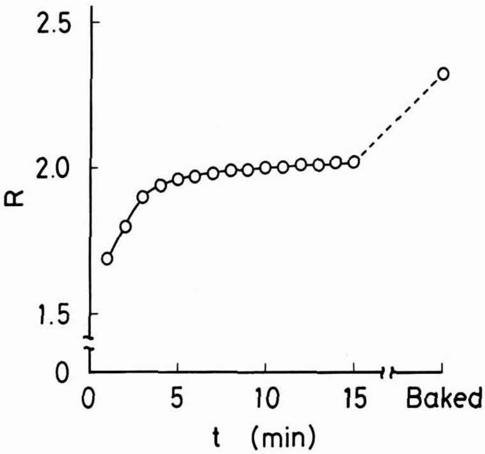


Figure 7—Variation of ratio R of L-value at $\theta_i=30°$ and $\theta_r=-60°$ to L-value at $\theta_i=30°$ and $\theta_r=+60°$ with time t after spraying. R indicates how parallel aluminum flakes are oriented to film surface or substrate surface

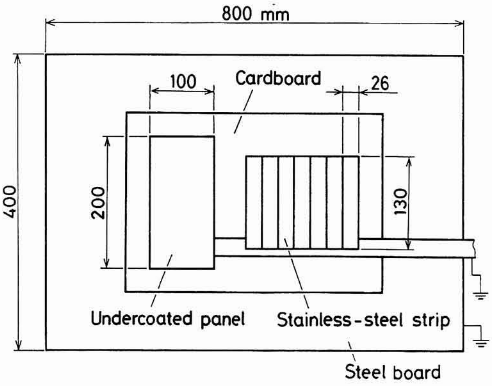


Figure 8—Preparation of specimens for measuring variations of ratio R, thickness and nonvolatile concentration of wet film with time after spraying. The steel board is carried to the left with conveyor

stainless-steel strip had been degreased with petroleum benzine and weighed.

The paints were sprayed with a Ransburg automatic electrostatic air spray gun equipped with a No. 6 cap in a conveyor line arrangement under various spraying parameters. Typical spraying parameters are shown in *Table* 1. Five conveyor speeds were selected for each paint to produce five different film thicknesses. A proper spray booth temperature was chosen for each paint to maintain acceptable coating appearance.

The variation of the ratio R with time t after spraying was measured with the panel in a horizontal position. Each panel was given a flash period of 15 min after spraying and subsequently baked for 30 min at 140°C (284°F). R was measured from 1 min (t = 1) to 15 min at an interval of 30 sec during the flash period, and also after baking.

The variations of the nonvolatile concentration and thickness with time t were determined using the seven stainless-steel strips by weighing the strips at predetermined times (t = 1, 2, 3, 5, 7, 10, 15 min) during the flash period and after baking (140°C, 30 min). The nonvolatile concentration NV at time t was determined from the following expression,

$$NV = 100 \cdot W_d / W_w \quad (1)$$

where W_d and W_w are the film weights after baking and at time t, respectively. The thickness T at time t was obtained from the following expression,

$$T = 100 \cdot T_d \cdot \rho_d / (NV \cdot \rho_w) \quad (2)$$

where T_d is the film thickness after baking; ρ_d and ρ_w are the film densities after baking and at time t, respectively.

The metallic paint A1 was a thermosetting acrylic melamine basecoat for an automotive basecoat/clearcoat painting process. Paint A1 contained 11.1% by weight aluminum flake pigment in the dry film, but no cellulose acetate butyrate polymer. The others, A2 and A3, were equal to A1 in pigmentation, but different in polymer composition. The modified paints, A2 and A3, contained 1.5 and 7.4% by weight cellulose acetate butyrate polymer in the dry film, respectively.

For paints A1, A2, and A3, the relation between the apparent viscosity and the nonvolatile concentration was examined using the wet film applied to a steel substrate with an air spray gun. The apparent viscosity was measured using a Tokyo Keiki EHD cone and plate viscometer at shear rates of 1 and 100 sec^{-1}. The nonvolatile concentration NV was determined gravimetrically, as previously described.

Table 1—Typical Spraying Parameters

Spray viscosity	2.4×10^{-2} Pa·s (20s Ford No.3 cup)
Paint flow rate	730 ml/min
Air flow rate	690 l/min
Open rate of air adjusting value	5 rotations
Applied voltage	−60 kV
Gun distance	30 cm
Length of stroke of reciprocator	1.4 m
Number of stroke of reciprocator	26/min
Conveyor speed	3 m/min
Number of coatings	1
Flash time	15 min
Spray booth temperature	20°C

Variations of Aluminum Flake Orientation, Thickness, Nonvolatile Concentration, and Viscosity with Time

The variation of the ratio R with time t after spraying is illustrated in *Figure* 9. It is seen that aluminum flakes are gradually oriented parallel to the film surface during the flash period and become more highly oriented during baking. The aluminum flake orientation immediately after spraying (t = 0) and the degree of the parallel flake orientation throughout the film drying process are dependent on spraying parameters such as conveyor speed.

The variations of film thickness and nonvolatile concentration with time t are illustrated in *Figures* 10 and 11. It is invariably seen that the film thickness decreases and the nonvolatile concentration increases due to the evaporation of volatiles. In addition, the thickness T_0 (T at t = 0), the nonvolatile concentration NV_0 (NV at t = 0), the decrement of the thickness, and the increment of the nonvolatile concentration throughout the film drying pro-

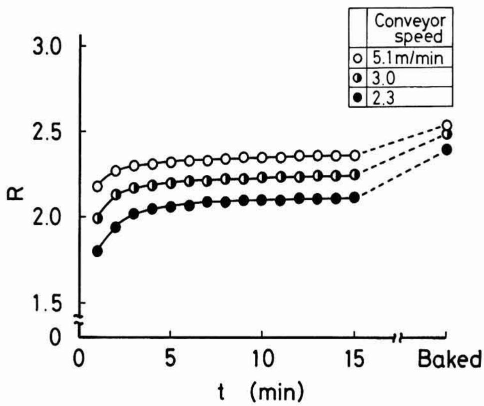


Figure 9—Variation of ratio R with time t after spraying

cess are also dependent on spraying parameters such as conveyor speed.

The variation of the apparent viscosity of the wet film with time is similar to that of the nonvolatile concentration, since the apparent viscosity increases with increasing nonvolatile concentration, as illustrated in *Figure* 12.

Factors Governing Aluminum Flake Orientation During Spraying

The dependence of the ratio R_0 (R at t = 0) on the thickness T_0 and apparent viscosity η_0 (η at t = 0) was studied using the three silver metallic paints. R_0 and T_0 were obtained by extrapolating the curves of R and T vs time t to t = 0, respectively. The apparent viscosity η_0 was determined by substituting NV_0 obtained by the extrapolation for NV in the curve of η vs NV shown in *Figure* 12.

The relation between R_0 and T_0 is shown in *Figure* 13. Three curves of paints A1, A2, and A3 are perfectly superimposed, though the paints are extremely different in viscosity behavior during spraying, as shown in *Figure* 12. The curve indicates that aluminum flakes in the wet film immediately after spraying are oriented less parallel to the film surface, as the film thickness T_0 increases. This fact suggests that the wet film acts as a buffer layer for paint droplets impinging on the substrate, playing a dominant part in the flake orientation.

The relation between R_0 and η_0 at a shear rate of 100 sec^{-1} is shown in *Figure* 14. The data do not superpose exactly, but in each case R_0 increases with η_0. This suggests that aluminum flakes in the wet film immediately after spraying are oriented more parallel to the film surface, as the apparent film viscosity η_0 increases. This tendency is attributed to the inverse correlation between the thickness and viscosity or nonvolatile concentration of the wet films prepared by varying only conveyor speed, which is difficult to eliminate. Similar results were obtained from the relation between R_0 and η_0 at a shear rate of 1 sec^{-1}.

Role of Wet Film as Buffer Layer

The penetration depth of a paint droplet impinging on the wet film as a buffer layer was estimated by microscopic observation of the droplets collected in 2.9 Pa·s viscosity silicone oil. The pigment-free acrylic melamine basecoat was sprayed onto a glass slide overlaid with the silicone oil layer of about 1 mm thickness, which traversed the spray pattern at a constant speed. The silicone oil viscosity was almost equal to that of the wet metallic film. The microscopic observation employed a Nikon V-12 profile projector, by adjusting the focus in the depth direction.

Micrographs in different focuses, shown in *Figure* 15, indicate that smaller paint droplets locate near the surface of silicone oil layer, while larger ones lie deeper. This fact supplies evidence that the penetration depth of the droplet increases as the droplet diameter increases. When the layer is as thin as the wet metallic film, all of the deposited droplets are separated into two groups by the combination of the droplet diameter and the layer thickness. One group is of larger diameter droplets, which

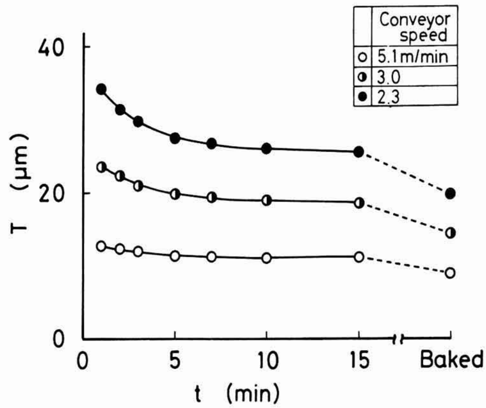


Figure 10—Variation of film thickness T with time t after spraying

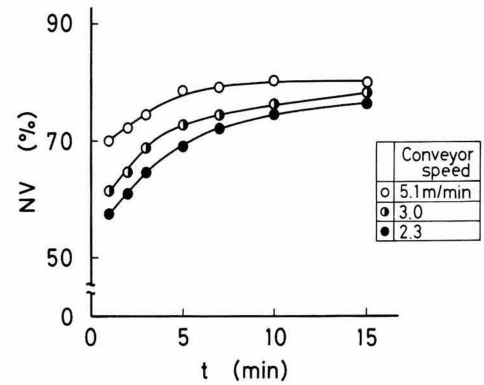


Figure 11—Variation of nonvolatile concentration NV with time t after spraying

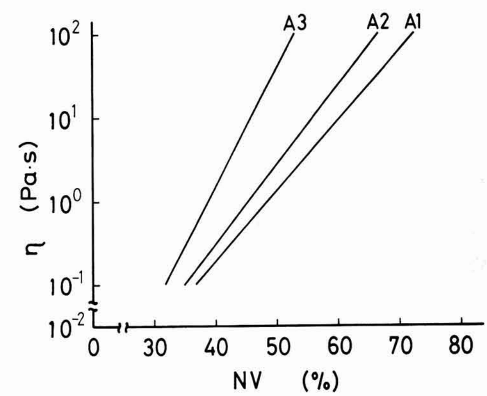


Figure 12—Relation between apparent viscosity η at a shear rate of 100 sec^{-1} and nonvolatile concentration NV for paints A1, A2, and A3

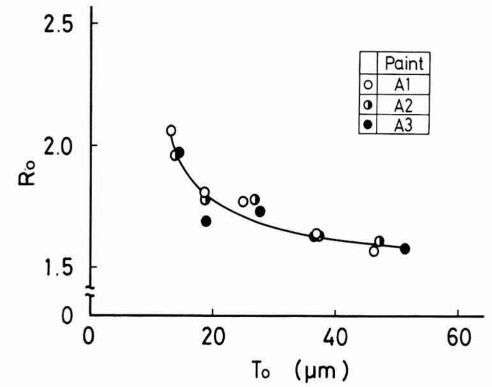


Figure 13—Relation between R_0 (R at t = 0) and film thickness T_0 (T at t = 0)

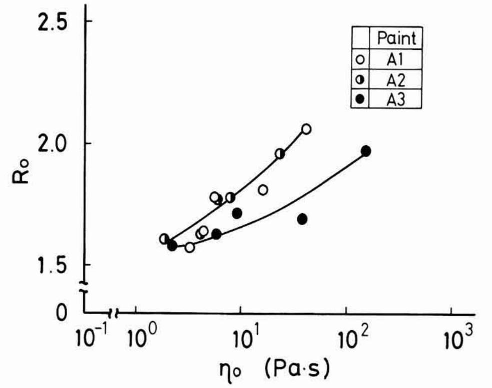
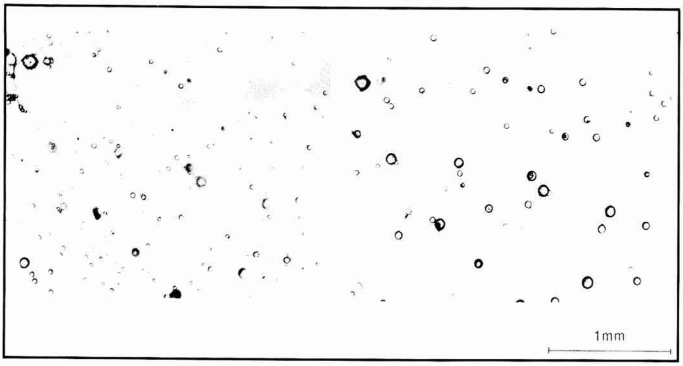


Figure 14—Relation between R_0 (R at t = 0) and apparent viscosity η_0 (η at t = 0) at a shear rate of 100 sec^{-1}

Figure 15—Paint droplets caught in silicone oil layer of 2.9 Pa·s viscosity and about 1 mm thickness. The left micrograph is focused on adjacent layer surface. The right is focused on the depth, though field of view is the same with the left



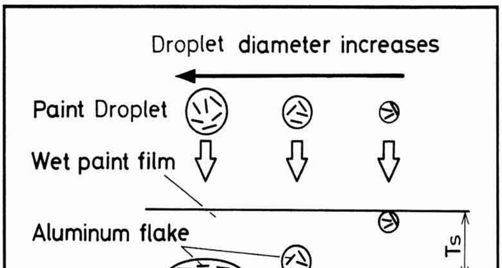


Figure 16—Model for aluminum flake orientation during spraying. Aluminum flakes contained in paint droplet are oriented parallel to film surface only when the droplet is large enough to penetrate wet film (thickness T_s) and spread out on substrate surface

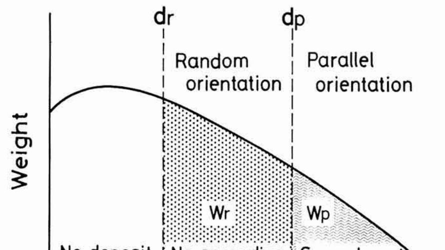


Figure 17—Adaption of the model shown in *Figure* 16 to droplet diameter distribution. The critical diameter d_r is of the smallest droplet that can reach film surface, being invariable throughout spraying. The other critical diameter d_p is of the smallest droplet that can spread out on substrate surface, increasing with the lapse of spraying time t_s. W_r and W_p are the weights of droplets without spreading out, and with spreading out, respectively

penetrate the layer and spread out on the substrate surface. The other is of smaller diameter droplets, which are caught in the layer without spreading out. The ratio of droplets that spread out to those that do not decreases as the layer thickness increases.

Model for Aluminum Flake Orientation During Spraying

When a paint droplet containing aluminum flakes impinges on a bare substrate and spreads out, aluminum flakes are oriented parallel to the substrate surface by the paint flow along the substrate surface. This is because the flake tends to be aligned along the flow so that the drag is minimized.

Actually, paint droplets impinge on the substrate overlaid with a wet paint film, as illustrated in *Figure* 16, though they impinge on an uncoated substrate only in the initial stage of spraying. The wet film plays a dominant role in the orientation of aluminum flakes contained in the following particles. The wet film thickness at spraying time t_s after onset of spraying is defined as T_s. When the film thickness T_s is smaller than the penetration depth of the following droplet, namely, the droplet diameter is so large that the droplet can penetrate the wet film and spread out on the substrate surface, aluminum flakes are oriented parallel to the substrate surface. On the other hand, when the droplet diameter is so small that the droplet can be caught in the wet film without spreading out (T_s is more than the penetration depth), aluminum flakes are randomly oriented.

The small droplets capable of depositing in the wet film are very important for metallic color, even if they account for only a small portion of the weight. This is because they locate near the film surface due to decreasing penetration depth, as shown in *Figures* 15 and 16.

The model shown in *Figure* 16 can be adapted for a paint droplet distribution, as shown in *Figure* 17. In the ideal case, the definition of a droplet diameter distribution provides two critical diameters, d_r and d_p. The critical diameter d_r is of the smallest droplet that can reach the film surface, being invariant throughout the spraying process. The other d_p is of the smallest droplet that can penetrate the wet film and spread out on the substrate surface, increasing with the lapse of spraying time.

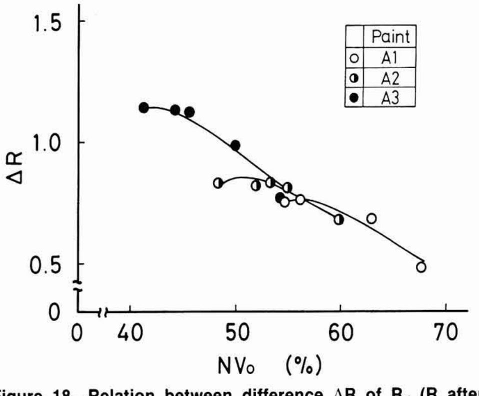


Figure 18—Relation between difference ΔR of R_d (R after baking) from R_0 and nonvolatile concentration NV_0 (NV at t=0). ΔR represents the degree of parallel flake orientation throughout film drying process

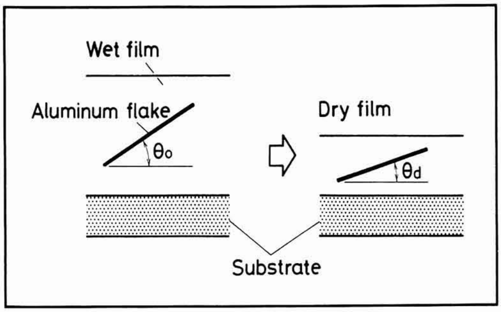


Figure 19—Model for aluminum flake orientation during drying. Aluminum flake is oriented parallel to film surface by shrinkage of film thickness caused by volatile evaporation

The orientation of aluminum flakes deposited in the wet film from t_s to $t_s + \Delta t$ depends on the weight W_r of the droplets whose diameter d is $d_p > d \geqq d_r$ and the weight W_p of the droplets whose diameter d is $d \geqq d_p$, since the droplets whose diameter d is $d_r > d$ are carried away. In a strict sense, W_r and W_p must be the weights of aluminum flakes contained in the droplets, and be corrected in terms of the droplet depth location.

The orientation of aluminum flakes dispersed throughout the wet film at spraying time t_s is roughly estimated by O_s defined by the following expression,

$$O_s = \int_0^{t_s} W_p \, dt / \int_0^{t_s} (W_p + W_r) \, dt \tag{3}$$

where the increase of O_s means that aluminum flakes in the wet film lie more parallel to the substrate surface or film surface. O_s decreases with elapsed spraying time t_s, because d_p increases, but d_r is constant. This indicates that the increase of spraying time, that is, of the wet film thickness T_0 immediately after spraying, results in poorer aluminum flake orientation in the wet film. This is consistent with the experimental result.

In our model, the increase in the viscosities of the droplets and film will suppress the penetration and deformation of the droplets in the wet film, resulting in poorer flake orientation. However, the experimental result indicates that the orientation of aluminum flakes in the wet film depends only on the wet film thickness. This must be because the viscosity effects are negligible in comparison with those of the film thickness.

Factor Governing Aluminum Flake Orientation During Drying

The dependence of the difference ΔR of R_d (R after baking) from R_0 (R at t=0) on NV_0 (NV at t=0) was studied using the three silver metallic paints. ΔR represents the degree of the parallel orientation of aluminum flakes that occurred during the film drying process.

The relation between ΔR and NV_0 is shown in *Figure* 18. Three curves of paints A1, A2, and A3 have a maximum of nonvolatile concentrations NV_0 of about 43, 51, and 56%, respectively. These nonvolatile concentration values correspond to an apparent film viscosity η_0 of 5 Pa·s at a shear rate of 100 sec^{-1}, as shown in *Figure* 12. Parts of the curves in *Figure* 18, which are in the range of apparent film viscosity much higher than 5 Pa·s, overlap, indicating that the degree of the parallel flake orientation throughout film drying process decreases as the nonvolatile concentration NV_0 increases. This fact confirms that the parallel flake orientation during drying is attributed only to the shrinkage of the film thickness caused by evaporation of the volatile from the wet film, when the viscosity of the wet film immediately after spraying is high enough to prohibit the disturbed movement of aluminum flakes under the effects such as gravity and evaporative convection. On the other hand, each curve in the range of apparent film viscosity lower than 5 Pa·s suggests that the degree of the parallel flake orientation in the drying process increases as the nonvolatile concentration NV_0 increases. This suggests that the parallel flake orientation is influenced not only by the shrinkage of the film thickness, but also by the disturbed movement of aluminum flakes, when the wet film viscosity is not sufficiently high.

Model for Aluminum Flake Orientation During Drying

The parallel orientation of aluminum flakes during drying due to the shrinkage of the film thickness has been proposed,[1] but has not been established experimentally.

When the viscosity of the wet film immediately after spraying is high enough to prohibit the disturbed movement of aluminum flakes under the effects such as gravity and evaporative convection, the flakes in the film are oriented parallel to the film surface by the shrinkage of the film thickness resulting from the volatile evaporation, as illustrated in *Figure* 19. When the nonvolatile concentration is uniform within the film, the degree $\Delta\theta_a$ of the parallel flake orientation throughout the film drying process is determined from the following expression,

$$\Delta\theta_a = \theta_0 - \theta_d = \theta_0 - \sin^{-1}[NV_0 \cdot \rho_0 (\sin\theta_0)/(100 \cdot \rho_d)] \qquad (4)$$

where θ_0 and θ_d are the inclination angles of the flake from the horizontal at $t = 0$ and after baking; ρ_0 and ρ_d are the film densities at $t = 0$ and after baking, respectively. Since ρ_d is almost equal to ρ_0, the expression indicates that the degree of the parallel flake orientation throughout the drying process decreases as the nonvolatile concentration NV_0 of the wet film immediately after spraying increases. This agrees with the experimental result.

When the viscosity of the wet film immediately after spraying is too low to prevent the disturbed movement of aluminum flakes, the random flake orientation resulting from the disturbed movement accompanies the parallel flake orientation resulting from the shrinkage of film thickness. The disturbed movement is prevented when the film viscosity is sufficiently increased by the volatile evaporation from the wet film. Random flake orientation will be favored over parallel flake orientation as the film viscosity immediately after spraying, that is, the nonvolatile concentration NV_0, decreases. This means that the degree of the parallel flake orientation throughout the drying process decreases as the nonvolatile concentration NV_0 of the wet film immediately after spraying decreases. This corresponds with the experimental result.

SUMMARY

A rapid optical method for quantifying variation of the aluminum flake orientation in wet metallic films with time has been developed. The method employs the ratio of two L-values of a new noncontact-type colorimeter equipped with a light source and two detectors at properly selected angles.

The mechanism of aluminum flake orientation for spray application has been studied using this method. Aluminum flakes contained in a metallic paint are oriented parallel to the film surface during spraying and drying.

During spraying, aluminum flakes are oriented parallel to the film surface by the paint droplet flow resulting from impingement of the droplet on the substrate surface. This parallel orientation occurs only when the paint droplet is large enough to penetrate the wet film as a buffer layer and spread out on the substrate surface. Therefore, the orientation of aluminum flakes dispersed throughout the wet film depends on the ratio of the weight of droplets that spread out to the weight of all deposited droplets. In practice, the flake orientation in the wet film immediately after spraying is less nearly parallel to the film surface as the film thickness increases, because the weight ratio of spread out droplets decreases.

During drying, aluminum flakes are oriented parallel to the film surface by the shrinkage of the film thickness caused by the evaporation of volatiles. The orientation may be disturbed by the effects of gravity and evaporative convection. When the film viscosity is high enough to prevent the disturbed movement of aluminum flakes, the degree of the parallel orientation caused throughout film drying process decreases as the nonvolatile concentration of the wet film immediately after spraying increases.

References

(1) Backhouse, A.J., "Routes to Low Pollution Glamour Metallic Automotive Finishes," Journal of Coatings Technology, *54*, No. 693, 83 (1982).

Manufacturing for Quality And Profitability

Theodore C. Kuchler, Jr.
Du Pont Company*

Introduction

Today, outstanding quality and excellent safety performance are significant business assets. Each provide us with the opportunity to differentiate our business. Experience tells us that to be the best in both quality and safety requires a strict operating discipline throughout the entire organization. Employees at all levels must participate.

We must conduct our businesses without hurting people, without making people sick, and without harming the environment. It is vitally important that we understand our customer's needs and provide quality products and services to fully satisfy those needs.

Quality, in its broadest sense, is doing the right things right, and on time. We look for quality in everything we do. This means we are concerned with much more than just the quality of our finished products.

The Process

The five elements to achieve the desired levels of performance in both quality and safety are similar and have common characteristics.

Documentation of processes and procedures need to be well conceived. They cover activity in operations, maintenance, analytical, administration, and emergency preparedness. In constructing the procedures, we need to include input from involved people, who must perform against the standards of the procedure. This method provides the mechanism for technology and techniques to be implemented and maintained throughout the entire organization.

Thorough training must be available to be sure that the capability of our people is continually developed and maintained at the desired performance levels.

Audits must identify the leading indicators that affect quality and safety. Statistical techniques are an integral part of the audit.

We must include a system to formally investigate abnormal incidents. Through the investigations we can identify causes of incidents or problems with the procedures. Corrections will upgrade the organization's standards of performance and will prevent the problems from recurring in the future.

Leadership in the organization must reinforce appropriate behaviors of teams and individuals. We should implement publicity programs throughout the organization which advertise and share people's experiences. We can also create groups within the organization where people can share experiences and perspectives. An environment to maintain high standards of safety and quality may be created by:

- "Top down" support where leaders provide resources and create the environment that enables the organization to function, and to "model" the desired behaviors.
- Establishing responsibility for both safety and quality in the line organization.
- Helping the organization develop a set of principles for day-to-day operations. The purpose of these principles is to provide guidance for people at all levels and to define boundaries for individual and collective activities. Standards of performance come from these principles. We want people throughout the entire organization to feel ownership for both quality and safety.
- Developing, among all employees, the idea that success of the business and their individual success are inseparable. Success in quality and safety add value to both the business and the individual.
- Maintaining competitive distinctiveness. We continually need to introduce new technology, procedures, and hardware.
- And, continually communicating the level of our performance throughout the organization. Feedback on our performance permits people at all levels to make timely, appropriate decisions.

The Future

A goal for industry is to continue to develop an external focus and internal partnering. Customers see the reality of our quality and safety programs in product safety management and responsibility for the materials we produce.

Good performance helps us be good citizens. The process for continual improvement in quality and safety involves striving for excellence. We all must implement continual small changes and encourage innovation. Also, our change is not complete if our customers don't perceive the change as positive.

There is no question that good quality and safety processes translate to good business. The behaviors and systems to accomplish both of these are very similar. Finally, it is necessary to be able to make a connection between what we do in these arenas and our overall business performance.

Presented at the 67th Annual Meeting of the Federation of Societies for Coatings Technology in New Orleans, LA, November 9, 1989.
*Chemical and Pigments Dept., Wilmington, DE 19898.

BIRMINGHAM .... OCT.

"Acid Curing"

The meeting's speaker was Thor Fjeldberg, of Dyno Industries, who spoke on "ACID CURING AND FORCE DRIED FINISHES."

The speaker discussed acid curing finishes and stated that they should be in use at least for the next 10 years. He also compared acid curing finishes with other products, explained the various acid cure systems, and stated their various advantages and disadvantages.

Mr. Fjeldberg admitted that although there had been no major breakthroughs in the development of acid curing finishes, constant improvements were being made.

The speaker compared melamine and urea formaldehyde resins. He stated that although melamine resins display much better resistance to high humidities, there are problems with cost and storage stability. Mr. Fjeldberg said mixtures of melamine and urea are often used.

Various standards exist concerning formaldehyde emissions from acid curing finishes, according to the speaker. Mr. Fjeldberg stated that at the present time an I.S.O. standard is being sought. He said that higher temperatures, faster curing systems, and special amino resins all help to reduce the formaldehyde emissions.

Q. If free formaldehyde is a problem on coated articles in schools, etc., how bad is it in the factories where the coating is applied?

A. This is not a problem. On storage, the coatings continue to emit formaldehyde after post curing.

Q. Will radiation curing and water-based systems take over from acid curing finishes?

A. Legislation could accelerate this; it is already happening in Scandanavia. Water-based products need better technology if they are to compete with radiation curing systems.

D.A. TONY WALLINGTON, *Secretary*

BIRMINGHAM .... NOV.

"Automotive Color"

Society member M.S. Mudge, of PPG Industries (U.K.) Ltd., gave the evening's technical presentation. Mr. Mudge talked about "AUTOMOTIVE COLOR AND STYLING."

The speaker explained that automotive color styling is done by design and is important for marketing and, in some cases, for corporate identity.

Mr. Mudge stated that color stylists are influenced by fashion trends, which are evident in fashion magazines.

However, the performance of pigments required for automotive manufacturing must be taken into account when forecasting color trends, according to the speaker. He stated that climatic conditions could possibly be an important factor when choosing a color for an automobile. Mr. Mudge used the example of France and Italy where the trend is toward whites and silvers, perhaps as a result of hotter climates.

The speaker used a slide show which pointed out the relative popularity of certain colors in 1987 and demonstrated the differences in color preferences. He stated that 10-12 colors account for the majority of automotive styling used globally. However, a substantial difference between solid, metallic, and mica colors exist between North America, Western Europe, and Japan. Mr. Mudge said that mica colors are popular in North America. This is due to technical problems with aluminum flake in high-solids coatings.

A possibility for the future, according to the speaker, is a three-coat system—solid color, mica, and clearcoats.

In conclusion, Mr. Mudge remarked that color is the most economical way to enhance a product.

Q. Which is more important, durability or style?

A. Any color which is used will already have been approved for durability.

Q. What about refinishing?

A. Three-coat systems can be a problem. Mica is better than aluminum flake and is less likely to curl, but aluminum flake is improving.

Q. Have there been any disasters in forecasting?

A. Although fashion groups have geen colors, generally speaking, green is a disaster color in automotive styling.

D.A. TONY WALLINGTON, *Secretary*

MONTREAL .... NOV.

"Formation of Latex Films"

Dennis H. Guthrie, of The Dow Chemical Company, was the meeting's speaker.

DETROIT SOCIETY—Officers for the year 1989-90 are as follows (l-r): Vice President—Latoska Price; Secretary—Liana C. Roberts; Treasurer—Patricia Hendrick; President—Van Evener; and Membership Committee Chairman—Kathleen Porter

Constituent Society Meetings and Secretaries

BALTIMORE (Third Thursday—Snyder's Restaurant, Linthicum, MD). VICTORIA KRAM, Lenmar, Inc. 150 S. Calverton Rd., Baltimore, MD 21223.

BIRMINGHAM (First Thursday—Strathallan Hotel, Birmingham, England). BERNARD MYATT, Worrall's Powders Ltd., St. Clements Rd., Aston, Birmingham, England B7 5AH.

CDIC (Second Monday—Sept., Dec., Mar. in Columbus; Oct., Jan., Apr. in Cincinnati; Nov., Feb., May in Dayton). JAMES FLANAGAN, Flanagan Associates, Inc., 10999 Reed Hartman Hwy., Cincinnati, OH 45242.

CHICAGO (First Monday—alternate between Sharko's Restaurant, Villa Park, IL and Como Inn, Chicago, IL). THEODORE FUHS, General Paint & Chemical Co., 201 Jandus Rd., Cary, IL 60013.

CLEVELAND (Third Tuesday—meeting sites vary). BEN CARLOZZO, Tremco, Inc., 10701 Shaker Blvd., Cleveland, OH 44104.

DALLAS (Thursday following second Wednesday—The Harvey Hotel, Dallas, TX). HARRY C. SIMMONS, JR., Sherwin-Williams Co., 2802 W. Miller Rd., Garland, TX 75041.

DETROIT (Second Tuesday—meeting sites vary). LIANA C. ROBERTS, A.T. Callas Co., 1985 W. Big Beaver, Troy, MI 48084.

GOLDEN GATE (Monday before third Wednesday—alternate between Francesco's in Oakland, CA and Holiday Inn in S. San Franscisco). MARGARET R. HARTMANN, Midland Div./Dexter Corp., 31500 Hayman St., Hayward, CA 94544.

HOUSTON (Second Wednesday—Sonny Look's Sir-Loin Inn, Houston, TX). JOSEPH CARAVELLO, Guardsman Products, 11502 Charles St., Houston, TX 77041.

KANSAS CITY (Second Thursday—Cascone's Restaurant, Kansas City, MO). H. JEFF LAURENT, F.R. Hall, Inc., 1920 Swift Ave., N. Kansas City, MO 64116.

LOS ANGELES (Second Wednesday—Steven's Steakhouse, Commerce, CA). SANDRA L. DICKINSON, McWhorter Co., 5501 E. Slauson Ave., Los Angeles, CA 90040.

LOUISVILLE (Third Wednesday—Executive West Motor Hotel, Louisville, KY). LLOYD BROWNING, Kelley Technical Coatings, Inc., 1445 S. 15th St., Louisville, KY 40210.

MEXICO (Fourth Thursday—meeting sites vary). ANTONIO JUAREZ, Amercoat Mexicana, via Gustavo Baz 3999, 54030 Tlalnepantla, edo de Mexico.

MONTREAL (First Wednesday—Bill Wong's Restaurant, Montreal). BRUCE BRIDGES, Reichhold Canada Inc., P.O. Box 120, St. Therese, Que., Canada J7E 4J1.

NEW ENGLAND (Third Thursday—Sheraton Lexington Hotel, Lexington, MA). JOSEPH H. WEINBURG, Permuthane Coatings, P.O. Box 3039, Peabody, MA 01961.

NEW YORK (Second Tuesday—Landmark II, East Rutherford, NJ). JEFFREY C. KAYE, MacArthur Petro & Solvents Co., 126 Passaic St., Newark, NJ 07104.

NORTHWESTERN (First Tuesday after first Monday—Jax Cafe, Minneapolis, MN). DANIEL W. DECHAINE, Valspar Corp., P.O. Box 1461, Minneapolis, MN 55440.

PACIFIC NORTHWEST (PORTLAND SECTION—Tuesday before third Wednesday; SEATTLE SECTION—the day after Portland; BRITISH COLUMBIA SECTION— the day after Seattle). STEVE REARDEN, Imperial Paint Co., 2526 N.E. Yeon Ave., Portland, OR 97210.

PHILADELPHIA (Second Thursday—Williamson's Restaurant, GSB Bldg., Bala Cynwyd, PA). PETER KUMZA, VIP Products Corp., 3805 Frankford Ave., Philadelphia, PA 19124.

PIEDMONT (Third Wednesday—Ramada Inn Airport, Greensboro, NC). RUBY JOHANNESEN, Southchem, Inc., P.O. Box 9026, Greensboro, NC 27429.

PITTSBURGH (Second Monday—Montemurro's Restaurant, Sharpsburg, PA). JOSEPH POWELL, Union Carbide Corp., P.O. Box 979, Latrobe, PA 15650.

ROCKY MOUNTAIN (Monday following first Wednesday—Holiday Inn North, Denver, CO). GARY SCHINGECK, Diamond Vogal/Komac, 1201 Osage St., Denver, CO 80204.

ST. LOUIS (Third Tuesday—Salad Bowl Restaurant, St. Louis, MO). STANLEY SOBOLESKI, U.S. Paint Div., 831 S. 21st St., St. Louis, MO 63103.

SOUTHERN (GULF COAST SECTION—third Thursday; CENTRAL FLORIDA SECTION—third Thursday after first Monday; ATLANTA SECTION—third Thursday; MEMPHIS SECTION—bi-monthly on second Tuesday; and MIAMI SECTION—Tuesday prior to Central Florida Section). VERNON SAULS, McCullough & Benton, P.O. Box 272360, Tampa, FL 33688.

TORONTO (Second Monday—Cambridge Motor Hotel, Toronto). VIK RANA, Ashland Chemicals, 2620 Royal Windsor Dr., Mississauga, Ont., Canada L5J 4E7.

WESTERN NEW YORK (Third Tuesday—meeting sites vary). MARKO MARKOFF, 182 Farmingdale Rd., Cheektowaga, NY 14225.

He lectured on "HUMIDITY AND TEMPERATURE EFFECTS UPON THE FORMATION OF LATEX FILMS 'COMPENSATED BY COALESCING AGENTS.'"

The speaker's talk focused on the importance and variance of climatic effects upon the formation of latex films and the compensating action of well chosen coalescing agents.

Dr. Guthrie stated that the two most significant factors that must be taken into consideration when switching from solvent to water-borne systems are: the effect of atmospheric humidity and temperature upon film formation. He showed the effect of humidity and temperature upon the formation of latex films from a theoretical computer modeling perspective and from actual tests. Data was presented to demonstrate how the selection of a proper coalescent package can help compensate for atmospheric conditions, which could be encountered during the application of latex coatings.

G.L. SIMPSON, *Director*

MONTREAL .... DEC.

"Mastering of Color"

President Gilles Belisle, of the National Research Council Canada, was presented the traditional Hüls/Canada gavel by Past-President Robert Ferrie, of Canbro, Inc.

Alexander Vignini, of Sico Inc., was elected Chairman of the Society's revamped Educational Committee.

The highlight of the meeting was the mini symposium entitled "THE MASTERING OF COLOR."

The first speaker was Toronto Society member Walter Fibiger, of Hoechst Canada Inc. His presentation was on the "PRACTICAL ASPECTS OF INSTRUMENT COLOR MATCHING."

The speaker stressed the importance of size and quality of the pigment data base in a computer color matching system. Mr. Fibiger reviewed some of the problems encountered when performance characteristics are not taken into account and the difficulties involved in sample preparation, interpretation of data, and the reliability of final results.

In conclusions, he offered some suggestions on how to avoid the most common pitfalls.

The next speaker was Marvin J. Schnall, of Troy Chemical Corporation and a member of the New York Society. Mr. Schnall talked about "COLOR NON-UNIFORMITY—CAUSES AND CURES."

Mr. Schnall stated that pigment floating and pigment flocculation are different mechanisms. Whether separately or in com-

NEW YORK SOCIETY—Elected officers for 1989-90 include: Society Representative—Saul Spindel; Treasurer—Michael C. Frantz; President—Arthur A. Tracton; Vice President—Roger P. Blacker; and Secretary—Jeffrey C. Kaye

bination, they are the primary causes of color non-uniformity, according to the speaker.

The factors involved in both mechanisms were described, as well as some methods of improving color uniformity through formulation modification and additive usage.

The meeting's third speaker was Simon Lawrence, of CIBA-GEIGY (U.K.) Ltd., who spoke on "THE CONTROL OF COLOR."

Tinting schemes are an intrinsic feature of trade-sales paint promotion, stated Dr. Lawrence. North America leads in the development of these schemes, followed closely by continental Europe. The speaker explained that the rest of the world is now attempting to close the gap, because the quality control of dry powder for this critical application is of more concern to pigment manufacturers than ever before.

Dr. Lawrence said satisfactory control of pigment deliveries requires close agreement between the supplier and the paint manufacturer on both test methods and tolerances. Also, it is very much a two-way partnership operation, according to the speaker.

In conclusion, Dr. Lawrence reviewed the more important aspects of classical organic pigment manufacture and control as they affect the paint manufacturer.

The mini symposium's final lecturer was Hans Wurth, of BASF (West Germany), who spoke on "YELLOW, ORANGE, AND RED: NEW POSSIBILITIES WITH REGULAR ISOINDOLINE BASED PIGMENTS."

The speaker stated that recent research on isoindoline based chromophores has provided new colored pigments which are suited for use in high quality coating systems. He said that variation of the substituents can lead to adjustment of the colors.

Mr. Wurth explained that optimization of the particle size towards a maximum covering capacity renders pigments with properties such as higher chroma, good rheology, and resistance to the elements of weather.

In conclusion, the speaker stated that in combination with selected inorganic pigments, the isoindolines will allow formulation of some lead-free high chroma coatings with good hiding potential.

G.L. SIMPSON, *Director*

NORTHWESTERN ....JAN.

"Hazardous Materials Management"

President Mark W. Uglem, of Hirschfield's Paint Mfg. Company, announced that the April 3 meeting will be Education Night. Scheduled guests include Federation Executive Vice President Robert F. Ziegler, *American Paint and Coatings Journal* Editor/Vice President Chuck Reitter, and Dr. Frank Jones, of North Dakota State University.

Ted Leines, of the Industrial Process Machine Company, spoke on "NEW TECHNOLOGIES FOR HAZARDOUS MATERIALS MANAGEMENT."

The speaker discussed waste recovery systems that he had worked with, i.e., the Pri-Vac, from the Dresser Recovery Company. The system operates on microwave energy under a vacuum for instant vaporizing of solvents to get paint sludge down to zero VOC for easy disposal. The cost of the system is about $70,000.

Mr. Leines reported that the fastest growing area in the field is VOC abatement. He showed a recovery system that would work on oven stacks to avoid odor complaints from neighbors.

Another way to remove vapors and to lower VOC emissions is a closed loop recovery system, stated the speaker. The machine works on the same principle as a dishwasher, explained Mr. Leines. Parts or containers to be cleaned are slid into the unit and washed in a cold process with a solvent until everything is clean. The solvent is then recovered via a still operation. About 0.5 lb of solvent is lost per batch.

The second speaker was Craig Johnson, of Byk-Gardner Company. He gave a presentation on "QUALITY CONTROL INSTRUMENTATION."

The speaker discussed gloss and its chromatic and geometric attributes including specular gloss, sheen, contrast gloss, surface haze, and distinctiveness of image. Mr. Johnson also explained the basic principles of incident, diffused, and scattered light as they relate to gloss meters.

The meeting's final speaker was Ed Smythe, of Byk-Gardner Company, who discussed two other test instruments—the gradient oven and the dynometer.

The oven was described as very useful for getting different cure temperatures on one panel. According to Mr. Smythe, the time temperature parameters can be set five different ways via a microprocessor. The speaker reported that this instrument can be used with an oven temperature recorder to match up a lab oven to a line oven. The oven's cost is in the $35-50,000 range.

The second instrument introduced by Mr. Smythe was the dynometer, a lab measuring device for testing surface tension, sedimentation rate, and settling characteristics of paints and coatings.

DANIEL W. DECHAINE, *Secretary*

PACIFIC NORTHWEST—PORTLAND SECTION ....OCT.

"Attapulgite-Based Products"

Technical Committee Chairman Gerald A. McKnight, of Rodda Paint Company, introduced the members of his survey group: John H. Daller, of Miller Paint Company; Richard G. Stevens, of Zehrung Corporation; and Kenneth Gross, of Imperial Paint Company.

The group has been tasked with surveying the Society member companies regarding ideas for a study on various topics of significant interest which can be submitted to the Federation.

The evening's speaker was John Mosko who gave a presentation entitled "ATTAPULGITE-BASED PRODUCTS, PERFORMANCE CO-THICKENERS IN WATER-BASED COATINGS."

JOHN WESTENDORF, *Secretary*

PACIFIC NORTHWEST— VANCOUVER SECTION ...... NOV.

"Coalescing Agents"

John Berghuis, of Kronos Canada, Inc., announced that the 1991 Society-sponsored symposium will be held in Vancouver, British Columbia.

The meeting's technical speaker was Daniel N. King, of Exxon Chemical Company, who presented a talk on the "EVALUATION OF NEW GENERATION COALESCING AGENTS FOR INDUSTRIAL ACRYLIC LATICES."

STEVE REARDEN, *Secretary*

PHILADELPHIA .... NOV.

"Low VOC Alkyds"

Educational Committee Chairman Richard D. Granata, of Lehigh University, announced that the proposed "Coatings Formulation" course has been scheduled for the spring.

Northwest Society member Richard Johnson, of Cargill, Inc., presented a talk on "NEW DEVELOPMENTS IN HIGH-SOLIDS AND WATER-REDUCIBLE COATINGS TO MEET THOSE LOW VOC TARGETS."

Mr. Johnson spoke about the way powder coatings and UV resins meet the new VOC regulations. However, the one drawback is that they require huge investments in expensive equipment, he said.

Water-reducible resins, which have been around for over 30 years, and high-solids resins, which experienced a 331% resin growth in the first four months of 1989 in trade sales and industrial coatings, are on the rise.

According to the speaker, the attractiveness of high-solids resins are ease of formulation, efficiency of application, versatility, low VOC to meet governments regulations, outstanding economics, performance, and new technology.

Mr. Johnson said baking high-solids polyesters have tremendous advantages over high-solids alkyds and consequently have become the workhorses. He stated that they cure at lower temperatures, are more economical, display better exterior durability, possess flexibility and humidity resistance, and give better adhesion and salt block.

The speaker noted that blocked isocyanates and urethanes have been put into high-solids solutions, with aromatics and aliphatics available. Also, air dry high-solids resins are on the market. House paint markets in California are being satisfied by these resins with the paints having the same properties as the old conventional resins.

In conclusion, Mr. Johnson stated that overall quality concerns are increasing with methods such as statistical process control, which allows the manufacturer to control the process instead of the end product. He said consistency, predictability, and better utilization of material result in cost savings, less pollution, and greater quality of morale.

PETER C. KUZMA, *Secretary*

PIEDMONT .... DEC.

"Interpersonal Relationships"

The evening's presentation was delivered by Herb Ragsdale, a consultant in employee/management relations. His topic was on the "IMPORTANCE IN INTERPERSONAL RELATIONSHIPS."

The speaker stated that if people feel positive about themselves, then they can treat others as they should—with awe, respect, and love.

RUBY JOHANNESEN, *Secretary*

PITTSBURGH .... NOV.

"Collaborative Testing Program"

Environmental Affairs Committee Chairman J. Ed Threlkeld, of Ashland Chemical Company, reported that the Environmental Protection Agency has established a new test for residual levels of benzene, toluene, and furfural.

Charles G. Leete, of Collaborative Testing Services Inc., was the meeting's technical speaker. He discussed the "COLLABORATIVE TESTING PROGRAM FOR THE PAINT AND COATINGS INDUSTRY."

Mr. Leete emphasized the need for laboratories to evaluate materials and products by means of standard procedures and to obtain results that are in agreement. He went on to say that the Collaborative Testing Program is aimed toward improvement in the reliability of paint and coatings testing and to the development of reproducible test methods.

According to Mr. Leete, the program is designed to help in the following ways: to check both instrument collaboration and operator technique; to compare the level and precision of testing with that of the competition; to reduce collaboration costs; to save production costs; to improve uniformity of supply; to provide documentation of testing capability; and to provide proficiency testing for accreditation.

JOSEPH POWELL, *Secretary*

Solution to February's *"CrossLinks"*

Chicago

(Apr. 2)—"Titanium Dioxide's Contribution to the Durability of Paint Films"—J.H. Braun, E.I. du Pont de Nemours & Co., Inc., and "Silicone Resin, Intermediates and Additives for Low VOC Coating Applications"—William A. Fenzel, Dow Corning.

(May 11)—Awards Night.

Cleveland

(Apr. 17)—"Corrosion—Radical Rust Research"—Brian S. Skerry, The Sherwin-Williams Co.

(May 15)—"Chemistry of a Stradivarious"—Joseph Nagyvary, Texas A&M University.

Dallas

(Apr. 12)—"Corrosion Reduction in Solvent and Water-Borne Coatings Using Zircoaluminates"—Lawrence B. Cohen, Manchem Inc.

(May 10) — "Titanium Dioxide Use"—Jack Dittmar, Hitox Corp.

Golden Gate

(Apr. 16)—"The Truth About Accelerated Weathering—It's Simpler Than You Think"—Douglas M. Grossman, The Q-Panel Co.

(May 14)—"New Developments in High Solids Resins and Rheology Additives"—Robert Van Doren, NL Chemicals.

Houston

(Apr. 11)—"Corrosion Reduction in Solvent and Water-Borne Coatings Using Zircoaluminates"—Lawrence B. Cohen, Manchem Inc.

(May 9)—"Titanium Dioxide Use"—Jack Dittmar, Hitox Corp.

Kansas City

(Apr. 13)—Ladies' Night.

(May 10)—Education Night.

(June 8-10)—Joint Meeting of St. Louis and Kansas City Societies. Holiday Inn, Lake of the Ozarks, Missouri.

Los Angeles

(Apr. 11)—"The Truth About Accelerated Weathering—It's Simpler Than You Think"—Douglas M. Grossman, The Q-Panel Co.

(May 9)—"New Developments in High Solids Resins and Rheology Additives"—Robert Van Doren, NL Chemicals.

New York

(Apr. 3)—"Calculation Approach to Efficient Titanium Dioxide Formulation in Coatings"—Rebecca Craft, E.I. du Pont de Nemours & Co., Inc.

(May 8)—"A Solvent Property and Solubility Parameter Calculator"—Mark Dante, Exxon Chemical Co.

Pacific Northwest Portland, Seattle & Vancouver Sections

(Apr. 17-19)—"The Truth About Accelerated Weathering—It's Simpler Than You Think"—Douglas M. Grossman, The Q-Panel Co.

(May 15-17)—"New Developments in High Solids Resins and Rheology Additives"—Robert Van Doren, NL Chemicals.

Philadelphia

(Apr. 28)—Awards Banquet.

(May)—Manufacturing Seminar.

Technical Committee Meetings

(Apr. 5)—"Pigment Synergism"—John Baiker, NYCO.

Pittsburgh

(Apr. 9)—Federation Officers' Visit and Past-Presidents' Night.

(May 14)—Annual Meeting.

Rocky Mountain

(Apr. 10)—"The Truth About Accelerated Weathering—It's Simpler Than You Think"—Douglas M. Grossman, The Q-Panel Co.

(May 7)—"New Developments in High Solids Resins and Rheology Additives"—Robert Van Doren, NL Chemicals.

St. Louis

(Apr. 17)—Manufacturing Meeting.

(May 15)—Past-Presidents' Night. "TiO_2 Update—Domestic and World" —Louis Griffis, Kerr McGee.

(June 8-10)—Joint Meeting of St. Louis and Kansas City Societies. Holiday Inn, Lake of the Ozarks, Missouri.

Toronto

(Apr. 9)—"Acrylic Coatings"—G. Shield, S.C. Johnson & Son Inc.

(May 14)—"Safe Use of Isocyanate Coatings"—Speaker to be announced.

Western New York

(Apr. 17)—"Factors of Influence in Material Weatherability"—Mike Crewdson, SubTropical Testing Service. Cambria's, Of Course!, Nepew, NY.

(May 15)—"Water-Borne Coatings for Wood"—Theodore DelDonno, Rohm and Haas Co. Shooters Restaurant, Buffalo, NY.

Elections

BIRMINGHAM

Associate

REED, TIM J.—Scott Bader Co., Wallaston Wellingborough, Northants.
SCHOLFIELD, ROBERT D.W.—Ferro Great Britain, Stoke-on-Trent, Straffordshire.

CDIC

Active

CASTLE, RICHARD—C.P. Inc., Richmond, IN.
BOOKER, THOMAS M.—C.P. Inc., Connersville, IN.
BUCHMAN, JEFFREY I.—Hanna Chemical Coatings, Columbus, OH.
HELTON, KAREN S.—Hanna Chemical Coatings, Columbus.
KUNKE, MIKE—Surface Research, Blacklick, OH.
LEWIS, THOMAS L. JR.—BASF Corp., Cincinnati, OH.
MANN, RICHARD E.—Surface Research, Blacklick.
MILLER, THOMAS H.—Bolce Paint Co., Cincinnati.
MOLLOHAN, KENNETH L.—Hanna Chemical Coatings, Columbus.
PODLEWSKI, RAYMOND—C.P. Inc., Connersville.
SIY, JOSE RULLEN—Yenkin-Majestic, Columbus.
TUCKERMAN, THOMAS D.—Yenkin-Majestic, Columbus.
WILLIAMSON, F. DALE—Yenkin-Majestic, Columbus.

Associate

DYNES, THOMAS B.—Unocal Chemicals Div., Middletown, OH.
HARPER, RONALD A.—Day-Glo Color Corp., Brookpark, OH.
HERMAN, CHRISTOPHER T.—B.F. Goodrich, Cincinnati, OH.
MERRITT, JIMMIE A.—The Meritech Co., Cincinnati.
SYNDER, HAL L.—Chemcentral, Westerville, OH.

CLEVELAND

Active

BOOTHE, DAVID P.—Lubrizol Corp., Wickliffe, OH.
BRUNORI, DAVID J.—PPG Cleveland, Cleveland, OH.
GRAFF, NORBERT E.—Sherwin-Williams Co., Cleveland.
HARDING, CHRIS C.—Waterlox Chemical & Coatings Corp., Cleveland.
MAZOROW, WAYNE—The Euclid Chemical Co., Cleveland.

Associate

ALESSANDRO, CARL J.—Byk-Chemie USA, Strongsville, OH.
CARLSON, DENNIS L.—Ferment ASC Corp., Mentor, OH.
KENNY, ROBERT D.—T.J. Bell Inc., Akron, OH.
MCALLISTER, JOHN W.—Dar Tech, Maple Heights, OH.

DALLAS

Active

CARLSON, DARRELL C.—Western Automotive, Grand Prairie, TX.
GOWEN, MARIA J.—DeSoto, Inc., Garland, TX.
HARLOW, HEWITT C.—Malvern Minerals Co., Hot Springs, AR.
HUGHES, STEVE—Hitox Corporation, Corpus Christi, TX.
KELLY, JOHN H.—DeSoto, Inc., Garland.
LIN, WEI—DeSoto, Inc., Garland.
MORGAN, DONITA G.—Dow Chemical, Dallas, TX.
STEPHEN, MATHEW—Sureguard, Inc., Grand Prairie.
WALKER, OLLIS L.—Lilly Industrial Coatings, Dallas.

Associate

BENNETT, RON L.—Crozier Nelson Sales, Irving, TX.
CLARK, TOM L.—R.B. Patterson Co., Inc., Dallas, TX.
FISACKERLY, FLETCHER D.—Kerr-McGee Chemical Corp., Oklahoma City, OK.
LEWIS, BILL—Acme Distributors, Richardson, TX.
MCHUGH, M. JAY—Crozier-Nelson, Guless, TX.
PHILLIPS, JIM R.—Evans Cooperage Hou., Garland, TX.
TOLLY, MARGARET J.—Union Carbide, Garland
WALTERS, RICHARD W.—Union Carbide, Garland.
YENKE, KATHERINE L.—UCAR Emulsion Systems, Garland.

HOUSTON

Active

BAUER, CARL J.—E.C.C. America Inc., Gonzales, TX.
BURKE, BARRY—D&F Distributing, Inc., Houston, TX.
CARRASCO, AIRTON—Tekno S.A. c/o Schneider, Houston.
JAMES, FRANK—Empire Coatings Inc., Houston.
MIRAMS, KEN J.—Dow Chemical Co., Freeport, TX.
RYGIEL, JOHN W.—Benjamin Moore Co., Houston.
SCHNEIDER, HANS J.—H.J. Schneider & Assoc., Houston.
SIMPSON, JAMES U.—Gulf Coast Chemres, Channelview, TX.
STEELE, DENNIS L.—Dow Chemical Co., Freeport.
WATERS, DONALD D.—Dow Chemical Co., Freeport.
WITTENAUER, KENT A.—Devoe-Raynolds, Houston.

Associate

ARTHUR, TOM L.—Delta Distributors, Houston, TX.
BOSS, EDWARD E.—Bossco Industries, Houston.
BRODOWSKI, BRUCE E.—MAT Chemicals, Houston.
FOERSTER, JAMES R.—Unocal Chemicals, Houston.
HEWETT, JAMES—Valley Solvents Co., Houston.
JANSEN, ERIC A.—Exxon Chemical, Houston.
JENKINS, HENRY B.—National Pigments & Chemicals, Houston.
LANE, ROCKY—Delta Dist. Inc., Houston.
MCDERMOTT, ARTHUR R.—Champion Chemicals, Inc., Sugarland, TX.
OWENS, BONNIE K.—Raw Materials Corp., Houston.
TUCKER, ROBBIE—Unocal Chemicals, Houston.
WHEELER, STEPHEN P.—Unocal Chemicals Div., Houston

Retired

HARPER, RITA M.—Houston, TX.

LOS ANGELES

Active

ALY, M. MOSELHY—Crossfield Products, Compton, CA.
ANGULO, SUZANNA—Poly-Lux Inc., Los Angeles, CA.
ARKOIAN, NORAIR A.—Trail Chemical Corp., El-Monte, CA.
BOLDUC, BILL J.—Clearprint, Irvine, CA.
GOTTSCHALCK, BERT A.—Engard Coatings Corp., Huntington Beach, CA.
LEON, JUAN T.—Dunn-Edwards Corp., Los Angeles.
LU, ROGER C.—Products Research & Chemicals, Burbank, CA.
MCKOWN, STEPHEN M.—Reliance Universal, Brea, CA.
MITRA, ARUP R.—Spraylat Corporation, Los Angeles.
MOSTEIRO, GERARDO—Reliance Universal, Brea.
PREISS, DAWN M.—PPG Industries Inc., Los Angeles.
QUINTEROS, PHILLIP—Hill Brothers Chemicals, Industry, CA.
SYPOWICZ, ROBERT H.—Arrowhead Coatings, San Bernardino, CA.

Associate

ANDERSON, ROBERT E.—U.S. Silica Co., Newport Beach, CA.
CURL, DONALD R.—E.T. Horn Co., La Mirada, CA.
FOWLER, STACY R.—McWhorter Inc., Los Angeles, CA.
MORRIS, CHARLES A.—Standard Industrial Minerals, Cucamonga, CA.
MULKERN, STEVE J.—Manville, Lompoc, CA.
REYNOLDS, STEVEN T.—Union Carbide, Long Beach, CA.
RIEGLER, BILL B.—Union Carbide, Long Beach.

Rozcicha, Edward J.—Harborlite Corp., Escondido, CA.
Shloss, Anthony L.—R.T. Vanderbilt Co., Buena Park, CA.
Skarvan, Robert J.—McWhorter Inc., Commerce, CA.
Wendt, Bill—Kemira Inc., Tustin, CA.

Retired

Hoffman, Arnold H.—Torrance, CA.

MONTREAL

Active

Boivin, Serge—Peinture Chateau, Montreal, Que.
Brouillette, Jacques—BAPCO Inc., Boucherville, Que.
Brown, Scott—Tioxide Canada Inc., Sorel, Que.
Chanuel, Denis—International Paints, Baie D'Urfe, Que.
Doe, Robert—Mira-Lux Industries, Saint-Laurent, Que.
Floriot, Yves—International Paints, Baie D'Urfe.
Gougeon, Francios—YBL Div. des Tech. Babn, Montreal.
Herbert, Michel—Domco Industries Ltd., Farnham, Que.
Khan, Shakil—Douchem, Boucherville.
MacRae, John—International Paints, Baie D'Urfe.
Neville, Denis—BAPCO Inc., Boucherville.
Papineau, Nicole M.—Tioxide Canada Inc., Sorel.
Pelletier, Mario—Societe Chimique Laurentide Inc., Shawinigan Sud, Que.
Saleh-Kotwal, Mohammed—International Paints, Baie D'Urfe.
Santini, Adriana—International Paints, Baie D'Urfe.
Thinh, Tran Phuc—Central Laboratory, Ministry of Transport-Government of Quebec, Sainte-Foy, Que.
Watkins, Barbara—Schmidt Printing Inks Ltd., Ville St. Laurent, Que.
Williams, Glenn T.—International Paints, Baie D'Urfe.

Associate

Akeson, Mark D.—APCO Industries Co., Ltd., Montreal, Que.
Chartrand, Gerard—Cookson Pigments Ltee', Brossard, Que.
Harris, Robert W.—Dow Chemical Canada Inc., Westmount, Que.
Larivere, Jean—Pigment & Chemical, Montreal.
Pattee, A. Kim—Vaudreuil Storage Inc., Vaudreuil, Que.

NORTHWESTERN

Active

Cebula, Casey M.—Sierra Corp., Minnetonka, MN.
Eklund, Wayne G.—H.B. Fuller, Vadnais Heights, MN.
Nevison, David R.—Valspar Corp., Minneapolis, MN.

Associate

Alexander, Carolyn R.—The Dow Chemical Co., Minnetonka, MN.

PACIFIC NORTHWEST

Active

Andersen, Paul R.—Consolidated Coatings, Delta, B.C.
Blaszczok, Henry J.—Tower Paint Div. of Cloverdale Paint Inc., Edmonton, Alberta.
Carnahan, David A.—Ashland Chemical, Portland, OR.
Grossman, Ronald S.—United Coatings, Greenacres, WA.
Heiber, Bill G.—Norris Paint Co., Salem, OR.
Johansson, Carl I.—PMR Research, Burnaby, B.C.
McCauley, Pat—Columbia Paint Co., Spokane, WA.
Mutch, Gary S.—Consolidated Coatings, Delta.
Paulson, Herbert C.—Daly's Inc., Seattle, WA.
Thorne, Trevor—General Paint, Vancouver, B.C.
Ward, Larry—General Paint, Vancouver.
Wheeldon, Roy—QLM Co., Kent, WA.

Associate

Dickman, Robert F.—E.T. Horn, Oakland, CA.
Doherty, Harry A.—Shell Canada Chemicals, Vancouver, B.C.
Hopping, David L.—Harcros Chemicals, Portland, OR.

AFFILIATED

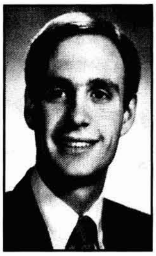
Tanipanichskul, Sanga—ICI Paints (Thailand) Ltd., Nonthaburi, Thailand.

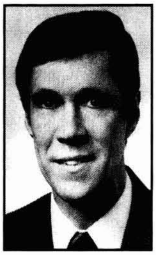
People

William F. Holmes has been appointed Vice President, Director of Technical Sales for National Pigments and Chemicals, Inc., Houston, TX. Mr. Holmes brings 33 years of experience to the position, previously having worked as the Technical Director for DeSoto Chemical Coatings in Garland, TX. He will be responsible for the North Texas, Oklahoma, and Arkansas areas.

Mr. Holmes currently is serving as Treasurer of the Federation of Societies for Coatings Technology and is a member of the Dallas Society.


W.F. Holmes


J.M. McKeon


A.C. Buchholz


A.M. Azar

Jeffrey M. McKeon has been appointed Technical Marketing Supervisor for Dock Resins Corporation, Linden, NJ. In his new position, he is responsible for sales and technical service support for the company's line of synthetic resin products. Mr. McKeon is a member of the New York Society.

Mozel, Inc., St. Louis, MO, has announced the retirement of **Richard N. Wagner** following 24 years of service with the company. Most recently, he served as a Senior Accounts Manager while on a reduced work schedule. Mr. Wagner is a member of the Southern Society.

Personnel changes have taken place during the past several months at Benjamin Moore & Company, Montvale, NJ.

John E. Lynch has retired as Director and Vice President—Operations, after 42 years with company. Mr. Lynch, who became Director in 1986, is a member of the New York Society.

Succeeding Mr. Lynch as Vice President—Operations is **Ward C. Belcher**. He joined the company in 1972 and most recently served as a Director.

Other appointments include: **Charles C. Vail**—Vice President of Budget and Risk Management; **John T. Rafferty**—General Counsel and Assistant Secretary; **John J. Oberle**—Corporation Operations Manager for the Central Laboratories, Corporate Purchasing, and Production Departments; **Jude T. Smith**—Technical Director; **Robert T. Knauer**—Director of Purchases; succeeding **P.T. Carolan** who retired; **Billy J. Sutton**—General Manager and Divisional Sales Manager of the Western Division, succeeding **James Shackelford** and **C.O. Larson**, who retired; and **Donald W. Everett**—Divisional Sales Manager of the Central Division.

Mr. Oberle and Mr. Smith are members of the New York Society.

The Darworth Company, Avon, CT, a division of Ensign-Bickford Industries, Inc., has appointed **Allan C. Buchholz** Director—Research and Development. He will handle all new product formulations and developments. Mr. Buchholz is a member of the Northwestern Society.

A series of appointments have taken place at National Starch and Chemical Corporation, Bridgewater, NJ. **Walter F. Schlauch** has been elected Group Vice President—Adhesives, Resins, and Specialty Chemicals. He joined National in 1963 as a Chemist in resin research. Mr. Schlauch will report to **James F. Kennedy**, Executive Vice President and Chief Operating Officer. Mr. Kennedy succeeds **Daniel F. Peck** who is retiring.

In other moves, **Florent Paquet** has been elected Corporate Vice President and General Manager—Resins and Specialty Chemicals Division. He most recently served as Group Vice President—Adhesives, Resins, and Specialty Chemicals, Canada. Mr. Paquet will report to Mr. Schlauch.

Also, **Raymond Simmons** has been promoted to Director of Marketing and Sales—Specialty Polymers and Chemicals. He most recently served as National Sales Manager, Resins Division. Mr. Simmons will report to Mr. Paquet.

Walter R. Rosemund has been promoted to Business Director for Functional Polymers—Specialty Chemicals Division, Union Carbide Chemicals and Plastics Company Inc., Danbury, CT. In his new post, he will be responsible for water soluble polymers. Mr. Rosemund most recently served as Business Director —New Business Development for the division's specialty products.

Votech Inc., Chicago, IL, a joint venture of Seegott Inc., and E.T. Horn Company, has named **Alison M. Azar** Account Manager. Prior to joining Votech, she was Technical Sales Representative for Arizona/ Sylvachem. Ms. Azar is a member of the New York Society.

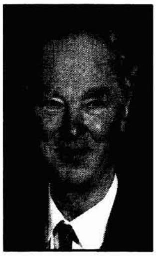
Obron Atlantic Corporation, Painesville, OH, has hired **Jon H. Fisher** to serve as Vice President and General Manager for the firm. He will be responsible for the total business operations of the company. Mr. Fisher previously worked for the Engelhard Corporation in the area of specialty minerals and colors. He is a Past-President of the Dry Colors Manufacturers Association.

The O. Hommel Company, Pittsburgh, PA, has appointed **Joseph Nemeth** to the position of Vice President—Ceramic Engineering. He will be responsible for all technical programs including research and development, company quality assurance programs, and all lab activities. Dr. Nemeth will focus on overall product engineering efforts of inorganic coatings.

The American Society for Testing and Materials (ASTM), Philadelphia, PA, has elected two new officers and four trustees to serve on the Board of Trustees for the Institute for Standards Research, a subsidiary of ASTM. Elected to serve as Chairman was **A. Ivan Johnson**, President of A. Ivan Johnson, Inc. **Derek Till**, a private consultant, will serve as Vice Chairman.

The four new trustees include: **John A. Blair**, Du Pont Company; **Carl B. Crawford**, retired from the National Research Council of Canada; **George E. Dieter, Jr**., of the University of Maryland; and **Kenneth L. Reifsnider**, of Virginia Polytechnic Institute and State University.

Larry Hill, of the Materials Research Laboratory, Defense Sciences and Technology Organization, Melbourne, Australia, was presented with an MRL Award for Excellence in Defense Consulting. He has been employed by MRL since 1962, and is responsible for handling coating problems for Australian Defense Services. Mr. Hill is an Affiliate Member of the Federation of Societies for Coatings Technology, an Honorary Life Member of Surface Coatings Association of Australia (formerly OCCA-Australia), and Honorary Editor of *Surface Coatings Australia*.



Lan Maycock has been named General Manager—Ink Vehicles by Akzo Coatings Inc., Troy, MI. Based in Chicago, IL, he will be responsible for the general management of the firm's two ink vehicles' operations located, respectively, in Matteson and Addison, IL. Mr. Maycock most recently held the position of Vice President of Sales and Marketing—Coating, Polymers and Resins Division of Reichhold Chemicals, Inc.

AB Wilh Becker, West Midlands, England, has announced a major restructuring of its European Industrial Coatings operations. Appointments include: **Geoff Longstaff**—Vice President of AB Wilh Becker, Business Area Manager of Powder across Europe and the U.S., and non-Executive Chairman of the U.K. Group; **John Lyon**—Managing Director of Becker Industrial Coatings; **Eddy Moules**—Managing Director of Becker Acroma; and **Bill Rising**—Controller of Becker Powders Business Area, covering all powder operations within the Becker Group. **Aled Roberts** remains as Managing Director of Becker Powders in the U.K.

William P. Radcliff has announced his retirement as President and Chief Operating Officer from Guardsman Products, Inc., Grand Rapids, MI. As part of the transition of duties, he becomes Vice Chairman until his retirement, effective at the end of 1990.

Elected President and Chief Operating Officer of Guardsman was **Charles E. Bennett**. Currently, he is Vice President—Finance and Chief Financial Officer.

Also, **Edward D. Corlett**—Director of Finance, was elected Vice President, Treasurer, and Secretary of the company.

John Lake has been named Director—Marketing for Carlo Erba Instruments, a subsidiary of Fisons Instruments, Valencia, CA. He will direct the North American marketing efforts for Carlo Erba's entire product line including gas chromatographs, elemental analyzers, capillary and microHPLC instrumentation, supercritical fluid chromatographs, and microstructure products. Mr. Lake previously has served as a Marketing Manager and Analytical Services Manager.

The Clay Division, J.M. Huber Corporation, Macon, GA, has made **John Bellnap** Vice President—Marketing and Sales. He will head the domestic and international market of Huber's kaolin clay and structured pigment products. Prior to joining Huber, Mr. Bellnap was Director of Marketing—Swift Adhesives Division at Reichhold Chemicals.

The Biomedical Systems Division of PPG Industries, Inc., Pittsburgh, PA, has named **Douglas R. Hillier** General Manager. He joined PPG in 1988 as Marketing Director—Biomedical Systems. Mr. Hillier, who has extensive management experience in the medical equipment industry, replaces **Edward F. Voboril** who left the company effective December 31, 1989 to pursue other interests.

David F. Ellison has been named Vice President—Engineering for the Macbeth Division of Kollmorgen Instruments Corporation, Newburgh, NY. His duties include planning and directing the overall engineering activities of the division. Mr. Ellison assumes responsibilities for the creation, development, design, and improvement of products and for providing engineering and technical assistance to other departments.

The Specialty Coatings Division, Dexter Corporation, Waukegan, IL, has appointed **Lee C. Soule** Vice President—Marketing. In this newly created position, he will be in charge of all division marketing, sales, and laboratory operations in North America. Mr. Soule began his career at Dexter in 1970 as Salesman for industrial products and golf ball coatings.

James E. Heil was appointed Manager—Product and Sales Training by Devoe & Raynolds Company, Louisville, KY. His new duties include the development and implementation of training programs for Devoe branches and dealer sales personnel. Mr. Heil joined Devoe from Porter International Coatings Company.

Obituary

Henry H. Reichhold, founder of Reichhold Chemicals, Inc., died December 11. He was 88 years old.

Born in Berlin and educated at the Universities of Berlin and Vienna, Mr. Reichhold began his career in Vienna with Beck, Koller and Company in 1921. In 1924, he emigrated to the U.S. and began work as a Laboratory Assistant in Ford Motor Company's Paint Department in Detroit, MI. In 1927, Mr. Reichhold founded the forerunner of his company and 11 years later it took its current name.

Mr. Reichhold retired as Chairman of Reichhold Chemicals in 1982 and from the Board of Directors in 1985.

Among his many contributions to the cultural, civic, and educational world are: reviving the disbanded Detroit Symphony Orchestra; designing and constructing the Akademie der Kunste in Berlin; serving as an original member of the Board of Overseers of the College of the Virgin Islands; and establishing the Henry H. Reichhold Scholarship fund for children of his employees.

In 1976, Mr. Reichhold was presented the Louis Pasteur Humanitarian Award by the Intra-Science Research Foundation of Los Angeles, CA, for his "personal commitment to science and progress and their application to the improved quality of living."

Herman C. "Hank" Miller, a Past Regional Vice President of the National Paint and Coatings Association, died December 26. He was a past member of the St. Louis Society.

Mr. Miller worked for more than 30 years with the Thompson-Hayward Chemical Company, St. Louis, MO, having served as Manager of the St. Louis District and Manager of the Industrial Coatings Division. He was retired from Thompson-Hayward.

Mr. Miller is survived by his wife, Grace; two daughters; a son; and grandchildren.

Robert W. Matlack, Former President of Federation, Dies at Age of 79

Robert W. Matlack, who was President and later Executive Vice-President of the Federation of Societies for Coatings Technology, died on January 17, at the Memorial Hospital of Burlington County, Mt. Holly, NJ. He was 79 years old.

Mr. Matlack was born on June 1, 1910, in Moorestown, NJ. He attended Moorestown Friends School and Westtown School, and received the B.S. Degree in Chemistry from Princeton University in 1931.

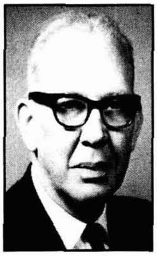
After graduation, he joined George D. Wetherill & Company, Inc., in Philadelphia, PA. Mr. Matlack served as Technical Director for several years and was elected President in 1943, succeeding his father, Samuel R. Matlack. He worked in that capacity until 1963, when he became Chairman of the Board and Treasurer. Mr. Matlack retired from the company at the end of the year.

He was appointed Executive Vice-President of the Federation on February 29, 1964. Mr. Matlack had been a member of the Federation for 35 years, at the time, and served as its President in 1948-49. Also, he had been Treasurer of the Federation's Paint Research Institute from 1957.

As Executive Vice-President of the Federation, he was also responsible for managing the Paint Industries' Show, the Federation's annual international exhibit of raw materials and equipment used in the coatings manufacturing industry. Mr. Matlack retired as Executive Vice-President of the Federation in December 1973.

Managing the Federation's Paint Show earned Mr. Matlack membership in the National Association of Exposition Managers. He went through the chairs of that organization and was elected to the Presidency in 1972.

In 1957, he was presented the highest honor of the Federation—the George Baugh Heckel Award for his outstanding contributions to the Federation and the protective coatings industry. In 1963, the Federation presented Mr. Matlack a special award for 20 consecutive years of devoted service as a member of the Board of Directors and/or the Finance Committee.



He was elected to Honorary Membership in the Federation and three of its Societies: Birmingham (England), Pacific Northwest, and Philadelphia. The latter presented him their Liberty Bell Award in 1962.

Mr. Matlack received the Paint Pioneer Award from the Philadelphia Paint and Coatings Association and the Industry Statesman Award from the National Paint and Coatings Association.

He was a Fellow of the American Institute of Chemists, and a member of the American Chemical Society, American Society for Testing and Materials, the Gallows Bird Society, the Princeton Club of Philadelphia, and the Moorestown Field Club.

Mr. Matlack also was a member of the Moorestown Friends School Committee and President of both the Friends Neighborhood Guild of Philadelphia and the Cricket Club Soccer League of Philadelphia.

After his retirement, he continued his interest in associations and exhibit management by becoming a consultant in those fields. Mr. Matlack was Show Manager of the National Association of Ceramic Manufacturers, and Executive Director of the Philadelphia Association of Metal Finishers, Delaware Valley Society of Association Executives, and the Wise Snack Food Distributors Association.

He is survived by his wife, the former Elizabeth Hendrickson; three sons, Louis R., of Moorestown, NJ, James H., of Washington D.C., and Richard W., of Falmouth, ME; nine grandchildren; and a sister, Mrs. Elizabeth Haines, of Medford Leas, NJ.

Kent State Spring Short Course Schedule to Focus On Rheology, Dispersion, and Adhesion

The Rheology and Coatings Laboratory at Kent State University, Kent, OH, has announced its schedule of spring short courses.

The programs scheduled are: "Applied Rheology for Industrial Chemists"—April 23-27; "Dispersion of Pigments and Resins in Fluid Media"—May 7-11; and "Adhesion Principles and Practice for Coatings and Polymer Scientists"—May 21-25. Each course will begin with an overview of the relevant scientific fundamentals followed by extensive discussion on the application of these principles in practice.

The rheology program will introduce basic concepts after which various rheological instruments and their selection for end use and processing will be described. The rheological measurements of coatings by stress rheometry and rheology control of high-solids coatings will be discussed. Additional topics to be examined are thermoplastic melts, latexes, dispersions, cure characterization, rheology of thermoset coatings, mechanical properties of coatings, and application of rheology to industrial problems.

Presentations in the dispersion course will be on surface chemistry and physics relative to dispersion, dispersant selection and measurement of quality, and particle size of dispersions. Various experts on the mechanics of dispersion of pigments, resins, and latexes in classic solvent and water media will speak. Types of dispersion equipment such as mixers, and ball and pebble, horizontal, sand, and related small media mills and their proper selection will be discussed.

Lectures during the adhesion class will focus on present principles of surface chemistry related to adhesion science, rheology, and fracture mechanics of glassy and elastomeric adhesives. Discussions on surface preparation, plasma treatment, adhesion promoters, and surface analysis techniques will be presented. Other topics during the program include rubber-to-metal and polymer-to-metal bonding, tack, release coatings, adhesion bond durability, and structural adhesives. The course will close with a lecture on adhesive application methods.

All three programs are designed for personnel in research, development, and quality control who have an interest in coatings, adhesives, elastomers, inks, and composites.

Additional information can be obtained by contacting Carl J. Knauss, Kent State University, Chemistry Dept., Kent, OH 44242.

SSPC Conference and Show Slated for Nashville

The National Conference and Exhibition of the Steel Structures Painting Council (SSPC), Pittsburgh, PA, will be held on December 2-7, at the Opryland Hotel, in Nashville, TN.

The technical program will consist of nine seminars on a wide variety of topics. Some seminars will address specific industries where coatings application plays an important role, including: "Painting in Fabricating Shops"; "Coating Water and Waste Treatment Facilities"; "Painting Chemical Plants"; and a forum on bridge coatings. Seminars geared toward more general issues of concern are: "Advances in Low VOC Coatings"; "Advances in Surface Preparation"; "Hazardous Materials: Handling and Disposal"; "Tank Linings"; and "General Coatings Technology."

A series of 12-14 tutorials/educational lectures will be offered by experts in the field. The tutorials will fall into four categories: "Coating Materials," "Surface Preparation and Application," "Inspection," and "Coatings Program Management."

For more information, contact Rose Mary Surgent, Meetings Mgr., SSPC, 4400 Fifth Ave., Pittsburgh, PA 15213-2683.

Louisville Society Cosponsoring Coatings Course On Synthetic Resins at University of Louisville

The Louisville Society for Coatings Technology in conjunction with the Department of Chemical Engineering, at the University of Louisville, Louisville, KY, is cosponsoring a coatings course at the school this semester.

The course, "Surface Coatings Technology I: Synthetic Resins," is the first of four courses in the Surface Coatings Technology series. The course provides an overview of the synthetic resin systems used in coatings technology. Emphasis is on the structure-property relationships and the benefits and limitations of these various resin types.

Some of the areas to be focused on during the course include: coatings; macromolecules; film formation, properties, and defects; step-growth polymerization—polyesters; and oils, oleoresinous binders, and akyds. In addition, discussions will focus on chain-growth polymerization—radiation curing; vinyls; polymerization techniques; aminoplasts and phenolic resins; isocyanate chemistries; epoxies, epoxy esters, and polyamides; silicones and cellulosics; low VOC coating technologies, and binder selection.

The class is geared toward chemists, chemical engineers, technicians, and others interested in coatings technology.

For more information, contact Paul R. Baukema, Reliance Universal, Inc., R & D Div., P.O. Box 37230, Louisville, KY 40233.

Coatings Classes Underway At George Brown College

Winter courses in coatings and plastics technology currently are underway at the St. James Campus of George Brown College, Toronto, Ont., Canada. The classes have been approved by the Ministry of Colleges and Universities and certified jointly by the College and the Toronto Society for Coatings Technology.

The courses are designed to be taken separately. Credits may be accumulated towards the Chemical Technician—Coatings certificate and/or diploma.

Coatings classes being taught include: "Resins—A," "Principles of Color Technology," "Paint Flow and Pigment Dispersion," and "Paint Flow and Pigment Dispersion Laboratory."

Also, a course in "Polymer Chemistry" and a "Polymer Chemistry Lab" is being offered.

Adhesives Course to Be Held in Washingtion in April; SUNY Announces Spring and Fall Program Slate

A short course on "Adhesives: Chemistry, Properties, and Applications" is scheduled on April 4-6, at the Georgetown Marbury Hotel, in Washington, D.C. The program is sponsored by The Institute of Materials Science with the cooperation of the Center for Continuing Education at the State University of New York, New Paltz, NY.

The program will emphasize updating the fundamental research and technology of adhesives. The seminar will feature lectures for scientists and engineers. Topics scheduled to be presented include:

"Fundamentals of Adhesion, Interfacial Forces, Wetting, and Spreading"—A.V. Pocius;

"Rubber Modification of Structural Adhesives"—A.V. Pocius;

"Material and Processes for Aerospace Adhesives"—T.J. Reinhart;

"Applications and Service Experience in Aerospace Adhesives"—T.J. Reinhart;

"Opportunities for Adhesives in the Automotive Industry"—J.W. Holubka;

"Chemical Interactions Between Adhesives and Substrates"—J.W. Holubka;

"New Adhesive Materials"—K.F. Drain;

"Characterization of Adhesive Materials"—K.F. Drain;

"Test Methods for Adhesive Joints—A Critical Review"—R.B. Krieger; and

"Design of Adhesive Joints"—R.B. Krieger.

Additional courses slated for the Spring are: "Polymer Blends and Alloys: Phase Behavior, Characterization Morphology, Alloying Technology"—April 18-20, Orlando, FL; "Crosslinked Polymers: Chemistry, Properties, and Applications"—May 2-4, Pearl River, NY; "Thermoplastic Elastomers"—May 2-4, Pearl River; and "Polymer for Electronic Applications"—May 2-4, Pearl River.

Courses to be offered during the fall include: "Fundamentals of Adhesion: Theory, Practice, and Applications"—October 10-12; "Chemistry and Properties of High Performance Composites: Designed Especially for Chemists"—October 10-12; "High Performance Polymers: Chemistry, Properties, and Applications"—October 10-12; "Principles in the Stabilization and Controlled Degradation of Polymers"—To be announced; "Scanning Electron Microscopy and X-Ray Microanalysis: Introductory Course for Semiconductors and Materials Science"—October 15-19; "Scanning Electron Microscopy and X-Ray Microanalysis in Cell Biology: Introduction to Immunogold Labeling, Backscatter and Macromolecular Imaging, and Cryosection Microanalysis"—October 15-19; "Advanced SEM: Characterization of Semiconductors and Microelectronics, Imaging Techniques"—October 22-25; and "Electron Beam Microanalysis"—October 22-25.

For more information, contact Angelos V. Patsis, Director, Institute of Materials Science, State University of New York, New Paltz, NY 12561.

Piedmont Society Awards $500 Scholarships

The Piedmont Society for Coatings Technology recently awarded scholarships to two local students in memory of Dr. Edmund O. Cummings, former Federation Honorary Member and head of the Chemistry Department at High Point College, High Point, NC.

Brian Whiteford, a freshman at High Point College with a GPA of 4.0, and Iris Wagstaff, a sophomore at the University of North Carolina at Greensboro with a GPA of 3.4, were awarded $500 scholarships. Both Mr. Whiteford and Ms. Wagstaff are chemistry majors at their respective schools. The scholarship monies were to be used for the spring semester classes.

The Piedmont Society annually awards two $1,000 scholarships. The criteria for the awards are that the student be a chemistry major and have a GPA of 3.0. In addition, the student needs a recommendation from their department head and should seek some interest in learning more about coatings, i.e., summer employment with one of the member companies.

The Piedmont Society Educational Committee which was responsible for presenting the scholarships includes: Chairman—James M. Bohannon, of Valspar Corporation; James A. Martz, of Lilly Company; Phillip Wong, of Reliance Universal, Inc.; Greg Muselman, of Lilly Company; Steven M. DuPont, of Ashland Chemical Company; Donald H. Logue, of Anchem, Inc.; and Mel D. Hurwitz, of the University of North Carolina at Greensboro.

Macbeth Donates Equipment To Terra Technical College

Color measurement equipment and teaching aids have been presented to Terra Technical College, Freemont, OH, by the Macbeth Division of Kollmorgen Instruments Corporation, Newburgh, NY. The contribution is for use in the college's newly established color matching course program.

Included among the donations were: a Color-Eye® spectrophotometer, an Optimatch™ color matching system with software designed for plastics applications, a SpectraLight™ calibrated lighting booth for making color judgments, a portable glossmeter, and the Farnsworth Munsell 100 hue color test.

Papers Solicited for NACE Concrete Symposium; Midwest Corrosion Conference Planned for 1990

The National Association of Corrosion Engineers (NACE), Houston, TX, and the American Concrete Institute invite all prospective authors to submit a paper for the "Concrete: Surface Preparation, Coatings and Linings, and Inspection Techniques" Symposium slated for January 28-30, 1991, at the J.W. Marriott Hotel, in Houston.

Papers on the following topics pertaining to coatings and concrete being solicited are: installation and curing of concrete; surface preparation of concrete; inspection of coatings and linings on concrete; coatings and linings for concrete in specific industries; maintenance and repair of concrete; and coatings of concrete.

All papers must be submitted by March 15, 1990 and include a proposal containing the topic, a 50-100 work abstract, and full details of their address and telephone/fax/telex number to Joseph Wolf, Wisconsin Protective Coatings Corporation, P.O. Box 216, Green Bay, WI 54305.

The major focus of the program will be on coatings and linings for concrete in any corrosive environment. Surface preparation specifically will be addressed, including water blasting, abrasive blasting (both wet and dry), and acid etching. New technologies of coatings will be discussed, as will techniques of coating concrete.

* * *

In other news, the Detroit Section of the NACE North Central Region has scheduled a Midwest Corrosion Conference on September 24-26, at the Hyatt Regency, in Dearborn, MI. The conference will be held in conjunction with the 1990 North Central Regional Meeting of NACE.

The conference will feature technical papers on corrosion in utilities/pipelines, transportation, and chemical/petrochemical industries. A basic $1^1/_2$ day corrosion course will be offered along with corrosion control equipment and materials exhibits.

For further details, contact Program Chairman Jerry Wenzel, Michigan Consolidated Gas Co., 3200 Hobson, Detroit, MI 48201.

Center for Professional Advancement Releases 'Intensive' Short Course Schedule for the Spring

The Center for Professional Advancement, East Brunswick, NJ, is sponsoring four "intensive"short courses this spring. Participants in the classes will be awarded Continuing Education Units which can be used toward certification by The National Certification Commission in Chemistry and Chemical Engineering, sponsored by The American Institute of Chemists.

"Water-Based Polymers: Chemistry and Applications Technology" will be held on April 23-27, in Chicago, IL. The course aims to review such scientific basis as exists in water soluble and water sensitive polymers and to bridge the gap that separates scientific principles and the application technologies.

The class on "Radiation Curing: Ultraviolet Light and Electron Beam Technology—in Coatings, Inks, Adhesives, and Photopolymers" is scheduled for May 8-10, in Somerset, NJ, and for June 6-8, in the San Francisco Bay area. The seminar is designed to provide comprehensive knowledge of this new technology. Detailed presentations will provide information on applications and markets, chemistry/photoinitiation technology, additives, business opportunities, equipment, formulations, synthesis methods, manufacturing, application techniques, evaluation and testing, health and safety, government regulations, advancements, and new developments/markets.

"Using the New Barrier Plastics Effectively" is slated for May 15-17, in Chicago. The seminar will focus on the newly developed barrier composites such as ethylene-vinyl alcohol and polyvinylidene chloride coextrusions. The basics of coextrusion technology and the processing characteristics of tie-layers and resins will be covered. Also, the physical and chemical properties of these newly introduced barrier materials will be discussed relative to the packaging of specific foods and drugs.

The course "Finishing and Decorating Plastics Surfaces: Treatment, Coatings, Printing" will be held on May 21-23, in East Brunswick, NJ. Various techniques used to finish and decorate plastic surfaces and the types of coatings used for these applications will be covered.

For more details, write The Center for Professional Advancement, P.O. Box 964, East Brunswick, NJ 08816-0964.

Lehigh University to Host Course on Latex Technology

The 21st annual short course "Advances in Emulsion Polymerization and Latex Technology" will be offered on June 4-8, at Lehigh University, Bethlehem, PA.

The class is an in-depth study of the synthesis and properties of high polymer latexes. The subject matter includes a balance of theory and applications, as well as a balance between chemical and physical problems. Lectures, given by leading academic and industrial workers, begin with introductory material and reviews, and progress through recent research results.

The course is designed for engineers, chemists, other scientists, and managers who are actively involved in emulsion work and for those who wish to develop expertise in the area.

Further information is available from Mohamed S. El-Aasser, Emulsion Polymers Institute, Lehigh University, 111 Research Dr., Bethlehem, PA 18015.

X-Ray System

A new tabletop x-ray fluorescence system designed to measure the thickness of virtually any coating, including multilayer coatings on any base, is the subject of a bulletin. The system is for precise measurements for the electronics, automotive, appliance, fastener, and aerospace markets. For details on the XRF-1000 system, write CMI International, 2301 Arthur Ave., Elk Grove Village, IL 60007.

Translucent Wood Finish

A high gloss translucent wood finish for front doors, garage doors, and frames and windows is the focus of product literature. The new one coat system is based on special ultraviolet resistant resins and pigments and was developed specifically for exterior use. The coating also can be used on interior surfaces where a high gloss finish is desired. More information on Cetol® TGL is available from Akzo Coatings Inc., 1845 Maxwell St., Troy, MI 48084.

Standards Catalog

The "1990 ASTM Publications Catalog" which describes 68 volumes of the "Annual Book of ASTM Standards," is in print. The publication also contains several hundred ASTM special technical publications, compilations, data series, manuals, and standard adjuncts. The catalog is available free from ASTM Customer Service, 1916 Race St., Philadelphia, PA 19103.

Nitroparaffins

A review has been printed which describes the economical transformation of nitroparaffins to nitrile oxides. The four-page technical publication, "Inexpensive Generation of Nitrile Oxides: Evolving Chemistry from an Industrial Viewpoint," is available from the Nitroparaffins Group, W.R. Grace & Co., 55 Hayden Ave., Lexington, MA 02173.

In-Store Color Matching

A new line of in-store color matching systems has been introduced in literature. The new system line is designed to meet the diversity of sales situations occurring in retail and chain store markets. For more data on the Paintmaker V, write Applied Color Systems, Inc., P.O. Box 5800, Princeton, NJ 08543.

Heavy Zinc Phosphate

A technical data sheet focuses on a heavy zinc phosphate which is designed to deposit phosphate coatings in excess of 1500 mg/ft on a wide variety of parts. The formulation is made without nickel, and poses fewer health hazards to workers. Detailed performance and application data on Irco Bond Supreme is available from Man-Gill Chemical Co., 23000 St. Clair Ave., Cleveland, OH 44117.

Electrochemical Impedance Measurement

A 16-page application note discusses electrochemical impedance measurement techniques and the instruments and software used to execute impedance measurements. The note summarizes the advantages and disadvantages of each technique and type of instrument. For more details on Application Note AC-3, write EG&G Princeton Applied Research, Electrochemical Instruments Div., CN 5206, Princeton, NJ 08543-5206.

Rheometer System

A product bulletin highlights a new rheometer system designed for measuring the viscosity and viscoelasticity of a broad spectrum of fluids from relatively non-viscous water-like materials to high viscous semi-solids. Testing methods include but are not limited to: oscillation as a function of amplitude with constant frequency; both single and series oscillatory measurements; shear jump, relaxation, and tension tests; and flow curves, equilibrium viscosity, viscosity as a function of time, and temperature. Write Contraves, Industrial Products Div., 11258 Cornell Park Dr., #612, Cincinnati, OH 45242-9006 for details on the Low Shear 40 Rheometer System.

Acetate-Ethylene Copolymer

A newly updated brochure highlights a fine particle size vinyl acetate-ethylene copolymer. The literature describes how the emulsion is used in interior and exterior paints, includes information regarding typical emulsion and film properties, and provides formulation recommendations. For a copy of the brochure, "Airflex® 500 Emulsion for Interior and Exterior Paints," write Air Products and Chemicals, Inc., Polymer Chemicals Div., 7201 Hamilton Blvd., Allentown, PA 18195-1501.

Solid Color Acrylic Stain

An exterior stain which is available in 15 contemporary colors is featured in literature. The water-based stains are designed to be mildew resistant, water-repellent, and will protect wood from warping and checking. Information on the O.V.T.® Solid Color Acrylic Stains is available from Samuel Cabot Inc., 100 Hale St., Newburyport, MA 01950.

Regulations Software Package

A software package which contains all of the OSHA regulations found in parts 1900 to 1910 of Title 29 of the Code of Federal Regulations (29 CFR) has been developed. The software replaces the 1100-page printed version of the regulations and is updated monthly, via an update disk and newsletter. Information on the FastRegs/OSHA software can be obtained by writing OSHA-Soft Corp., Rte. 122—Amherst Station, P.O. Box 668, Amherst, NH 03031-0668.

Emulsion Polymers

A full line of emulsion polymers is the subject of a 16-page, color coded selection guide. The publication provides reference to the typical properties and applications of over 100 water-based polymer products. A copy of the selection guide which highlights RES™ polymers is available from Unocal Polymers, 1345 N. Meacham Rd., Schaumburg, IL 60196.

Portable Color Measurement

A new portable spectrocolorimeter is featured in a two-color brochure. The hand-held color measurement system is battery operated and offers user-selectable color scales and indices. For a brochure on the MiniScan, write HunterLab, Hunter Associates Lab., Inc., 11491 Sunset Hills Rd., Reston, VA 22090.

Cationic Electrocoating

An automated electrocoating system designed with the latest state-of-the-art equipment is the subject of product literature. The cationic electrocoating system has the capacity to paint parts up to 600 mm (24 in.) x 1000 mm (39 in.) in size. Write Cincinnati Industrial Machinery, Div. of Eagle-Picher Industries, Inc., 3280 Hageman St., P.O. Box 41027, Cincinnati, OH 45241.

Diatomite and Silicate Fillers

A newly revised four-color, 32-page brochure which describes properties and applications of diatomite and synthetic hydrous calcium silicate mineral additives has been published. The literature features schematics and charts, and emphasizes the minerals' functional properties. For a free copy of "Functional Fillers for Industrial Applications," write Manville Service Ctr., 1601 23rd St., Denver, CO 80216.

Microbiocide

A technical data sheet highlights a recently introduced microbiocide designed to exhibit broad spectrum activity against bacteria and fungi. The microbiocide can be applied as a single program or in combination with traditional biocides to form a synergistic program. More details on Biosperse® 257 is available from Marketing Services, Drew Industrial Div., One Drew Plaza, Boonton, NJ 07005.

Composites Directory

The 1990 edition of a composites directory listing more than 500 organizations with descriptions of their products and/or services is in print. The directory, which includes an international section for the first time, also lists fabricators/manufacturers, material suppliers, tooling, test laboratories/equipment, major industry users, weaving, consultants, and educational institutions and services. To order the "Directory of Composites Manufacturers, Suppliers, Consultants and Research Organizations," code number 1638, write Publication Sales, Society of Manufacturing Engineers, P.O. Box 930, Dearborn, MI 48121.

Antifoam Agents

An updated brochure featuring foam control agents has been published. The six-page, four color publication describes performance characteristics, physical properties, and applications for six different antifoam agents. For a copy of the "Polyglycol Foam Control Agents" brochure, write the Chemicals & Performance Products Dept., The Dow Chemical Co., 2020 Willard H. Dow Ctr., Midland, MI 48674.

Post Mixer

A new brochure which describes a post mixer product line is in print. The mixers can be used for portable and Department of Transportation applications and are available in standard ranges from 3 to 15 horsepower, but can be custom designed up to 50 horsepower. For further data on the mixer, write Epworth Manufacturing Co. Inc., 1400 Kalamazoo St., South Haven, MI 49090.

Carbon Black Dispersion

A technical report focuses on carbon black dispersion. The new 16-page publication covers many aspects of carbon black dispersion, including the effect of carbon properties on dispersability, the selection of dispersion equipment, dispersion techniques and procedures, how to measure dispersion quality, and many more. A copy of Technical Report S-131 is available from Cabot Corp., Special Blacks Div., Billerica Technical Ctr., 157 Concord Rd., Billerica, MA 01821.

Waste Minimization

A 300-page manual for business owners and managers on how to approach and implement a pollution prevention program and meet the waste minimization certification requirements of the Environmental Protection Agency has been published. A special chapter of the manual targets waste reduction techniques for 11 specific industries. The "Hazardous Waste Minimization Manual for Small Quantity Generators—Second Edition" is available from the Center for Hazardous Materials Research, Univ. of Pittsburgh Applied Research Ctr., 320 William Pitt Way, Pittsburgh, PA 15238.

Color Wheel

A circular slide-chart which demonstrates relative amounts of buff TiO_2, white TiO_2, and other pigments and tints needed to formulate a rainbow of colors for coatings and plastics is the subject of a product data sheet. The wheel displays suggested percentages of pigments and tints which appear in windows. For more information on the color wheel, contact Kandy Van Dyke, Hitox Corp. of America, P.O. Box 2544, Corpus Christi, TX 78403.

Scrub Tester

A product sheet highlights a scrub tester which has a set speed of 37 $^1/_2$ strokes per minute. The tester is designed to determine the wear resistance of materials such as paint, coatings, plastics, paper goods, floor coverings, etc. Additional details on the Model "D" Scrub Tester are available from Paul N. Gardner Co., Inc., 316 N.E. First St., Pompano Beach, FL 33060.

Polyolefins

A new eight-page brochure which provides property data on numerous polyolefin resins is available. Included in the literature is data on thermoplastics, low temperature caulks, mastics, and sealants. For a copy of the publication, write Quantum Chemical Corp., USI Div., 11500 Northlake Dr., P.O. Box 429550, Cincinnati, OH 45249.

Reactive Diluent

An eight-page booklet describing a new reactive diluent for aqueous industrial baking coatings is available. Typical physical properties of the diluent are listed in a table and formulation guidelines are discussed. A copy of "UCAR® Reactive Diluent RD 65-2," designated F-60726, is obtainable by contacting Union Carbide Chemicals and Plastics Co. Inc., Solvents and Coatings Materials Div., Dept. L4488, 39 Old Ridgebury Rd., Danbury, CT 06817-0001.

Microbytes Barium Sulphate

Product information highlights microbytes barium sulphate. The microbytes are designed to exhibit high brightness and consistent fine particle size. The principal applications include surface coatings, paints, and powder coatings. Write Pluess-Staufer International, Inc., 655 Washington Blvd., Suite 900, Stamford, CT 06901, for more details on the microbytes.

Pumping System

A technical data sheet introduces an electrically driven, constant displacement pumping system which is designed to provide constant fluid delivery throughout the pumping operation. The complete system includes the electric motor, mechanical variable-speed drive, dual diaphragm pump, motor starter, fluid pressure gauge, safety relief valve, back pressure regulator, valves, and hoses. For more information on the Model EP Pumping System, contact Kathryn Olszonowicz, Nordson Corp., Corporate Headquarters, 28601 Clemens Rd., Westlake, OH 44145.

Laboratory Supplies

A science catalog which offers information on hundreds of products for the analytical, environmental, and life sciences laboratory is available. A separate section of the publication focuses on chromatography and biochromatography, covering a wide range of products. For a free copy of the "EM Science Catalog," write EM Science, 480 Democrat Rd., Gibbstown, NY 08027.

Pearlescent Pigments

A new four-page, fully illustrated brochure which shows how pearlescence and iridescence can be used to create unique and elegant visual effects in all products, packaging, and graphics has been published. The literature uses text and photographs to familiarize the reader with pigments, and briefly covers their optical properties. A copy of "Discovering the Colorful World of Mearl Pearlescent and Iridescent Luster Pigments" can be obtained by writing The Mearl Corp., 41 E. 42nd St., New York, NY 10017.

Book Review

METALLIC AND CERAMIC COATINGS: PRODUCTION, HIGH TEMPERATURE PROPERTIES AND APPLICATIONS

By
M.G. Hocking, V. Vasantasree, and P.S. Sidky

Copublished by
John Wiley & Sons, Inc.
605 Third Ave.
New York, NY 10158 (1989)
xv + 670 Pages, $165.00

Reviewed by
Michael E. Graham
BIRL, Industrial Research Laboratory
Northwestern University
Evanston, IL

This work is a compendium of information covering the production, properties, and applications of metallic and ceramic coatings for high temperature, corrosive environments. The research and development activity in coatings for harsh environments has been enormous over the past 30 years. The authors have attempted to provide a comprehensive reference work for the industrialist and R&D engineer. The breadth of coverage has necessitated rather brief descriptions in many areas but little has been left unmentioned. There are more than 2000 references assembled in an alphabetical listing according to authors' names and an additional chronological bibliography of general source material. The book is fully indexed for rapid access to specific subject matter.

The 10 chapters include coverage of coating methods as well as their applications in various environments. The first chapter presents a general background and is followed by a more extensive description of the range of high temperature coatings in Chapter 2. Chapters 3-6 survey the techniques available for coatings of various kinds. The techniques covered include the broad categories of physical vapor deposition and chemical vapor deposition as well as pack, slurry, sol-gel, hot-dip, electrochemicals and chemical methods. Also included are laser surface treatment, rapid solidification processing, spraying, welding, cladding, and diffusion methods.

Physical properties are surveyed in Chapter 7 and chemical behavior in Chapter 8. The discussions in these chapters are woven around the mechanical and thermal aspects of coating performance, with charts and graphs used to demonstrate and compare coatings. Chapter 9 deals with the characterization of coatings by NDT as well as microscopy and spectroscopy techniques. It also contains sections on coating repair and a tabulation of coatings function in various high temperature application areas. The final chapter surveys the success record of high temperature coating application, along with its role in conservation of strategic materials and areas for future investigation. This book is a valuable starting point for those meeting the demands of high temperature service environments through the application of engineered coatings.

INTRODUCTION TO THERMAL ANALYSIS: TECHNIQUES AND APPLICATIONS

Authored by
Michael E. Brown

Published by
Chapman and Hall
29 W. 35th St.
New York, NY 10001 (1989)
ix + 211 Pages, $39.95

Reviewed by
Charles R. Hegedus
Naval Air Development Center
Warminster, PA

In the author's words, the objective of this book is "to help someone with little or no knowledge of what thermal analysis can do, to find out briefly what the subject is all about, to decide whether it will be of use to him or her, and to help in getting started on the more common techniques." As such, the text successfully achieves this goal by providing a general description of thermal analysis techniques, equipment, and applications.

The book contains 17 chapters and three appendices. The first two chapters provide a brief definition and history of thermal analysis along with one table of the main techniques used and properties analyzed, and a second table listing common thermal events. The succeeding six chapters present the more common techniques: thermogravimetry, differential thermal analysis, differential scanning calorimetry, thermoptometry, thermodilatometry, thermomechanical analysis, and dynamic mechanical analysis. For these techniques, the author provides an introduction, a discussion of equipment and operation, experimental parameters, typical data ranges, and sensitivity and interpretation of data, and potential applications. In most cases, physical examples are provided to give the reader a "feel" for the technique. In several of these chapters, the author suggests the use of complementary techniques, some of which are not directly associated with thermal analysis. He later provides two chapters elaborating on combining thermal analysis techniques and evolved gas analysis, respectively.

One chapter is dedicated to a brief description of less common techniques (emanation thermal analysis, thermomagnetometry, thermoelectrometry, thermosonimetry, and thermoacoustimetry). This is followed by a discussion of the use of microcomputers in thermal analysis, including hardware and software requirements, data storage and processing, and automation of equipment. Two chapters present detailed examples of utilizing thermal analysis techniques for determining reaction kinetics and material purity. Finally, the author provides a listing of common source literature and a discussion on choosing thermal analysis equipment. One appendix provides introductory experiments and another provides software for data capture, storage, display, and processing.

This book provides a basic and general presentation of thermal analysis. It is easy to read and contains numerous figures and tables which further clarify the subject. Although much too simplistic for those experienced in thermal analysis, it provides a good starting point for the novice. As such, students, intern scientists and engineers, and technicians would be best served by this text. It would be a good complement or substitution for an introductory short course on the subject. The references provide a path for the more interested reader to follow.

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Coming Events

FEDERATION MEETINGS

For information on FSCT meetings, contact FSCT, 1315 Walnut St., Ste. 832, Philadelphia, PA 19107 (215) 545-1506, FAX: (215) 545-7703.

1990

(Mar. 19-23)—Federation Seminars on Statistical Process Control. O'Hare Marriott, Chicago, IL. Level I: Mar. 19-20, Level II: Mar. 21-23.

(Apr. 25-26)—Symposium on Color and Appearance Instrumentation (SCAI). Sponsored by the FSCT and the Inter-Society Color Council. Cleveland Airport Marriott, Cleveland, OH.

(May 16-19)—Federation "Spring Week" Seminar on the 16th and 17th; Society Officers Meeting on the 18th; Board of Directors Meeting on the 19th. Galt House, Louisville, KY.

(Oct. 29-31)—68th Annual Meeting and 55th Paint Industries' Show. Convention Center, Washington, D.C.

1991

(Nov. 4-6)—69th Annual Meeting and 56th Paint Industries' Show. Convention Center, Toronto, Ontario, Canada.

SPECIAL SOCIETY MEETINGS

1990

(Mar. 14-16)—Houston and Dallas Societies. Southwestern Paint Convention. Doubletree at Post Oak, Houston, TX. (Neil McBride, P.O. Box 841156, Houston, TX 77284-1156).

(Apr. 4-7)—Southern Society. Annual Meeting. Sandestin Beach Hilton, Destin, FL. (James R. Salisbury, Union Carbide Corp., 2043 Steel Dr., Tucker, GA 30084).

(Apr. 25)—Detroit Society. Annual Symposium on Future of Coatings Under Study. Management Education Center, Troy, MI. (Bohdan Melnyk, 26727 Newport, Warren, MI 48089).

(May 3-5)—Pacific Northwest Society. Annual Symposium. Red Lion Hotel, Bellevue, WA. (Dennis Hatfield, J.F. Shelton Co., 116 Andover Pk. W., Tukwila, WA 98188).

(May 21)—Philadelphia Society. Annual Coatings Technology Seminar. Philadelphia Airport Hilton, Philadelphia, PA. (Larry Kelly, Peltz Rowley Chemical Co., 5700 Tacony St., Philadelphia, PA 19135).

(June 6-7)—Cleveland Society. 33rd Annual Technical Conference. NASA Lewis Research Center, Cleveland, OH. (DeVilla Moncrief, Sherwin-Williams Co., 601 Canal Rd., Cleveland, OH 44113).

(June 8-10)—Joint Meeting of the St. Louis and Kansas City Societies. Holiday Inn, Lake of Ozarks, MO. (Roger Haines, Tnemec Co., P.O. Box 1749, N. Kansas City, MO 64141).

1991

(Feb. 18-20)—Western Coatings Societies' 20th Biennial Symposium and Show. San Francisco Hilton, San Francisco, CA. (Patricia Shaw, Davlin Coatings, Inc., c/o P.O. Box 9459, El Cerrito, CA 94530).

(May 2-4)—Pacific Northwest Society. Annual Symposium. Meridien Hotel, Vancouver, British Columbia, Canada. (John P. Berghuis, Kronos Canada, Inc., 3450 Wellington Ave., Vancouver, B.C., Canada V5R 4Y4).

OTHER ORGANIZATIONS

1990

(Mar. 18-20)—"The Global Outlook for TiO_2 and TiO_2 Replacement/Extenders." International Conference. Stouffer Concourse Hotel, St. Louis, MO. (Conference Services, Falmouth Associates Inc., 170 U.S. Route One, Falmouth, ME 04105).

(Mar. 21-23)—"Estimating for Painting Contractors and Maintenance Engineers." Short course sponsored by University of Missouri-Rolla (UMR). St. Louis, MO. (Coatings and Polymer Science Program, Dept. of Chemistry, UMR, Rolla, MO 65401-0249).

(Mar. 22)—"Printing Inks for the 90's." Symposium co-sponsored by the Midlands Section of the Oil & Colour Chemists' Association (OCCA) and the Society of British Printing Ink Manufacturers (SBPIM). Grand Hotel, Brimingham, England. (Chris Pacey-Day, OCCA, Priory House, 967 Harrow Rd., Wembley, Middlesex, England HA0 2SF).

(Mar 25-29)—RadTech '90—North America. Radiation Curing Conference and Exposition. Hyatt Regency Chicago, Chicago, IL. (RadTech International North America, 60 Revere Dr., Ste. 500, Northbrook, IL 60062).

(Mar. 26-29)—ASTM Committee B-8 Meeting on Metallic and Inorganic Coatings. Sheraton New Orleans, New Orleans, LA. (Peggy Loughran, ASTM, 1916 Race St., Philadelphia, PA 19103).

(Mar 26-30)—"60th Introductory—The Basic Composition of Coatings." Short course sponsored by University of Missouri-Rolla (UMR). Rolla, MO. (Coatings and Polymer Science Program, Dept. of Chemistry, UMR, Rolla, MO 65401-0249).

(Apr. 2-6)—11th International Corrosion Congress. Florence, Italy. (AIM—Associazione Italiana di Metallurgia, Piazzale Rodolfo Morandi, 2, I-20121 Milano, Italy).

(Apr. 5-8)—Farbe '90. Munich Trade Fair Centre. (Gerald G. Kallman, President, Kallman Associates, Five Maple Ct., Ridgewood, NJ 07450-4431).

(Apr. 8-14)—"Session I—Basic Coating Inspection" and "Session II—Intermediate Coating Inspection." Courses sponsored by National Association of Corrosion Engineers (NACE). Philadelphia, PA. (NACE Education and Training, NACE, P.O. Box 218340, Houston, TX 77218).

(Apr. 16-21)—Materials Research Society Spring Meeting. San Francisco Marriott Hotel, San Francisco, CA. (Materials Research Society, 9800 McKnight Rd., Ste. 327, Pittsburgh, PA 15237).

(Apr. 17-18)—Washington Paint Technical Group 30th Annual Symposium. Holiday Inn Crowne Plaza, Arlington, VA. (Washington Paint Technical Group, P.O. Box 12025, Washington, D.C. 20005).

(Apr. 18-20)—"Waste Combustion in Boilers and Industrial Furnaces." Conference sponsored by the Air & Waste Management Association. Hilton Hotel, Kansas City, MO. (Dan Denne, Meeting Dept., Air & Waste Management Association, P.O. Box 2861, Pittsburgh, PA 15230).

(Apr. 22-24)—Inter-Society Color Council Annual Meeting. Cleveland Airport Marriott, Cleveland, OH. (James E. Grady, Program Chairman, Pigments Dept., CIBA-GEIGY Corp., 7187 White Pine Dr., Birmingham, MI 48010).

(Apr. 22-27)—Spring Meeting of American Chemical Society (ACS). Boston, MA. (ACS, Dept of Meeting & Divisional Activities, 1155-16th St., N.W., Washington, D.C. 20036).

(Apr. 23-27)—Corrosion/90 sponsored by the National Association of Corrosion Engineers (NACE). Bally's Hotel, Las Vegas, NV. (NACE, Conference Manager, P.O. Box 218340, Houston, TX 77218).

(Apr. 23-27)—"Applied Rheology for Industrial Chemists." Short course sponsored by Kent State University (KSU). Kent, OH. (Carl J. Knauss, Director, Cooperative and Continuing Education, Chemistry Dept., KSU, Kent, OH 44242).

(Apr. 23-27)—"Water Based Polymers: Chemistry and Applications Technology." Course sponsored by The Center for Professional Advancement. Chicago, IL. (The Center for Professional Advancement, General Information, P.O. Box H, East Brunswick, NJ 08816-0257).

(Apr. 24)—"Introduction to Paint Manufacture." Symposium sponsored by the Newcastle Section of the Oil & Colour Chemists' Association (OCCA). James Duff Lecture Theatre, Science Laboratories, South Road, Durham, England. (Brian Gregory, OCCA, Priory House, 967 Harrow Rd., Wembley, Middlesex, England HA0 2SF).

(Apr. 25)—44th Annual Symposium/37th "Back to Back" Symposium—"Computers and Instrumentation in the Coatings Industry." Sponsored by Chemical Institute of Canada, Protective Coatings Division. The Old Mill, Toronto, Ontario, Canada. [Robert McComb, Publicity, Protective Coatings Divisio, (416) 566-1733].

(Apr. 26)—44th Annual Symposium/37th "Back to Back" Symposium—"Computers and Instrumentation in the Coatings Industry." Sponsored by Chemical Institute of Canada, Protective Coatings Division. Hélène de Champlain Restaurant, Ile Ste-Hélène, Montreal, Quebec, Canada. [Steve Valente, Program Chairman, Protective Coatings Division, (514) 397-3531].

(Apr. 30-May 2)—Surface Coating '90. Sponsored by the National Chemical Coaters Association (NCCA). The Sheraton Sturbridge Resort and Conference Center, Sturbridge, MA. (Shirley Spears, NCCA, P.O. Box 44275, Cincinnati, OH 45244).

(Apr. 30-May 4)—"Measurement of Toxic and Related Air Pollutants." Conference sponsored by Air and Waste Management Association. Mission Valley Hotel, Raleigh, NC. (Sandy Riley, Meetings Dept., Air and Waste Management Association, P.O. Box 2861, Pittsburgh, PA 15230).

(May 2-9)—Surface Treatment '90. Hannover Fairgrounds, Hannover, West Germany. (Hannover Fairs USA Inc., 103 Carnegie Center, Princeton, NJ 08540).

(May 7-11)—"Dispersion of Pigments and Resins in Fluid Media." Short course sponsored by Kent State University (KSU). Kent, OH. (Carl J. Knauss, Director, Cooperative and Continuing Education, Chemistry Dept., KSU, Kent, OH 44242).

(May 8-10)—Haztech International Conference and Exhibition. Sponsored by the Institute for International Research. George R. Brown Convention Center, Houston, TX. (Rachelle Scheinbach, Executive Director, Institute for International Research—Bellevue, 13555 Bel-Red Rd., Bellevue, WA 98009).

(May 8-10)—"Radiation Curing: Ultraviolet Light and Electron Beam Technology—In Coatings, Inks, Adhesives, and Photopolymers." Course sponsored by The Center for Professional Advancement. Somerset, NJ. (The Center for Professional Advancement, General Information, P.O. Box H, East Brunswick, NJ 08816-0257).

(May 9-11)—Marine and Offshore Coatings Conference. Sponsored by National Paint and Coatings Association (NPCA). Radisson Annapolis Hotel, Annapolis, MD. (NPCA, 1500 Rhode Island Ave., N.W., Washington, D.C. 20005).

(May 14-15)—"Analysis of Paints and Related Materials." Symposium sponsored by ASTM Committee D-1. Pittsburgh, PA. (Marsha Firman, ASTM, 1916 Race St., Philadelphia, PA 19103).

(May 14-18)—"Physical Testing of Paints and Coatings." Short course sponsored by University of Missouri-Rolla (UMR). Rolla, MO. (Coatings and Polymer Science Program, Dept. of Chemistry, UMR, Rolla, MO 65401-0249).

(May 14-19)—"Interpretation of IR and Raman Spectroscopy." Course and Workshop. Vanderbilt University, Nashville, TN. (Clara Craver, Director, Fisk Infrared Institute, Box 15, Fisk University, Nashville, TN 37203).

(May 15-17)—"Recent Advances in Flame Retardancy of Polymeric Materials." Crowne Plaza Hotel, Stamford, CT. (Business Communications Co., Inc., 25 Van Zant St., Norwalk, CT 06855).

(May 15-17)—"Using the New Barrier Plastics Effectively." Course sponsored by The Center for Professional Advancement. Chicago, IL. (The Center for Professional Advancement, General Information, P.O. Box H, East Brunswick, NJ 08816-0257).

(May 21-23)—12th International Conference on "Advances in the Stabilization and Controlled Degradation of Polymers." Luzern, Switzerland. (A.V. Patsis, Institute of Materials Science, State University of New York, New Paltz, NY 12561).

(May 21-23)—"Finishing and Decorating Plastics Surfaces: Treatment, Coatings, Printing." Course sponsored by The Center for Professional Advancement. East Brunswick, NJ. (The Center for Professional Advancement, General Information, P.O. Box H, East Brunswick, NJ 08816-0257).

(May 21-25)—"Adhesion Principles and Practice for Coatings and Polymer Scientists." Short course sponsored by Kent State University (KSU). Kent, OH. (Carl J. Knauss, Director, Cooperative and Continuing Education, Chemistry Dept., KSU, Kent, OH 44242).

(May 30-June 1)—4th International Conference on "Crosslinked Polymers." Luzern, Switzerland. (A.V. Patsis, Institute of Materials Science, State University of New York, New Paltz, NY 12561).

(June 4-7)—Powder and Bulk Solids Conference/Exhibition. Rosemont (Chicago), IL. (Angela Piermarini, Show Manager, Powder and Bulk Solids Conference/Exhibition, 1350 E. Touhy Ave., P.O. Box 5060, Des Plaines, IL 60017-5060).

(June 4-8)—"Advances in Emulsion Polymerization and Latex Technology." 21st annual short course sponsored by Lehigh University. Bethlehem, PA. (Mohamed S. El-Aasser, Emulsion Polymers Institute, Lehigh University, 111 Research Dr., Bethlehem, PA 18015).

(June 6-8)—"Radiation Curing: Ultraviolet Light and Electron Beam Technology—In Coatings, Inks, Adhesives, and Photopolymers." Course sponsored by The Center for Professional Advancement. San Francisco Bay Area. (The Center for Professional Advancement, General Information, P.O. Box H, East Brunswick, NJ 08816-0257).

(June 11-15)—"High Solids Coatings." Short course sponsored by North Dakota State University (NDSU). Fargo, ND. (Janalee Brandt, Administrative Assistant, Division of Continuing Studies, NDSU, Fargo, ND 58105).

(June 13-15)—Solid Waste and Recycling Technology Conference and Exhibition. Sponsored by the Institute for International Research. Cobo Conference/Exhibition Center, Detroit, MI. (Rachelle Scheinbach, Executive Director, Institute for International Research—Bellevue, 13555 Bel-Red Rd., Bellevue, WA 98009).

(June 18-20)—64th American Chemical Society (ACS) "Colloid and Surface Science" Symposium. Sponsored by ACS Division of Colloid and Surface Chemistry, Lehigh University, Bethlehem, PA. (Mohamed S. El-Aasser, Emulsion Polymers Institute, Lehigh University, 111 Research Dr., Bethlehem, PA 18015).

(June 18-29)—"Coatings Science." Short course sponsored by North Dakota State University (NDSU). Fargo, ND. (Janalee Brandt, Administrative Assistant, Division of Continuing Studies, NDSU, Fargo, ND 58105).

(June 27-30)—Dry Color Manufacturers' Association (DCMA) Annual Meeting. The Greenbrier, White Sulphur Springs, WV. (DCMA, 300 N. Washington St., Alexandria, VA 22320).

(July 9-13)—16th International Conference on "Organic Coatings Science & Technology." Athens, Greece. (A.V. Patsis, Institute of Materials Science, State University of New York, New Paltz, NY 12561).

(July 18-20)—"Basic Coatings for Sales and Marketing Personnel." Short course sponsored by University of Missouri-Rolla (UMR). St. Louis, MO. (Coatings and Polymer Science Program, Dept. of Chemistry, UMR, Rolla, MO 65401-0249).

(July 23-25)—"Polymer Analysis and Characterization." International symposium sponsored by Du Pont Company and the Czechoslovak Academy of Sciences, Brno, Czechoslovakia. (Howard G. Barth, ISPAC Chairman, Du Pont Co., Experimental Station E228/238, P.O. Box 80228, Wilmington, DE 19880-0228 or Josef Janca, Inst. Analytical Chem., Czechoslovak Academy of Sciences, Leninova 82, 611 42 Brno, Czechoslovakia).

(Aug. 26-31)—Fall meeting of the American Chemical Society (ACS). Washington, D.C.. (ACS, Dept. of Meetings & Divisional Activities, 1155-16th St., N.W., Washington, D.C. 20036).

(Sept. 10-14)—NACE Fall Committee Week/90 sponsored by the National Association of Corrosion Engineers. (NACE, P.O. Box 218340, Houston, TX 77218).

(Sept. 10-14)—"Laboratory Corrosion Testing." Short course sponsored by Southwestern Ohio Section of the National Association of Corrosion Engineers (NACE) and Ohio State University. Columbus, OH. [John Beavers (614) 761-1214 or Steve Corey (317) 456-6271].

(Sept. 16-22)—20th FATIPEC Congress. Acropolis, Nice, France. (Jacques Roire, A.F.T.P.V., 5 rue Etex, 75018 Paris, France).

(Sept. 24-26)—Midwest Corrosion Conference in conjunction with 1990 North Central Regional Meeting of the National Association of Corrosion Engineers. Hyatt Regency, Dearborn, MI. (Jerry Wenzel, Program Chairman, Michigan Consolidated Gas Co., 3200 Hobson, Detroit, MI 48201).

(Sept. 25-27)—Finishing '90. Exhibition sponsored by Turret Group plc. Telford Exhibition Center, Telford, Shropshire, England. (Nigel Bean, Turret Group plc, 171 High St., Rickmansworth, Herts, WD3 1SN).

(Sept. 26-28)—Haztech International Conference and Exhibition. Sponsored by the Institute for International Research. Brooks Hall, San Francisco, CA. (Rachelle Scheinbach, Executive Director, Institute for International Research—Bellevue, 13555 Bel-Red Rd., Bellevue, WA 98009).

(Oct. 2-3)—"Industrial Painting: Application Methods." Short course sponsored by Kent State University (KSU). Kent, OH. (Carl J. Knauss, Director, Cooperative and Continuing Education, Chemistry, KSU, Kent, OH 44242).

(Oct. 2-4)—Haztech International Conference and Exhibition. Sponsored by the Institute for International Research. David L. Lawrence Convention Center, Pittsburgh, PA. (Rachelle Scheinbach, Executive Director, Institute for International Research—Bellevue, 13555 Bel-Red Rd., Bellevue, WA 98009).

(Oct. 9-11)—Powder Coating '90. Technical Conference and exhibition sponsored by Powder Coatings Institute. Cincinnati Convention Center, Cincinnati, OH. (Powder Coatings Institute, 1800 Diagonal Rd., Ste. 370, Alexandria, VA 22314).

(Oct. 14-18)—"Corrosion Engineering of the Future." Seminar sponsored by the National Association of Corrosion Engineers (NACE) and the U.S. Armed Forces. Richmond, VA. (Gary Wiatrek, Membership Services Coordinator, NACE, P.O. Box 218340, Houston, TX 77218).

Advertisers Index

'Humbug' from Hillman

With the value of "knowledge" in mind, I turn to the store of it found in the Farmers' Almanac of 1973 donated by my late friend, Roy Tasse.

The Wordage Game

There are lots of good words in our language
Which have never seen much light of day.
Since taught is "he teached," why not praught for "he preached?"
Should this be not used in some way?

There are other good words which are strangers
And ought to be used by us all.
Since mouses are mice, why aren't houses call hice?
And damn-it-all shortened to dall?

Some spelling is worse than our wordage
As a couple of instances show.
If a tree limb's a bough, why not how now brown cough,
And some dough for the man on the gough?

If you think this search for new wordage
Is rough, I must go along too.
For the fact that it's tough is the very same stough
That I'm trying to get through to yough.

—John Franklin

—Hotel clerk: "We have no more rooms with a bath. Would you mind sharing a bath with another man?"

Guest: "No, as long as he stays at his end of the tub."

—At a travel bureau a clerk was trying to convince a woman of the safety of air travel. She remained unconvinced until he threw in the clincher, "Madam, if it wasn't safe, would we be using the fly now pay later plan?"

—Sign in a local bank: "If your husband is losing interest, tell him to see us."

—Sign in a church parking lot: "Unauthorized cars will be spirited away at the owner's expense."

—Sign in a department store: "Towels for the whole damp family."

—Sign in a waterbed store: "Your vinyl resting place."

Here lies the body of Ephraim Wise
Safely tucked between his two wives
One was Tillie and the other Sue
Both were faithful, loyal and true
By his request in ground that's hilly
His coffin is set tilted toward Tillie

While cleaning out his office, prior to retirement, Dick Kiefer came upon the following clip from the *Chemical & Engineering News* of October 1984. I guess enough time has elapsed to justify repeating the quote.

Kenneth Smith, of Fanwood, NJ, has passed along the response of a magazine for vegetarians to a reader who asked for "the safest, most effective method for removing chemicals and pesticide residue from fresh fruits and vegetables without leaving a soap taste and without resorting to expensive commercial products."

The magazine replied in part, "Obtain an ounce of pure hydrochloric acid from a drugstore . . . Dissolve the powder in three quarts of water. The solution can be saved and used many times. Place fruits and vegetables in the solution for five minutes, then remove and rinse with fresh water."—Cautious Dick makes no comment, nor shall I.

During almost 10 years of "Humbug," it has been interesting to me how many stories pop up in different parts of the country as verified fact in each area. For example, in November we printed an AP release, datelined Pittsburgh, submitted by Ed Raswyck, that told the story of a gas station robbery attempt where the robber shot himself in the unmentionables while shoving the gun in his belt. In December, along comes a photocopy of a news article in the *Times Herald* from Hugh McCranie with a much embroidered story of "A 24-year old Dallas man who reportedly shot himself in the genitals while trying to rob an adult bookstore—then hobbled into the same store on crutches the next day for a second try." Well, that's one way of eliminating the criminal element of the future — nip it in the bud!

I've recently received a chiding letter from R. Alan Brown, Ph.D in reference to the story in the same November issue, crediting Victor Hugo with writing, in 1862, the brilliant comment that, "there are fifteen acids intermediate between margaric acid and formic acid." Annoyed, Dr. Brown counts SIXTEEN acids, not fifteen, although he does concede that it did not affect the outcome of the French revolution.

Reader Brown concludes with the following P.S., "I don't think Stephen Hirsh (to whom the revelation was attributed) can count and you should have checked before publishing such stuff."

Well, that puts me exactly in my place! I guess Dr. Brown is not aware that "Humbug" is dedicated to the distortion of scientific knowledge. Me and Chicken Little!!!

—Herb Hillman
Humbug's Nest
P.O. Box 135
Whitingham, VT 05361


Ask us about ABRASION...
We'll
work
with you!