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TECHNOLOGY

August 1990

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Urethane
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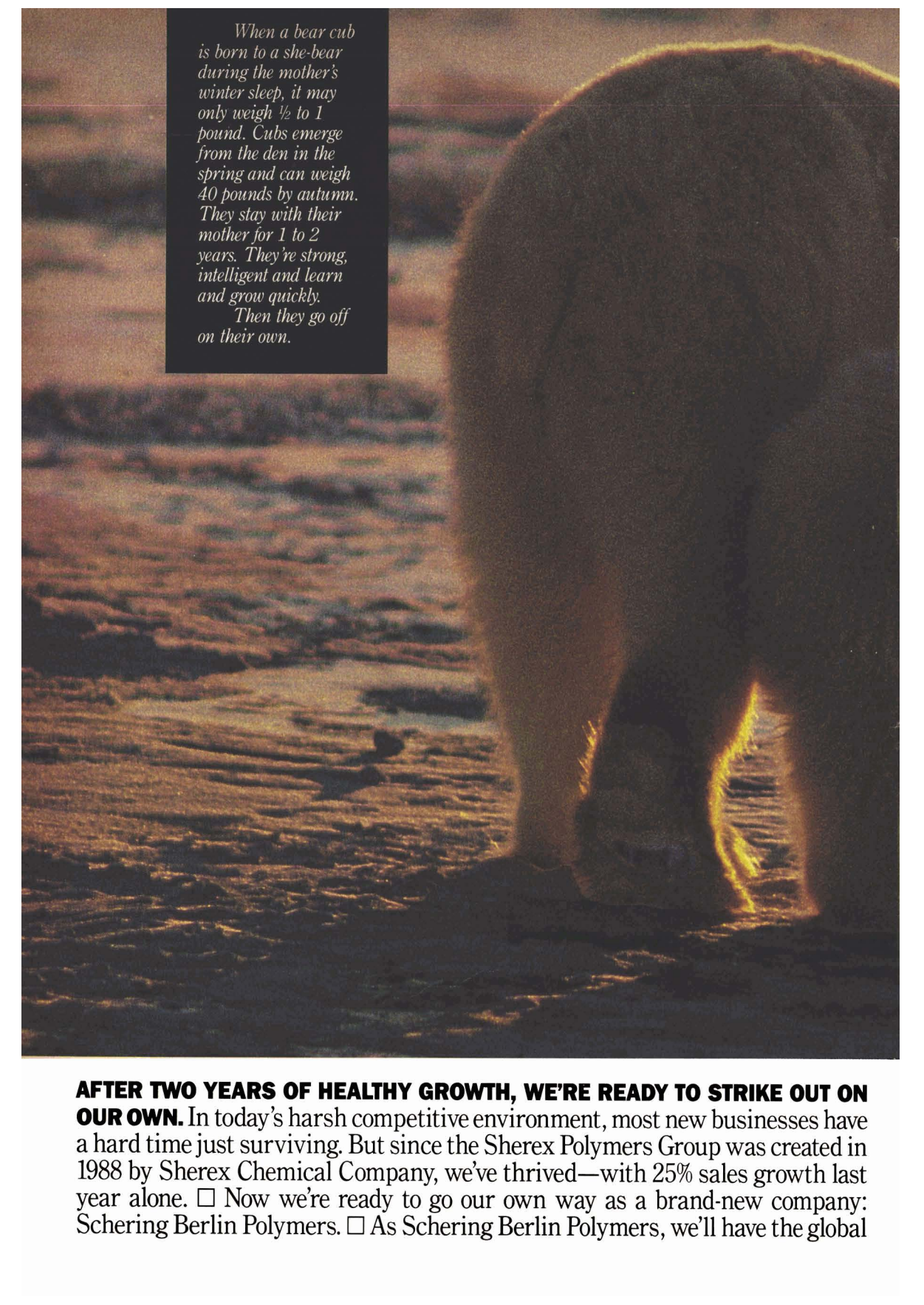
Scientific Instruments



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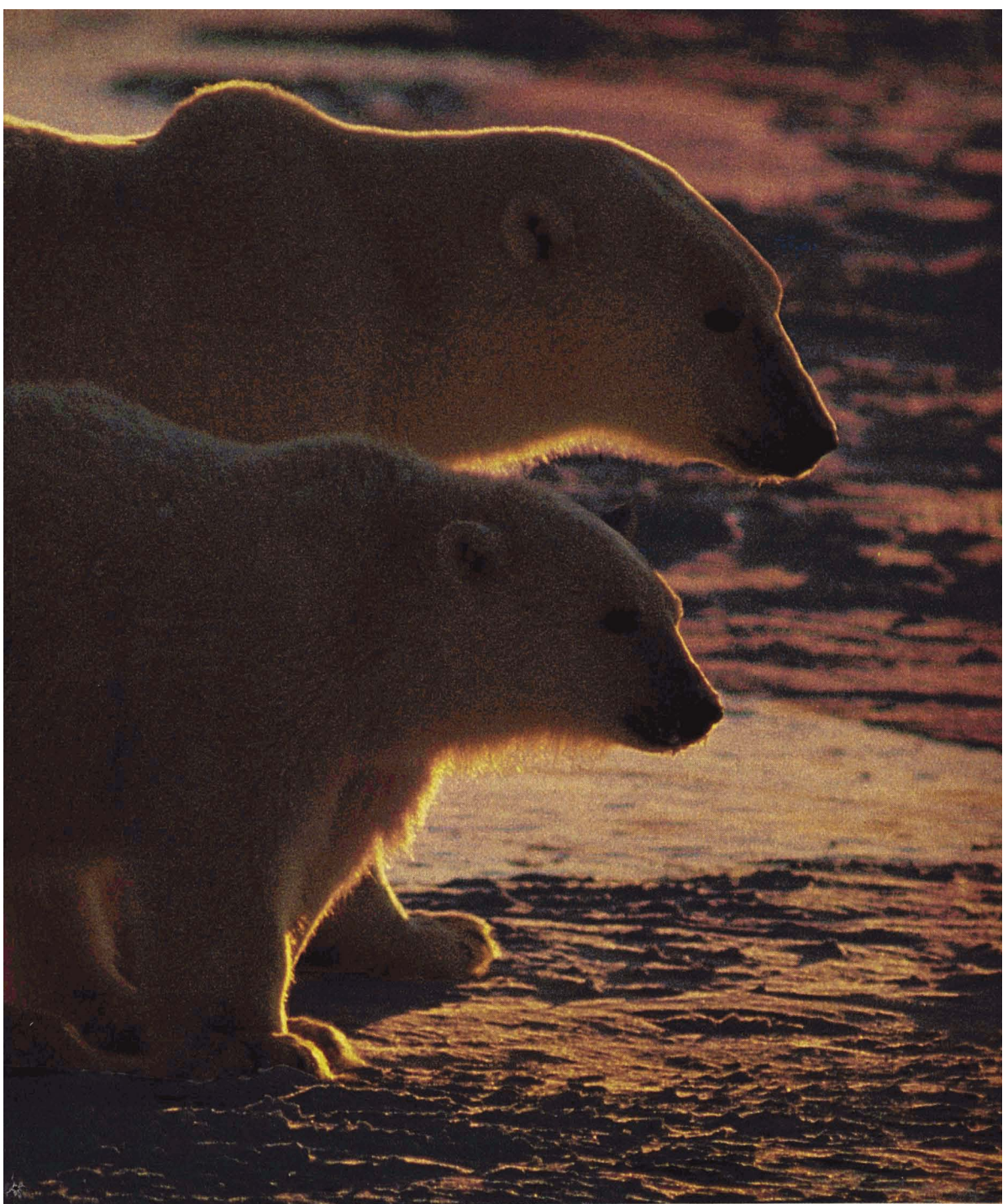
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Subject: Testing; Object: Quality

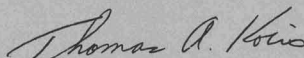
The upcoming FSCT Annual Meeting offers coatings industry personnel another opportunity for technical updating on a goodly cross-section of topics, as evidenced by the program offerings listed on page 15.

Among the features is a session sponsored by the Professional Development Committee on "Testing—The Key to the Quality Revolution," which will focus on the importance of testing proficiency to a quality management system.

One of the primary tools used in managing quality is Statistical Process Control, which increasingly is what you need to be using to get your product through the customer's door—the growing trend to require documented evidence that your coatings are being produced with SPC as a prerequisite for evaluation and acceptance.

This requirement to demonstrate SPC capability underscores the necessity of reliable and valid test procedures to assure uniformity of results, for SPC cannot function unless the source of the data—the test—is under control. In this regard, Dr. Peter Hunt, President of Productivity Management Consultants, who conducts Federation-sponsored seminars on SPC, observes that the coatings industry has much work to do in upgrading its testing procedures.

Improvement in this area is mandatory for those firms which are serious about operating in the mainstream of modern coatings technology and who are in step with the theme of this year's Annual Meeting, "A Decade of Decision: Preparing for the Year 2000." For the future will surely bring additional demands from customers (and regulators) to verify ability to test for compliance with specific requirements, and those who cannot will pay dearly for the deficiency.



Thomas A. Kocis,
Contributing Editor

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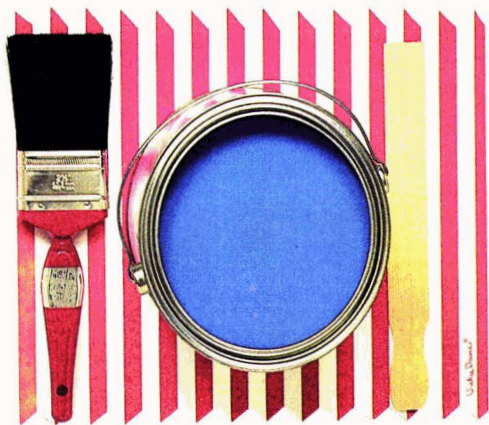
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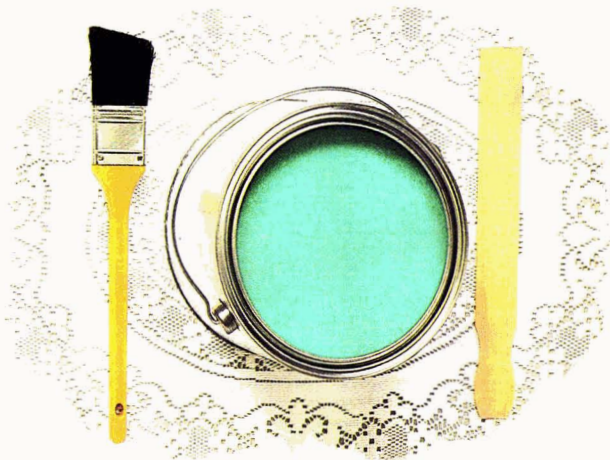
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Abstracts of Papers in This Issue

TWO-COMPONENT ISOPOLYESTER URETHANE COATINGS FOR PLASTICS—S.H. Shoemaker

Journal of Coatings Technology, 62, No. 787, 49 (Aug. 1990)

There has been a dramatic rise in the use of plastics for automotive and business machine applications. Many of these plastics require decorative and/or functional coatings. This paper discusses the development of high-solids two-component isopolyester urethane coatings for plastics.

The resin system is a low molecular weight hydroxyl functional polyester composed of equimolar parts of isophthalic acid and adipic acid, in addition to neopentyl glycol and trimethylol propane. The resin is crosslinked with aliphatic polyisocyanate resins based on hexamethylene diisocyanate to form the final coating film. These coatings will air-dry or cure at low temperatures and are therefore ideally suited for heat sensitive thermoplastics. The polyester resin system offers the desirable balance of flexibility and hardness that coatings for plastics require. The coatings exhibit excellent impact strength, hardness, elongation, abrasion resistance, and weatherability, in addition to good chemical and moisture resistance.

SURVEY OF ACCELERATED TEST METHODS FOR ANTI-CORROSIVE COATING PERFORMANCE—B.R. Appleman

Journal of Coatings Technology, 62, No. 787, 57 (Aug. 1990)

Findings are presented on the latest advances in procedures for short-term evaluation of coatings. Specific methods are described for inducing degradation by natural exposures, standard and cyclic accelerated tests, and accelerated outdoor tests. The paper also reviews techniques for evaluating degradation, including analytical methods for assessing microscopic damage, and new techniques for assessing macroscopic damage. Also, survey findings are presented on the current practice of accelerated testing by paint users, manufacturers, and raw materials suppliers. Items include types of tests most commonly used, major uses of accelerated tests, which tests are most heavily relied upon, and the use of statistics. Several recommendations are given for improving the technology and the practice.

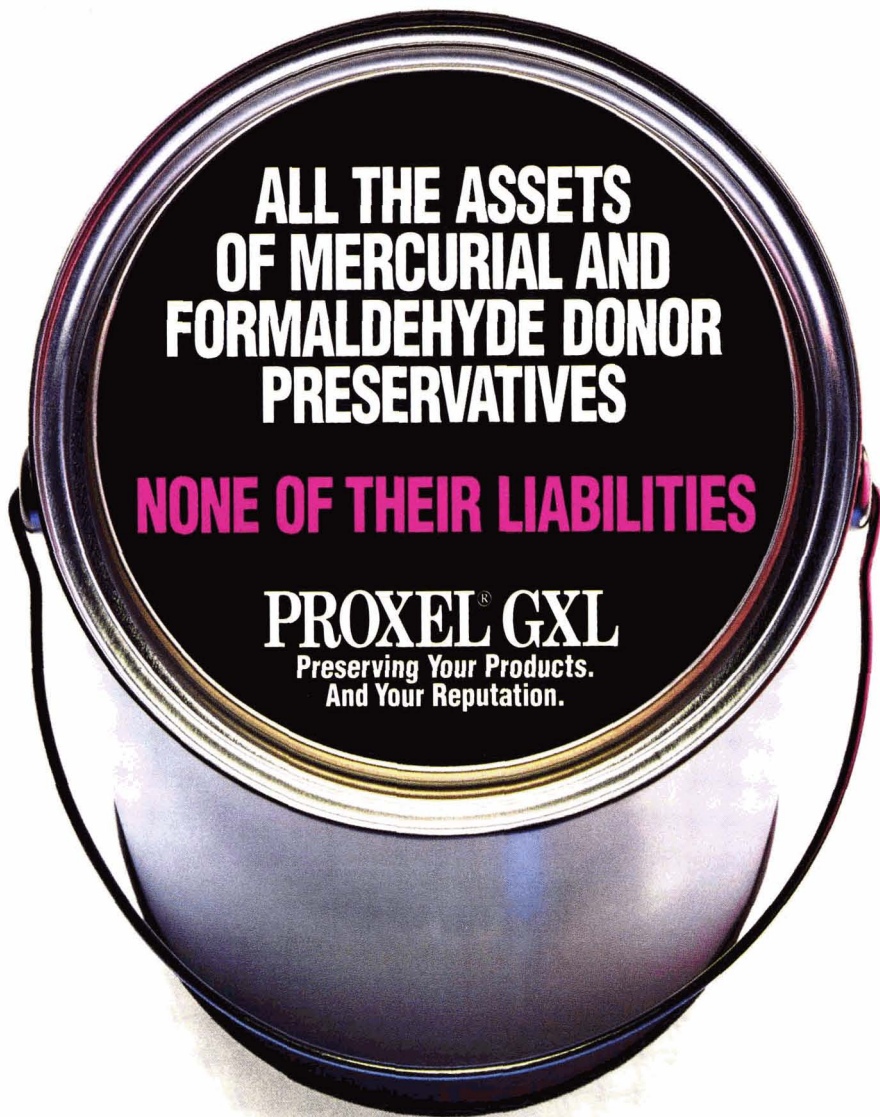
1990/91 Schedule of Special Paint Show Issues

1990 Paint Industries' Show • Convention Center, Washington, D.C. • October 29-31

SEPTEMBER — Featured are the Preliminary Program of Technical Sessions, floor plan of show exhibitors, registration forms, housing forms and hotel information, as well as general show information.

OCTOBER — This special Annual Meeting and Paint Show Issue, which is distributed at the show in addition to our regular circulation, contains Abstracts of Papers to be presented; the Program of Technical Sessions; floor plan of show exhibitors; a list of exhibitors and their booth numbers, classified by product/service; an alphabetical list of exhibitors and their booth numbers; and general show information.

JANUARY — This Annual Meeting and Paint Show Wrap-Up Issue features articles on all exhibitors, with emphasis on products and special booth features; photo displays of award-winning booths; as well as a complete review of important Annual Meeting and Paint Show happenings.



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William F. Holmes, of Dallas, and Colin D. Penny, of Baltimore, Are Nominated to Federation Officer Positions for 1990-91

William F. Holmes, Vice President—Technology, National Pigments & Chemicals, Inc., Garland, TX, has been nominated for the position of President-Elect of the Federation of Societies for Coatings Technology.

Mr. Holmes, currently Secretary-Treasurer of the Federation, has been a member of the Board of Directors since 1987. He was the Dallas Society Representative to the Board of Directors from 1973 to 1976. Mr. Holmes is the Secretary-Treasurer of the Coatings Industry Education Fund, serves on the Finance Committee, and is an Ex Officio member of the Professional Development Committee. In addition, he has served as Chairman of the Annual Meeting Host, Membership, and Technical Advisory Committees. Mr. Holmes also was a member of the Educational, Nominating, Annual Meeting Program, and A.F. Voss/*American Paint Journal* Awards Committees.

He is a Past-President of the Dallas Society (1979-80) and has served on the Society's Technical Committee.

Mr. Holmes is graduate of Texas Tech University and has served the coatings industry for 34 years.

SECRETARY-TREASURER

Nominated to serve as Secretary-Treasurer of the Federation is Colin D. Penny, President, Hampton Paint Mfg Company, Inc., Hampton, VA.

Mr. Penny is a member of the Board of Directors and is Chairman of the Planning Committee, Vice President of the Coatings Industry Education Fund, and a member of the Ad Hoc Building Committee. He also was Chairman of the



C.D. Penny

Technical Advisory and Paint Show Exhibits' Awards Committee, a member of the Finance Committee, and the Federation delegate to the Scientific Committee (NPCA).

Mr. Penny is a Past-President of the Baltimore Society (1974-75) and, in 1976, was presented the Herman H. Shuger Memorial Award of the Baltimore Coatings Industry Awards Council. In addition, he served on the Educational Committee of the Baltimore Society.

Mr. Penny is a graduate of Bristol College of Technology in England. Active in the coatings industry for 43 years, he has been a member of the Oil and Colour Chemists' Association since 1952 and is a Past-President of the Washington Paint Technical Group.

PRESIDENT

The current President-Elect, Kurt F. Weitz, Manager—Technical Support, Indusmin Inc., Division of Falconbridge Limited, Toronto, Ont., Canada, will assume the Presidency at the close of the 1990 Annual Meeting, October 31, in Washington, D.C.

Mr. Weitz served as Treasurer of the Federation (1988-89), has been a member of the Executive Committee since 1985, and serves on the Board of Directors. He was the Toronto Society Representative to the Board of Directors from 1981 to 1988. Mr. Weitz is a member of the Finance Committee, and was a member of the Roon Awards (six years) and Professional Development Committees, and a Trustee of the Coatings Industry Education Fund.

A Past-President of the Toronto Society (1974-75), he was graduated from the University of Toronto and has served the coatings industry for 33 years.

Employed by Indusmin for 22 years, Mr. Weitz has been engaged with the development of nepheline syenite and feldspar as extenders in paints, plastics, rubber, and adhesives. He is a member of the American



K.F. Weitz

Chemical Society and the Society for Plastics Engineers.

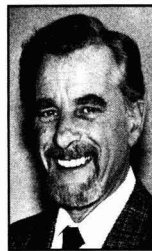
OTHER NOMINATIONS

The Federation Nominating Committee also submitted the names of candidates for Executive Committee and Board of Directors positions.

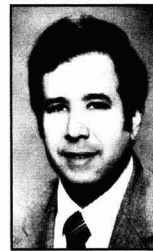
Executive Committee

Society Representative Members:

Jan P. Van Zelm, Regional Sales Manager, Byk Chemie USA, Castaic, CA, has



J.P. Van Zelm



J.D. Giusto

been nominated for a three-year term. Mr. Van Zelm has been the Los Angeles Society Representative to the Board of Directors since 1984 and is a member of the Nominating Committee.

He is a Past-President of the Los Angeles Society (1981-82). Mr. Van Zelm is Co-Chairman of the Society's Educational Committee and a member of the Cal Poly Project Committee. He also served on the Manufacturing Committee with presented with the Society's Outstanding Service Award.

Educated in the Netherlands, Mr. Van Zelm has been in the coatings industry for 32 years.

Joseph D. Giusto, Vice President—Operations, Lenmar, Inc., Baltimore, MD, has been nominated to serve a one-year term to fill the unexpired term of Thomas E. Hill. Mr. Giusto has been the Baltimore Society Representative to the Board of Directors since 1985.

He was President of the Baltimore Society (1983-84) and served as Chairman of the Membership and Nominating Committees. Mr. Giusto received Society Merit Ci-



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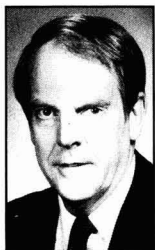
tations in 1983 and 1985, and was awarded the Herman H. Shuger Memorial Award of the Baltimore Coatings Industry Awards Council in 1986.

Educated at Johns Hopkins University, he has been a part of the coatings industry for 23 years. Mr. Giusto currently is President of the Baltimore Paint and Coatings Association.

Board of Directors

Past-President Member—(Two-year term):

Deryk R. Pawsey, Western Canada Area Manager, Rohm and Haas Canada Inc., Vancouver, B.C., Canada, a Past-President



D.R. Pawsey

of the Federation (1987-88) has been nominated for a two-year term. Mr. Pawsey is Chairman of the Liaison Committee and serves on the Finance and Ad Hoc Building Committees. He was a member of the Executive Committee for eight years and served as the Pacific Northwest Society

Representative to the Board of Directors for five years. The 1984 recipient of the Federation's George Baugh Heckel Award, Mr. Pawsey was a six-term Chairman of the Paint Industries' Show Committee, and also was active on the By-Laws, Corrosion, Heckel Award, Professional Development, Specifications, and Technical Information Systems Committees. He was a member of the Editorial Review Board of the JOURNAL

OF COATINGS TECHNOLOGY and was a Trustee of the Coatings Industry Education Fund.

Mr. Pawsey is a Past-President of the Pacific Northwest Society (1975-76) and received their Outstanding Service Award in 1985.

Educated in England, he has been with Rohm and Haas for 17 years.

Members-at-Large:

Thad T. Broome, Research Fellow, J.M. Huber Corporation, Clay Division, Macon, GA, has been nominated for a two-year term. Mr. Broome is a member of the Paint History Committee. He served as Chairman of the 1989 Annual Meeting Host Committee and was a member of the Technical Advisory Committee.

Mr. Broome is a Past-President of the Southern Society (1980-81) and twice served as Chairman of the Atlanta Section of the Society. He was Chairman of the Technical Committee, a member of the Finance Committee, and is the Society Historian.

Mr. Broome is a graduate of Georgia State University and has been active in the coatings industry for 30 years.

Berger G. Justen, Florida Branch Manager, Ribelin Sales, Inc., Tampa, FL, has been nominated for a two-year term. Mr. Justen is a member of the Educational and Nominating Committees, and was the South-



B.G. Justen



L.F. Holzknicht

ern Society Representative to the Federation Board of Directors from 1981 to 1989. He also was a member of the Environmental Affairs Committee.

Mr. Justen is Past-President of the Southern Society (1977-78) and served as Chairman of the Society's By-Laws Committee.

He attended the University of Florida and has been a member of the coatings industry for 27 years.

Louis F. Holzknicht, Laboratory Manager, Devco Coatings Company, Louisville, KY, has been nominated to serve a one-year term to fill the unexpired term of Mr. Penny. Mr. Holzknicht is a Past-President of the Louisville Society (1989-90) and was Chairman of the Society's Technical Committee.

He graduated with the B.S. and M.S. Degrees from Moorehead State University, and has been active in the coatings industry for 13 years.

Mr. Holzknicht has been a member of the American Chemical Society for 20 years.

Elections will take place during the Board of Directors meeting on October 28, in Washington, D.C.

Don't Miss The Boat

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There are 26 Constituent Societies in the Federation of Societies for Coatings Technology. Membership in a Constituent Society also includes membership in the Federation.



FSCT Past-Presidents Terry F. Johnson (left) and Howard Jerome were presented with Federation Honorary Membership plaques by President John Ballard at the recent joint meeting of the Kansas City and St. Louis Societies, in Lake of the Ozarks, MO. Messrs. Johnson and Jerome were elected as Honorary Members of the Federation by the Board of Directors on May 19, in Louisville

Preliminary Program Lineup Is Announced For 1990 Annual Meeting in Washington, D.C.

A total of 14 program sessions, featuring more than 60 technical presentations, await registrants at the 1990 Federation Annual Meeting and Paint Industries' Show in the Washington, D.C., Convention Center, October 29-31.

Program Committee Chairman Gary Gardner, of Tnemec Co., Inc., has announced the preliminary schedule of presentations, noting that concurrent sessions will be held throughout, following the opening Keynote Address on Monday morning, October 29, "A Generation of Eagles," by Lee Sherman Dreyfus, President, Lee Sherman Dreyfus, Inc., and former Governor of the State of Wisconsin.

Following is the session schedule and presentation topics at each.

MONDAY, OCTOBER 29

Professional Development Committee Symposium

Part I—Testing: The Key to the Quality Revolution

—Testing Quality in the Coatings Industry

—Development of Government Criteria to Assess Testing Proficiency

Part II—Advanced Topics in Coatings Research

—New Developments in Transportation Coatings

—New Viewpoint in Formulation of Latex Coatings

—Novel Liquid Organic Corrosion Inhibitors for Coatings

Coating a Sound Foundation

—Wood/Coating Interactions: Pretreatments, Primers, and Topcoats

—Aluminum Sheet Substrate/Coating Interfacial Adhesion as Related to Surface Properties and Processing Conditions

—Substrate Factors Affecting the Performance of Organic Coatings on Steel and Steel Sheet Surfaces

—Coating Thermoplastic Olefins

Interactive Effects of Coatings Components

—Structural Effects of Hydroxyalkyl (methyl)acrylate Monomer on Cure Rates of Acrylic Polyol Resins

—Water-Reducible Unsaturated Polyester Prepolymers as Binders for UV-Curable Coatings

—Role of Emulsifiers in Autodeposition Latexes

—Formulating Stable Acrylic Latex Paint Containing Zinc Oxide

—Development of a New Adhesion Promoter for Coating Thermoplastic Polyolefin

—Effect of Diol Selection on Polyesters for Urethane Coatings

Society Papers

—Changes in Hiding During Latex Film Formation. Part II. Pigment Packing Effects; and Part III. Effect of Dispersant Level and Emulsion Properties—Cleveland Society



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

—Effect of Dispersion on the Physical and Performance Properties of Trade Sales (Architectural) Coatings—Baltimore Society

—Correlation of Hardness in Coating Films Using Koenig and Sward Pendulum Hardness Testers—Toronto Society

—Statistical Model Study of How Coatings Dry—Golden Gate Society

TUESDAY, OCTOBER 30

Coatings History in the Making—A Technology Profile—I

—Electron Beam Processing—Now and for the Future

—UV Curing—A Compliance Technology for the 90s

—Electrodeposition—The Adventure Continues

—Photoinitiated Laser Curing: State of the Art and Opportunities

Coatings History in the Making: A Technology Profile—II

—Retrospect and Prospect of Water-borne Industrial Coatings

—Status and Future Prospects for High Solids Coatings

—Powder Coatings from Finishing Curiosity to Finishing Ahead in the 90s

—Architectural Water-borne Coatings: Technology Advances in the Past Decade

Manufacturing Committee Seminar On "Challenging Tradition"

Polymers: The Key Building Block

Panel of speakers will explore new and unique production concepts, with emphasis on flexible manufacturing and various alternatives to the normal batch process for just in time custom colors.

—Fundamental Studies of Epoxy Resins for Can and Coil Coatings. III. Effect of Bisphenol Structure on Flexibility and Adhesion

—Use of Oxazolidines as a Route to High Build, One-Component, Moisture-Curing Polyurethane Coatings for the Construction Industry

—Novel Fluoropolymer Resins for Coating Applications

—Conducting Polymer Colloids

Room Awards Competition Papers—I

—Gloss of Paint Films and the Mechanism of Pigment Involvement

—Prediction of Coating Failure Over Sheet Molding Compound (SMC): Solvent Permeation Studies

—Interactions of Associative Thickeners with Paint Components as Studied by Use of a Fluorescently Labeled Model Thickener

—Surface Studies of Hydrous Oxide-Coated Rutile in Non-Aqueous Media

Room Awards Competition Papers—II

—Specific Interactions and Adsorption of Film-Forming Polymers

—Adhesion and Flexibility Contributions to the Performance of Epoxy Phosphate Ester Coatings

—Phase Change Control of Reactivity 2. Synthesis and Reactivity of Latent Amine Catalysts for Epoxy-Carboxyl Hybrid Powder Coatings

—Rheological Considerations of Abrasion Resistant Self-Healing Polyurethane Resins

—Ketoxime-Blocked Aromatic Isocyanate-Epoxy Resin-Based Low-Temperature Cured Water-borne Coatings

Safety and Performance

—Solvent-Based Paint Strippers: Alternatives to Methylene Chloride

—Polyurethane Coatings: Safe Application in Outdoor Maintenance Painting

—Characterization of the Components of an Oven Condensate by Gas Chromatography/Mass Spectrometry

—Flexible Coatings for Exterior Wood
—Statistical Analysis of the Evolution of the Yellowness Index During an Accelerated Weathering of a Coating

Corrosion Committee Symposium on Anti-Corrosive Coatings

—How to Develop an Improved Laboratory Corrosion Test
—Compliance When Using Heavy Metals
—Development of Chromate-Free Primers for Aluminum and Steel to Meet CGSB Specifications
—General Phenomenon of Adhesion

WEDNESDAY, OCTOBER 31

Regulatory Affairs

—Crystalline Silica: A Material Showing "Limited Evidence of Carcinogenicity" to Humans
—A Coatings Manufacturer's Guide to Regulatory Requirements and Pollution Prevention Options
—Formaldehyde Regulatory Update

Basics for the Year 2000

—Spheroidal Iron Oxide Yellows: A New Generation of Pigments for Paints and Colorants
—Sorption of Moisture on Epoxy and Alkyd Free Films and Coated Steel Panels
—Cyclic and Continuous Immersion Results for Scribed and Unscribed Alkyd Coated Steel Panels

Fourth Annual "Paint Show 5000" to Be Held During Annual Meeting & Paint Industries' Show

Runners and joggers from throughout the paint industry will be gathering on the Capitol Mall on Tuesday, October 30, 1990 for the Fourth Annual Paint Show 5000. The five kilometer (3.1 mile) run is sponsored by Troy Chemical Corporation, in conjunction with the Annual Meeting and Paint Industries' Show of the Federation of Societies for Coatings Technology.

This year, The Paint Show 5000 will be run on a TAC approved course along the inner walkways of the Capitol Mall, between the major museums of the Smithsonian Institute and in sight of the Capitol and the Washington Monument. The run is scheduled to start at 7:00 a.m. across Madison Drive from the Ice Rink about 30 yards from 7th Street.

In the first three years of the event, runners have enjoyed the unique view of the convention city provided by the run; from the streets of Downtown Dallas; the

Concluding the programing, on Wednesday morning, will be the Joseph J. Mattiello Memorial Lecture by Dr. Henry J. Leidheiser, formerly Director of the Center for Coatings Research at Lehigh University, who will speak on "Electrochemical Techniques for Studying Protective Polymeric Coatings."

The Awards Luncheon will follow the Mattiello Lecture. Featured speaker will be Douglas Kiker, TV news correspondent.

Paint Industries' Show

Available exhibit space in the 1990 Paint Show has been expanded to almost 88,000 sq. ft., up from the record-setting 73,000 sq. ft. of exhibits in New Orleans in 1989. Currently, 276 industry supplier companies have reserved 86,000 sq. ft. of exhibit space at the Washington Convention Center, making the 1990 event the largest ever sponsored by the Federation.

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.

Hotels and Reservations

Nine hotels have reserved blocks of rooms for the Federation, with the Sheraton Washington serving as headquarters hotel. Other hotels include the Omni Shoreham, Washington Hilton, Capital Hilton, Ramada Renaissance Techworld, Grand Hyatt Washington, Holiday Inn Crowne Plaza, J.W. Marriott, and Days Inn/Downtown Convention Center. All housing will be proc-

essed through the Washington, D.C. Convention and Visitors Bureau. (For housing information, see pages 21-28 in this issue.)

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, 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 was sent to all members in April. (See page 27 for advance registration form.) 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 Suite*—Richard DiMarcantonio, of Steeltin Can Corp.; and *Spouses' Activities*—Carolyn (Richard) Chodnicki and Carolyn (Tom) Mitchell.

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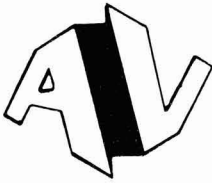
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Federation of Societies for Coatings Technology

AUDIO/VISUAL PRESENTATIONS

(All A/V presentations include slides, cassette tapes and scripts)

CAUSES OF DISCOLORATION IN PAINT FILMS

Some of the common causes of paint discoloration, such as mildew, sulfide staining, dirt retention, and staining by cedar or redwood, are illustrated on houses and on painted panels. Chemical tests for distinguishing between these types of stains are shown. A test for distinguishing efflorescence and chalking of paint films is also described. 15 minutes (37 slides) \$40

THE SETAFLASH TESTER

Produced by the Technical Committee, Birmingham Paint, Varnish and Lacquer Club

The Setaflash Tester offers the capability to quickly ascertain the flash point of a volatile product. This presentation describes the equipment and explains the procedures for determining flash point in two temperature ranges (ambient to 110° C; 0° C to ambient) by both the flash/no-flash method and the definitive method. 54 minutes (134 slides) \$100

FEDERATION TRAINING SERIES ON TEST METHODS*

Volume II

(3 Lessons) Lessons vary from 7 to 11 minutes (79 slides) . . . \$70

Lessons	<i>Producing Society</i>
A Simple Method to Determine Microbiological Activity	Philadelphia
A Salt Spray (Fog) Testing Cabinet	Golden Gate
Wet Film Thickness Gages	Golden Gate

*Volume I not available at this time.

HIGH SPEED DISPERSION

Produced by the Manufacturing Committee, Montreal Society for Coatings Technology

The program covers theoretical and practical techniques used for dispersion in paint plants, showing laboratory test equipment and plant scale manufacturing procedures. 20 minutes (60 slides) \$65

INTRODUCTION TO RESIN OPERATIONS

Produced by the Manufacturing Committee, Toronto Society for Coatings Technology

This presentation has been developed to assist in the selection and training of resin plant operators, and focuses on basic concepts of manufacture and the role of a resin operator. 12 minutes (58 slides) \$65

A BATCH OPERATED MINI-MEDIA MILL

Produced by the Manufacturing Committee, New York Society for Coatings Technology

This presentation describes the design and operation of a batch operated mini-media mill, and was developed to assist in the training of plant personnel to operate such equipment. 8½ minutes (51 slides) \$60

NOW AVAILABLE!

OPERATION OF A VERTICAL SANDMILL—(Produced by the Manufacturing Committee, Kansas City Society for Coatings Technology). This program describes the design and operation of a vertical sandmill, to assist in the training of plant personnel to operate such equipment. 14 minutes (73 slides). \$75

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Regulatory UPDATE

AUGUST 1990

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 National Paint and Coatings Association, Washington, D.C.

Lead/Mercury—The Lead Ban Act, S. 2593 (Sen. Bradley D-NJ), and the Lead Exposure Reduction Act, S. 2637 (Sen. Reid D-NV), were introduced in early May. On June 26, a hearing on both bills was held before the Toxic Substances, Environmental Oversight, Research and Development Subcommittee of the Senate Environment and Public Works Committee. No further action has been scheduled. If this legislation is not passed before the October recess, it is sure to see significant action next Congress—especially if coupled with the mercury issue. (Both are being publicized as urgent children's health issues). Sen. Bradley is likely to introduce mercury legislation sometime this summer.

Clear Air—The Clean Air Conference is being held up because of the appointment of an unprecedented number of conferees. One-hundred thirty-two House Members have been appointed to the Senate's nine. Action is tentatively scheduled for late July, but because both Houses will be in recess for the month of August, it is likely the conference will be completed in late September.

Resource Conservation and Recovery Act (RCRA) Reauthorization—RCRA was due to be reauthorized in 1988 and has been supplementally appropriated ever since. It is unlikely that reauthorization will happen this year because of the long clean air debate and unexpected oil spill legislation. Over 100 RCRA bills have been introduced this Congress, but both Senate and House members prefer to consider a comprehensive package as opposed to individual pieces of legislation. Undoubtedly, RCRA will be the first order of business when Congress reconvenes next January. The debate could be as lengthy as the clean air debate, incorporating the Administration's so-called pollution prevention program, interstate waste transport, waste management, waste reduction, and recycling issues.

Superfund—Superfund is due to be reauthorized in 1991. Oversight hearings could begin in the fall, and a complete restructuring of the program could take place next Congress. There has been talk of turning Superfund into a Public Works Project—which would further divide jurisdictional responsibilities and delay reauthorization.

Environmental Protection Agency

June 18, 1990—55 FR 24692

Underground Storage Tanks Containing Petroleum; Financial Responsibility Requirements

Action: Proposed Rule

Under Section 9003 (e) and (d) of the Resource Conservation and Recovery Act (RCRA), the Environmental Protection Agency (EPA) has proposed financial responsibility requirements for local governmental owners and operators of underground storage tanks that contain petroleum.

The proposal would allow local governments to use four alternative mechanisms to show financial responsibility for "taking corrective action and compensating third parties for bodily injury and property damage caused by sudden and non-sudden accidental underground storage tank releases." The proposed financial assurance mechanisms would be added to the existing mechanisms contained in the rule promulgated October 26, 1988.

EPA believes that by adding the new mechanisms, more local governmental operators will be able to comply with the financial assurance requirements, and will save local governments approximately \$288 million over 10 years.

Comments will be accepted until August 17, 1990, and should be mailed to the Docket Clerk (Docket No. UST-3), Office of Underground Storage Tanks (WH-562A), U.S. EPA, 401 M Street, S.W., Washington, D.C. 20460. For further information, contact The RCRA/Superfund Hotline at (800) 424-9346.

Environmental Protection Agency

June 29, 1990—55 FR 26986

Hazardous Waste Management System; Identification and Listing of Hazardous Waste; Toxicity Characteristics Provisions

Action: Final Rule; corrections

Under Subtitle C of the Resource Conservation and Recovery Act (RCRA), certain hazardous wastes are subject to regulation because of their potential to leach significant amounts of toxic constituents. The EPA promulgated a rule on March 29 (55 FR 11798) to revise the existing toxicity characteristics which are used to identify those wastes.

EPA has subsequently determined that certain revisions should be made in order to ensure consistency of the toxicity characteristics leaching procedure (TCLP), and to clarify the

The Regulatory Update is made available as a service to FSCT members, to assist them in making independent inquiries about matters of particular interest to them. Although all reasonable steps have been taken to ensure the reliability of the Regulatory Update, the FSCT cannot guarantee its completeness or accuracy.

quality assurance section. The effective date remains September 25, 1990.

For further information, contact the RCRA/Superfund Hotline at (800) 424-9346 or (202) 382-3000. For information

on specific aspects of the rule, contact Steve Cochran, Office of Solid Waste (OS-332), U.S. EPA, 401 M Street, S.W., Washington, D.C. 20460, (202) 475-8551.

States Proposed Legislation and Regulations

California

Toxic Substances—A. 2610 (O'Connell) specifies that a community facilities district may be established to finance services with respect to removal or remedial action for the cleanup of any hazardous substance released or threatened to be released into the environment.

Household Hazardous Waste—A. 2707 (LaFollette) imposes a state-mandated local program by requiring each city to prepare, adopt, and submit by July 1, 1991, to the county in which it is located a household hazardous waste element of specified content; and other provisions.

Liability Insurance—A. 2730 (LaFollette) requires the Insurance Commissioner, upon a determination, after a public hearing, that environmental impairment liability insurance is not generally available in this state, to implement a marketing assistance program to assist liability insurers to form a consortium with the ability to make insurance available against liability arising from unauthorized releases of petroleum from underground storage tanks.

Air Quality—A. 2759 (Eaves) requires every air pollution control district to establish and implement a system to offset increases for stationary and mobile sources, thereby imposing a state-mandated local program. Establishes a state panel to develop guidelines for mobile sources offset programs, which requires the State Air Resources Board to adopt, and districts to implement, as specified.

A. 3783 (Campbell) applies a penalty to violation of a rule or regulation of an air pollution control district or air quality management district limiting emissions of toxic air contaminants identified by the state board; increases the civil penalties and fines.

A. 4059 (Wyman) states that pollution control districts and air quality management districts have the power to require any owner or operator of any nonvehicular air pollution emission source to collect or disclose data necessary to reveal the nature or extent of air pollution discharges therefrom.

A. 4092 (Roybal-Allard) requires air pollution control officers to request an inventory of chemical substances from a supplier of volatile organic compounds or hazardous materials, for permit or enforcement purposes; provides procedures to protect trade secrets from disclosure.

A. 4093 (Roybal-Allard) allows the air pollution control officer of an air pollution district or air quality management district to issue a cease and desist order as to a release or threatened release of hazardous substances or a release of air contaminants that may pose a substantial endangerment to public health and safety or the environment.

S. 1770 (McCorquodale) creates the San Joaquin Valley Air Quality Management District; assumes the functions of the county air pollution control districts in those areas; specifies the duties and functions of the district with respect to the adoption of rules and regulations; permits the district to adopt a schedule of fees levied on sources of air pollution subject to district regulation.

S. 2652 (Russell) requires every district including specifically the Bay Area Air Quality Management District, the South Coast Air Quality Management District, and the Sacra-

mento Metropolitan Air Quality Management District to consider cost effectiveness in adopting regulations.

S. 2672 (Presley) allows increases at a stationary source in one air pollution control district or air quality management district to be offset by reductions in another district, whereby reductions in the emission of air contaminants may be banked and used to offset future increases in emissions.

S. 2776 (Torres) revises the definition of "toxic air contaminant" to delete an exclusion for pesticides and include a description of cancer-causing substances. Redefines the threshold level below which no health effects are anticipated. Imposes new duties on the affected agencies, including air pollution control districts and air quality management districts with respect to reducing or eliminating emissions of toxic air contaminants.

A proposed CARB regulation specifies how transported pollutants affecting ozone concentrations shall be mitigated in district air quality plans required by the California Clean Air Act. It also establishes mitigation requirements for districts located within the five upwind air basins or areas that are the source of "significant" or "overwhelming" transport. Comment deadline is August 8, 1990, and hearings are scheduled for August 9 and 10, 1990. For more information, contact, Mr. Terry McGuire, Chief, Technical Support Division, (916) 322-5350 or Catherine Witherspoon, Chief, Office of Air Quality Planning and Liaison, (916) 322-2739, Air Resources Board, P.O. Box 2815, Sacramento, CA 95812.

Hazardous Waste—A. 2834 (Quackenbush) revises the definition of a "waste" to mean any material not otherwise excluded from regulation, which is considered inherently wastelike; disposed of; discarded by being burned or incinerated; or recycled, or accumulated, stored or treated before recycling, except as specified, or before, or in lieu of, or being disposed of, or being discarded by being burned or incinerated.

S. 2774 (Torres) revises the definition of manifest to mean a shipping document originated and signed by a generator of hazardous waste, which contains all of the information required by the department and which complies with federal and state regulations; requires any person generating hazardous waste which is transported, or submitted for transportation, for offsite handling, treatment, storage, disposal, to complete a manifest prior to the time of transportation.

Taxes—A. 3580 (Katz) authorizes a city, county, or city and county to levy a tax by ordinance on the sale of aerosol paint containers and felt tip markers. Requires the local entity imposing such a tax to contract with the State Board of Equalization to administer and enforce the tax. Requires the tax to be collected by every retailer of a taxed item and requires that retailer to remit the tax to Board.

Building Codes—A. 3588 (Speier) requires the State Department of Health Services to develop guidelines for the reduction of volatile organic concentrations from new construction materials in newly constructed or remodeled office buildings, as specified, and to submit them to the Legislature, the Department of General Services, and the State Buildings Standards Commission by January 1, 1992.

Packaging—A. 3994 (Sher) makes it unlawful for any person to represent that any consumer good, as defined, which it manufactures or distributes is “ozone friendly,” “biodegradable,” “photodegradable,” “recyclable,” or “recycled” unless that article meets specified definitions or meets definitions established in trade rules adopted by the Federal Trade Commission.

Connecticut

Hazardous Waste—This proposed regulation adopts written guidelines, as part of the Hazardous Waste Management Service’s participation in the Environmental Protection Agency’s WRITE Program, for solicitation of interest procedures and technical evaluation criteria for providing economic and technical evaluations of innovative technologies, in use or about to be implemented, that reduce the volume or toxicity of hazardous waste at industrial facilities. For more information, contact Kathleen C. Golas, Chairwoman and Executive Officer, Connecticut Hazardous Waste Management Service, Suite 360, 900 Asylum Avenue, Hartford, CT 06105, (203) 244-2007.

Delaware

Packaging—S. 503 (Minner) prohibits the sale of packaging materials to which certain heavy metals have been intentionally introduced during the manufacturing or distribution of packaging; prohibits the sale of products packaged in such materials; requires Department of Natural Resources and Environmental Control to review the effectiveness of these prohibitions and to consider recommending the prohibition of other toxic substances contained in packaging.

Florida

Air Quality—This regulation proposed by the Florida Department of Environmental Regulation on June 8, 1990, changes the recordkeeping requirements for stationary point source emission test procedures and revises the compliance schedule for Reasonably Available Control Technology requirements. For more information, contact Edward T. Huck, Division of Air Resources Management, Department of Environmental Regulation, Twin Towers Office Building, 2600 Blair Stone Road, Tallahassee, FL 32399-2400.

Hawaii

Packaging—H. 1023 (Kotani) requires that all plastic containers have labels indicating the plastic resin used to produce the plastic container product.

Illinois

Air Quality—The Pollution Control Board proposed a regulation requiring the Illinois Environmental Protection Agency to propose and the Pollution Control Board to adopt a list of toxic air contaminants. It includes procedures for the determination of toxic air contaminants, evaluating characteristics of a toxic air contaminant, identification requirements for new emission sources and procedures for listing and delisting of toxic air contaminants. For more information, contact Dorothy M. Gunn, Clerk, Illinois Pollution Control Board, State of Illinois Center, Suite 11-500, 100 W. Randolph Street, Chicago, IL 60601.

Hazardous Waste—In separate regulatory proposals, the Pollution Control Board has updated its hazardous waste rules

to correspond with amendments adopted by the U.S. Environmental Protection Agency. Specific regulations (1) amend the definition of “designated facility” and update the reference to “test methods for evaluation solid waste, physical/chemical methods”; (2) change or add various hazardous waste exclusions; (3) change certain terminology pertaining to hazardous wastewaters; (4) move the requirements for certain hazardous waste tests to another section of the Board’s rules; (5) add additional manifest requirements for generators dealing with out-of-state transport of hazardous waste which has not yet been listed in the disposer’s state; and (6) change certain terminology pertaining to liner systems in landfills. Comment deadline for all proposals is August 6, 1990. For more information, contact Ms. Dorothy M. Gunn, Clerk, Illinois Pollution Control Board, State of Illinois Center, Suite 11-500, 100 W. Randolph St., Chicago, IL 60601.

Louisiana

Hazardous Waste—H. 1241 (Bolin) relates to land disposal of hazardous waste. Provides for hazardous wastes and residues which have been treated.

H. 1880 (Bolin) relates to the prohibition of land disposal of hazardous waste; provides with respect to exemptions from such prohibition.

H. 1884 (Laborde) relates to the taxation of hazardous waste; provides for the definition of hazardous waste.

Massachusetts

Environmental Issues—H. 587 (Angelo/Durand) same as S. 968 (Padula) requires the Department of Environmental Management to aid small businesses affected by environmental laws.

H. 5252 (Rosenberg) protects the environment through increased recycling and waste reduction.

A proposed regulation establishes a program for the certification of laboratories to conduct analytical measurements for the purpose of determining compliance with Department of Environmental Protection standards where the Department requires that such measurements be conducted by a certified laboratory. For more information, contact Ann Marie Allen, Department of Environmental Protection, Lawrence Experiment Station, 37 Shattuck Street, Lawrence, MA 01843, (508) 682-5237.

Underground Storage Tanks—H. 3611 (Local Sponsor) regulates the storage of outdoor tanks containing toxic chemicals.

H. 5249 (Collaro) regulates the relocation of underground tanks containing flammable liquids.

H. 5253 (Rosenberg) relates to the removal of underground storage tanks.

H. 5944 (Committee on Natural Resources and Agriculture) relates to protecting the environment through the establishment and administration of an underground storage tank cleanup program.

S. 995 (Wetmore) regulates the relocation of underground tanks containing flammable liquids.

Michigan

Toxic Substances—A proposed regulation concerns the proposed occupational health rules for formaldehyde; deals with permissible exposure limits, workplace monitoring, respiratory protection, regulated areas, protective clothing, medical surveillance, and other matters. For more information, contact Division of Occupational Health, Bureau of

Environmental Occupational Health, Department of Public Health, 3423 North Logan Street, P.O. Box 30195, Lansing, MI 48909, (517) 335-8238.

Minnesota

Occupational Safety and Health—A proposed rule relates to the occupational exposure to formaldehyde, lead, asbestos, tremolite, anthophyllite, and actinolite. For more information, contact Occupational Safety and Health Division, Department of Labor and Industry, 443 Lafayette Road, St. Paul, MN 55155-4307, (612) 297-3254.

New Jersey

Hazardous Waste—A. 2623 (LoBiondo) requires hazardous waste generators to submit minimization plans.

Toxic Substances—A proposed regulation requires local boards of health to perform investigations and abatements for childhood lead poisoning. For more information, contact Edmond D. Duffy, Coordinator, Accident Prevention and Poison Control Program, Department of Health, CN 364, Trenton, NJ 08625.

Right-To-Know—This proposal pertains to the Worker and Community Right-to-Know Act. For more information, contact Richard Willinger, Manager, Right-to-Know Program, Division of Occupational and Environmental Health, Department of Health, CN 368, Trenton, NJ 08625-0368.

New York

Hazardous Waste—S. 2886 (Daly) directs the Department of Environmental Conservation to establish an education and compliance program to provide information and assistance to generators of small quantities of hazardous waste to assist them in complying with governmental regulations.

S. 5276 (Daly) requires hazardous waste generators to establish hazardous waste reduction plans and requires certification that such plan is in operation.

Oklahoma

Hazardous Waste—This proposal clarifies that a hazardous waste site post closure permit is handled like an operations permit; clarifies language concerning waste generator notices; allows transporters of waste to combine compatible wastes; clarifies TSD language and all full-time on-site inspectors; clarifies permitting language and confidentiality, spills, remediation. Insures Oklahoma rules are clear and consistent with federal hazardous waste programs. For more information, contact Damon Wingfield, Waste Management Service, Board of Health, Room 810, State Health Department Building, Oklahoma City, OK 73152, (405) 271-5338.

Oregon

Toxic Substances—A Department of Agriculture proposal establishes a pesticide operator and pesticide applicator li-

cense category, Marine Fouling Organism Control; includes tributyltin based marine antifouling paints or coatings as restricted use pesticides. For more information, contact Chris Kirby, Assistant Administrator, Plant Division, Department of Agriculture, 635 Capitol Street, N.E., Salem, OR 97310-0110, (503) 378-3776.

A Department of Environmental Quality proposed regulation requires all toxics users to prepare reduction plans, notify the Department of Environmental Quality that plans have been completed, prepare annual progress reports, and submit certain information to the department on an annual basis. Hearings were held on July 9 and 10, 1990. For more information, contact Jan Whitworth, Department of Environmental Quality, 811 S.W. 6th Avenue, Portland, OR 97204, (503) 229-6434.

Pennsylvania

Household Hazardous Waste—H. 2729 (Cole) provides for household hazardous waste collection programs.

S. 1725 (Musto) provides for household hazardous waste collection programs.

Tennessee

Air Quality—An APCD proposed regulation clarifies the applicability of volatile organic compound rules and visible emission regulations; clarifies that permit conditions mutually agreed upon which will exempt a source from a regulation, must be submitted to EPA as a revision to the State Implementation Plan; clarifies that exempt solvents are treated as water; specifies the recordkeeping requirements; concerns surface coating of fabrics and metals. A hearing was held on July 3, 1990. For more information, contact Division of Air Pollution Control, 701 Broadway, Customs House, Fourth Floor, Nashville, TN 37247-3101.

Utah

Occupational Safety and Health—An OSHA Proposal incorporates general industry standards for occupational exposure to hazardous chemicals in laboratories. For more information, contact Don Anderson, Occupational Safety/Health Division, 160 East 300 South, Salt Lake City, UT 84151, (801) 530-6901.

Vermont

Toxic Substances—H. 540 (Murphy) creates a State Emergency Response Commission and enables the emergency management division to respond to chemical emergencies and assess fees against storers, transporters, and users of chemicals.

Household Hazardous Waste—H. 733 (Schaefer/Hockert) bans disposal in solid waste landfills of specified hazardous household material, imposes a tax on the sale of these specified hazardous household materials, and creates and funds a state program to manage and dispose of these materials.

FEDERATION OF SOCIETIES FOR COATINGS TECHNOLOGY

68th Annual Meeting

55th Annual Paint
Industries' Show

**Housing
Information**

**Advance
Registration
Form**

WASHINGTON CONVENTION CENTER
Monday, Tuesday, Wednesday ★ October 29-30-31, 1990
WASHINGTON, D.C.

FEDERATION OF SOCIETIES FOR COATINGS TECHNOLOGY
1990 ANNUAL MEETING AND PAINT INDUSTRIES' SHOW
WASHINGTON CONVENTION CENTER
MONDAY, TUESDAY, AND WEDNESDAY, OCTOBER 29, 30, 31, 1990

The combined Annual Meeting and Paint Industries' Show is a major educational activity of the Federation. This international coatings manufacturing industry event consists of three days of technical program sessions and exhibits, running concurrently. Registration is required for admission.

**"A DECADE OF DECISION:
PREPARING FOR THE YEAR 2000"**

The theme of the 1990 Annual Meeting emphasizes that, more so than in decades past, the 1990s will demand decisions on coatings technology, substrates, and application methods which will influence the products, markets, and profitability of the industry as it enters the 21st Century. 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 on the program will be the Mattiello Memorial Lecture, Roon Awards Papers, Society Papers, and Seminars. Speakers will come from throughout the world of coatings science and manufacture.

**PRODUCTS/SERVICES OF OVER 260
EXHIBITORS TO BE FEATURED AT
RECORD-BREAKING SHOW**

The Paint Industries' Show — the largest and best international exhibit of its kind in the world — will feature attractive exhibitor displays devoted to a wide variety of raw materials, production equipment, containers, laboratory apparatus, testing devices, and services furnished to the coatings manufacturing industry.

The purpose of the Show is to provide attendees with an opportunity to learn of the latest developments in these products and services. Key personnel from the top technical and sales staffs of exhibitor companies will be on hand. More than 260 exhibitors from the U.S., Canada, and Europe will utilize over 89,000 net square feet of exhibit space at the Show. Exhibit hours will be 11:00-5:30 on Monday; 9:00-5:30 on Tuesday; and 9:00-3:00 on Wednesday.

PARTICIPATING HOTELS

Nine hotels in Washington D.C. have reserved rooms for the Annual Meeting. A description of each follows:

Sheraton Washington (FSCT Headquarters)

Largest hotel in Washington with a variety of restaurants/lounges. Facilities for the handicapped. Metro subway stop nearby. Within walking distance to National Zoo. Non-smoking rooms available.

Omni Shoreham

Restored landmark one block from the Sheraton. Situated on 11 acres, the hotel offers lighted tennis courts. Jogging trails in nearby Rock Creek Park.

Grand Hyatt

Located directly across from the Washington Convention Center. Twelve-story atrium structure features lobby lagoon. Metro center 1/2 block away. State of the art fitness center. Rooms for non-smokers and handicapped available.

Ramada Renaissance

Across the street from the Convention Center this new hotel is part of the Techworld complex. Pool and executive fitness center available.

Holiday Inn Crowne Plaza

One block from Convention Center this new hotel features a complete health club with indoor pool.

J.W. Marriott

Located two blocks from White House and nearby Smithsonian Institution. Indoor pool.

Capital Hilton

Located in downtown business district. Two blocks from White House.

Washington Hilton

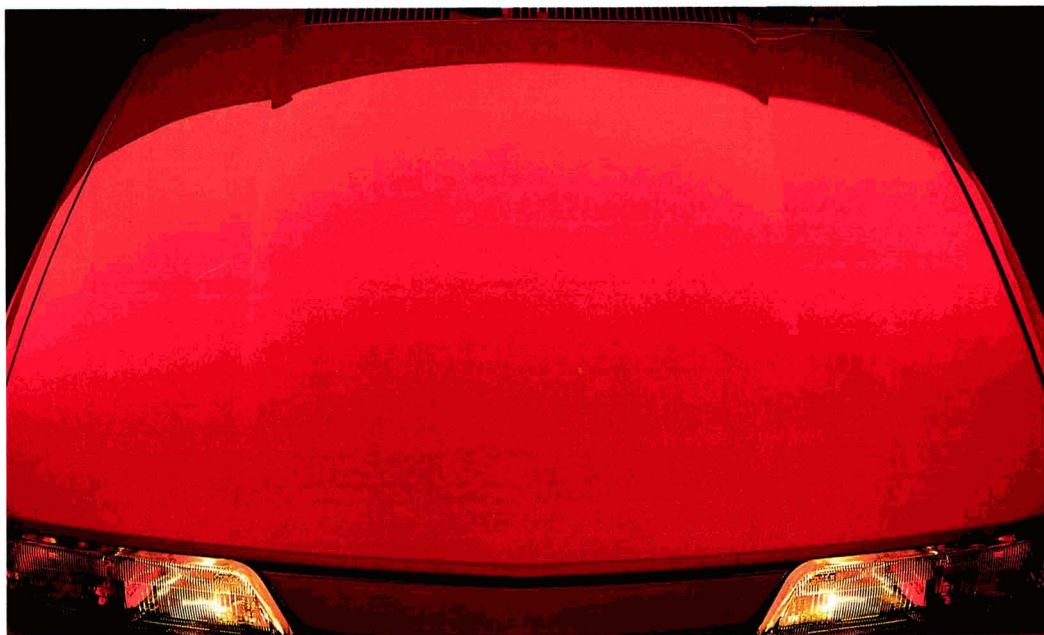
Downtown seven-acre hotel features lighted Har-Tu tennis courts. All rooms redecorated in 1988.

Days Inn Downtown/Convention Center

Two blocks from Convention Center. Valet parking.

**WE DON'T
SEE IT
AS A FINISH.**

**WE SEE IT
AS A
START.**



It's after you've decided to specify CIBA-GEIGY additives for your coatings that our work really begins.

First, we must make sure that our products — light stabilizers, antioxidants and corrosion inhibitors — meet tightly defined specs for purity and consistency, yours as well as ours. So we've instituted supplier qualification programs and have begun SPC/SQC programs at our manufacturing facilities.

We must also make sure that we've got the production capacity to meet your needs. So we've invested \$100 million in the U.S.

in the last five years. And we plan to spend \$300 million more over the next five years.

And we must make sure there are no production or formulation problems with our materials. So our technical service representatives work with you, often on-site, to help you analyze your problems and make recommendations. They speak your language because they've worked in the coatings industry themselves.

Finally, we must make sure that you're ready for tomorrow. So at seven additives research centers throughout the world,

we're working on new ways to use our additives. And we're also developing new additives to solve problems for automotive, trade sales, and industrial coatings.

What it all adds up to is this: If you want to protect your finishes, CIBA-GEIGY is the place to start.

For more information, call toll-free, 800-431-1900 (in New York, 914-347-4700), or write to: CIBA-GEIGY Corporation, Additives Division, Seven Skyline Drive, Hawthorne, NY 10532.

CIBA-GEIGY

HOTEL ROOM AND SUITE RATES

Map Key	Hotel	Singles	Doubles/Twins	Suites	
				1 BR	2 BR
1	Sheraton Washington*	\$145,160,170	\$175,190,200	\$260-1,600	\$555-1,700
2	Omni Shoreham	130	150	350-425	525-1,200
3	Grand Hyatt*	152,167,182	175,200,215	425-950	500-1,100
4	Ramada Renaissance	148,168	168,188	500-2,000	648-2,148
5	Holiday Inn Crowne Plaza	130	150	300-450	450-600
6	J.W. Marriott	155	168	475-700	700-900
7	Capital Hilton	145,165,180	165,185,200	550	700
8	Washington Hilton	125,135,145	145,155,165	360-680	525-845
9	Days Inn Downtown Convention Center	70	70		

Note: Rates subject to 11% District of Columbia Sales tax and \$1.50 occupancy tax per room per night. Upon receipt of confirmation from the Housing Bureau, please send deposit check directly to hotel.

*Requests for accommodations at either Sheraton or the Hyatt will be limited to 10 rooms per company.

SHUTTLE BUS ROUTES

Route 1

Sheraton Washington	24th Street Entrance
Omni Shoreham	Walk to Sheraton Washington
Washington Hilton	T Street Entrance

Route 2

Capital Hilton	16th Street
J.W. Marriott	E Street Entrance

Downtown Hotels

Grand Hyatt	Walk to Convention Center
Ramada Renaissance	Holiday Inn Crowne Plaza
	Days Inn Downtown



Key

- A. White House
- B. Union Station
- C. U.S. Capitol
- D. Smithsonian Institution
- E. Jefferson Memorial
- F. Washington Monument
- G. Lincoln Memorial
- H. Department of State
- I. Arlington Cemetery
- J. Supreme Court
- K. Library of Congress

**1990 FSCT ANNUAL MEETING AND PAINT INDUSTRIES' SHOW
 WASHINGTON CONVENTION CENTER, WASHINGTON, D.C.
 MONDAY, TUESDAY, AND WEDNESDAY, OCTOBER 29, 30, 31**



HOUSING INSTRUCTIONS

Hotel reservations are easy this year—everything can be done by phone! We are using the Housing Bureau of the Washington Convention and Visitors Association to make reservations. Please call them directly, weekdays between 9 a.m. and 5 p.m. (EST).

Metropolitan Washington area: (202) 842-2930
 United States: 1-800-535-3336
 Canada: 1-800-535-3356

Reservations must be made by September 28, 1990.

International attendees may send hotel reservations to:

FSCT Housing Bureau
 1212 New York Avenue, NW
 Washington, D.C. 20005 USA

International attendees ONLY may send reservations by facsimile machine to (202) 789-7037. All eleven items requested below must be included when sending any form of written reservation.

All changes/cancellations prior to September 28 should be made directly with the housing bureau. After this date, please contact the hotel directly with changes or cancellations.

Confirmations will be sent to you from the housing bureau. If a credit card number has been given, a deposit is not required. Otherwise, please send deposit amount indicated on the confirmation directly to the hotel within 15 days of receipt of confirmation.

Please have the following information available PRIOR to calling for reservations:

1. Name of Convention: FSCT
2. 1st, 2nd, and 3rd choice of hotels
3. Arrival/Departure dates
4. Number of rooms required
5. Type of room (single, double, etc.)
6. Number of persons in party
7. Arrival time
8. Name of credit card, number, and expiration date
9. Names of occupants of room
10. Confirmation address
11. Telephone number

NON-EXHIBITOR REGISTRATION INSTRUCTIONS

Advance register to attend the 1990 Annual Meeting and Paint Industries' Show by filling out the form included in this brochure.

The registration options are listed below. Advance registration forms must be received by October 5.

Register in Advance and SAVE!

Full Time	Advance	On-Site
Member	\$65	\$75
Non-member	\$80	\$95
Spouse	\$50	\$60

If you register in advance you may pick up your badge in the Convention Center during the following hours (use H Street or 9th Street entrance):

Saturday, Oct. 27	1:00 pm - 5:00 pm
Sunday, Oct. 28	8:00 am - 5:00 pm
Monday-Tuesday, Oct. 29-30	8:00 am - 5:30 pm
Wednesday, Oct. 31	8:00 am - 3:00 pm

On-Site Registration

Register at Convention Center (use H Street or 9th Street entrance).

Sunday, Oct. 28	8:00 am - 5:00 pm
Monday-Tuesday, Oct. 29-30	8:00 am - 5:30 pm
Wednesday, Oct. 31	8:00 am - 3:00 pm

Cancellation and Refund Policy

All cancellations must be submitted in writing to the FSCT Headquarters Office. Cancellations received by October 5 will be subject to a \$10 handling charge. *No refunds will be issued after that date.*

HOW TO MAKE YOUR ARRANGEMENTS

1. To place AIRLINE reservations, call the toll free numbers for Delta and US Air.
2. To make HOTEL reservations, call the housing bureau's toll free number. Housing cut-off date is September 28.
3. ADVANCE REGISTER for the Annual Meeting and Paint Industries' Show by filling out the form and mailing it as instructed with your registration payment.
4. To register your SPOUSE or GUEST, fill out spouse portion of the advance registration form.
5. Mark OCTOBER 29-31 on your calendar. Don't forget—you get a discount if you register by October 5.

DELTA AND US AIR OFFER SPECIAL FARES TO D.C.

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, 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.

FEDERATION BOARD OF DIRECTORS TO MEET ON SUNDAY IN SHERATON

The Board of Directors of the Federation will meet on Sunday, October 28, at 9:00 a.m. in the Sheraton Washington Hotel.

FEDERATION ANNUAL LUNCHEON WILL BE HELD ON WEDNESDAY

The annual Federation Luncheon will be held on Wednesday, October 31, at the Convention Center. Tickets may be purchased in advance or at the registration area in Washington, D.C.

HALLOWEEN EVE TOUR OF D.C. TO HIGHLIGHT SPOUSES' PROGRAM

The Spouses' Program will open on Monday with a wine and cheese social in the Convention Center. On Tuesday following Continental Breakfasts at the Sheraton Washington and the Grand Hyatt, there will be a spectacular tour of Washington's most famous sights and museums. One of the special delights of the tour will be the guides' tales of Washington's past and present, and, especially for Halloween, the city's best documented ghost stories. Luncheon will be served in the fabulous America restaurant at Georgetown's Washington Harbour Complex. On Wednesday morning Continental Breakfast will again be served at the Sheraton Washington and the Grand Hyatt Hotels.

NPCA TO MEET SAME WEEK AT WASHINGTON HILTON

The National Paint and Coatings Association will meet beginning Wednesday, October 31, at the Washington Hilton. Persons who have registered for NPCA and who pick up their badges on Tuesday, October 30 will be admitted to the Paint Show on *Tuesday only* with the compliments of the Federation.



The Sheraton Washington Hotel—headquarters hotel for the Federation's 68th Annual Meeting

1990 Advance Registration

FEDERATION OF SOCIETIES FOR COATINGS TECHNOLOGY
1315 Walnut St., Philadelphia, PA 19107

C	Office Use Only
U	Date Received _____
V	Amount \$ _____
	Check No. _____

Please fill out this form and mail with a check in the correct amount (made payable to the FSCT) to the Federation address shown above. All checks must be payable in U.S. Funds. Any that are not will be returned. DEADLINE DATE FOR ADVANCE REGISTRATION IS OCTOBER 5. NONE WILL BE ACCEPTED AFTER THAT DATE.

A \$10.00 charge will be made for cancellations received prior to October 5. No refunds will be made after that date.

INDUSTRY REGISTRATION FEES: INFORMATION FOR REGISTRATION BADGE:

A **MEMBER** **\$65.00**

Please name the Federation Society in which you are a paid-up member:

Federation Constituent Society

NICKNAME

FIRST NAME LAST NAME

COMPANY

B **NON-MEMBER** **\$80.00**

STREET

G **SPECIAL FEE FOR RETIRED MEMBERS** **\$25.00**

Federation Constituent Society

CITY STATE (U.S. only) POSTAL CODE

COUNTRY (OTHER THAN U.S.)

TELEPHONE NO.

BUSINESS CLASSIFICATION DATA FOR THE ABOVE REGISTRANT:

YOUR COMPANY (CHECK ONE BLOCK)

AA Manufacturers of Paints, Varnishes, Lacquers, Printing Inks, Sealants

BB Manufacturers of Raw Materials

CC Manufacturers of Equipment and Containers

DD Sales Agent for Raw Materials + Equipment

EE Government Agency

FF Research/Testing/Consulting

GG Educational Institution Library

HH Paint Consumer

JJ Other

YOUR POSITION (CHECK ONE BLOCK)

KK Management/Administration

LL Manufacturing and Engineering

MM Quality Control

NN Research and Development

PP Technical Sales Service

QQ Sales and Marketing

RR Consultant

SS Educator/Student/Librarian

TT Other

SPOUSES REGISTRATION AND INFORMATION FOR REGISTRATION BADGE:

D **SPOUSE** **\$50.00**

SPECIAL FEE FOR THE SPOUSES OF RETIRED MEMBERS ONLY:

H **\$25.00**

NICKNAME

FIRST NAME LAST NAME

CITY STATE (U.S. only) POSTAL CODE

TICKETS FOR FEDERATION LUNCHEON, WEDNESDAY, OCTOBER 31 (@\$ 25.00)

Z **NUMBER REQUIRED:** _____ **\$25.00 EACH.**

<p>A CHECK IN THE AMOUNT OF: \$ _____ IS ENCLOSED</p>

1990 Paint Industries' Show

Current List of Exhibitors

ACS-Datcolor
Aceto Corp.
Advanced Coating Tech.
Advanced Software Designs
Air Products & Chemicals, Inc.
Alcan-Toyo America, Inc.
Allied-Signal, Inc.
Ambrose Co./Pioneer Packaging
American Cyanamid Co.
American Institute of Chemists
American Iron & Steel Institute
Amoco Chemical Co.
ANGUS Chemical Co.
Anker USA, Inc.
Aqualon Co.
Arco Chemical Co.
Aries Software Corp.
Ashland Chemical Co.
Atlas Electric Devices Co.
Atochem North America, Lucidol

B&P Environmental Resources
BASF Corp.
T.J. Bell, Inc.
Bilt-Rite Corp.
Blackmer Pump Div.
Bohlin Reologi, Inc.
Brookfield Eng. Labs., Inc.
Brookhaven Instruments Corp.
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
CR Minerals Corp.
CSC Publishing Inc.
Cabot Corp.-Cab-O-Sil Div.
Cabot Corp.-Special Blacks Div.
Calgon Corp., Div. of Merck
The Carborundum Co.
Cardolite Corp.
Cargill, Inc.
Caschem, Inc.
Catalyst Resources, Inc.
Cellier Corp.
Chemical & Engineering News
Chemical Marketing Reporter
Chemical Week
Chem-Tel, Inc.
CIBA-GEIGY Corp.
Clawson Tank Co.
Coatings Magazine
Colloids, Inc.
Color Corp. of America
Colores Hispania, S.A.
Colorgen, Inc.
Columbian Chemicals Co.
Consolidated Research Inc.
Cookson Pigments, Inc.
Coulter Electronics, Inc.
Cray Valley Products Intl.
Crosfield Chemicals, Inc.
Cuno Process Filtration Prods.
Cyprus Industrial Minerals Co.

D/L Laboratories
DSA Consulting, Inc.
DSET Laboratories, Inc.
Daniel Products Co.
Dantco Mixers Corp.
Davies Can Co.
Day-Glo Color Corp.

Degussa Corp.
University of Detroit
Diano Color Products
Dominion Colour Corp.
Dow Chemical USA
Dow Corning Corp.
Draiswerke, Inc.
Drew Chemical Corp.
Du Pont Co.

E.C.C. America
EM Industries, Inc.
Eagle Picher Minerals Inc.
Eagle Zinc Co.
Eastern Michigan University
Eastman Chemical Products
Ebonex Corp.
Eiger Machinery Inc.
Elcometer, Inc.
Elders Resources Chemical Inc.
Elektro-Physik USA, Inc.
Elmar Industries, Inc.
Engelhard Corp.
Epworth Mfg. Co., Inc.
Erichsen Instruments, Inc.
Etna Products Inc.
European Coatings Journal
Exxon Corp.

FMC Corp.
FMJ International Publications Ltd.,
Paint & Chemical Div.
Fawcett Co. Inc.
Federation of Societies for Coatings
Technology
Filter Specialists, Inc.
Freeman Polymers Div. of Cook
Composites & Polymers
Fryma, Inc.
H.B. Fuller Co.

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
Henkel Corp.
Heucotech Ltd.
Hilton Davis Co.
Hitox Corp. of America
Hockmeyer Equipment Corp.
Hoechst Celanese Corp.
Hoechst Celanese Corp./Waxes &
Lubricants Group
Horiba Instruments, Inc.
J.M. Huber Corp.
Huls America, Inc.
Hungarian Aluminium Corp.
HunterLab

ICI Americas Inc.
ICI Resins U.S.
ITT Marlow Pumps
Ideal Mfg. & Sales Corp.
Indusmin Inc.
Industrial Finishing Magazine
Interfibe Corp.

J&L Instruments Corp.
Jaygo, Inc.
S.C. Johnson Wax

KTA-Tator, Inc.
Kemira Oy
Kenrich Petrochemicals, Inc.
Kent State University
King Industries, Inc.
Kronos, Inc.

Langston Companies, Inc.
Leeds & Northrup, Unit of General
Signal
Liquid Controls Corp.
The Lubrizol Corp.

3M, Industrial Chemicals Div.
Macbeth Div., Kollmorgen Corp.
Magnesium Elektron, Inc.
Malvern Instruments
Malvern Minerals Co.
Manchem, Inc.
Manville Sales Corp.
Matec Applied Sciences
McWhorter, Inc.
The Mearl Corp.
Michelman, Inc.
Micromeritics Instrument Corp.
Micro Powders, Inc.
Micron, Inc.
Mid-States Eng. & Mfg.
Miller Engineering, Inc.
Miller Manufacturing Co., Inc.
Millipore Corp.
Milton Roy Co.
MiniFIBERS, Inc.
Minolta Corp.
Mississippi Lime Co.
University of Missouri-Rolla
Mitech Corp.
Mixing Equipment Co.
MixMor, Inc.
Mobay Corporation
Modern Paint & Coatings
Monsanto
Morehouse Industries, Inc.
Mountain Minerals Co., Ltd.
Myers Engineering

NYCO
Nemetre Co.
Netzsch Incorporated
Neupak, Inc.
Neutronics, Inc.
New Way Packaging Mach. Inc.
North Dakota State University

ORB Industries, Inc.
Oak Printing Co.
Orbron Atlantic Corp.
Ortech International

PPG Silica Prods. a Unit of PPG
PQ Corp.
PRA Laboratories
Pacific Micro Software Eng.
Paint & Coatings Industry Magazine
Paint Research Associates
Pen Kern, Inc.
Penn. Color, Inc.
Pfizer Inc.
Pfizer Pigments, Inc.
Phillips 66 Co.
Poly-Resyn, Inc.
Premier Mill Corp.
Progressive Recovery, Inc.
Pyosa, S.A. de C.V.

Q-CIM
The Q-Panel Co.
Quantachrome Corp.

Raabe Corp.
Red Devil, Inc.
Reichhold Chemicals, Inc.
Rheometrics Inc.
Rheox, Inc.
Rhone-Poulenc Inc.
Rhône-Poulenc Spec. Chems.
Rohm and Haas Co.
Ronningen-Petter
Rosedale Products, Inc.
Charles Ross and Son Co.
Russell Finex, Inc.

Sandoz Chemicals Corp.
Sannor Industries, Inc.
Semi-Bulk Systems, Inc.
Serac, Inc.
Shamrock Technologies, Inc.
Sheen Instruments Ltd.
Shell Chemical Co.
Sherox Chemical Co.
The Sherwin-Williams Co.
Shimadzu Scientific Instrument
Silberline Mfg. Co., Inc.
Sino-American Metals & Minerals
(S.F.) Inc.
Siva International, Inc.
South Florida Test Service
Univ. of Southern Mississippi
Spartan Color Corp.
Startex Chemical Co.
Steel Structures Painting Council
Sub-Tropical Testing Service
Sun Chemical Corp.
Systech Environmental Corp.

Tego Chemie Service USA
Texaco Chemical Co.
Thiele Engineering Co.
Tintometer Co.
Tioxide America, Inc.
Troy Chemical Corp.
TurboMixer Corp.

U.S. Silica Co.
U.S. Stoneware Corp.
Unimin Specialty Minerals Inc.
Union Carbide Chemicals & Plastics
Union Process, Inc.
United Catalysts, Inc.
United Mineral & Chemical
United States Testing Co.
Universal Color Dispersions
Unocal Chemicals Div.

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

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

X-Rite, Incorporated

Zeelan Industries, Inc.
Zircon Corp.



Spring 1990 Board of Directors Meeting

Thirty-four members and 13 guests attended the Spring Meeting of the Board of Directors of the Federation of Societies for Coatings Technology on May 19, 1990, in Louisville, KY.

The following were in attendance:

Officers

President John C. Ballard
 President-Elect Kurt F. Weitz
 Secretary-Treasurer William F. Holmes

Society Representatives

Baltimore Joseph D. Giusto
 Birmingham Gerry Gough
 C-D-I-C Lloyd J. Reindl
 Chicago Richard M. Hille
 Cleveland Fred B. Schwab
 Dallas Van G. Falcone
 Detroit William W. Passeno
 Golden Gate Timothy Donlin
 Houston Joseph Caravello
 Kansas City Norman A. Hon
 Los Angeles Jan P. Van Zelm
 Louisville James A. Hoeck
 Mexico Antonio Pina
 Montreal Horace S. Philipp
 New England Maureen Lein
 New York Saul Spindel
 Northwestern Richard L. Fricker
 Pacific Northwest William Shackelford
 Philadelphia Wayne Kraus
 Piedmont James E. Husted
 Pittsburgh Raymond C. Uhlig

Rocky Mountain John Delmonico
 St. Louis John Folkerts
 Southern Dan Dixon
 Toronto Arthur K. Hagopian
 Western New York Mark Schindler

Other Members

James E. Geiger Southern
 John Lanning Louisville
 John J. Oates New York
 Colin Penny Baltimore
 Patricia Shaw Golden Gate

Guests

Federation Past-Presidents Joseph Bauer, Neil S. Estrada, and Terry F. Johnson. (Board Members James Geiger and John Oates are also Past-Presidents of the Federation.)

Richard Himics, Chairman of the Professional Development Committee.

Sidney Lauren, Chairman of the Educational Committee.

Chuck Reitter, Editor/Vice President, *American Paint & Coatings Journal*.

The following Society Officers, who attended their meeting the previous day: Robert McD. Barrett (Birmingham); John Bartlett (Pacific Northwest); Jack Duis (Golden Gate); Gerardo del Rio (Mexico); and Annette Saunders (Piedmont).

Staff

Rosemary Falvey, Director of Meetings and Conventions; Thomas A. Kocis, Director of Field Services; Patricia D. Viola, Director of Publications; and Robert F. Ziegler, Executive Vice President.



From left: Executive Vice President Robert Ziegler and President John Ballard (Louisville)

The report of the Fall 1989 Board of Directors Meeting was approved as published in the January 1990 JOURNAL OF COATINGS TECHNOLOGY.

Reports of the Officers And Staff

PRESIDENT BALLARD

Since the Annual Meeting in New Orleans I have attended the following Committee meetings and regional conventions:

Finance, Investment, and Executive Committee Meetings—January 25: Overall, the Federation's budget and financial strength so far in 1990 has been exemplary. In addition, the new FSCT headquarters building utilized low rate creative financing. Hopefully, we will be able to move into the new building in the latter part of July 1990. A report was given by the Mellon Bank concerning our investments which indicated a positive advancement.



President-Elect Kurt Weitz (Toronto) and Mark Schindler (Western New York)

Southern Decorating Products Show—February 8-10: Judy and I attended this well-organized product show and met with several of the SDPA executive members concerning our work with the JPICC Committee.

47th Annual Southwest Paint Convention—March 14-16; Houston, TX: Judy, Bob Ziegler and I attended the seminar activities and found renewed total attendance figures at this spring meeting. The theme "High Solids Coatings: How to Get There from Here" concerned formulation around various regulations certainly boosted seminar attendance. In addition, there was a supplier's "tabletop" display event which seminar attendees could discuss and observe assorted raw materials and services during the first two days of the conference. These tabletop displays were well attended and participation by the attendees toward this type of presentation was excellent.

Louisville Society—March 21: Bob Ziegler and I represented the Federation at the Louisville Society meeting. The Federation Staff arrived on March 20 and had meetings with the Galt House to finalize preparations for the FSCT Spring Week, in Louisville, May 16-19. The FSCT Officers and Staff met with the Executive Committee of the Society for an update on activities from the Louisville contingent as well as FSCT programs.

Southern Society Annual Meeting—April 4-7: Judy and I, along with Bob Ziegler, attended this meeting at the Sandestin Beach Hilton, Destin, FL. The seminar here was "Innovation—The Keys to Success." The technical presentations were excellent and emphasized formulations to meet various regulations. The attendance at the technical presentations as well as the planned activities were excellent. Bob and I met with the Board of Directors for breakfast for an FSCT update. The Southern Officers discussed their 1991 meeting in Memphis, TN, and Society education plans.

JOHN C. BALLARD,
President

PRESIDENT-ELECT WEITZ

Since the last Board of Directors Meeting of November 7, 1989 held during the Annual Meeting and Paint Show, I have been privileged to attend the following meetings on behalf of the Federation.

December 5, 1989—75th Anniversary Celebration, Cleveland Society for Coatings Technology.

January 25-26, 1990—Finance/Investment/Executive Committee Meetings, Federation Headquarters, Philadelphia, PA.

February 20, 1990—NPCA Board of Directors Meeting, Boca Raton, FL.

April 25, 1990—JPICC Meeting, NPCA Headquarters, Washington, D.C.

May 3-5, 1990—43rd Pacific Northwest Symposium, Bellevue, WA.

May 8, 1990—PaVaC Awards, New York Society for Coatings Technology, E. Rutherford, NJ.

KURT F. WEITZ,
President-Elect

SECRETARY-TREASURER HOLMES

The newly created post of Secretary-Treasurer of the Federation, done to satisfy incorporation requirements, started out with a flourish in New Orleans, as this office actually had to take minutes of the Coatings Industry Education Fund. On careful reading of the duties as adopted in the By-Laws, it became obvious that due to the nature of the geographical location of the officers, some better method of conducting business would be needed. Staff has requested our attorneys to investigate possible By-Laws revisions to facilitate the financial operations.

The travel portion of the office began early on, with a Society visit to St. Louis in November, and Los Angeles, in early January. Later visits were made to Minneapolis and Pittsburgh in April. The diversity and commitment of the membership of the Constituent Societies is truly impressive. Brief remarks were made to all four Societies concerning the Federation activities, particularly the new building and the educational functions.

In January, in addition to the meetings of Finance, Investment, Executive, and other Committees in Philadelphia, the initial meeting of the Accounts Review Committee was held with Deryk Pawsey and myself meeting with Charles Schmidt, FSCT Controller, and Bob Ziegler, in order to get the new Treasurer up to speed on accounting procedures and reports generated, with the idea of keeping the membership informed on the workings of the Federation. A report of this meeting will be distributed at the Board Meeting. (The report follows Mr. Holmes' report.)

The Federation keeps the Treasurer supplied with a large amount of monthly information on operations and general ledger information, compared to previous periods, making a monthly review easy to perform. All accounts are in satisfactory shape, with a particularly strong registration of exhibitors for the 1990 Paint Show in Washington, D.C.

We appear to be doing quite well as far as finances are concerned, as well as with most of our programs.

WILLIAM F. HOLMES,
Secretary-Treasurer

REPORT ON FINANCIAL ACCOUNTS REVIEW

Purpose: To review accounts of the Federation for purposes of familiarization with the incoming Treasurer, and to answer questions of the Executive Committee, as brought forth by the Planning Committee, concerning duties of the Treasurer and accounts of the Federation.

Secretary-Treasurer Holmes and Past-President Deryk Pawsey met with Executive Vice President Robert F. Ziegler and Controller Charles Schmidt on January 24, 1990, at the Federation Office.

Mr. Schmidt gave a fairly in depth overview of the Federation's internal accounts system, the method of record keeping, and an explanation on the allocation of expenses to the various line item accounts. Most account records are now on computer and can be accessed readily.

Following this overview, several individual expense items were randomly selected and tracked through the computer records to the original invoices and expense accounts. In addition, computer print outs of the current and previous expenses of the past two Federation Presidents were made, and again random spot checks were made to ascertain the origin of the invoice or expense statements.

In all cases, everything was found to be copacetic. It must be stressed, however, that this cursory examination of a limited number of accounts could not in any way be construed as an audit.

Mr. Schmidt responded to questions and requests in an expeditious and professional manner, during which it became evident that a great deal of care and thought go into the allocation of expenses. Certain procedures that were noted, while perhaps acceptable for a nonprofit organization, would cause questions by Board members and the membership as a whole, who are accustomed to operating in a different atmosphere.

Of particular concern was the way some items were handled, to wit, the master billing accounts at large Federation functions, lack of feedback to Officers on exact charges they were incurring, and the lack of descriptions of attendees and purpose of the meal functions.

However, overall, we were impressed with the accounting system method and the detailed record keeping. The system appeared to be set up in a very professional manner.

Arising out of this brief review of the accounting system, the following recommendations are made with the suggestion that the Executive Committee adopt them as established procedure or practices.



Baltimore Society Representative Joseph Giusto and FSCT Secretary-Treasurer William Holmes (Dallas)

RECOMMENDATIONS:

(1) *Expense Form*—The current expense form is inadequate for detailing expenses incurred in an acceptable manner for standard accounting practices. It should be completely revised. Suggestions on an acceptable format have been given to Messrs. Ziegler and Schmidt.

(2) *Master Billings*—It is recommended that hotels be requested to provide each recipient with a copy of the bill that is being mastered, so that the charges may be validated. This is currently not being done, opening the possibility of incorrect billing by the hotel of an individual's account. Also, this would serve to notify the recipient of charges being picked up by the Federation.

(3) *Credit Cards*—(a) Executive Committee and Staff who hold phone and/or travel credit cards should be given a copy of the monthly charges so they can verify them and also be aware of dollar expense incurred.

(b) All credit cards and phone billing numbers supplied to Executive Committee members should be cancelled when that person leaves the Executive Committee unless by special temporary arrangements with the Executive Vice President.

(4) *Free Airline Tickets*—The disbursement of free airline tickets, earned through convention packages or other means, should be managed in such a way as to maximize benefit to the Federation (through minimization of air travel costs for Staff and Officers). A log of use should be available for inspection and audit as with any other resource and should be documented to the Executive Committee on an annual basis.

(5) *Entertainment*—For entertainment expenses, all names, positions, and organizations of persons entertained should be shown on the expense statement. (This is not always done at present.)

(6) *A Permanent "Accounts Review Committee"*—This Ad Hoc Committee should be made a permanent "Annual Accounts Review Committee." Composition should be: "The Secretary-Treasurer and the two immediate available Past-Presidents not on the Executive Committee." The reason for two Past-Presidents is two-fold, namely to reduce the Committee (one day) workload and more importantly, for continuity. The new Secretary-Treasurer and first immediate Past-President will not be fully familiar with the way to conduct the accounts review. [There is always the question of "delicacy" when (personal) expense accounts are being reviewed.] It is further suggested that the expense accounts for the Officers and the Executive Vice President be automatically reviewed by the



Members-at-Large Patricia Shaw (Golden Gate) and Colin Penny (Baltimore)

Committee together with any items of expenditure they see fit to examine and a written report on their findings be presented at the spring Executive Committee meeting.

WILLIAM F. HOLMES
1989/90 Secretary-Treasurer

DERYK R. PAWSEY
Past-President 1987/88

EXECUTIVE VICE PRESIDENT ZIEGLER

1989 FINANCIAL STATEMENT

The final, audited report of income and expenses for 1989 showed a total income of \$2,474,991 and expenses of \$2,345,867. The statement has been sent to the Board.

1990 BUDGET AND FIRST QUARTER STATEMENT

The Finance and Executive Committees have approved the 1990 budget, allocated as follows:

Income: Publications—33.8%; Membership Dues—1.9%; Annual Meeting & Paint Show—56%; Educational Activities—3.2%; and Miscellaneous—5.1%.

Expenses: Federation Office/Administration—37.6%; Publications—24.8%; Annual Meeting & Paint Show—19.2%; Officers/Board/Committee—9.2%; Educational Activities—8.6%; and Miscellaneous—0.6%.

The 1990 budget is balanced at \$2,498,300.

The first quarter financial statement shows an increase of income over expense of \$1,043,723 (vs \$802,382 in first quarter 1989).

PUBLICATIONS

JCT—Total pages published in 1989 were 1,199 compared to 1,181 in 1988. Although advertising pages decreased slightly from 1988 to 264 pages, total dollar volume rose \$17,000 to \$439,702, just short of the budgeted figure of \$440,000. A new advertising marketing package was implemented at the end of 1989 which resulted in an increase in advertising during the first three months of 1990. Increases were also seen in technical articles and Federation-related news pages in 1989. In order to increase dissemination of the FSCT "Guide for Coatings Courses," this normally separate publication was included in the pages of the *JCT* for the first time. It is hoped that this important educational information will be more widely used in this new format. Savings on *JCT* typesetting costs

totalled more than \$20,000 in a nine-month period as a result of the implementation of the desktop publishing system.

Year Book—The 1990 edition of the Membership Directory was published in March and mailed to the membership. We thank those Societies which cooperated in providing membership rosters on time.

Series Units—"Sealants and Caulks," the 14th monograph in the new Federation Series was published in 1989. Presently, four additional manuscripts are in-hand for publication in the near future: "Aerospace and Aircraft Coatings"; "Introduction to Coatings"; "Cationic Radiation Curing"; and "Rheology." These will join the previously published booklets: "Film Formation"; "Radiation Cured Coatings"; "Introduction to Polymers and Resins"; "Solvents"; "Coil Coatings"; "Corrosion Protection by Coatings"; "Mechanical Properties of Coatings"; "Automotive Coatings"; "Coating Film Defects"; "Application of Paint and Coatings"; "Organic Pigments"; "Inorganic Primer Pigments"; and "Marine Coatings."

Approximately 18 additional booklets are in various stages of completion, and we extend the Federation's appreciation to Series Editors Drs. Thomas J. Miranda and Darlene Brezinski, for their continuing efforts.

IR Atlas—The new, revised edition of the *Infrared Spectroscopy Atlas* is in the final stages of preparation and should be published prior to the Annual Meeting. Over 1,200 additional spectra will be included to the new edition, with these and current spectra being digitized and offered as computer software by the Nicolet Corp. under an agreement with the Federation. We sincerely thank the IR Atlas Advisory Board and, in particular, James Julian, who developed the spectra, Alan Brandau, who revised the text, and Darlene Brezinski, for her overall contributions.

MEMBERSHIP

Total membership remains fairly static with 7,251 members vs. 7,246 in 1989. Current membership breakdown is: Active—4,654; Associate—2,079; Educator/Student, Retired and Honorary—518. We congratulate all of the hard-working Society Membership Chairman for their good work. In particular, above average gains were posted by Pittsburgh (13.7%), Philadelphia (13.3%), and Mexico (11.5%) Societies.

Staff and FSCT Membership Chairman Brenda Carr are discussing the possibility of implementing a Federation-wide membership campaign in the coming year.

ANNUAL MEETING & PAINT SHOW

Despite torrential downpours, two separate sites for the Annual Meeting and Paint Show, and an unexpected doubling of spouse attendance, the 1989 event was an unqualified success. Total attendance was the second highest ever at 7,947, and exhibit space set a new record of 73,625 net square feet. The Annual Meeting is scheduled to return to New Orleans in 1994.

Plans for the 1990 Annual Meeting and Paint Show are well underway. Original exhibit space has been increased to accommodate additional interest in the Paint Show and, again, a new record for booth space will be set with over 88,000 sq. ft. of exhibits in Washington, D.C.'s Convention Center. All technical programming will be held at the Center, and Program Chairman Gary Gardner and his Committee have developed a program of presentations equaling the amount and quality of the 1989 Annual Meeting and Paint Show. The theme of the meeting is "A Decade of Decision: Preparing for the Year 2000."

The Baltimore Society will serve as the Host Society for the event, and General Chairman Richard Chodnicki and his Committee are prepared to assist in Washington.

The Housing and Registration brochure has been mailed to all members. New for 1990 is that all housing reservations will be done by telephone rather than by mail. The Housing Bureau has

assured us that this has worked well in the past and should serve to provide quick response to room requests.

COMMITTEE LIAISON

Staff continues to work closely with the Federation's many committees, which include the Corrosion, Educational, Finance, Investment, Manufacturing, Planning, Annual Meeting Program, Professional Development, Technical Advisory, and Ad Hoc Building and FSCT History Committees.

Response to the Professional Development Committee's Survey of membership is an overwhelming 42%. We sincerely thank the membership for their support and cooperation in this effort.

SPRING WEEK

The seventh annual "Spring Week" of the Federation will be held May 16-19 in Louisville, KY. The program for the seminar, "Coatings Technology in the 1990s," was developed by the Louisville Society, and will be held on May 16-17. We sincerely thank the Society for their efforts in this and in planning the social events during the week. We also thank the Eastman Chemical Products Co. and Mobay Corp. for hosting the Society Officers and Board receptions.

The Incoming Society Officers meeting will be held on May 18, and 25 of 26 Societies are scheduled to attend this informative gathering of future Society leaders.

The Board of Directors will meet on May 19, for the first time on a Saturday in response to the increasingly high cost of air travel. We sincerely appreciate this gesture and hope that many of the members will take advantage of this opportunity to reduce transportation expenses.

OFFICER/STAFF VISITS

Visits since the last report have been made to the monthly meetings of the St. Louis, Los Angeles, Louisville, Pittsburgh, and Northwestern (by Pat Viola) Societies in the company of an Officer. The Federation was also represented at the 75th Anniversary of the Cleveland Society, the Southwestern Paint Convention, Southern Society Annual Meeting, Pacific Northwest Annual Symposium, the Annual Baltimore Coatings Industry Awards Dinner (by Tom Kocis), and New York Society's annual PaVaC Dinner.

Other industry events attended by Officers and Staff included the annual meeting of the National Decorating Products Association and the Joint Paint Industry Coordinating Committee.

FSCT HEADQUARTERS BUILDING

A presentation updating the status of the building will be made at the Board Meeting by Chairman James Geiger and members of his Committee. Briefly, a majority of construction has been completed. However, some delays were experienced and the original completion date of April 1990 has been pushed back to July.

We have contracted with an interior design firm and, working with Committee members Deryk Pawsey and Colin Penny, the firm has completed interior plans and the selection of furnishing and finishing materials.

We look forward to the successful completion of this project and the relocation of your headquarters to its permanent home. In Washington, the Federation booth will feature a display of the new headquarters. In addition, the 1991 Spring Week is scheduled to be held in Philadelphia, offering an opportunity to all Board members to visit the new location.

STAFF

We welcome one addition to the staff since the last report. Lisa Torrens has quickly become an integral part of our family while serving as receptionist. I sincerely thank her and the remaining 13 talented Staff members: Sam Amicone (JCT Associate Editor); Audrey Boozer (JCT Subscription Manager); Meryl Cohen (Order



Past-Presidents John Oates (New York) and James E. Geiger (Southern)

Department); Rosemary Falvey (Director of Meetings and Conventions); Victoria Graves (Meetings Coordinator); Tom Kocis (Director of Field Services); Dottie Kwiatkowski (Secretary); Lorraine Ledford (Advertising Services Manager); Linda Madden (Desktop Publishing Operator); Charlie Schmidt (Controller); Mary Sorbello (Secretary); Patricia Viola (JCT Editor/Director of Publications); and Kathleen Wikiera (JCT Assistant Editor).

ROBERT F. ZIEGLER,
Executive Vice President

DIRECTOR OF FIELD SERVICES KOCIS

COMMITTEE LIAISON

Professional Development—Committee met on January 16-17 in Cleveland.

Member and career survey forms were developed for distribution to Federation membership. Committee will analyze and evaluate survey results and submit report for publication in JCT.

Planning back-to-back sessions for 1990 Annual Meeting on "Advanced Topics in Coatings Technology" and "Professionalism in Testing."

Topic selected for next seminar/workshop offering is "Coatings Applications Methods and Techniques," with focus on how application methods and equipment can influence formulation—state-of-the-art and "what's coming down the pike."

Another round of seminars on Statistical Process Control for Coatings (Level I and II) was held March 19-23 in Chicago under PDC auspices. Again conducted by Dr. Peter Hunt, the seminars attracted a total of 96 registrants, and were again very well received; Dr. Hunt is not only knowledgeable about SPC and its application in the paint industry, but is an excellent instructor who welcomes and encourages attendee questions and comments.

An additional Level I SPC seminar is scheduled for May 8-9 in Toronto (at Society request); approximately 35-40 registrants are expected.

Program—Planning for 1990 Annual Meeting programming began at organizational meeting of Committee held last November at the New Orleans Convention; follow-up discussions were held at subsequent meeting in Chicago on November 30.

Theme for 1990 Annual Meeting, "A Decade of Decision: Preparing for the Year 2000," emphasizes that the current decade will

demand decisions on coatings technologies, substrates, and environmental considerations which will influence the products, markets, and profitability of the industry as it enters the new century. Presentations will explore these areas as they relate to current state-of-the-art and future demands.

Early planning and publicity have generated a substantial number of manuscript offerings, and indications are that there will be an abundant supply of quality presentations for the three days of programming in Washington.

Manufacturing—Committee met in Mobile, AL, on March 29-30. A tour of the Mobile Paint Mfg. Co. facility in nearby Theodore, AL, was held in conjunction with the meeting.

Committee-sponsored seminar at 1990 Annual Meeting will have as its theme, "Challenging Tradition," and will explore new and unique manufacturing concepts. Speakers will be invited to discuss: bar coding; computer programs; packaging innovations; new dispersion technology; and matching color "in the wet."

Nominee has been selected for recommendation to Morehouse Industries as 1990 recipient of Golden Impeller Award, presented for outstanding achievement in dispersion technology.

Education—Steering Committee met in Chicago on March 7.

Major agenda items were review of scholarship program, promoting greater student participation in Southern Society A.L. Hendry Award competition, and re-evaluation of Committee objectives and activities.

Annual meeting with Society Educational Committee representatives will be held Saturday, June 2, in Minneapolis.

Annual update of "Guide to Coatings Courses" was published in the February issue of the JCT.

Corrosion—Committee met at Federation headquarters on February 13.

Presentations being developed for Committee-sponsored symposium at 1990 Annual Meeting. Topic is "Anti-Corrosion Coatings: The Next Generation," and emphasis will be on technical and regulatory trends that will influence the future formulation of corrosion-prevention coatings. Prospective speakers will be sought to address such aspects as: adhesion; mechanisms; physical properties; performance; and regulations.

Editing nears completion of final report on "A Survey of Accelerated Test Methods for Anti-Corrosive Coating Performance," conducted by Steel Structures Painting Council, as well as modified version of the report for publication in JCT.



Society Representatives Maureen Lein (New England) and Horace Philipp (Montreal)

Technical Advisory—Committee will meet on May 10, in Chicago.

Major topic of discussion will be role the Technical Advisory Committee can play in assisting the Federation-sponsored Proficiency Testing Program for coatings laboratories. Other agenda items include review of current activities, suggestions for future efforts, and plans for the Annual Meeting with Society Technical Committee representatives.

Joint Coatings/Forest Products—Committee met at U.S. Forest Products Laboratory in Madison, WI, on March 19.

Final drafts of four monographs have been completed and are currently being reviewed: Effects of Acidic Deposition on Painted Wood; Painting Recommendations for Pre-Primed Exterior Medium Density Hardboard Siding; Application Recommendations for Smooth, Embossed and Saw-Textured Surfaces; and Prevention of Extractive Discoloration.

Four other monographs are in various stages of production: Low VOC Finishes; Mildew Resistance; Finishability of CCA Pressure-Treated Wood; and Moisture Control in Housing.

Goal is subsequent publication in JCT.

Reviewed and discussed priority list of research projects for undertaking by Forest Products Lab.

SYMPOSIUM ON COLOR AND APPEARANCE INSTRUMENTATION (SCAI)

This event, sponsored by the Federation in conjunction with the Inter-Society Color Council (ISCC), will be held April 25-26 in Cleveland under the auspices of the Federation's ISCC Committee.

The SCAI theme is "Combining Appearance and Color," and programming will focus on new instruments, optical models, and computer simulation techniques which are opening the door to a better understanding of the complex appearance phenomenon; featured are the "hands-on" displays of instrumentation equipment of 10 supplier firms.

Over 200 registrants will take part; included are attendees from Canada, England, Belgium, West Germany, Switzerland, Finland, The Netherlands, and Japan.

MISCELLANEOUS

Staff support provided for publicity, speaker contact, and on-site arrangements for Spring Seminar on "Coatings Technology for the 1990s"; Committee of Louisville Society members have developed programming for the event . . . Continuing staff assistance provided to Advisory Board in development of booklets for new Series on Coatings Technology . . . Liaison and support also provided for activities of Roon Awards and American Paint & Coatings Journal Awards Committees . . . Annual update of "Talks Available to Constituent Societies" being readied for publication.

THOMAS A. KOCIS,
Director of Field Services

Coatings Industry Education Fund

The Trustees of the CIEF met on Thursday, January 25, 1990, at the Federation offices in Philadelphia. Items of current or continued interest include:

Presentation of Plaques to Past-Presidents—Due to an oversight, the Federation office had not presented plaques to past CIEF Presidents at the Annual Meeting. The Board asked the Federation to prepare plaques for the Past Presidents, and to allocate time for their presentation at the Annual Meeting in Washington, D.C. Funds for the plaques will be drawn from CIEF funds.

Donation to California Polytechnic State University—A one-time donation of \$5000 was made to "Cal Poly" to help establish a

coatings educational program at the school. This project was spearheaded by the Los Angeles Society for Coatings Technology, which also sent a request to the Federation for a \$25,000 donation. Although not intended as such, the CIEF portion became part of the \$25,000 donation sent on Federation letterhead.

The Joseph A. Vasta Memorial Scholarship Fund—The Vasta Scholarship Fund, which currently stands at nearly \$37,000, was given for the first time in 1989. To convey information regarding the recipient, as well as discuss other aspects of the grant procedure, such as the universities which will receive Vasta scholarship funds, the President sent a letter to all contributors to the Vasta Memorial Scholarship Fund.

Additional Scholarship Concepts—The Trustees are actively discussing the potential for funding of a scholarship similar in concept to the Vasta Fund, but which might represent a memorial tribute to any number of deceased Society members. This might be funded either from donations made by friends, family and colleagues, or in the form of "living bequests," made by members in the form of insurance policies, gifts, etc. Progress on this topic will be reported as it occurs.

Potential Restructuring of the CIEF Board—The Trustees have discussed at length the request of the Executive Committee that the CIEF By-Laws be amended to turn over the duties of the Trustees to the FSCT Executive Committee. While the merits and disadvantages of this potential action—and there appear to be both—have been debated without resolution to date, it is the President's view that the tug-of-war over CIEF is merely a symbol of the much larger, but more subtle, drama being played-out within the Federation at large. In the case of CIEF, the conflict seems to exist between those who feel the CIEF does nothing, is therefore a needless expense, and should be dissolved—and those who feel that CIEF could do much good, but has been prevented from doing so by those who wish to see it dissolved. This is otherwise known as a "Catch 22," but may closely parallel the conflict in the Federation between those who believe that we may have a series of rainy days, will be underfunded, and therefore should not plan future expenditures—and those who believe that, in spite of rainy days, the Federation will be seriously overfunded in the next 5-10 years, and had better plan its projects and expenditures accordingly. These are tricky points to debate, and any rash action will probably have a profound effect on the future of the Federation—for better or for worse.

GEORGE R. PILCHER,
President, CIEF Trustees

Review of Actions Of Executive Committee

(One of the duties of the Board of Directors is to approve or disapprove the actions of the Executive Committee.)

The actions of the Executive Committee of November 10, 1989 and January 26, 1990 were included with the minutes mailed previously to Board members. The actions of May 18, 1990 were distributed at the meeting.)

NOVEMBER 10, 1989

That the Planning Committee's recommendation that the Treasurer's report to the Board on all financial matters be approved.

That the proposal of Robert Athey regarding FSCT sponsorship of independent publication of Society Papers be respectfully declined.

That the Professional Development Committee proceed with a draft of the membership survey and forward to the Executive Committee for final approval.



Toronto Society Representative Arthur Hagopian and St. Louis Society Representative John Folkerts

That \$133,800 be appropriated to Federation Committees (21-24500) in 1989-90; \$20,000 to the Educational Committee (20-25609); and \$20,000 to the Professional Development Committee (20-25611).

That JCT Editor Patricia D. Viola, be promoted to Director of Publications and that Assistant to the Treasurer Charles D. Schmidt be promoted to Controller.

That the 1990 staff salary budget be set at \$474,900.

[On a motion by Mr. Oates, seconded by Mr. Folkerts, the actions for November 10, 1989 were unanimously approved, with the exception of an Executive Committee request to the CIEF Trustees to revise the By-Laws regarding the composition of the Board of Trustees.]

JANUARY 26, 1990

That the estimated income and expense statement for 1989 be approved. (Income—\$2,464,692; Expense—\$2,342,277).

That the budget for construction of the Federation Headquarters Building be increased \$30,000 to \$1,530,000.

That the Liaison Committee be requested to prepare a report on the benefits and negatives regarding foreign Society acquisition.

That the 1991 Spring Week Meeting be held in Philadelphia, and the 1992 Spring Week Meeting be held in Boston.

That the proposal of the National Paint & Coatings Association to supply regulatory information for the FSCT *Regulatory Update* Newsletter be approved at an annual fee up to \$25,000 per year.

That the FSCT Travel Policy developed by the Liaison Committee be approved as amended by the Executive Committee.

That the 1998 Annual Meeting and Paint Industries' Show be held in Washington, D.C., October 26-28, in conjunction with NPCA.

That the sale price of the revised *Infrared Spectroscopy Atlas* be set at \$150 for members; \$200 for non-members.

That exhibit space rental rates for the 1991 Paint Industries' Show be increased from \$14 to \$16 per square foot.

That advertising rates for the JOURNAL OF COATINGS TECHNOLOGY, FSCT Membership Directory, and Annual Meeting Program Book be increased an average of 14%, effective January 1, 1991.

That the President represent the Federation at the annual meeting of the Professional Decorating Contractors Association at his discretion.

That the Federation make a one-time grant of \$20,000 to assist in the establishment of a coatings program at California Polytechnic State University.



Van Falcone (Dallas), Fred Schwab (Cleveland) and Richard Hille (Chicago)

That the recommendation of the Professional Development Committee regarding the sponsorship of an additional 1990 Statistical Process Control Seminar in Toronto be approved.

That the report of the By-Laws Committee regarding the proposed amendment to change the status of Retired Members be accepted and forwarded to the Board without the recommendation of the Executive Committee.

That the Professional Development Committee-sponsored survey of FSCT membership be approved.

That the recommendations of the Investment and Finance Committees be approved, along with the Operating Budget for 1990, as amended by the Executive Committee: Income—\$2,498,300; Expense—2,498,300.

[On a motion by Mr. Van Zelm, seconded by Mr. Dixon, the actions of the Executive Committee for January 26, 1990, were unanimously approved.]

MAY 18, 1990

That the First Quarter 1990 Financial Statement be accepted as reported with Income of \$1,635,450 and Expense of \$591,727.

That the Educational Committee be requested to develop a survey of industry management for future personnel requirements and qualifications and entry salary levels.

That the Planning Committee be requested to develop long-range strategic plans for best utilization of available funds.

That the Executive Committee recommend Board approval of an increase of \$70,000 to the Headquarters Building construction budget.

That the Planning Committee's request for an increase of \$3,500 to its 1990 budget be approved.

That the reimbursement of one night's lodging expenses for members attending meetings over Saturday night be approved.

[On a motion by Mr. Donlin, seconded by Mr. Hagopian, the actions of the Executive Committee for May 18, 1990 were unanimously approved.]

Report of the Ad Hoc Office Building Committee

The Building Committee is happy to report that the Federation office building is preceding about as had been anticipated. The building is approximately 70% complete at this time. The exterior of the building is basically complete, with the exception of the

windows. The interior walls presently are being installed. Building completion has now been moved back to late July due to all the typical glitches and delays that always affect a project of this magnitude.

As stated last fall, all developers give very optimistic completion dates at the beginning of projects which never materialize, and this project is no exception. The Committee is very pleased with the quality of the building to date, and the professionalism of the developer.

At the inception of this project, the Building Committee arbitrarily allocated \$100,000 in the building budget for phones, fire alarms, and all the miscellaneous expenses associated with completing an office building. It became very evident in January that this was a totally inadequate funding budget for the building. The Committee requested additional funds from the Executive Committee, who in turn authorized an additional \$30,000 at the January meeting. The facts of the matter are that we really need an additional \$70,000 to complete the building in a first class fashion. This money would allow the Federation to replace old desks and filing cabinets all at one time, and make everything in the building uniform. The Committee's thoughts are that if we do not do it now, we probably will never achieve this uniformity.

J.E. GEIGER,
Chairman

[Following his verbal report, Mr. Geiger and Mr. Ziegler made a slide presentation of the building's construction. Mr. Geiger requested that the construction budget be increased by \$100,000 to a total budget of \$1,600,000. On a motion by Mr. Dixon, seconded by Mr. Van Zelm, the Board unanimously approved the request.]

Nominations

The Nominating Committee proposes the following slate of candidates to the Board of Directors for the 1990-1991 term:

President-Elect: William F. Holmes, Dallas Society (National Pigments & Chemicals, Inc.). One-year term. He is currently Treasurer.

Treasurer: Colin D. Penny, Baltimore Society (Hampton Paint Mfg. Co., Inc.). One-year term.

Executive Committee: Jan P. Van Zelm, Los Angeles Society (Byk Chemie USA). Three-year term; and, Joseph D. Giusto, Baltimore Society (Lenmar, Inc.). One-year term to fulfill term of Thomas E. Hill.

Board of Directors (Members-at-Large): Berger G. Justen, Southern Society (Justen and Associates); Thad T. Broome, Southern Society (J.M. Huber Co.). Two to be elected; two-year terms each. Louis Holzknacht, Louisville Society (Devoe Marine Coatings Co.). To fulfill remainder of term of Treasurer nominee Penny.

Board of Directors (Past-President Member): Deryk R. Pawsey, Pacific Northwest Society (Rohm and Haas Canada Inc.). Two-year term.

I would like to thank the members of the Nominating Committee (Past-President Howard Jerome, Society Representatives Berger Justen and Jan Van Zelm, and Member-at-Large George Pilcher) for their assistance in selecting these candidates.

JAMES E. GEIGER,
Chairman

Society Business

Los Angeles—Mr. Van Zelm thanked the Federation and CIEF for their contribution of \$25,000 (\$12,000—FSCT; \$8000—FSCT Educational Committee; \$5,000—CIEF) to the Coatings Program

at California Polytechnic University. He noted that a total of \$60,000 has been contributed by industry.

Mexico—Mr. Pina reported that the Mexico Society will offer Federation publications for sale in its country. This service will be formatted on the agreement the FSCT currently has with the Birmingham Club.

New Business

ELECTION TO FEDERATION HONORARY MEMBERSHIP

Howard Jerome, a Past-President of the Federation, was proposed by the St. Louis Society for Federation Honorary membership. As specified in the Standing Rules II (D), the Secretary of each Society and the Board of Directors were advised of the nomination.

[On a motion by Mr. Spindel, seconded by Mr. Hagopian, the Board unanimously elected Mr. Jerome a Federation Honorary member by secret ballot.]

Terryl F. Johnson, a Past-President of the Federation, was proposed by the Kansas City Society for Federation Honorary Membership. As specified in the Standing Rules II (D), the Secretary of each Society and the Board of Directors were advised of the nomination.

[On a motion by Mr. Dixon, seconded by Mr. Fricker, the Board unanimously elected Mr. Johnson a Federation Honorary member by secret ballot.]

Committee Reports

ANNUAL MEETING PROGRAM COMMITTEE

The 1990 Annual Meeting Program Committee first met November 8, 1989, during the Annual Meeting in New Orleans. During this meeting, we agreed that the 1990 Annual Meeting should have a theme centered around preparing for the 21st Century. Since 1990 is the first year of the last decade of this century, we should use this decade to prepare our companies and our industry for the 21st Century.

Our second meeting was held November 30, 1989, at the O'Hare Hilton Hotel in Chicago. We achieved our primary goal of establishing a theme title only after considerable discussion with much "backing and filling." Our 1990 theme is "A Decade of Decision: Preparing for the Year 2000," emphasizing that more than ever before, the decade of the 1990s will demand astute, accurate decisions on coatings technologies, substrates, application methods, manufacturing techniques and that these decisions will shape the products, markets, and profitability of the industry as it enters the 21st Century.

We plan four one-half-day each theme sessions:

October 29, 1990, Monday afternoon—Substrates: George Pilcher is developing this session around factors that influence the successful coating of substrates, i.e., ferrous and non-ferrous metals, wood, plastic, and composites.

The next two sessions will center around Technologies:

October 30, 1990, Tuesday morning—Gerry Parsons is locating speakers to focus on topics of curing technologies such as UV, electrodeposition, electron beam, laser, and vapor curing.

October 30, 1990, Tuesday afternoon—Mary Brodie is planning a session that will concentrate on the new low VOC technologies of water-borne and high solids coatings.

October 31, 1990, Wednesday morning—Bob Brady is putting together the final theme on regulatory matters. He will concentrate on waste disposal, formaldehyde, and silica.

We will have one theme session going at all times throughout the program. In addition to the theme sessions, we will have various presentations based upon our news release request for papers. We have received 20 abstracts that could result in papers suitable for presentation. These prospective presenters are to submit papers to the Program Committee by May 15, 1990. Each member of the Program Committee will read and comment on the suitability of each paper for our program.

Several FSCT Committees are putting together half-day sessions for the 1990 program. The Corrosion Committee is planning a session on "Anti-Corrosive Coatings: The Next Generation." The Manufacturing Committee will present a session entitled "Challenging Tradition" (new ways to manufacture coatings). The Professional Development Committee is planning a session on "Advanced Topics in Coatings Research and Reliability Testing."

In addition to these sessions, we expect to have five to seven Society papers, six to ten Roon papers and two to five foreign papers, producing a program of about 12-14 sessions and 48-60 papers.

Our goal is to have the program finalized by July 1, 1990.

I'm look forward to our "Decade of Decision" and believe that our 1990 program will help everyone prepare for the year 2000.

GARY W. GARDNER,
Chairman

CORROSION

The Corrosion Committee held its second meeting of the year on February 7, 1990 at FSCT Headquarters, in Philadelphia. The following agenda items were discussed:

- (1) Review of Committee Symposium at 1989 Annual Meeting
- (2) Committee presentation at 1990 Annual Meeting
- (3) SSPC Survey Project
- (4) Publication Award
- (5) SSPC Proposal for "Performance Evaluation Consortium."

Review of 1989 Annual Meeting Symposium—Last year's symposium was a 2-1/2 hour presentation on "New Approaches to



Society Representatives Richard Fricker (Northwestern) and Saul Spindel (New York)



Timothy Donlin (Golden Gate) and William Passeno (Detroit)

Corrosion Control." The program featured five speakers who discussed: accelerated weathering, statistical design, cyclic testing methods, and impedance spectroscopy.

The Committee agreed that the program was well received, with a larger than normal turnout. Overall quality of the presentation was much better than in 1988, although the visuals were generally considered poor. The top presentations based on critique cards returned by attendees, were "Chemical Insight into the Credibility of Accelerated Weathering Tests" (Dr. John Gerlock, Ford Motor Co.) and "Electrochemical Impedance Spectroscopy for Solving Corrosion Control Problems with Protective Organic Coatings" (Dr. Richard Granata, Lehigh University).

1990 Annual Meeting Symposium—The Committee plans a symposium on "Anti-Corrosion Coatings: The Next Generation" for presentation at the 1990 Annual Meeting. The focus of the presentations will be on the technological and regulatory trends that will influence the future formulation of corrosion preventive coatings.



Southern Society Representative Dan Dixon and Rocky Mountain Representative John Delmonico

The program will be finalized at the Committee's scheduled June meeting.

SSPC Survey Article and Project—Editing of both the Project and Article are near completion and will be turned into Federation Headquarters by May 15. It is the strong recommendation of the Committee that both items be made available to the FSCT membership at the earliest possible time.

Publication Award—To date, five papers have been submitted for this year's award and we expect several more before year's end. This program continues to run smoothly.

SSPC Proposal for "Performance Evaluation Consortium"—The SSPC proposal represents a major industry-wide research undertaking. This proposal has been placed on the agenda of our scheduled June Committee meeting and will receive lengthy review and discussion. After this meeting the Committee will submit some specific recommendations concerning the SSPC proposal.

The Committee next plans to meet on June 5, 1990 at FSCT Headquarters.

M. JAY AUSTIN,
Chairman

EDUCATIONAL

Scholarship Funding for 1990—The institutions and the Federation funds granted to them for undergraduate scholarships in 1990 are as follows: University of Detroit—\$2,000; Eastern Michigan University—\$9,000; Kent State University—\$7,000; University of Missouri-Rolla—\$9,000; North Dakota State University—\$10,000; and University of Southern Mississippi—\$6,000. Total funding amounts to \$43,000.

The Cal Poly Program—The Educational Steering Committee had served as the initial forum for the advocacy of Federation support of the Cal Poly program by one of its members, the late David R. Kittredge, of the Los Angeles Society. The Committee was therefore highly gratified to hear that a contribution of \$20,000 from the Federation, plus \$5,000 awarded by the Coatings Industry Education Fund (CIEF) trustees from their independent fund, were combined to yield the requested total contribution of \$25,000 for the Cal Poly program. The Federation portion of the contribution consisted of \$12,000 of general funds and \$8,000 that has been requested by the Steering Committee for a discretionary fund as seed money for new educational programs of merit. It is hoped that a Federation grant to this discretionary fund will be renewed, to permit encouraging support for promising new educational ventures.

Personal Liaison with the Scholarship-Recipient Colleges—A principal concern in the deliberations of the Steering Committee during its past few meetings has been the perceived need to exercise an increasingly high level of accountability for the results of the Federation's expenditures for education, and to evaluate those results in terms of useful contribution to the technical power of the industry. While the phrase "More bang for the buck" is a crude cliché, it is difficult to gainsay the validity of the concept in the case of an organization like the Federation that has limited funds to allocate for very extensive requirements.

The Steering Committee has embarked on an important approach to this expanded concept of accountability by volunteered visits by five of its members (Paul Baukema, Louisville; Don Boyd, Pittsburgh; Ted Fuhs, Chicago; John Gordon, Los Angeles; and John Oates, New York) to the scholarship-recipient colleges nearest to their home base (to minimize travel expense). They will review the curricula; attempt to meet the professors and representative groups of students; collect information on the placement records of the schools ("capture rate"), and, to the maximum extent possible in a brief visit, attempt to promote career opportunities in the coatings industry. The results of these visits will, of course, be

reported to the Committee, and, in due course, to the Board of Directors.

Status of the Federation Videotape, "The Choice"—A great deal of effort, and a substantial amount of Federation money, was expended on the videotape, "The Choice"; this videotape was targeted to audiences of high school students to whom we aimed to convey the message that it was worth their making the coatings industry "the choice" for their career plans. Members of the Steering Committee and other interested members of the various Societies have graciously used their time to go into high schools with the videotape, to supplement it with their own comments about the industry, and to answer questions from the student audiences and their teachers.

It is no disparagement of the efforts of the Committee under the inspiring leadership of the late Joe Vasta to report that a significant flaw in the videotape, that has become apparent through its display in inner city schools, is that students in minority ethnic groups are insufficiently represented among the actors. The effect, therefore, is that to the members of the minority groups, the message of "The Choice" does not seem to be about them, or their problems and employment prospects. Our conclusion has to be, "Live and Learn."

Another, and possible equally important weakness, has been the inability of our members to obtain a significant number of commitments from executives in local paint companies to hire young people who have only a high school education, for laboratory work. The promotional "pitch" of "The Choice" is therefore undermined. This experience can be seen as an indirect confirmation of some other, early comments about "The Choice" from a group such as the Scientific Committee of the NPCA, that the videotape is directed to an audience at too low a level, and that what we really need is a tape directed to students at the college level. The Steering Committee will certainly give this matter a great deal of thought before making a recommendation for the expenditure of the amount of money that it would take to produce a new videotape.

Support of Programs for High School Chemistry Teachers—A summer program oriented to coatings technology for high school chemistry teachers at Eastern Michigan University, in which Johnny Gordon has been involved, is especially interesting in the light of the foregoing observations about "The Choice." It seems that here is an opportunity to make an impression for the coatings industry on the men and women who, in turn, are the ones who make the impressions on students. If we can generate some interest among teachers in the challenges and career opportunities in coatings technology, we can be inspiring some missionaries. On the basis of excellent results so far, with enthusiastic response from the teachers involved, the EMU program has attracted tangible industry support, including a grant of \$2,000 from the Society of Manufacturing Engineers (SME). A recommendation has been made for the Federation to match the SME's support of this program, since we have at least as much of a stake in it as the SME does. With feedback from EMU, which we are sure would be available upon request, this type of program could well be one that could be undertaken on a local basis by one or more of the other colleges who are among the recipients of our scholarship funds.

Plans for Full Educational Committee Meeting—Federation members who travel by air to any extent are well aware of the continuing steep increases in fares. The only "bargain" fares still available are for trips involving a stay over a Saturday, for which it is possible to realize savings of up to 50%. For this reason, the next annual meeting of the full Educational Committee has been scheduled for Saturday, June 2, in Minneapolis. The willingness of members of the Educational Committee to give up a precious summer weekend day in order to save a rather large amount of money for the Federation deserves a most hearty vote of thanks.

Survey on Individual Society Expenditures for Scholarships—It is common knowledge in all of the individual Societies that sums are being regularly appropriated for specific scholarships, prizes to

winners of local science fairs, and other, similar education-oriented activities. In some instances, sums contributed by public-spirited companies and individuals in memory of departed associates or relatives are being administered by local Societies. We have had a feeling that in total, these sums can add up to a considerable figure. We therefore mailed a survey form to Society Presidents and Educational Committee chairs for information on these funds; the results will be published in JCT.

The Hendry Award—At this time of year, for the last few years since the Hendry Award was established, we are always on tenterhooks, hoping for the appearance of some papers of sufficient quality for consideration for the Hendry Award. As this report is being written, it is too early to tell what the results will be this year. We can only hope that the \$1,000 cash award and the considerable prestige that goes with it will attract some good papers.

The University of Waterloo Scholarship Grant—A first-time scholarship grant of \$4,000 was made to the University of Waterloo for the year 1989. Subsequently, a Steering Committee policy review of the Federation scholarship program led to the decision to restrict grants to undergraduate education. The reasoning was that graduate students in our industry who are employed are very frequently the recipients of employer tuition subsidies, and/or often have access to fellowship support from other sources. Since our grant to Waterloo was being used for graduate study, we saw that this was inconsistent with the newly stated policy, although the grant was given and accepted entirely in good faith. The grant was not renewed for 1990.

The sensitivity of the Steering Committee to this situation was reflected in its request to the chairman to make a personal visit to the University of Waterloo, accompanied by one or more officers or members of the Toronto Society, to explain the Federation's new scholarship guidelines. We were to make it clear that the door to participation by the University of Waterloo in the Federation's undergraduate scholarship support program would remain open. Upon notification of this planned visit, Clarke Boyce, former Federation President and the sponsor of Waterloo, offered to attend to this courtesy himself, and to try to promote the start of an undergraduate scholarship program in coatings science. At the same time, the Steering Committee will be recommending consideration of the University of Waterloo as a candidate for a fellowship grant by the Coatings Industry Education Fund (CIEF).

SID LAUREN,
Chairman



Wayne Kraus (Philadelphia) and William Shackelford (Pacific Northwest)

ENVIRONMENTAL AFFAIRS

The Committee consists of nine members (in addition to the Chairman) from almost every region of the United States plus one member from Canada. The agreement to have the *Regulatory Update* supplied by the NPCA was finalized and the first issue was received by three members of the Committee for editing on March 15 for inclusion in the April issue of the JCT.

SIDNEY J. RUBIN,
Chairman

HOST

Presently all Committee Chairmen are in place and have a working knowledge of the scope and assignment of their Committees. The Chairmen are assembling their personnel at this time and should have them oriented well in advance of the Show.

Spouses' Committee is working with the Federation Staff on securing Washington tour and arrangements for all hospitality activities. Officers of the local Society (Baltimore) have been advised as to their participation and assistance to the Host Committee.

RICHARD C. CHODNICKI,
Chairman

LIAISON

Committee Duties—The duties and objectives as defined in the Year Book require revision to conform to current practices and requirements. The Committee will develop updated duty descriptions and submit them to the Executive Committee as recommendations.

Federation Travel Policy Guidelines—As charged by the Executive Committee, the 1989 Committee (Chairman, Carlos Dorris) developed a set of guidelines for member and staff travel. Further modifications have now been made and the guidelines adopted in January by the Executive Committee.

Oil and Colour Chemists Association UK (OCCA)—The Committee met with OCCA President Graham North, Mr. Fred Morpeth, Board Member, and Mr. Chris Pacey-Day, General Secretary during the Annual Meeting and Paint Show in New Orleans last November to review our working relationships. This was a beneficial meeting serving to improve our communication lines.

Benefit Analysis of Federation Expansion with Other Technical Organizations—The Executive Committee has charged the Committee to explore the effects, financial and otherwise, that liaison, affiliation, or union with other overseas organizations would have on the Federation. This is now under consideration.

Surface Coatings Association of Australia (SCAA)—Initial exploratory discussions on the feasibility of any FSCT and SCAA affiliation were held during the Annual Meeting and Paint Show in New Orleans last November with Mr. E.C. Saultry, SCAA Advisory Committee Chairman. The question of possible liaison, affiliation, or union in greater or lesser degree was tentatively explored. Mr. Saultry has now reported back to his organization and they in turn are now reviewing the possibilities and ramifications of any such moves.

At this point in time, neither the FSCT or the SCAA have formally initiated any policy regarding any form of liaison or affiliation and are unlikely to do so until both have established their own objectives for expansion with other groups.

DERYK R. PAWSEY,
Chairman

MANUFACTURING

The Federation's Manufacturing Committee held its Spring Meeting on March 29-30, 1990, at Stouffers Riverfront Plaza, in Mobile, AL.



Society Representatives Raymond Uhlig (Pittsburgh) and James Husted (Piedmont)

Our first item of business was to welcome three new members to the Committee—Michael Hasser, of Carboline; Scott McKenzie, of Southern Coatings and Chemicals; and Steven Marcus of Marcus Paint Company.

The Committee toured the Mobile Paint facility and had a good reception from their personnel.

We critiqued the Manufacturing Committee-sponsored seminar which was held at the Annual Meeting in New Orleans and discussed various way to improve upon our format and to make future programs more successful. At the Annual Meeting, we distributed audience survey/critique cards and used the feedback from this information to help us on improvements as well as to guide us on topics of interest for manufacturing personnel throughout the coatings industry.

The main thrust of the Spring Meeting was to develop our seminar for the 1990 Annual Meeting, in Washington, D.C. The general topic that we chose was "Challenging Tradition." This will be an investigation into flexible manufacturing and various alternatives to the normal batch process for just in time custom color. The format will be to have four outside speakers discuss various aspects of the main theme. We will have representatives from Dunn-Edwards Paint Co., in Los Angeles; Tnemec Co., in Kansas City; ACS, in Princeton; and Miller Equipment, in Chicago. One of our Committee members will serve as moderator to coordinate the various speakers and we will follow up the presentations with a general discussion/question/answer session from the audience. We have received confirmation from the Program Chairman, Gary W. Gardner, that our seminar will be held on Tuesday, October 30, from 9:00 am to 11:00 am. We will be having a meeting of all of the speakers early this summer to make sure the topics all tie in together.

The Committee made a unanimous selection for our nominee to receive the Morehouse Golden Impeller Award and have forwarded this name to Mr. Morehouse for his input.

We began planning for the 1991 Annual Meeting seminar and we will firm this up at our next meeting.

The last item on our agenda was the Coatings Manufacturing Digest which we have been working on for the last couple of years. It was the Committee's decision to change our whole approach on this project and to go directly to our industry suppliers in an attempt to get generic manufacturing material which we can then compile in digest form. We are also considering space for advertising in this process and our intent will be to come up with a manufacturing

"handbook" covering a wide range of topics at no major cost to the Federation.

As stated previously, we are committed to fulfilling the responsibilities of the Committee and, with the help of all of the Committee members and the Federation Staff, we hope to be able to continue in this tradition.

JOSEPH P. WALTON,
Chairman

MEMBERSHIP

A list of non-members who attended the Annual Meeting in New Orleans was received from the Federation Office. The list is being reviewed and the names will be disseminated to the appropriate local Membership Chairmen so they may begin to follow up on them by August.

Also received was a list of those registered for North Dakota State University's Short Courses and a list of non-member attendees at the FSCT seminar on Statistical Process Control, in Chicago, March 19-23. These will also be reviewed and the names distributed.

Upon receipt of the above information, Society Membership Committee Chairmen will also be asked to compare their 1989 and 1990 rosters and follow up on members who did not renew. This may give them some insight into memberships needs.

Current membership promotional literature and letters are being reviewed with Victoria Graves, FSCT Membership Coordinator. Additions, updates, and modifications will be considered.

BRENDA L. CARR,
Chairman

PROFESSIONAL DEVELOPMENT

Since the last written report to the Board of Directors, the Professional Development Committee has met twice; on November 7, 1989, in New Orleans, and on January 16-17, 1990, in Cleveland. Highlights of our current and projected activities are as follows:

Statistical Process Control (SPC) Lecture/Workshops Level I and II—This year we offered one session each of Levels I and II during the same week in Chicago. Both sessions were well-attended, with 51 persons attending Level I, and 45 attending Level II. There were 30 attendees who participated in both sessions. Another Level I seminar will be held in Toronto (at Society re-



Norman Hon (Kansas City) and Joseph Caravello (Houston)

quest), with anticipated attendance of 35-40. Committee will review potential demand and feedback from attendee questionnaires before deciding whether to offer any SPC courses in 1991. A testimonial letter from a major coatings manufacturer, with added descriptive copy, appeared in the December 1989 issue of the *JOURNAL OF COATINGS TECHNOLOGY*.

FSCT/PDC Membership Surveys—The latest FSCT/PDC survey forms were mailed in March to obtain a clearer idea of the makeup of the membership, to track whatever changes occurred since the first survey in 1986, and to utilize the information provided to design and conduct activities to benefit members. Also included in the 1990 survey were questions on career development and on the JCT. As of this writing, a strong response from the membership has already occurred, hopefully leading to our goal of 4000 or more returns.

PDC PARTICIPATION IN THE 1989 ANNUAL MEETING

"Advanced Topics in Coatings Technology"—Committee-sponsored session was well received with a peak attendance of about 250.

PDC Survey Card—A total of 210 cards were returned during the meeting with the following as the top five topics selected: (1) New Technologies; (2) Coatings Tests: Precision/Reliability; (3) Polymer Science; (4) Application Techniques; and (5) Colloid/Surface Chemistry.

Publicity—An article on the PDC appeared in the *Convention Daily* issued during the Annual Meeting.

"Advanced Topics in Coatings Research" and "Professionalism in Testing" Dual Symposia Sponsored by the PDC at the 1990 Annual Meeting in Washington, D.C.—Leading authorities from industry, government, and academia have been invited to participate in back-to-back 1 1/2-hour sessions. The "Professionalism in Testing" half-session is a step in the PDC's objective to focus on building awareness of the need for accurate and reproducible testing in the coatings industry. Appreciation plaques will again be presented to symposia speakers.

Modern Analytical Resources: "The Coating Chemist's Ally"—Repeat of this event (developed by the PDC as the 1989 Federation Spring Seminar held in Los Angeles) has been scheduled for September 1990 in Chicago. However, an ASTM symposium on "Analysis of Paints and Related Materials," to be held May 14-15, 1990, in Pittsburgh, has been broadened in scope with some serious



Louisville Society Representative James Hoeck and Los Angeles Society Representative Jan Van Zelm

overlaps with the PDC event, which could adversely affect attendance in September. Plans are to reschedule for Spring 1991 (March or April), with possible collaboration with ASTM.

Future Projects—Based on interest expressed by Annual Meeting attendees surveys in 1988 and 1989, a key topic is "Coatings Applications Methods and Techniques," which the Committee feels could be developed into a seminar of wide appeal. Focus would be on how application methods and equipment can influence formulations.

The mission of the PDC continues to be the professional development of the technical staff of the coatings industry through continuing education activities. In this mission, the PDC welcomes and actively seeks suggestions and proposals from all concerned parties. The PDC also thanks the Federation for its continued support and for many useful discussions.

RICHARD J. HIMICS,
Chairman

PUBLICATIONS

Since our last report, the following items of interest are noted:

Met in Detroit on March 29, 1990 with members of the Publications Committee to review overall policy and scope of the Committee. One of the issues needed to be resolved is the scope of Federation publications, which should be in the realm of this Committee. Two examples include the *Infrared Spectroscopy Atlas* and the *Paint/Coatings Dictionary*.

We also discussed the format of the JCT and whether to change the masthead and Editorial page in view of what other publications are doing. It was agreed to leave the present setup as is.

The possibility of adding an anecdotal page was discussed and will be explored by Pat Viola.

On March 30, the Editorial Review Board met and discussed the following: Manuscript supply is an ongoing effort. We have a good supply of papers and are working hard to keep that supply flowing. We continually scan the available meetings, symposia and conferences for available papers.

A review of the membership of the Editorial Review Board has been carried out and new members added as required. Several suggestions for new candidates were received and will be pursued. We also rely on outside reviewers when required.

We are working on the publication of seminal papers to provide archival papers for our readers. We have one key topic identified and will be planning to publish this year.

Fourteen Federation Series Manuscripts have been published; the latest being "Aerospace Coatings." "Introduction to Coatings Technology" is now in preparation and is due shortly. We expect to have at least three more this year suitable for publication.

Book Review, Humbug from Hillman, and the CrossLinks Crossword Puzzle are ongoing features and continue to be well received.

The new *Infrared Spectroscopy Atlas* is expected this year.

There was some discussion about raising the cost of the monographs in the *Federation Series on Coatings Technology* to \$10.00 per copy.

The Chairman expresses his appreciation to the members of the Committee and the Federation Staff for their contributions.

THOMAS J. MIRANDA,
Chairman

TECHNICAL ADVISORY

The Technical Advisory Committee held its annual meeting with the Society Technical Committee Chairman October 4-5, 1989 at the Dupont Plaza Hotel in Washington, D.C. The meeting included:

1. A report on the use of personal computers.
2. A tour of the FBI's Scientific Analysis Section Laboratory.
3. Reports of Technical Committee activity in various Societies.
4. A project "Brainstorming" session.

A full report of this meeting was published in the *JOURNAL OF COATINGS TECHNOLOGY*, 62, No. 783, April 1990, page 29.

The Technical Advisory Committee will meet in May 1990. Our goals for the meeting would be to establish a date and place for our next meeting with the Society Technical Committee Chairmen; to establish a program for the meeting; and to determine what the TAC can and should contribute to the Collaborative Testing Program (CTP). We invited Chuck Leete, of CTP, to attend this meeting.

GERRY K. NOREN,
Chairman

TECHNICAL INFORMATION SYSTEMS

The Technical Information Systems Committee completed the Annual Subject Guide to the 1989 issues of the *JOURNAL OF COATINGS TECHNOLOGY*. This index was published in the December 1989 issue of the JCT.

The Committee is currently working on the 1990 Index to be published in the December 1990 issue of the JCT.

HELEN SKOWRONSKA,
Chairman

AD HOC FSCT HISTORY

Our Committee consists of Charles Beck, Cleveland Society; Fred Schulenberg, *American Paint & Coatings Journal* staff and star reporter from St. Louis; and Michael Malaga, Cleveland Society.

We recently lost our fourth member who knew more about the Federation than all of us combined. Bob Matlack died January 17, 1990. He was a Past-President of the Federation and former Executive Vice President of the FSCT.

Last month our Executive Vice President Robert Ziegler obtained for each of us four 10 x 12 inch binders that we will be using for all the information to be collected.

So far I have received information from 16 Societies. We are hoping to receive Society Histories from Baltimore, Chicago, Dallas, Detroit, Mexico, Northwestern, Piedmont, Rocky Mountain, St. Louis, and Western New York.

Most of the Societies are doing a fine job of getting the information we need.

If we do not hear from you we will try to find enough information from old paint journals and other books or magazines that we might find in the Federation library.

MICHAEL MALAGA,
Chairman

**The next meeting of the Board of Directors will be on Sunday,
October 28, at 9:00 a.m., in the Sheraton Washington Hotel,
Washington, D.C.**

Paint Companies to Eliminate Mercurial Biocides Use In Formulating Interior Latex Paints by August 20

Manufacturers (registrants) of mercury products registered as pesticides for use in latex paints have agreed to voluntarily discontinue sales of mercurial biocides used to preserve interior latex paints by August 20. The announcement was made at a press conference conducted by the Environmental Protection Agency (EPA), on June 29, in Washington, D.C.

The announcement, which followed discussions between the EPA and the Chemical Manufacturers Association's (CMA) Biocides Panel Mercury Compounds Task Force, was made over concerns by the EPA and the Centers for Disease Control (CDC) that the presence of mercurial biocides in interior paints may present a health hazard.

EPA spokesman Linda J. Fisher, Assistant Administrator for Pesticides and Toxic Substances, stated that mercury compounds are used as preservatives in approximately 30% of the interior use latex paint products currently on the market. Mercurial biocides also are used in 20-35% of exterior latex paints. Oil-based paints do not contain mercury.

According to CMA, mercurial biocides, primarily phenylmercuric acetate (PMA), are used as preservatives to prevent bacterial and fungal growth while paints and other compounds are in their containers, and to control mildew on exterior paints. The chemicals are regulated as pesticides by EPA under the Federal Insecticide, Fungicide, Rodenticide Act (FIFRA). Mercurial biocides have been used for over 40 years.

Effective on August 20, the following specific actions regarding mercury in paint products will be taken:

(1) The elimination of mercury in interior paints.

(2) All new exterior paints formulated with mercury after August 20 will include new warning labels which: state that the paint contains mercury; stress limitation to outdoor use; warn of potential health hazards; and caution against exposure to children.

(3) No new mercury-containing paints will be labeled for both interior and exterior use (dual purpose), as some now are.

"While available evidence suggests that mercury poisoning is rare, EPA is concerned about the potential risks to public health and the environment that may be associated with the use of mercury in paints," said Ms. Fisher. "EPA wants to prevent the potential risks that mercury in indoor paint can pose."

The elimination of mercury in interior latex paints agreement between EPA and the CMA Task Force calls for a phase out period for users of mercurial biocides.

EPA is allowing an approximate one-year existing stocks provision for distribution, sale, and use of voluntarily cancelled products subject to this action. These existing stocks only may be used in the manufacture and formulation of exterior paints and coatings until June 27, 1991.

According to Ms. Fisher, the National Paint and Coatings Association (NPCA), Washington, D.C., is working with the paint

manufacturers to relabel all paints with higher mercury levels (over 200 ppm) for exterior use only. The EPA believes that consumers may continue to use interior paints with lower mercury levels (200 ppm or less) without unreasonable risk if they follow label directions, which include ventilating thoroughly during and after use and minimizing exposure to children.

Ms. Fisher predicted that the approximate cost to the paint companies for label modification, reformulating stocks of interior latex paints, and efficacy testing could be from \$40 to \$50 million. She stated that the consumer should only realize an increase of 1%.

The concern over mercurial biocides used in interior latex products stems from a reported case of acro-dynia, a rare form of mercury poisoning that occurs in some sensitive children. According to Dr. William Roper, Director of the Federal CDC, Atlanta, GA, a four-year-old child in Michigan, whose home was painted with a mercury-containing paint (930 ppm vs the allowable 300 ppm) in 1989, was diagnosed as having acro-dynia. Following months of medical treatment, the child is almost entirely recovered. EPA reports indicate that exposure to mercury also may cause other adverse effects to the nervous system and kidneys. However, according to NPCA, the Michigan case was the only such reported incident in the 20 years in which acro-dynia has been associated with paints containing mercurial biocide.

Mercury registrants have labeled their own products with specific directions and are delivering similar sticker labels to the paint manufacturers. The labels prohibit use of mercury products to formulate interior paint. Warning statements and maximum allowable rates are required on all newly-formulated mercury-containing exterior paints.

"We applaud the responsibility of the registrants of mercury for agreeing to delete this use from their registrations and to accelerate the development of data so EPA can make prompt decisions on the remaining uses," said EPA's Fisher.

In addition, EPA will continue to review the potential risks of mercury in paint products by taking the following steps:

(continued on page 45)

Reichhold Relocates to Temporary Facility in Durham, NC

Reichhold Chemicals, Inc., temporarily has relocated its corporate headquarters to Durham, NC. The offices of the corporate president and vice presidents recently were moved to temporary offices in Alston Technical Park, in Durham.

Last year, the company announced its intention to consolidate its corporate headquarters, three division administrative offices, and laboratories for its U.S. resin businesses on a 100-acre site in Research Triangle Park, NC. In the interim, almost all of the company's administrative personnel have relocated to the temporary facility.

Suitt Construction Company has been chosen as the general contractor for the new

office/laboratory complex. Cost of the construction covered by the contract is more than \$30 million.

The building will have approximately 320,000 square feet on a 100-acre site and will house approximately 500 Reichhold administrative and laboratory employees.

The headquarters offices are expected to be completed by the end of 1991, with the laboratory facilities completed by January 1992. Approximately 200 employees relocated from White Plains and Buffalo, NY, Jacksonville and Pensacola, FL, and Dover, DE will occupy the new building along with about 200 locally hired secretarial, clerical, and other technical support personnel.

SCM Chemicals to Start TiO₂ Business in Korea

Chairman, President, and Chief Executive Officer Donald V. Borst, of SCM Chemicals, Baltimore, MD, has announced that SCM and Lucky Metals, Seoul, Korea, have formed an alliance to launch a new development in the global titanium dioxide business.

By the end of 1991, TiONA(r) brand titanium dioxide pigments will be produced by a new Lucky Metals plant near Ulsan, Korea. The plant will be designed by Lucky Engineering Company, Ltd., and built by Lucky Metals. The facility will have an annual capacity of 40,000 metric tons of pigment. The Ulsan plant will incorporate SCM technology to produce chloride-process titanium dioxide and will include full provision for health, safety, and environmental protection.

When the facility begins operations, SCM will supply raw materials to the Ulsan plant, which will then process the titanium dioxide into a variety of TiONA(r) pigment grades suited to the needs of coatings, plastics, and other products.

Prior to the facility's completion, Lucky Metals will serve as SCM's agent for TiONA(r) titanium dioxide in Korea. After the Ulsan plant begins operations, SCM will, in turn, distribute Lucky Metals-produced

TiONA(r) pigments to other global markets.

SCM Chemicals is owned by Hanson Industries, the U.S. arm of the British/American industrial management company, Hanson PLC. SCM is a manufacturer of titanium dioxide, and markets colored pigments, silica products, and titanium tetrachloride.

Union Carbide to Build Latex Plant in Dubai, UAE

Plans to construct a latex manufacturing plant in the Jebel Ali Free Zone in Dubai, United Arab Emirates, has been announced by Union Carbide Chemicals and Plastics Company, Inc., Danbury, CT.

Union Carbide currently operates a terminal in the Jebel Ali Free Zone, and the new latex plant will supplement an existing investment in local facilities and services. The plant is designed to incorporate the most modern latex production technology, including environmental protection.

The broad range of latex polymers produced at the new plant will meet needs for interior and exterior paints, roof coatings, adhesives, and sand/dust control materials.

Start-up of the new plant is expected to be in late 1991.

Moët-Hennessy Awards 1990 Science for Art Prizes

Hans Kuhn, most recently Professor at the University of Marburg and Director of the Department of Biophysical Chemistry at the Max Plank Institute in Göttingen, West Germany, and Werner Ostertag, of BASF, in Ludwigshafen, have been named the winners of the 1990 "Science for Art" competition. The contest is sponsored by Moët-Hennessy—Louis Vuitton Groupe, a Paris-based company.

The contest is aimed at all scientific surveys of innovation of a technical process dealing with the creation or the improvement of a sensory, tactile, or visual effect using the surface or interface of solids and fluids. The competition is divided into two categories, scientific and innovation.

In the scientific category, Dr. Kuhn was recognized for his work on "Molecular Assembly, Color, and Living Matter."

Dr. Ostertag was the winner of the innovation prize for his work on "Colored Palette of Iron Oxide under the Spell of Aluminum."

Problems.

CRATERING AND PINHOLING

From foreign matter and contaminants.

FISHEYES

From inadequately dispersed antifoam.

ORANGE PEEL

From surface tension variations during drying.

DE WETTING

From a contaminated surface.

CREEPING AND CRAWLING

From too high a coating surface tension.

Paint Companies to Eliminate Mercurial Biocides

Continued from Page 43

(1) Require the manufacturers of mercury preservatives to submit a substantial amount of new testing data in order to clarify the potential risks which may be posed by outdoor uses of paint containing mercury. EPA will decide whether additional actions are needed based on the results of those studies or other available information.

(2) EPA is discussing with the registrants appropriate regulatory measures concerning the use of mercury in certain products used in construction work, including acoustical plaster, adhesives, and spackling and jointing compounds.

The EPA is conducting studies to determine the rate at which mercury vapors are released after paint is applied, the actual concentrations in the air, and the amount of time it takes mercury to dissipate.

As a result of the discussions with the mercury registrants, only PMA will remain registered for use in paint. Use will be limited to exterior paints and coatings, and miscellaneous interior uses.

According to the EPA, most pesticidal uses of mercury were banned in 1976. The use of mercury in paint was allowed to continue because it was determined that effec-

tive alternatives were not available. EPA believes that alternative preservatives are available today and are already used by many paint companies. In addition, EPA does not think that any of the alternatives present an unreasonable risk.

Businesses who wish to dispose of mercury-containing paint may be subject to Subtitle C regulations governing hazardous waste under the Resource Conservation and Recovery Act. The method of disposal will depend on the concentration of mercury in the paint and the quantity of hazardous waste that the business generates each month. Call the RCRA/Superfund Hotline (in Washington, D.C.: 382-3000; toll-free: 800-424-9346) for further information.

The EPA has compiled a data base (which represents approximately 1500 paint manufacturers in the U.S.) that lists which paint products contain mercury. These data are available through State Health Departments, EPA Regional Offices, and the National Pesticide Telecommunications Network (800-858-7378).

According to J. Andrew Doyle, NPCA's Executive Director, there appears to be no scientific evidence that paints formulated

with the currently-regulated levels of mercury pose a health hazard. However, "since the material will be eliminated from interior products . . . and the manufacturers of exterior products will be providing even more detailed label instructions concerning their safe use," the Association believes it can help reduce confusion by providing the best possible information in the meantime.

ASTM Opens New Office In Hertfordshire, England

ASTM, Philadelphia, PA, opened a new office in Hertfordshire, England, on May 1 to serve its European members.

The new office will answer questions about ASTM, coordinate symposia and Standards Technology Training courses held in Europe, and provide rooms for standards development meetings.

Bill Keeshan will serve as the Office Manager. Inquiries can be addressed to him at ASTM European Office, 27-29 Knowl Piece, Wilbury Way, Hitchin, Herts SG4 0SX, England. The new office also can be reached by telephone: 0462 437933; fax: 0462 433678; and telex: 825684 ATPG.

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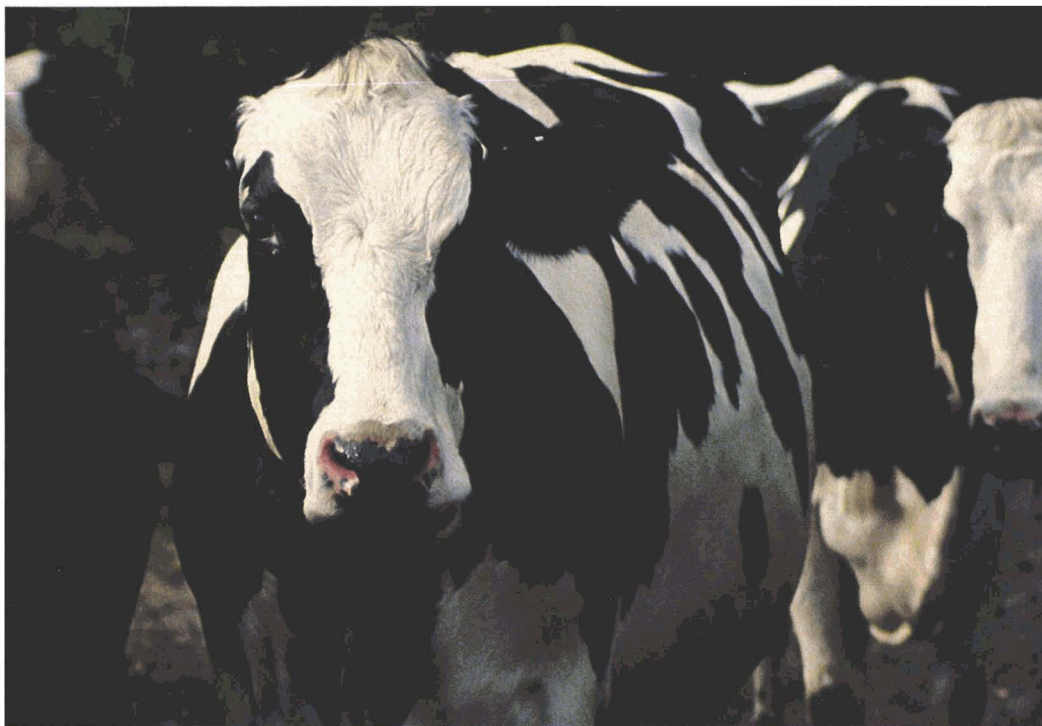
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The JOURNAL OF COATINGS TECHNOLOGY is published monthly by the Federation of Societies for Coatings Technology for its membership of approximately 7,300 in 26 Constituent Societies in the United States, Canada, Great Britain, and Mexico. The JOURNAL is devoted to the advancement of knowledge in the science and technology of surface coatings, the materials comprising such coatings, and their use and performance.

The Editors invite submission of original research papers, review papers, and papers under the special headings *Open Forum* and *Back to Basics*, as well as *Letters to the Editor*. All manuscripts will be assumed to be previously unpublished writing of the authors, not under consideration for publication elsewhere. When review papers contain tables or graphs from copyrighted articles, the authors will be required to obtain permission for use from the copyright holders. When the organization with which the authors are affiliated requires clearance of publications, authors are expected to obtain such clearance before submission of the manuscript. Papers presented to associations other than the Federation must be released by written communication before they can be considered for publication in the JOURNAL OF COATINGS TECHNOLOGY. Authors are obligated to reveal any exceptions to these conditions at the time a manuscript is submitted.

The JOURNAL OF COATINGS TECHNOLOGY has first right to the publication of papers presented at the Annual Meeting of the Federation and at local regional meetings or symposia of the Constituent Societies.

Papers in which proprietary products or processes are promoted for commercial purposes are specifically unacceptable for publication.

SUBMISSION OF MANUSCRIPTS...

...for the Journal

Four complete copies should be sent to the Editor, JOURNAL OF COATINGS TECHNOLOGY, 1315 Walnut St., Philadelphia, PA 19107. The cover letter should address copyright clearance, and release issues discussed above and should specify paper category: *Original Research*, *Review*, *Open Forum*, or *Back to Basics*.

Letters to the Editor: The JOURNAL will consider for publication all correspondence relevant to the coatings industry and to the contents of the JOURNAL. When a letter concerns an article appearing in the JOURNAL, the original author is usually given an opportunity to reply.

...by Constituent Societies For Annual Meeting Presentation

Ten complete copies of the manuscript are required for committee review. The set of copies should be addressed to the Editor at the address listed previously.

...for Roon Foundation Award Competition

Ten complete copies of the manuscript are required, and should be submitted to the Chairman of the 1990 Roon Awards Committee, Richard Eley, The Glidden Co., 16651 Sprague Rd., Strongsville, OH 44136. (For complete details, see "Roon Awards" section of the JOURNAL in January 1990 issue.)

MANUSCRIPT PREPARATION

In general, authors are advised to use the "Handbook for Authors" published by the American Chemical Society as a guide to the preparation of manuscripts (ACS, 1155 Sixteenth St., Washington, D.C. 20036). Another excellent reference work is "How to Write and Publish a Scientific Paper," by Robert A. Day (ISI Press, 3501 Market St., University City Science Center, Philadelphia, PA 19104).

Authors are encouraged to consider submissions in several categories and to prepare their manuscripts accordingly. The categories are:

Original Research Papers: The main technical content of the JOURNAL OF COATINGS TECHNOLOGY will continue to be original research papers. Editors support the trend in scientific writing to a direct, less formal style that permits limited use of personal pronouns to avoid repetitious or awkward use of passive voice.

Review Papers: Papers that organize and compare data from numerous sources to provide new insights and unified concepts are solicited. Reviews that show how advances from other fields can beneficially be applied to coatings are also desired. Reviews that consist mainly of computer searches with little attempt to integrate or critically evaluate are not solicited.

Open Forum: Topics for this category may be nontechnical in nature, dealing with any aspect of the coatings industry. The subject may be approached informally. Editors encourage submission of manuscripts that constructively address industry problems and their solutions.

Back to Basics: Papers that provide useful guides to Federation members in carrying out their work are solicited. Topics in this category are technical but focus on the "how to" of coatings technology. Useful calculations for coatings formulation and procedures that make a paint test more reproducible are examples of suitable topics. Process and production topics, i.e., paint manufacture, will also be reviewed in the *Back to Basics* category.

If a submitted paper consists of the text of a presentation made previously to a monthly or special meeting of a Society for Coatings Technology, or to another technical group, the name of the organization and the date of the presentation should be given. If someone other than the author of the paper made the presentation, this information, too, should be noted. Papers originally composed for oral presentation will have to be revised or rewritten by the author to conform to the style described in this guide.

Manuscripts should be typed with double spacing on one side of 8 1/2 x 11 inch (22 x 28 cm) paper, with at least one-inch (2.5 cm) margins on all four sides. All paragraphs should be indented five spaces, and all pages should be numbered at the top center, or upper right corner.

Title

The title should be as brief and informative as possible. Selection of titles that are key word-indexable is a helpful and recommended practice.

Authors' Biographies and Photographs

Give complete names, company or institutional affiliations, and brief biographical sketches of all authors. If available, submit a 5 x 7 inch (13 x 18 cm) black-and-white photograph with glossy or smooth high sheen surface, for each author. See later section on photographs for further details.

Abstracts

A 75-100 word abstract must be part of the manuscript, and should be a concise description of the key findings or teachings of the work described in the paper. The abstract should not repeat the title or include reference numbers, nor should it duplicate the Conclusion or Summary.

Text

Main headings and sub-headings should be used to improve readability, and to break up typographical monotony. The text should *not* be presented as an alphanumeric outline.

The main headings usually should be INTRODUCTION, EXPERIMENTAL, RESULTS AND DISCUSSION, and SUMMARY or CONCLUSIONS. Sub-headings will be specific to the subject.

Only as much review as is necessary should be given to provide an introduction to the subject; the main burden for extensive background should be placed on the list of references.

Standard scientific and technical terminology should be used to convey clear and unambiguous meaning, but the use of technical jargon or slang should be avoided. Authors should bear in mind that the JOURNAL has an international audience, for many of whom English is a second, not native, language. Use of regional idioms or colloquialisms should be avoided. The use of obscure abbreviations is also discouraged. When appropriate, abbreviations should be made in parenthesis immediately following first mention of the term in the text, and then used alone whenever necessary.

Recent issues of the JOURNAL should be consulted for desired style and technical level.

Metric System

Metric system units should be used wherever applicable with the equivalent English units shown afterwards in parentheses. The ASTM Metric Practice Guide, E 380-72 (American Society for Testing and Materials, 1916 Race St., Philadelphia, PA 19103) is a convenient reference.

Tables, Graphs, and Drawings

Tables, rather than descriptive text, should be used only when they are genuinely helpful. They should be proportioned in accordance with the height and width limitations of the JOURNAL'S pages. Each table should be typed on a separate sheet, rather than included in the text, and appended to the manuscript. Each table should be numbered and have a descriptive caption. Tables should be referenced in the text (e.g., "See Table 1").

In numerical data in tables, numbers less than one should have a zero before the decimal point.

Graphs should be on good quality white or nonphotographic blue-lined 8 1/2 x 11 inch paper. Each graph should be drawn on a separate sheet, numbered, and the captions listed on a *copy* of the original graph. Graph captions and legends should also be typed on a separate sheet from original for typesetting.

Drawings should conform to the guidelines given for Graphs and should be proportioned to fit the height-to-width ratio of the JOURNAL'S pages and columns.

Photographs

All photographs should be sharp, clear, black-and-white prints no larger than 8 x 10 inches in size. Photos should be clearly labeled on the reverse side, taking care not to mar the image.

Color prints and slides are unacceptable.

When illustrations are secured from an outside source, the source must be identified and the Editor assured that permission to reprint has been granted.

Nomenclature

Whenever possible, generic names should be used in preference to trade names. When trade names must be used to avoid ambiguity, and the name is a registered trademark, the symbol R, in a circle or parentheses, should be given immediately following, and the manufacturer listed as a footnote. In general, trade names should be used only in footnotes or in an appendix, rather than in the text.

If special nomenclature is used, include a nomenclature table giving definitions and dimensions for all terms.

Nomenclature of chemical compounds should conform to the style of *Chemical Abstracts* and the IUPAC rules. For oligomeric or polymeric materials, characteristics such as molecular weight, polydispersity, functional group content, etc. should be provided.

Equations

Equations must be typed, or written clearly, with equations numbered sequentially in parentheses to the right. If Greek letters are used, write out their names in the manuscript margin at the first point of use. Place superscripts² and subscripts₂ accurately. Avoid the use of superscripts in a manner that can lead to their interpretation as exponents.

Summary

The paper should be concluded with a summary which is intelligible without reference to the main text. The summary may be more complete than the abstract, listing conclusions drawn from the text. A well written summary can serve to inspire the busy reader to turn back to the paper, to read it thoroughly.

Acknowledgment

If used, it should follow the summary.

References

These should be listed in the numerical order in which they are cited in the text, and should be placed at the end of the manuscript. Names of authors may or may not be shown in the text with reference numbers. If possible, include titles of articles referenced in the literature. The following are examples of acceptable reference citations for periodicals,^{1,2,3} books,⁴ and patents.⁵

- (1) Pascal, R.H. and Reig, F.L., "Pigment Colors and Surfactant Selection," *Official Digest*, 36, No. 475 (Part 1), 839 (1964).
- (2) Davidson, H.R., "Use and Misuse of Computers in Color Control," *JOURNAL OF COATINGS TECHNOLOGY*, 54, No. 691, 55 (1982).
- (3) Stephen, H.G., "Hydrogen Bonding—Key to Dispersion?," *J. Oil & Colour Chemists' Assoc.*, 65, No. 5, 191 (1982).
- (4) Patton, T. (Ed.), "Pigment Handbook," Vol. 1, John Wiley & Sons, Inc., New York, 1973.
- (5) Henderson, W.A. Jr. and Singh, B. (to American Cyanamid Co.), U.S. Patent 4,361,518 (Nov. 30, 1982).

OTHER INFORMATION

Galley proofs will be sent to the author for checking about six weeks prior to publication.

Offprints may be purchased in quantities of 100 or more. Authors will receive price quotations. Each author will receive a complimentary copy of the JOURNAL issue in which his or her paper was published.

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Two-Component Isopolyester Urethane Coatings for Plastics

Stephen H. Shoemaker
Amoco Chemical Company*

There has been a dramatic rise in the use of plastics for automotive and business machine applications. Many of these plastics require decorative and/or functional coatings. This paper discusses the development of high-solids two-component isopolyester urethane coatings for plastics.

The resin system is a low molecular weight hydroxyl functional polyester composed of equimolar parts of isophthalic acid and adipic acid, in addition to neopentyl glycol and trimethylol propane. The resin is cross-linked with aliphatic polyisocyanate resins based on hexamethylene diisocyanate to form the final coating film. These coatings will air-dry or cure at low temperatures and are therefore ideally suited for heat sensitive thermoplastics. The polyester resin system offers the desirable balance of flexibility and hardness that coatings for plastics require. The coatings exhibit excellent impact strength, hardness, elongation, abrasion resistance, and weatherability, in addition to good chemical and moisture resistance.

INTRODUCTION

Plastic parts often require decorative and/or functional coatings. Thermoplastics have relatively low heat distortion temperatures; consequently, coatings for these plastics must air-dry or cure at low temperatures. Dependent upon the application, coatings for plastics must also possess other properties, including: adhesion, flexibility, tensile strength, hardness, moisture resistance, abrasion resistance, impact resistance, etc. High-solids two-component polyester urethane

coatings, based upon isophthalic acid, have been developed that satisfy these requirements. This paper focuses on the development of coatings for automotive plastics; these coatings also are appropriate for business machine and general industrial plastics.

Four polyurethane coating systems have been prepared and evaluated. Three of the coatings are based on a low molecular weight polyester resin. These three coatings differ only in the polyisocyanate that is used for crosslinking. The fourth coating is formulated from a commercially avail-

Table 1—Polyester Resin

Charge Component	Weight	Moles	Equivalents
Isophthalic acid	314	1.89	3.78
Adipic acid	276	1.89	3.78
Neopentyl glycol	496	4.78	9.56
Trimethylol propane	48	0.36	1.08
	1134	8.92	18.20
(Water off)	134		
	1000		

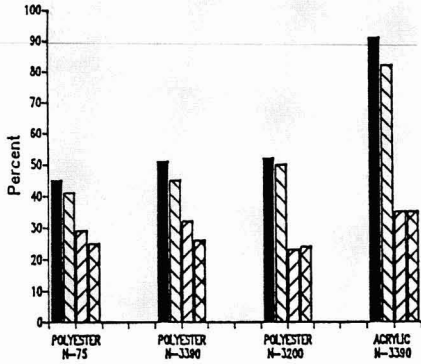
Resin Properties

Acid number (solids)	8
Nonvolatiles, weight %	70
Solvent	1:1 MEK: ethyl-3-ethoxypropionate
Viscosity	
Gardner-Holdt	E
Brookfield, cps	241
(#2 spindle, 100 rpm)	
Gardner color	<1
Hydroxyl excess	40%
Molecular weight	730 (number average)
Hydroxyl number (solids)	160
Hydroxyl eq. wt. (solids)	350.6
Wet density, lb/gal	8.8

Presented at the 67th Annual Meeting of the Federation of Societies for Coatings Technology, in New Orleans, LA, on November 9, 1989.

* Research and Development Dept., Mail Station E-2, P.O. Box 3011, Naperville, IL 60566.

Sward



Pencil

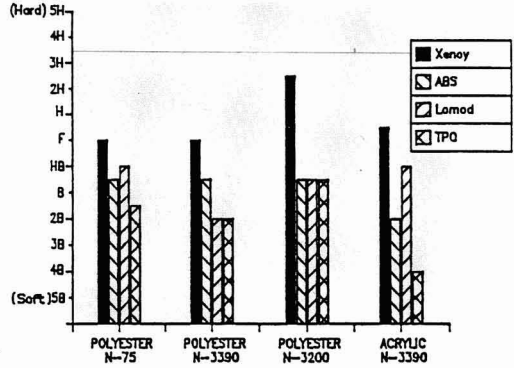


Figure 1—Hardness data

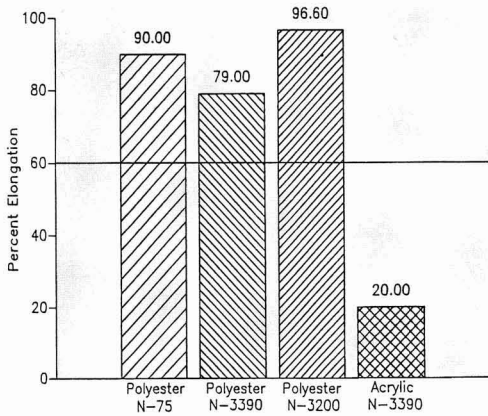
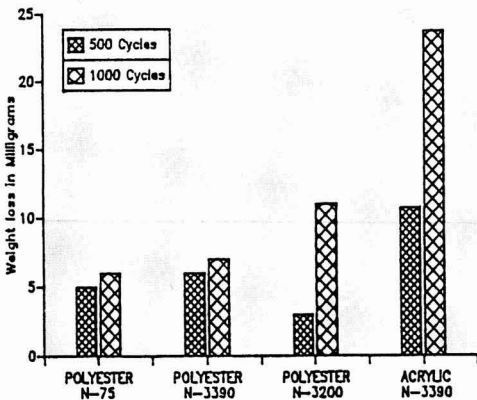


Figure 2—Elongation

Table 2—Commercial Acrylic Resin Properties

Acid number (solids)	1.6
Nonvolatiles, weight %	69
Solvent	methyl n-amyl ketone
Viscosity	
Gardner-Holdt	74
Brookfield, cps	6000-11500
(#3 spindle, 5 rpm)	
Gardner color	<1
Molecular weight	8000-9000
Hydroxyl eq. weight (solids)	425
Wet density, lb/gal	8.6

Weight Loss



Wear Cycles/Mil

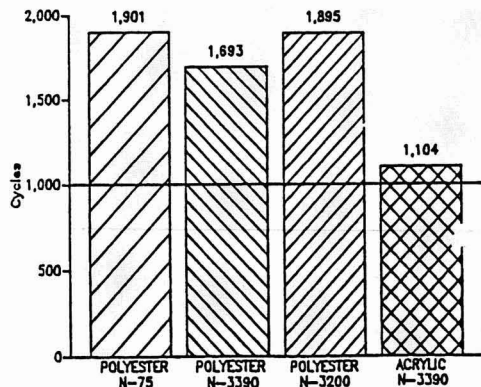


Figure 3—Taber abrasion

Table 3—Two-Component Urethane Coating Formulations

Component I:	A Polyester	B Polyester	C Polyester	D Acrylic
Polyester resin (70% NVM)	508.08	505.11	526.73	
Commercial acrylic resin ... (69% NVM)				445.86
Titanium dioxide	38.12	38.16	38.35	30.73
Carbon black	1.99	1.98	2.03	1.63
BYK 351	12.00	12.00	12.00	12.00
Ethyl-3-ethoxypropionate ..	149.01	197.78	209.29	337.20
Dibutyltin dilaurate	0.58	0.57	0.58	0.47
Component II:				
Desmodur N-75 (75% NVM)	290.22			
Desmodur N-3390 (90% NVM)		244.40		172.11
Desmodur N-3200 (99.3% NVM)			211.02	
	1000.0	1000.0	1000.0	1000.0
NCO: OH ratio		1.1:1		
Pigment: binder ratio		0.07:1		
Titanium dioxide: carbon black ...		95:5		
Catalyst level		0.10% (on resin solids)		
Flow agent level		0.60% (on total weight)		

able high-solids acrylic resin and is included for comparison as these types of coatings are used extensively in the industry.

DISCUSSION AND RESULTS

Table 1 presents the formulation and properties of a low molecular weight hydroxyl functional polyester resin composed of equimolar parts of isophthalic acid and adipic acid,

in addition to neopentyl glycol and trimethylol propane. To achieve a low molecular weight, the polyol portion is calculated to yield 40% stoichiometric excess hydroxyl functionality. To process the resin by fusion, all ingredients are charged to a kettle equipped with a steam heated partial condenser, agitator, thermometer, and inert gas sparge. The charge is slowly heated until the mixture can be agitated. Heating is continued until an overhead temperature of 93-98°C can be maintained. The resin is processed at maximum kettle temperature of 232°C until an acid number of less than 10 is obtained. The resin is then cooled to 170°C and thinned with ethyl-3-ethoxypropionate, then further cooled to 80°C and thinned with methyl ethyl ketone (MEK) to 70% solids. The resultant resin has a Gardner color of less than one, a Gardner-Holdt viscosity of E, and a number average molecular weight of 730.

The characteristic properties of a commercially available acrylic resin are presented in Table 2. This resin is a hydroxyl functional acrylic that has been designed to be reacted with aliphatic isocyanates to produce high-solids acrylic urethane coatings.

Two-component urethane coating formulations and properties are given in Tables 3 and 4. The Component I ingredients (resin, pigments, flow additive, and solvent) are milled to a Hegman grind of seven or more. The isocyanate portion (Component II) and the catalyst are mixed with Component I immediately prior to application.

Formulas A, B, and C are each prepared from the polyester resin and are identical except for the type of aliphatic polyisocyanate used as the crosslinking agent. The isocyanate portion of Formula A is Desmodur N-75, a biuret of hexamethylene diisocyanate (HDI) produced by Mobay Corporation. Formula A has a viscosity of 28 sec on a #4 Ford cup (at 25°C) at 65.39% solids. The resultant volatile organic content (VOC) is 3.08 lb/gal. Formula B contains Mobay's Desmodur N-3390, a trimer of hexamethylene diisocyanate. The lower viscosity of this isocyanate yields a coating with a #4 Ford cup viscosity of 24 sec. This is four

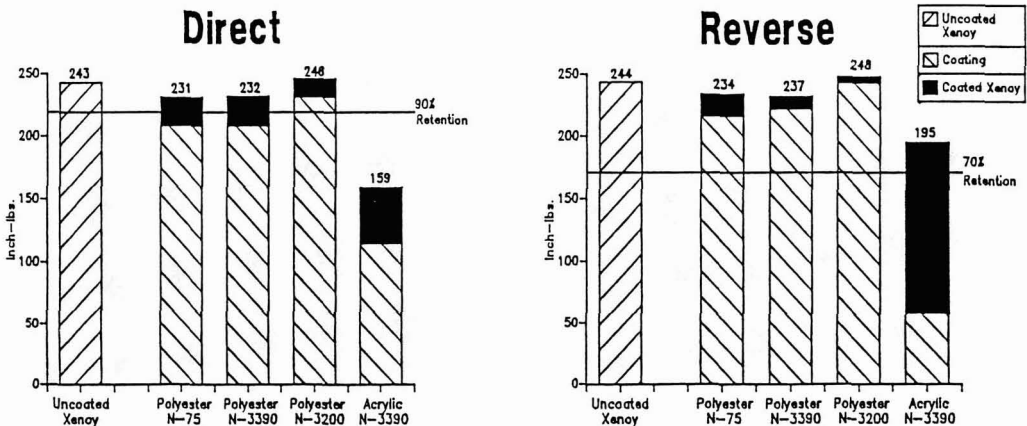


Figure 4—Room temperature (23°C) impact resistance on Xenoy

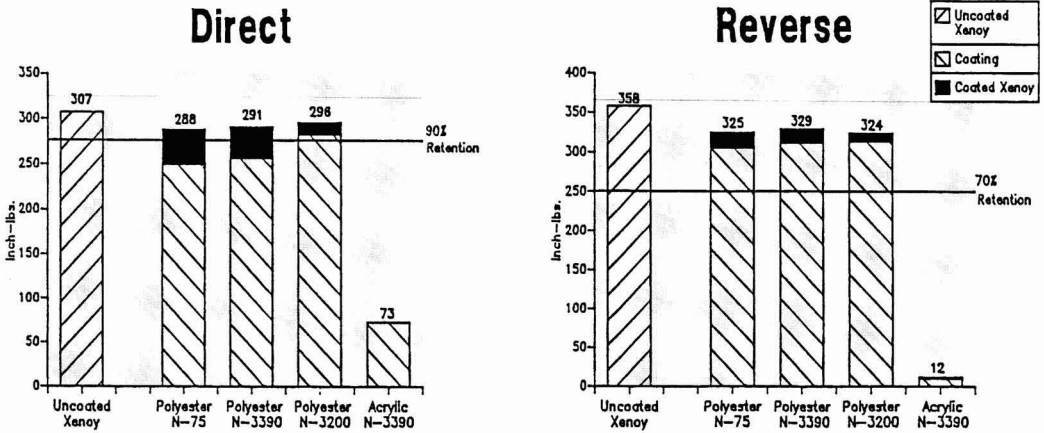


Figure 5—Low temperature (-29°C) impact resistance on Xenoy

seconds lower than that of Formula A, at the same solids level. Similarly, Formula C is prepared with Desmodur N-3200, a low viscosity biuret of HDI. The Formula C coating has a #4 Ford cup viscosity of 22 sec at 65.85% solids. Therefore, these new polyisocyanates enable one to formulate coatings to higher solids, and therefore lower VOC levels, while still maintaining sprayable viscosities.

The acrylic urethane (Formula D) is formulated with Desmodur N-3390. To achieve a spray viscosity comparable to the polyester urethane it was necessary to limit the solids level of the acrylic coating to 54.0%.

It is interesting to note that each of the polyester urethanes has a VOC level in the range of 3.05 to 3.15 lb/gal. However, at a similar viscosity, the "high solids" acrylic urethane has a VOC of 3.99 lb/gal.

The pot lives of these urethane coating are less than one hour, therefore application must be completed soon after the two components are mixed, and then all equipment must be thoroughly cleaned. Plural component spray equipment is commonly used for industrial application. The coating is cured for 45 min at 80°C and then aged for seven days prior to physical testing.

The physical properties of the coatings were evaluated on a variety of thermoplastic substrates: General Electric Xenoy (Grade DX 1102), a polycarbonate/polybutylene terephthalate alloy; Borg Warner Cycolac ABS (Grade L-1000); General Electric Lomod (Grade 910); a polyetherester elastomer;

and Republic Plastics Thermoplastic Olefin (Grade ETA 3055). Xenoy is a high impact engineering thermoplastic designed for exterior automotive parts, such as bumpers and fenders. ABS is a commodity plastic that could be used in a variety of automotive, business machine, and general industrial applications. Lomod and thermoplastic olefin (TPO) are elastomeric plastics suitable for automotive fascias and bumper covers. An adhesion promoting primer (Seibert Oxidermo AP 0003) must be applied to the TPO prior to the application of the topcoat.

Table 5 presents the results of several physical tests. All testing, other than cure (as evidenced by double MEK rubs), was performed after panels were stored at 25°C/50% R.H. for seven days. All four coatings demonstrated excellent adhesion to each of the substrates. In general, the cure test for each system was good. However, there was some softening of Formula B on ABS and Formula C on ABS and TPO. In these cases, it is likely that the MEK had penetrated the coating film and, subsequently, attacked the solvent sensitive ABS substrate or, in the case of TPO, the adhesion promoting primer. Initial gloss is approximately 90% in all cases. Each coating maintains adhesion and original gloss after 240 hr water immersion at 43°C. However, all the coatings on TPO exhibited fine blisters by the tenth day of the test. Exposure to 0.1 N hydrochloric acid, by placing a drop of solution on the coated panels for two hours, had no effect on either the polyester or the acrylic coating systems.

The gasoline resistance test was conducted as outlined in the Ford Motor Company Engineering Material Specification ESB-M16J6-A ("Exterior Impact Resistant Coating for Thermoplastics"). A 50 mL buret was adjusted to drip gasoline at a rate of one drop every three seconds from a distance of 300 mm onto a painted Xenoy panel, which had been placed at a 60° angle. Again, in all cases, the gasoline had no effect on either the polyester or acrylic coatings.

Coated TPO panels were used to evaluate cold flexibility. The panels were placed in a -29°C freezer for a minimum of four hours. The frozen panels were then bent over a one-half-inch mandrel and the coating was inspected for cracks. Polyester formulas A and B passed while C was marginal.

Table 4—Two-Component Urethane Coating Properties

	A Polyester	B Polyester	C Polyester	D Acrylic
Actual NVM, weight %	65.39	65.04	65.85	54.00
Viscosity, #4 Ford (sec)	28	24	22	24
Wet density, lb/gal	8.89	8.96	8.99	8.67
Theoretical VOC, lb/gal	3.08	3.13	3.07	3.99
gm/l	369	375	368	479

Table 5—Physical Properties

	A Polyester N-75	B Polyester N-3390	C Polyester N-3200	D Acrylic N-3390		A Polyester N-75	B Polyester N-3390	C Polyester N-3200	D Acrylic N-3390
Film thickness (mils)	1-1.2	1-1.2	1-1.2	1.2	Softening	No	No	No	No
Crosshatch adhesion (%)					Comments	No change in appearance			
Xenoy	100	100	100	100	ABS				
ABS	100	100	100	100	Discoloration	No	No	No	No
Lomod	100	100	100	100	Softening	No	No	No	No
TPO	100	100	100	100	Comments	No change in appearance			
Cure—Double MEK rubs					TPO				
Xenoy	100	100	100	100	Discoloration	No	No	No	No
ABS	100	85	69	100	Softening	No	No	No	No
Lomod	100	100	100	100	Comments	No change in appearance			
TPO	100	100	80	100					
Gloss (%)					Gasoline Resistance				
Xenoy	91.7	91.4	92.0	92.0	Xenoy				
ABS	91.7	91.2	91.0	88.2	Discoloration	No	No	No	No
Lomod	92.3	92.0	91.5	92.3	Loss in gloss	No	No	No	No
TPO	91.3	92.1	91.7	92.1	Softening	No	No	No	No
					Pencil, no cut	F-H	F-H	2H	F
					Adhesion, (%)	100	100	100	100
					Cold Flexibility (-29°C)				
					(one-half-inch mandrel)				
					TPO	Pass	Pass	Marginal	Fail
					Stain Resistance				
					(24 hr exposure)				
					ABS				
					Mustard	2*	2	2	7
					Catsup	8	9	9	10
					Iodine	3	2	3	1
					Ink	10	10	10	10
					Lipstick	9	10	8	10
					Coffee	8	9	7	10
					Cola	10	10	10	10
					Bleach	10	10	10	10
					Liquid detergent	10	10	10	10
					Black felt pen	4	7	4	10
					Water Immersion				
					(240 hr, 43°C)				
					Adhesion (%)				
					Xenoy	100	100	100	100
					ABS	100	100	100	100
					Lomod	100	100	100	100
					TPO	100	100	100	100
					Gloss (% change)				
					Xenoy	-0.55	-1.20	-0.03	-2.56
					ABS	-1.31	-1.64	0.00	-2.44
					Lomod	0.00	-0.43	0.00	0.00
					TPO	-0.83	-1.74	-1.23	-2.92
					Blister rating (ASTM D 714-56)				
					Xenoy	none	none	none	none
					ABS	none	none	none	none
					Lomod	none	none	none	none
					TPO	8-9 D	8-9 D	8-9 D	8-9 D
					Acid Spot Resistance				
					(2 hr, 0.1 N HCl)				
					Xenoy				
					Discoloration	No	No	No	No

(a) Rating system: no change—10; very slight—9; slight—8; moderate—6; considerable—4; severe—2; extreme—0.

The acrylic formula failed the cold flexibility test over both one-half-inch and one-inch mandrels.

For the stain resistance test a drop of each stain was placed on coated ABS panels and covered with a watch glass for a 24 hr period. The polyester coatings demonstrated good resistance to catsup, ink, lipstick, coffee, cola, bleach, and detergent. The acrylic coating has good resistance to all of the stains except for iodine.

Sward and pencil hardness data are presented in *Figure 1*. It is apparent that the measured coating hardness is actually a function of the underlying substrate. Accordingly, the same coating exhibits a greater Sward hardness number on Xenoy than on Lomod. In addition, the pencil hardness test is

somewhat subjective and the data may be inconsistent. Therefore, Sward hardness data for coatings on Xenoy are used for the sake of comparison. Each of the polyester coatings has a Sward hardness in the range of 45 to 55. The acrylic coating has a Sward hardness of 91, which is approximately 80% greater than the polyester counterpart (Formula B).

Ford Motor Company Engineering Material Specification ESB-M2J121-B ("Exterior Elastomeric Enamels") requires that the coating have a minimum elongation of 60%. Dies of coated panels are elongated in an instron at a rate of 50 mm/min at 23 +/- 2°C until the first crack occurs in the paint film. The polyester coatings easily meet this requirement (*Figure 2*). Coating elongation of the TPO substrate ranges from

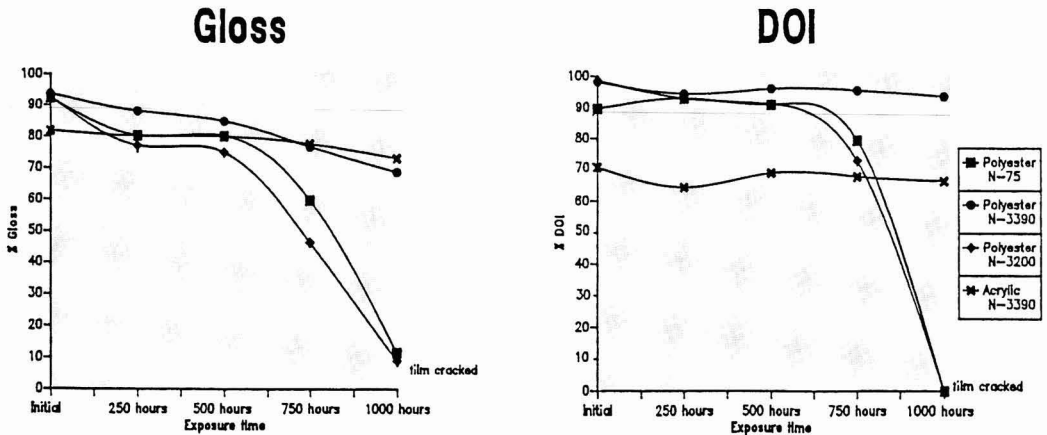


Figure 6—Accelerated (QUV) weathering exposure data

79% for Formula B to 96.6% for Formula C. The acrylic coating, however, only achieves 20% elongation.

Taber abrasion was performed on coated ABS panels using 500 g weights and CS-10 abrading wheels. Ford Specification ESB-M16J6-A requires a minimum of 1000 cycles per mil of coating to wear through. All three of the polyester coatings demonstrated excellent abrasion resistance, with results ranging from approximately 1700 to 1900 cycles per mil. Formulas A and C, the two polyester urethanes based on the biurets of HDI, exhibit the best abrasion resistance (Figure 3). The acrylic coating achieves an abrasion resistance of only 1100 cycles per mil. Data on weight loss after 500 and 1000 cycles is also included.

Engineering thermoplastics used for bumpers and fenders have outstanding impact strength and it is necessary that the applied coating not have a detrimental effect on this property. Room temperature (23°C) and low temperature (-29°C) impact resistance of the four coatings on Xenoy is

presented in Figures 4 and 5, respectively. A Gardner falling dart impact device was used to generate the data. For reference, the direct and reverse impact strengths of uncoated Xenoy are listed for each temperature. Each bar shows the results for coating failure and, more importantly, for failure of the coated substrate. Coating failure is defined to be the first evidence of a crack in the coating, while substrate failure is the first evidence of a crack in the underlying coated Xenoy panel. Coating failure precedes failure of the coated substrate. Impact retention is defined to be coated Xenoy impact strength divided by the impact strength of the uncoated Xenoy control. Ford Specification ESB-M16J6-A requires 90% direct and 70% reverse impact retention. Typically, impact retention is influenced by two characteristics of the coating. The first is coating flexibility. If the coating is considerably less flexible than the plastic then, upon impact, the coating will tend to crack before the plastic. This crack in the coating may then propagate into the plastic and result in "premature"

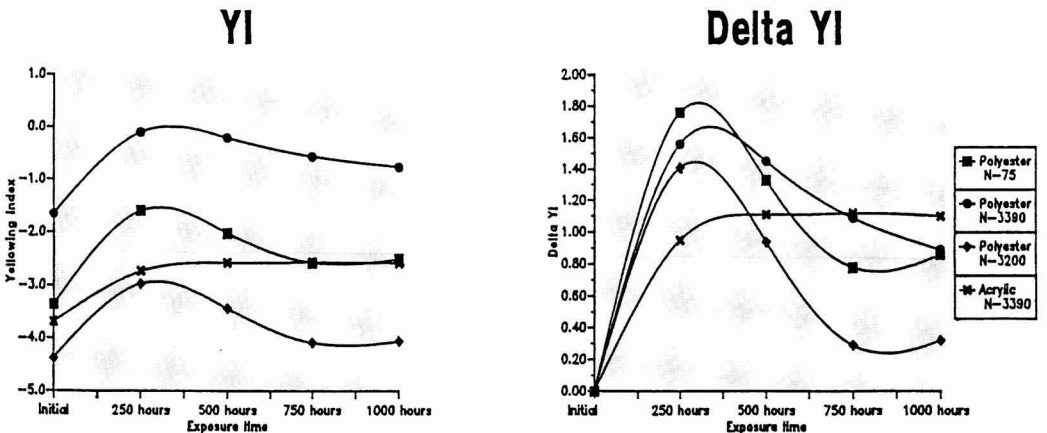


Figure 7—Accelerated (QUV) weathering exposure data

part failure. Second, aggressive solvent systems may attack the plastic and thereby lower retention.

The room temperature (23°C) data (direct and reverse) indicate that panels coated with any of the three polyester urethanes retain greater than 95% of the uncoated Xenoy impact strength. However, panels coated with the acrylic urethane, retain only 65% (direct) and 80% (reverse) of the uncoated impact strength. Similarly, at -29°C (direct and reverse), panels coated with the three polyester urethanes retain greater than 90% of the uncoated Xenoy impact strength. The acrylic urethane coated panels retain only 24% (direct) and 3.4% (reverse) of the uncoated Xenoy impact strength.

Accelerated (QUV) weathering data is presented in Figures 6 and 7. White urethane coatings (pigment to binder ratio of 0.9 to 1) were applied to Xenoy panels for the evaluation. Gloss, distinctness of image (DOI), and yellowing index (YI) were measured throughout the 1000 hr exposure time. An exposure cycle consists of four hours of UV light at 60°C followed by four hours of condensation at 40°C. Standard UVB-313 bulbs were chosen as the light source for the testing. The polyester and acrylic urethanes based on the trimer of hexamethylene diisocyanate (N-3390) exhibited good gloss and DOI retention over the 1000 hr exposure time. The polyester urethanes based on the biurets of HDI (N-75 and N-3200) weathered poorly and the films cracked after 1000 hr QUV exposure. The polyester urethanes yellowed to a greater extent over the first 250 hr of exposure, however, after 1000 hr, the polyesters actually yellowed less than the acrylic urethane.

CONCLUSION

The isopolyester urethane coatings described in this paper demonstrate superior properties, when compared to a commercially available high-solids acrylic, as coatings for plastics. These coatings offer the balance of flexibility and hardness that coatings for plastics require. The polyester urethanes meet or exceed automotive specifications for adhesion, gloss, moisture resistance, acid resistance, gasoline resistance, hardness, cold flexibility, elongation, taber abrasion, and impact resistance.

The commercial acrylic resin discussed in this study is designed to make low VOC acrylic urethane coatings. However, when compared at the same viscosities, the polyester urethane has a theoretical VOC of approximately 3.1

lb/gal as opposed to 4.0 for the "high-solids" acrylic urethane. In addition, the cold flexibility, abrasion resistance, elongation, and impact resistance of the polyesters far exceed that of the acrylic. The weatherability of the two coatings is comparable. The acrylic excels only in hardness, although the polyester urethane is sufficiently hard for most applications.

Analysis of the accelerated weathering data indicates that the judicious choice of polyisocyanate is essential to achieving acceptable performance in the final paint films. Of the three polyisocyanates tested, the trimer of hexamethylene diisocyanate exhibited the best performance.

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Survey of Accelerated Test Methods For Anti-Corrosive Coating Performance

Bernard R. Appleman
Steel Structures Painting Council*

Findings are presented on the latest advances in procedures for short-term evaluation of coatings. Specific methods are described for inducing degradation by natural exposures, standard and cyclic accelerated tests, and accelerated outdoor tests. The paper also reviews techniques for evaluating degradation, including analytical methods for assessing microscopic damage, and new techniques for assessing macroscopic damage. Also, survey findings are presented on the current practice of accelerated testing by paint users, manufacturers, and raw materials suppliers. Items include types of tests most commonly used, major uses of accelerated tests, which tests are most heavily relied upon, and the use of statistics. Several recommendations are given for improving the technology and the practice.

The protective coatings industry is facing a challenging period of tremendous change. Environmental pressures for the reformulation of traditional protective coatings (with a proven track record of performance) towards lower VOC and away from environmentally unacceptable "toxic" materials have greatly intensified. These pressures have forced the industry into a major effort to develop and evaluate acceptable replacement materials.

The replacement of these unacceptable materials has increased the importance for the short-term evaluation and prediction of long-term coating performance. The need for reliable accelerated testing procedures is not new; it's a problem that has been with our industry for years. However, even though the need is well recognized, it is not being adequately addressed.

In the effort to fill its mandated leadership role in the corrosion area, the Corrosion Committee of the Federation of Societies for Coatings Technology (FSCT) established a project entitled "Survey of Accelerated Test Methods for Anti-Corrosive Coating Performance." Several goals that the Corrosion Committee wanted to achieve with this survey were:

- *Presentation of the initial survey results at the 1987 Annual Meeting in Dallas, TX.*

- *Preparation of this article for the JOURNAL OF COATINGS TECHNOLOGY.*

- *Publication of the final survey report available for distribution to the industry through the FSCT.*

The Corrosion Committee intends to use the information generated from this report to develop a mechanism for new technology development in the area of accelerated corrosion testing.

—JAY AUSTIN, Chairman
FSCT Corrosion Committee

INTRODUCTION

The protective coatings industry, although widely referred to as a "mature" industry, is under enormous pressure for change. Because of environmental, health, and economic factors, there is a continuing and ever-pressing need for new and more durable coating materials. Recently, the need to shift to coatings with reduced levels of volatile organic compounds has become greatly intensified because of the Environmental Protection Agency (EPA) requirement to reduce ozone levels. This subject has been widely discussed in the literature and does not require further elaboration. The combined efforts of the paint manufacturers, resin and other raw materials suppliers, and government and other owner facilities, as well as the regulators, are in the hundreds of millions of dollars.

New materials are also being sought for other "endangered chemical species," such as certain glycol ethers, low molecular weight isocyanates, and lead and chromate corrosion-inhibiting pigments. Again, in these areas there have been major research and development efforts to develop, formulate, and evaluate replacement materials.

Replacing these conventional materials is challenging enough, but in addition, there is the requirement of improved performance over conventional materials. Coating users are demanding, and manufacturers are promising, improvements such as increased durability, greater ease of application, and greater tolerance for lower-quality surface preparation.

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A vital element in the programs to develop replacement products is the need to evaluate coating performance. Coatings designed to replace long-lived corrosion protection coatings must be evaluated in a relatively short period of time. Users want to be assured that the new products will provide the same type of durability, corrosion protection, and appearance that the solvent-based and lead and chromate type systems provided. There is an urgent need for reliable testing procedures that can assess the long-term performance of corrosion protective coatings.

The need for reliable short-term or accelerated testing procedures is not new; on the contrary, this question has been raised and discussed at meetings and in the literature repeatedly for decades. However, the pressures to identify and evaluate new coatings systems have perhaps never been greater than today.

FSCT Corrosion Committee Survey

The Corrosion Committee of the Federation of Societies for Coatings Technology (FSCT) recognized this need and established a project entitled "Survey of Accelerated Test Methods for Anti-Corrosive Coating Performance." A contract was awarded to Steel Structures Painting Council (SSPC) in late 1986 with the following objective: to review and evaluate standard and newly developed test methods, apparatus, and approaches for accelerated testing and predicting of field performance of anticorrosive coatings.

This article is a condensation of several major sections of the report, which is available from FSCT.¹

Defining Short-Term Test Procedures

One of the first steps is to determine just what is meant by a "short-term test procedure." The phrase "short-term" indicates that the time to complete the test procedure is substantially less than the time for the coating system to fail in service. For the purposes of this study, it was assumed that corrosion protective coatings are expected to have a useful service life of 5 to 20 years. It was further assumed that a "shortened" time frame would be approximately one magnitude less than the "real" time, thus a procedure was considered short-term if it provided results within about 6 to 12 months. Of course, there are many techniques that can provide information in a much shorter period of time, and these also were evaluated in this program.

Short-term test procedures consist of four basic components: preparing specimens, inducing degradation, evaluating degradation, and analyzing data.

PREPARE SPECIMENS: In any experiment, it is necessary to prepare specimens using good experimental design, and with careful laboratory techniques and proper monitoring and recording. This step includes items such as insuring uniform surface preparation, representative samples of the coatings, proper application, uniform and accurate film thickness, proper conditioning, and an adequate number of specimens. This portion of the testing will not be addressed further in this article.

INDUCE DEGRADATION: The second element is to expose the specimens in an environment in which they will be

stressed and degraded. Usually the objective is to cause coatings to undergo short-term degradation which is comparable to the degradation that occurs under actual or service conditions. This subject will be the major focus of this article.

EVALUATE DEGRADATION: After exposing the coating to conditions that cause degradation, it is necessary to monitor or measure the extent of degradation. This article reviews methods for assessing microscopic damage and macroscopic degradation.

ANALYZE DATA: The final step is to assess and analyze the data collected. The goal is to estimate or predict the long-term performance of the protective coating system. A review of these methods and their applications to coatings is given in the full report.¹

METHODS OF INDUCING DEGRADATION OF COATING SYSTEMS

Degradation is defined as "any detectable reduction in the chemical or physical properties of a fully cured coating." Coatings are complex physical-chemical composites, consisting of various components and phases; they are dynamic reactive systems with many inherent weaknesses.

There are many internal stresses acting on a coating to dislodge it from the surface or to cause internal cracks, voids, or separations. To these stresses are added various external stresses produced by the interaction with the environment and substrate. In this section, the discussions will be about the external stresses, which are those over which the experimenter has the greatest degree of control.

Exposures can be classified into the following categories: artificial accelerated, natural atmospheric (unaccelerated), and accelerated natural.

A nonartificial (i.e., "natural") exposure is one which occurs either in nature (e.g., outdoor locations such as test fence) or in service (e.g., interior or exterior of process vessel). An "accelerated" exposure is one in which the stress factors are higher than would occur under normal service conditions. Most laboratory test chambers are artificial accelerated tests (e.g., salt spray), whereas the real-time, or service tests (e.g., Florida test station), are unaccelerated natural exposures. Accelerated natural tests are those in which an extra stress (e.g., water spray or concentrated sunlight) is placed on a coating exposed in natural (i.e., atmospheric) conditions.

Artificial Accelerated Exposures

The type that has received the most attention and also the most criticism is artificial accelerated exposures. The basic idea is to simulate or reproduce the stresses or conditions of real-world exposure but at a more intense level. It is clear that laboratories cannot produce all the stresses inherent in an outdoor environment. It then becomes necessary to identify the most significant stresses.

Artificial accelerated exposures can be classified based on the types of stress and the manner in which they are imposed. One of the most important distinctions among exposure tests is whether they are constant stress or cyclic stress.

CONSTANT STRESS TESTS: In "constant stress" chambers, a stress (or a combination of stresses) is applied monotonically for an extended period of time. Examples of such tests are salt spray, temperature/humidity, condensing humidity, and immersion cabinets.

A temperature/humidity cabinet is an example of a constant stress chamber, which can provide variations of a standard atmosphere. A standard "unpolluted" atmosphere consists of atmospheric gases: nitrogen, oxygen, carbon dioxide, and water vapor. Of these, only oxygen and water vapor are expected to influence the performance of coated metals. In the natural environment, the oxygen concentration is relatively constant, but the concentration of water vapor (i.e., relative humidity) varies considerably with location, time of day, and season.

The effect of the water vapor concentration can be studied by varying the relative humidity at a given temperature. It is also of interest to observe the coating's performance at various temperatures under constant humidity. Martin and McKnight² studied the reactions of acrylic and alkyd coatings exposed to a humidity chamber at constant relative humidity (at several temperatures). By excluding other stresses, the researchers were able to show an Arrhenius plot of degree of degradation vs inverse temperature, and estimate activation energies. In another major investigation using a constant single stress test, the SSPC has immersed epoxy panels in pure (deionized) water at varying temperatures.³

Most constant stress chambers, however, use multiple stresses in order to degrade the coating. Immersion in salt water, for example, exposes the coating to the actions of both water and salt. Similarly, the salt spray test (i.e., ASTM B-117) subjects the coating to a mist of salt particles and water.

In addition, many of these tests are run at elevated temperatures. Temperature is one of the most crucial variables in any type of artificial exposure. The temperature normally increases the rate of most chemical processes, including corrosion and film degradation reactions.

The temperature has a major effect on the rheology of the cured coating. Most coatings are formulated to maintain an integral film over a range of temperatures; however, if that range is exceeded, a coating could undergo reactions or transformations that would not occur under natural conditions. An important concept here is the glass transition temperature (T_g), the ramifications of which have been thoroughly described by Hill.⁴

A major criticism of tests, such as the salt spray, is that they do not allow relaxation of the stress, such as a drying-out period. Because the level of stress normally changes periodically under "natural" conditions, constant stress chambers may produce degradation that is not observed in nature.

CYCLIC TESTS: Cyclic accelerated tests provide a regular variation of stress. In some cases, the coating is simply removed from the stress (e.g., removing a coated panel from an immersion bath for a few hours). The Kesternich test is another such example.⁵ The specimen is exposed to a combination of water vapor and sulfur dioxide for eight hours, followed by 16 hours in which the chamber is open to the ambient laboratory environment.

Some cyclic tests provide alternating stresses rather than merely relaxing a stress. The most common example of this

is the light exposure with water apparatus, or "weather chamber." The cycle here is a xenon or carbon-arc lamp (to simulate the sunlight spectrum) followed by a water spray (to simulate rain).⁶

Recently, many researchers and equipment manufacturers have come to believe that improvements in accelerated testing lie in developing better and more representative cyclic tests. This development of new testing procedures has proceeded along two distinct directions. One group has emphasized development of cyclic variations of salt spray and other tests designed to simulate corrosive environments; the other trend has focused on the modification and refinement of accelerated weathering devices where the concern is for appearance properties (primarily gloss).

The most widely used accelerated test for corrosion testing is the salt spray test. This is true in spite of the vast amount of unfavorable comments that have been heaped on this test for many years.⁷⁻⁹ A number of researchers have attempted to reduce the disadvantages of the salt spray by using it in conjunction with other accelerated tests, thus the highway agencies and automobile manufacturers have developed their own specialized cyclic corrosion tests.^{10,11} In these tests, the specimens are rotated among two or three separate chambers. In this manner, the coatings receive a relaxation period for each of the stresses, as well as receiving a variety of stresses. Most of these laboratories are convinced that these cyclic tests provide a more realistic simulation of the field exposures for bridges, automobiles or other structures. Several of these cycles have recently been reviewed.^{11,12}

A more sophisticated approach toward cyclic corrosion testing is the development and use of specialized test chambers which automatically produce the desired cycle. An early example is the "Prohesion" cabinet developed by Timmins of British Rail.¹³ It is now commercially sold in the U.K. and the manufacturer and several users have claimed its superiority over conventional salt spray. In particular, Skery has presented data suggesting that the crystal structure and appearance of corrosion products produced in outdoor exposures is much more closely simulated by the Prohesion cabinet than by salt spray.¹⁴ Other manufacturers have also designed cabinets with capabilities for introducing cycles of salt spray, water (fog) spray, and gases such as sulfur dioxide.

Natural Atmospheric Exposure Testing

The vast majority of industrial maintenance coatings are exposed under atmospheric conditions. "Real-time" atmospheric exposures are considered the most reliable by researchers in the industry, as the coating is tested in the type of environment in which it will ultimately be exposed; there are no "artificial" conditions imposed on the coated substrate. The coating is exposed simultaneously to all the potential stress factors, for example, sunlight (ultraviolet radiation), rain, dew, atmospheric pollutants (acid rain, ozone), and temperature and humidity fluctuations. There are, however, some major drawbacks to the use of outdoor exposure tests, some of which are quite obvious. These include the following: variability of "natural" environment; large number of stresses; lack of controls; and slow degradation.

VARIABILITY OF ENVIRONMENT: Atmospheric exposures are inherently variable. First of all, there are enormous variations among different parts of the country (i.e., Florida vs California vs the Northeast). A long-term average of temperature or solar radiation or relative humidity would show enormous differences among these locations. Even within a smaller geographical area, the proximity of industry or local variations in weather patterns also would result in significant differences in the exposure environment. Furthermore, studies have shown that significant fluctuations will occur even at a single test site from year to year or season to season.^{15,16} This complicates the efforts to establish correlations between accelerated tests and exposures in south Florida, which has been accepted as the industry standard "natural site."

MULTIPLE STRESSES: Because of the large number of stresses that are acting upon a coating in the atmospheric environment, it is extremely difficult to isolate the effects of specific stresses. Thus, if a coating fails, it is difficult to determine what the most important factor was (i.e., sunlight, condensation, thermal cycling, or a combination of these factors).

LACK OF CONTROLS: This factor relates directly to the variability of the exposure. For a test to be most useful, it should provide reproducible results with replicate specimens. As noted previously, two identical panels exposed at the same location at different years or months will not be exposed to the same environment, and hence not give necessarily a comparable performance.¹⁶ For planning of a test program, a researcher needs to know that a standard coating will degrade in (for example) six months, so that a candidate can be judged on its ability to last for a comparable period. This type of consistency in performance is difficult to achieve using outdoor exposure testing.

SLOW DEGRADATION: Finally, and perhaps most significantly, the outdoor degradation of most protective coating systems is extremely slow. With today's technology, it is not uncommon for coating systems to last 10 to 20 years, even in aggressive environments. Waiting even five years is not a very practical approach to developing new products for the industry.

In some situations where conventional coatings only last two or three years, outdoor exposure testing in these same environments has proven beneficial. This approach may also apply for coatings applied over poorly prepared surfaces or under other adverse conditions with consequent expected lifetime of only a few years.

For the majority of applications, outdoor degradations are too slow for screening new products. A number of researchers have attempted to speed up the natural process by increasing the intensity of certain stress factors, while retaining the multiple stresses imposed by nature.

Accelerated Natural Exposures

Some examples of these accelerated natural exposures are as follows: water or solution spray; concentrated sunlight; concentrated heat (black body temperature); periodic immersion; and specialty treatments.

OUTDOOR WATER OR SOLUTION SPRAY: Several agencies have established tests with periodic spraying of salt, water,

or acidified water onto specimens exposed in outdoor panel racks. This treatment is designed to accelerate the degradation induced by a combination of salt, acid, and moisture, which are extremely corrosive to exposed steel, and also can attack the coating itself. Spray frequency ranges from once a week¹⁷ to several times per day.¹⁸ The spraying may be automated or manual. Acceleration factors of up to tenfold have been attributed to this type of testing, but little confirmed data have been presented.^{18,19}

CONCENTRATED SUNLIGHT: This is a technique in which specialized mirrors (Fresnel reflectors) are used to reflect sunlight to the location where the panel is exposed. The mirrors are rotated to follow the sun, so that the maximum amount of UV radiation is received.^{19,21} This technique was commercialized by a testing laboratory based in Arizona. A similar unit has recently been developed by a Florida testing firm. A variation of the test uses periodic water spray to simulate the effect of rain.

BLACK-BODY RADIATION: In this technique, racks are constructed with heat-absorbing material so that the panels will be heated to above the ambient temperature.²⁰ The increased temperature will presumably increase the rate of any polymeric degradation or corrosion reactions because of the temperature dependence of most chemical processes. In this test, the panels do not receive increased levels of UV radiation. This test has been widely used by the automotive industry, which has developed several standard test methods.

SPECIALIZED TECHNIQUES: An example of a specialized technique is periodic immersion. A testing agency in Florida has developed a device which periodically cascades test panels with seawater. This is similar to the outdoor salt spray previously described, except that the panels are subjected to a surge of water which immerses them for a short period and has some erosive or washing force.

METHODS TO EVALUATE DEGRADATION

Coatings placed in natural or artificial environments will be acted upon by various stresses in these environments. These include factors such as UV light, moisture from condensation or rain, thermal expansion/contraction, and effects of impurities, inhomogeneities, or incompatibilities in the film itself. Thus, coatings placed in various environments will become damaged.

Both macroscopic and microscopic damage can be assessed in experiments to obtain performance data in a shortened time frame.²²

Analytical Techniques for Characterizing Coating Performance (Microscopic Damage)

Several analytical techniques have been developed which can be applied to the study of coating performance, and in some instances provide early indications of the onset of coating failure. In the full report¹, these techniques shall be divided into the following categories: Electrical and Electrochemical Techniques; Chemical Analysis by Spectroscopy; Physical Techniques; and Mechanical Properties. This article reviews several of the most noteworthy techniques.

ELECTROCHEMICAL IMPEDANCE SPECTROSCOPY (EIS): EIS is the most widely employed AC electrochemical technique. EIS is the term used for the study of changes in the faradaic resistance of a paint material. This technique is particularly well suited to the study of resistance inhibition coatings. As the faradaic resistance of a paint film is inversely proportional to the rate of any electrochemical reaction occurring under or within said paint film, it can give a measure of the corrosion rate under a paint film, often well before visual observation of corrosion is possible. Not only can the technique do this, but also it provides a quantitative measure of the rate of corrosion. As early and accurate information pertaining to the onset of corrosion under a paint film is made available, one can design experiments permitting evaluation of a coating's protective function under a series of conditions. This can, in turn, allow more rapid determination of both the factors affecting a coating's performance, and hence more rapid turnaround in designing effective coating systems. Scully gives a fuller description of the advantages and disadvantages of electrochemical impedance spectroscopy.²³ Other electrochemical methods available are DC resistance, dielectric properties, and cathodic disbondment.

INFRARED SPECTROSCOPY: There are several related techniques which are included under this heading. All share the strength of infrared (IR) spectroscopy: the ability to fingerprint, and hence identify specific compounds. Due to the rapidity of data acquisition, time dependent changes in the chemistry of coatings can be readily followed. Recent developments involving Fourier transform (FT) infrared spectrometers and dispersive infrared techniques have made IR spectroscopy more amenable to the study of applied coating films. Other related techniques having similar utility include diffuse reflectance IR, reflection absorption IR, total attenuated reflection IR, photoacoustic IR, or emission IR spectroscopy. In addition, traditional transmission IR spectroscopy can be employed to study transparent films and solutions, while solid samples capable of being ground to a fine powder may be examined by suspension in compressed KCl or NaCl as a pellet.

Added advantages of IR spectroscopy, particularly when FT techniques and computer hardware are available, include smaller sample requirements and the ability to monitor changes in the composition of the coating by subtraction of the spectrum of the original state of the coating film.

NUCLEAR MAGNETIC RESONANCE (NMR): NMR is a tool which can detect subtle differences in chemical environments of organic species. The technique is based on precise measurements of absorption of radio frequency energy of solutions or solids placed in a powerful magnetic field. NMR spectroscopy has been used extensively as a quality control technique for coating products, additives and solvents. Recent advances in sample preparation could permit certain coating materials to be studied as "free film" type solid samples. Traditional NMR spectroscopy can certainly be employed as a destructive technique, requiring very little sample, for the study of changes in the chemistry of the polymeric binder of aged or deteriorating coatings, following separation of the pigmentation. The kinetics and processes of resin cure can also be followed.^{24, 25}

ELECTRON SPIN RESONANCE SPECTROSCOPY (ESR): ESR or electron paramagnetic resonance spectroscopy provides information on the structure and concentration of free radicals formed in polymers as a result of degradation. Like NMR, it is based upon the separation of otherwise degenerated energy levels (spin states) by an applied external magnetic field. In the case of ESR these are electron spin states. ESR can determine the presence of low concentration of radicals. A principal disadvantage is that ESR measurements must be made at low temperatures and the resultant spectra are often very difficult to interpret. ESR has been used to follow radical processes in the UV irradiation and photodegradation of coatings. It may also be employed to study the curing of polymers, especially those employing free radical curative agents.²⁶

X-RAY PHOTOELECTRON SPECTROSCOPY (XPS): XPS, also known as electron spectroscopy for chemical analysis, depends on the measurement of binding energies of electrons from molecules close to the surface as a result of X-ray bombardment. Information can be obtained on the structure, chemical bonding, and elemental composition of the surface of a sample. Typical sampling depth is 2 nm, significantly less than the 5 μm depth achievable with infrared spectroscopy. The principal advantage is a near uniform response to all elements except hydrogen. Applications for XPS include investigation of chemical changes on polymers surfaces due to surface modification or weathering. Studies of degradation of coatings, corrosion of base metals, and deterioration of metals protected by coatings are also possible.²² Other related techniques for studying surfaces are Auger spectroscopy and secondary ion mass spectrometry (SIMS).

SCANNING ELECTRON MICROSCOPY (SEM): SEM is a form of microscopy which uses electrons rather than light to detect the contours and appearance of surfaces. It can achieve magnifications of several hundred to one thousand or more and gives greater depth of field than optical microscopy.²⁷ From an adaptation of SEM called X-ray emission spectroscopy (XES), qualitative chemical information can be obtained, identifying the presence of elements with an atomic number equal to or greater than sodium. Quantitative data is difficult to obtain, but one can obtain data permitting mapping of individual corrosion sites on a sample. SEM and its companion or adapted techniques have been employed to obtain useful information pertaining to the rheology, morphology, and chemical make-up of a surface film.

PHYSICAL TECHNIQUES: There are a number of techniques to examine physical properties of coating films. Free volume microprobe and related techniques provide information about changes in the intramolecular space (free volume) degree of swelling, which can be related to extensive crosslinking.²²

Infrared thermography should not be confused with infrared spectroscopy, but is a powerful technique for detecting nascent underfilm failure due to corrosion or blistering. The sample specimen is heated and the thermal emissions evaluated using a thermographic camera. Corrosion spots and blisters can be distinguished from nondeteriorated coating areas due to their different thermal conductivities and emissions. Similarly, air-filled blisters can often be distinguished from water-filled blisters. Sensitivity increases with tem-

Table 1—Survey Results—Corrosion Tests

	Salt Spray		Immersion		Humidity	
	Some Use	Frequent Use	Some Use	Frequent Use	Some Use	Frequent Use
Paint Users	74%	28%	66%	38%	31%	16%
Manufacturers ...	87%	76%	87%	63%	79%	50%
Suppliers	78%	67%	44%	44%	44%	33%
Overall	74%	52%	70%	49%	43%	31%

perature, but decreases with coating thickness. Highly conducting coatings such as inorganic zinc-rich primers may not yield good results for detection of corrosion spots. A major attraction of this method is the potential for detecting defects thermographically which are not visually detectable.²⁸

A related technique, thermal wave microscopy, is a laboratory method for detection of small corrosion spots under a coating. It accomplishes this by measuring the local thermal expansion of a surface induced by exposure to a focused modulated beam such as an electron beam or a laser.²²

MECHANICAL PROPERTY MEASUREMENT TECHNIQUES

CANTILEVER BEAM—Internal stresses can develop in paint coatings as a result of solvent evaporation causing the coating to shrink. The T_g increases above ambient temperature impeding the shrinking process, causing internal stress resulting in coating cracks, adhesion failure, etc. Cantilever beam measures the internal stresses by coating the paint film onto thin metal strips and measuring the resulting deflection of the substrate as the coating dries. The technique is suitable for both thermoset and thermoplastic coatings.²²

TORSIONAL BRAID ANALYSIS—Torsional braid analysis provides information concerning the mechanical properties of polymers and coatings—in particular accurate T_g . Differential Scanning Calorimetry (DSC) of highly crosslinked polymers (e.g., alkyds) does not yield accurate T_g (for example, DSC of alkyd yields T_g of fatty acid segments only). Dynamic mechanical analyses such as torsional braid provide the only accurate means of T_g of highly crosslinked coatings. Since T_g changes are associated with film aging, torsional braid provides considerable accelerated aging information at relatively low cost. Samples can be measured as free films or wet coatings, supported on a glass braid (torsional braid).²⁹

Early Detection of Degradation

In their comprehensive review of nonelectrical measurement techniques, McKnight, Martin, and Nguyen²² note that many of the analytical techniques have been used successfully to characterize the degradation of relatively pure polymeric materials. Because organic coatings are more complex than polymers, applications of these techniques (to coatings) have been more limited and less successful. Consequently, there is little data relating early property changes

to in-service performance. The authors concluded, "because of the complexity of the degradation of coating systems, a combination of methods will be needed to characterize early degradation to the extent that service life prediction of coating systems can be based on these measurements."

New Techniques for Assessing Macroscopic Damage

Conventional techniques for assessing macroscopic damage are primarily based on comparisons to a visual standard. One example is ASTM D610/SSPC VIS 2 for rust rating. This well-known standard consists of a series of diagrams with relatively uniformly spaced rust spots corresponding to various fractional areas of the surface (i.e., 0.3%, 0.1%, 0.3%, 1%, etc.). Each of these percentages is assigned a numerical grading starting from 10 (perfect) to 0 (complete failure).

Recently, there have been a number of new techniques developed for visual assessment. These techniques are intended to reduce the subjective nature of visual assessments and to make them more suitable for use on typical structures. The examples discussed are as follows: quantitative visual assessment by grid overlay; quantification of defects by computer image processing; diagrams on extent and distribution of corrosion; and photograph reference standards for structures.

QUANTITATIVE VISUAL ASSESSMENT BY GRID OVERLAY: One technique uses a transparent grid which is laid over the panel. A count is made of the number of boxes containing a defect (e.g., rust spot or blister). The individual grid elements are of 0.1 to 0.2 inches in width (2-1/2 to 5 mm). Thus, for a 3 x 5 in. area there would be approximately 500 squares. This technique provides a semiquantitative estimate of the portion of the panel or test area which is rusted or blistered. The technique has been used for evaluating degradation of coatings in various testing programs.^{30, 31} Direct comparisons between this technique and the conventional methods (ASTM D714 and D610/SSPC VIS 2) indicated clearly the improved accuracy with the grid overlay technique. Moreover, use of the grid forces the evaluator's eye to examine the entire panel more carefully and results in the detection of tiny defects which would be missed in a cursory visual examination.

QUANTIFYING DEFECTS BY COMPUTER IMAGE PROCESSING: Computer image processing of corrosion defects is an extension of the quantitative visual examination previously described. In this technique, an image is made of the surface to

Table 2—Survey Results—Weathering Tests

	Weather Chambers		UV/Condensation		Other Cyclic	
	Some Use	Frequent Use	Some Use	Frequent Use	Some Use	Frequent Use
Paint Users	47%	19%	25%	9%	9%	0
Manufacturers ...	53%	37%	71%	68%	21%	0
Suppliers	56%	44%	56%	44%	11%	0
Overall	44%	32%	46%	35%	13%	0

Table 3—Survey Results—Miscellaneous Tests

	Cathodic Disbondment		AC Impedance	Mechanical Testing	Thermal Analysis
	Frequent Use	Some Use*	Some Use*	Some Use*	Some Use*
Paint Users	13	25	0	25	13
Manufacturers	5	32	11	37	11
Suppliers	11	11	0	22	33
Overall	10	27	5	28	12

* Occasional use only. No respondents reported frequent usage of any of these tests.

be analyzed. This can be from a photograph, a video camera still, or from direct projection onto a surface to be rated. The image is digitized into gray levels ranging from white to black in approximately 100 increments. The operator then selects a gray level which represents the lightest shade depicting corrosion (assuming corrosion shows up darker than uncorroded areas). The computer then computes the percentage of the surface which is corroded (or otherwise degraded) based on the percentage of the area which is as dark or darker than the selected gray level.³² Early results showed that this technique could successfully be used in laboratory studies of corrosion and blistering occurring in salt fog tests. More recently, researchers have used the computer imaging to evaluate photographs of portions of structures in various stages of degradation.

EXTENT AND DISTRIBUTION DIAGRAMS: The standard method for evaluating rust (ASTM D610/SSPC VIS 2) has been criticized because it depicts a uniform distribution of rust. Consequently, several attempts have been made to develop diagrams which take into account the nonuniformity of degradation. One of the more successful efforts was initially developed by a marine paint company for evaluating ship-board coatings. In this technique (which has been issued as ASTM F1130) there are two sets of diagrams. The overall extent diagrams depict the total portion of the area which is affected by the corrosion (or defect). A second set of diagrams depicts the "extent within the affected areas." These diagrams have been used successfully for evaluating the condition of ship hulls and other components and are now being evaluated by other government agencies for use on buildings and industrial structures.

PHOTOGRAPHIC REFERENCE STANDARDS OF STRUCTURAL COMPONENTS: Structures such as highway bridges are not readily evaluated by simple percentage corrosion diagrams, because of the complexity of the structural shapes. Virginia DOT has recently developed an alternative procedure based on a new type of photographic standards.³³

INDUSTRY PRACTICE IN ACCELERATED TESTING

In addition to examining advances in the technology of accelerated testing, the FSCT study also sought to determine the extent of usage of the more conventional test methods. A written questionnaire was sent to several hundred individu-

als who had expressed interest in coatings evaluation. Over 100 responses were received.

There were 12 different test methods, each of which was cited by at least three respondents. These can be divided into categories as follows: *Corrosion Testing Chambers*—salt spray cabinet, immersion, and humidity/condensation; *Additional Corrosion Tests*—cathodic disbondment, AC impedance, and sulfur dioxide and moisture; *Weathering Tests*—Weather-Ometer, UV radiation-condensation, and other cyclic tests; *Thermal and Mechanical Tests*—thermal expansion/contraction, mechanical testing, and thermal analysis.

Responses are presented in *Tables 1-3*, and subcategorized according to whether the respondent was from a user agency, a paint manufacturer, or a raw materials supplier. Overall, the salt spray and immersion are the most commonly used tests in the industry. Interestingly, among users, immersion testing has a higher incidence of frequent use than salt spray, with the latter used more by manufacturers. Humidity testing is used much more widely by manufacturers than by users of paints.

In the area of weathering, the weather chambers and the UV/condensation cabinets are about equal overall. However, users favor weather chambers by about a two to one margin, whereas manufacturers show greater use of the UV/condensation type. Manufacturers also show the highest incidence of using other cyclic weather tests.

The survey showed that cathodic disbondment is a relatively widely used test by both users and manufacturers, whereas AC impedance, which requires a greater capital investment and sophistication, is used almost exclusively by manufacturers. Mechanical testing also is widely used (28% overall). Because of the small number of respondents, the data on raw material suppliers is not accorded much weight.

Respondents to the survey were also asked to indicate how they utilized the results of accelerated tests and what tests were most heavily relied upon. As shown in *Table 4*, there was a wide diversion of uses for accelerated tests. Overall, they are most often used as the major means for evaluating new product performance. Users, however, rely on accelerated tests primarily for quality control and conformance to specifications.

The accelerated test most heavily relied on is, by a fairly wide margin, the salt spray test. Other tests widely relied upon include accelerated weathering (both Weather-Ometers and UV/condensation tests) and immersion. Outdoor exterior exposures, including fence test and service tests, were cited by about 12% of the respondents.

The survey also included a question about the use of statistics for evaluating, correlating, and predicting coating

Table 4—Survey Results—Major Uses of Accelerated Testing Data

	Quality Control	Screening	Major Evaluation New Products	Supplement to Field Tests
	Paint Users	1 ^a	3	2
Manufacturers	4	2	1	3
Suppliers	4	1	2	3

(a) Ranked in order of importance (1 = most important).

performance data. The response indicated that statistical methods are very rarely used in coating evaluations. About 80% of the respondents either did not fill in the blanks or responded "none" to the question on statistics. Approximately 10% of the respondents indicated that they compare candidate coatings to known or standard coatings, but this by itself does not demonstrate any use of statistics. Fewer than 10% of the respondents listed any actual statistical tests; those named were t-test, analysis of variance, and linear regression, which are all fundamental statistical techniques. Three respondents noted the use of standard deviation, which is not actually a statistic, but at least shows that the user recognizes the need for some measure of the uncertainty. A few of the comments (e.g., "use statistics only in quality control" or "too few samples for statistics") indicate that the individuals are aware of statistical methods but did not utilize them in evaluating coating performance.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions on Accelerated Methods For Degradation by Corrosion

THERE IS A COMPELLING NEED FOR VALID SHORT-TERM EVALUATION PROCEDURES: Restrictions on VOC and other paint components have forced manufacturers to replace many of the standard industry products such as lead-based alkyds and conventional vinyls, epoxies and urethanes. The industry has expended millions of dollars to develop new technologies to meet these requirements, but owners are reluctant to adopt them because they do not have the long-term field experience of the systems they are replacing. Thus, both manufacturers and owners must have available short-term tests which can provide a good indication of the long-term durability and integrity of protective coatings. Otherwise, they must use lower technology coatings (e.g., long-oil alkyds or phenolic oils) or risk early and costly premature failures with application of unevaluated systems.

CURRENTLY USED ACCELERATED METHODS DO NOT MEET THE INDUSTRY NEEDS FOR RELIABILITY, ACCURACY, OR REPRODUCIBILITY: The most commonly used accelerated corrosion test methods are salt spray and condensation/humidity testing (along with immersion testing). In particular, the salt spray is heavily relied upon to determine coating performance, and is often equated with corrosion resistance. The developers and users of these tests, however, have not produced evidence that the tests can correlate with exterior exposures or predict long-term performance of protective coatings. In fact, the bulk of the studies show that salt spray does not correlate with exterior exposure, even at marine environments. There is also a lack of evidence that these tests give consistent reproducible results from one instrument to another and one time to another.

SALT SPRAY AND OTHER TESTS ARE USED IN SPITE OF KNOWN SHORTCOMINGS: There is widespread recognition within the industry of the deficiencies of salt spray and humidity testing. Several raw material and coating manufacturers have expressed their frustration at being required to develop formulations that provide good salt spray resistance, rather than optimizing the formulations to give the best exterior per-

formance. The most common reason given for continued use of these tests by raw material manufacturers and coating manufacturers is that their customers (the paint manufacturers and owners/specifiers, respectively) require them in their specifications. The customers respond that this is the standard that has been presented by the industry as the ultimate test, and that it has been used historically for this purpose.

NEWLY DEVELOPED CYCLIC TESTS SHOW SIGNIFICANT PROMISE: Two different approaches have been developed, both using the concept of a cyclic exposure to the most aggressive corroding agents. Cyclic corrosion cabinets, initially developed in the U.K., have been touted in publications which report that these instruments give better representation of the type of degradation that occurs in exterior exposures. These tests have not been widely used in the U.S., and the claims have not been adequately verified. The second approach utilizes a periodic solution spray on surfaces exposed at outdoor test facilities, thereby intensifying the attack and increasing the rate of degradation. These techniques have also received favorable literature review but have not been experimentally verified in well-controlled experiments.

THE USE OF STATISTICS IS PRACTICALLY NONEXISTENT IN COATING EVALUATION: The results of the survey indicated that over 90% of the industry does not use statistics nor recognize the need, or importance, of statistics in evaluating performance data. The basic principles of scientific measurement and comparison also are widely disregarded when evaluating coating performance. As a consequence, many experimental results are not valid, and the conclusions are not reliable. For example, conclusions based on a comparison of a single test panel per coating have an extremely high chance of being erroneous. Groups and individuals making formulation, marketing, or procurement decisions based on such data run very high risks of making the wrong choice. In addition, a substantial amount of money is being wasted on testing that does not measure up to standards for valid measurement and evaluations.

Conclusions on Coating Characterization Techniques

MANY NEW AND SOPHISTICATED TECHNIQUES HAVE BEEN AND ARE BEING DEVELOPED: New analytical and instrumental methods for characterizing polymeric materials and organic chemicals are being increasingly utilized for coatings evaluation. A few, which are considered to have high potential for improving the understanding of coatings, include the following: electrochemical impedance spectroscopy, electron spin resonance, attenuated total reflectance infrared spectroscopy, and infrared thermography. Each of these techniques addresses a different aspect of the science of evaluating, monitoring, or predicting performance.

MOST TECHNIQUES ARE SUITED PRIMARILY FOR RESEARCH, NOT ROUTINE EVALUATIONS: Characterization techniques are designed to study fundamental properties of coating materials (e.g., oxidation state, electrical potential or resistance, presence of free radicals, visco-elastic properties.) Thus, they may help us in understanding the processes of film formation, degradation, or corrosion, but most of them are not suitable for routine examination of coating performance.

For most of these, the equipment is expensive, and the conducting and analysis of the experiments requires considerable expertise and experience. Thus, they are not likely to be used for full-scale comparisons of candidate formulated coatings. One of the important goals, however, is that these sophisticated characterization techniques may be suitable for evaluating the validity of short-term accelerated tests. The latter would then be amenable to being used by owners, manufacturers, and other groups in the industry who have the practical need for reliable data on performance evaluation.

Recommendations for Coating Evaluators

Based on the preceding, it is imperative that organizations and individuals within the protective coatings industry take specific actions. Recommendations are presented for three groups: those who perform the tests, those who utilize the results, and industry at large. The former includes primarily paint manufacturers and raw materials suppliers, but also pertains to users, who conduct their own evaluation programs. The second group includes owners and specifiers, that is, those who are ultimately responsible for establishing and verifying qualification tests and performance standards for coatings.

BETTER STATISTICS ARE ESSENTIAL: There needs to be a greater recognition and utilization of statistical methods in the design and analysis of experiments. It may not always be possible to use a large number of replicates, but at the very least evaluators should be aware of the limitations of their studies and the expected precision and validity of the results. There are numerous examples and illustrations of the use of standard statistics on coatings evaluation. They are not mysterious, exotic, or a mathematical maze. They are part and parcel of good scientific experimental procedures. It must also be recognized that statistics must be used along with practical experience and common sense.

IMPROVED PREPARATION AND OPERATION TECHNIQUES: Many evaluators are not sufficiently meticulous about the experimental procedures. In particular, the methods for preparing specimens and conducting accelerated and other tests are not performed in accordance with the requirements of the manufacturer or the industry standard (e.g., ASTM B 117 for salt spray testing). This, by itself, can invalidate any test result. One approach is for more laboratories to participate voluntarily in laboratory accreditation programs.

ACCELERATED TEST SHOULD BE USED WITHIN KNOWN LIMITATIONS: Too many evaluators are not aware of, or ignore, the limitations of salt spray, humidity, and other laboratory tests. These tests are at best suitable for screening of products and for quality control tests. In particular, salt spray testing has essentially no value for predicting exterior performance, and its use for that purpose or for the general evaluation of corrosion protection should be discouraged. The most commonly used accelerated weathering tests (weather chambers and ultraviolet/condensation cabinets) have shown some value for screening coatings but for these also, the user must be aware of specific limitations due to wavelength and other effects.

COMBINATION AND CYCLIC TESTS ARE CONSIDERED BEST FOR PRELIMINARY EVALUATION: Although no tests have been proven

to provide even moderately good correlation with exterior exposures, the general consensus is that a sequence of exposure environments is more realistic and gives better results than a constant stress test such as salt spray. Tests which have shown some positive results include several of the following conditions: salt spray, dry period, salt-free high humidity, cold or freeze, and ultraviolet light. Caution should be exercised when using these techniques, as their primary benefit is still likely to be for preliminary screening among large numbers of candidate coatings.

EXTERIOR EXPOSURE TEST NEEDED TO CORROBORATE PRELIMINARY DATA: Because of the lack of proven correlation with accelerated tests, decisions on marketing, procurement, or service application should ultimately be based on exterior tests in representative environments. These can be done on test fences, on representative structural elements (e.g., I-beam sections), or as patches or sections of actual structures in service (listed in order of increasing preferences). For evaluation of weathering effects (e.g., gloss or color retention), ASTM and other results indicated that up to 24 months may be needed to give adequate differentiation among different types of coatings. A similar time frame is recommended for evaluating corrosion protection of coatings.

STANDARD CONTROL PAINTS REQUIRED FOR ALL TYPES OF TESTING: Exterior exposure environments are highly variable from year to year and location to location. Therefore, in any type of testing, it is essential that coatings be compared to a system of known performance which has been accepted as an industry or company standard. Controls also are highly recommended for accelerated testing because various studies have shown that there also is a high degree of variability in salt spray, humidity, and other commonly used accelerated testing chambers.

Recommendations for Coatings Users and Specifiers

BECOME KNOWLEDGEABLE ABOUT COATING PERFORMANCE EVALUATION: The selection and procurement of coatings is an extremely important part of the overall operation of a plant or facility. Organizations incur substantial costs for materials and for labor of application, and the consequences of poor material selection can be many times more costly in terms of equipment down time, product contamination, and rework costs. Thus, those responsible for testing and procuring the coating should be knowledgeable in the technology of testing. This knowledge can be acquired by attending courses, lectures, participating in technical societies, and by regularly receiving technical literature. It is the responsibility of the upper management of these organizations to insure that properly trained individuals are involved in these activities, either as employees of the owner, as consultants, or by other arrangement.

DEMAND BETTER DATA: As noted previously, a common complaint of coating and raw material suppliers is that the owners require tests that are not appropriate. Owners' representatives should carefully consider the need for tests such as salt spray as a performance requirement. If owners demanded more scientific evidence of coating performance, then the suppliers would produce it. Owners are in a position to

demand that data be furnished on number of replicates, standard deviation, types of controls used, calibration of instruments, and design of experiments. Many manufacturers' technical personnel are aware of the deficiencies of their own testing programs and would welcome the opportunity and challenge to develop more scientifically valid experiments.

General Recommendations for Industry

EDUCATE USERS AND MANUFACTURERS: As presented in this article and the referenced report,¹ there is a considerable body of knowledge and technology pertaining to the methods of producing degradation, of characterizing and evaluating coatings, and of analyzing data. To a large extent, the users and manufacturers are not knowledgeable about this technology and are not properly utilizing it. As a first step, there needs to be better dissemination of the problems with current practice and the availability of better technology. This dissemination can be accomplished by conferences, workshops, and articles; however, these items themselves require a major commitment by the owners, manufacturers, and service organizations that such an effort is worth the effort and expense. We believe that strong justification can be made on behalf of such efforts.

ENCOURAGE AND SUPPORT METHOD DEVELOPMENT: Another important conclusion is that there is a great need for improved techniques and equipment for coating evaluation. These needs are in each of the three areas discussed: producing degradation, evaluating and characterizing coatings, and analyzing results. Some of these techniques are being developed by individual companies and government agencies. However, there needs to be a stronger industry-wide program to facilitate the development of the technology. These can be in the form of cooperative research and development programs or by greater attention to exchange of information among active research and development groups and technical associations.

SUMMARY

This article reviewed several different approaches for inducing and characterizing degradation of a protective coating system.

Degradation can be induced by artificial accelerated exposure, natural unaccelerated exposure, and accelerated natural exposure. Artificial exposures or accelerated tests which apply a "constant" stress, while widely utilized, have been criticized because, under real conditions, stresses are constantly changing. Accordingly, there has been a surge of interest in cyclic corrosion tests and cyclic weathering tests. Most of the cyclic corrosion tests utilize salt spray as one of the components of the cycle. Variations include manual or automated drying-out periods, or addition of other stresses, such as humidity, ultraviolet, immersion, or freeze/thaw.

Outdoor exposure testing, although often considered the most reliable means of evaluating performance, also has some significant drawbacks, including the variability of the environment, the large number of stresses present, the lack of control systems, and slow degradation. A hybrid approach to testing combines the features of both accelerated and

natural testing. Examples include spraying water or solution on outdoor panels, and concentration of solar radiation.

Coatings degradation can be evaluated for microscopic damage or macroscopic damage. Analytical techniques for microscopic damage include: electrochemical impedance spectroscopy, infrared, nuclear magnetic resonance, electron spin resonance and other spectroscopies, thermography, and cantilever beam. New techniques for assessing macroscopic damage include quantitative visual assessments, computer imaging process, diagrams of extent and distribution of damage, and photographic reference standards.

Current practice in accelerated testing by paint users, paint manufacturers, and raw materials suppliers was evaluated via a questionnaire mailed to a large number of representatives. The most commonly used corrosion tests are salt spray and immersion. Accelerated tests are most often used as the major evaluation for new products, with the salt spray test being the one most relied on by all groups surveyed. For the vast majority of testing of protective coatings, no statistical analysis methods are used. Recommendations are given for coating evaluators, coating end-users, and the industry at large for improving the practice of accelerated testing of coatings.

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Progress in Coatings Technology: 1989

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INTRODUCTION

The coatings industry is the most mature of the polymer-related industries. Yet, in spite of the development of many surfaces that do not require protective or decorative coatings, the coatings industry continues to grow. Fortunately, steps have been taken to record the history of this important industry via museum exhibits¹ and books.² Opportunities were provided for discussion of progress in the Annual Meeting and Paint Industries' Show in New Orleans, LA, sponsored by the Federation of Societies for Coatings Technology,³ the 16th Annual Water-Borne and Higher-Solids Coatings Symposium,⁴ progress review of previous years,⁵ a homestudy course sponsored by the National Association of Corrosion Engineers, and the establishment of the Joseph A. Vasta Memorial Scholarship which will rotate yearly between University of Southern Mississippi, University of Missouri-Rolla, University of Detroit, Eastern Michigan University, and North Dakota State University, and new coatings books.⁶⁻⁹

In a comprehensive report, R.P. Savage has called the coatings industry, which is a major consumer of polymers, a microcosm of the chemical industry.¹⁰ Coatings production has continued to grow during the past decade and is approaching the \$12 billion level. However, while coatings imports were much less than exports in the past, these sales data are now essentially in balance.

According to the Freedonia Group, the U.S. coatings industry will produce 12 billion gallons of paint at a value of \$13.5 billion in 1992. The present consumption of coatings is 15 liters/per capita in North America, 10 liters/per capita in Eastern Europe, and 1 liter/per capita in the Far East. The four leading producers account for over 30% of the U.S. production of coatings.

The sales in million dollars, by the leading coatings producing firms in 1989 were as follows:

Sherwin-Williams	584
Valspar	133
DeSoto	121
RPM	97
Standard Brands	76
Pratt and Lambert	67
Lilly	53
Guardsman	48

Architectural coatings account for 50% of coating shipments but account for only 40% of the total dollar value. Products coatings (OEM) account for 36% and special purpose coatings account for 15% of the annual coatings production.¹¹

The number of U.S. paint companies has declined from 1459 in 1967 to about 900 in 1989. The U.S. paint industry employs more than 60,000 workers.

European companies produced over five million tons of paint in 1988. The production of individual European nations in (thousands of tons) is shown as follows:¹²

West Germany	1.2
Italy	0.95
UK	0.86
France	0.75
Netherlands	0.25
Belgium	0.15
Other EC	0.87
Other Western Europe	0.58

Japanese companies produced 2.9 million tons of organic coatings in 1987.

The production of powder coatings increased from one million pounds in 1960 to 100 million pounds valued at \$33 million in 1988.¹³

Over 500 million pounds of hot melt coatings were produced in the U.S. in 1988.¹⁴ The coatings and adhesives industries used 430 million pounds of synthetic latex in 1988 and it is anticipated that this volume will increase to 550 million pounds in 1993.

The total North American sales of adhesives and sealants in 1987 was \$4.7 billion. The worldwide value was about

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\$10 billion.¹⁵ The sales outlets, in million dollars, was as follows: construction (440), automotive (390), packaging (365), aerospace (190), electronics (150), and other (195). The product mix for adhesives and sealants was as follows: epoxies (24%), hot melts (16%), polyvinyl butyral (14%), polyurethanes (14%), silicones (11%), polysulfide (5%), and other (16%).

The total employment by the adhesive and sealant industry in the U.S. is 21,000. There are 600 formulators operating in 700 U.S. adhesive and sealant plants¹⁶ which produce about 11,000 individual products.¹⁷

Water-borne architectural paint, special purpose coatings and solvent-based architectural coatings account for 34%, 16%, and 14%, respectively, of the U.S. paint and coatings consumption.¹⁸ The principal resins used in U.S. coatings are alkyds (26%), acrylics (20%), vinyls (17%), epoxies (8%), polyesters (8%), and polyurethanes (5%). The total solid resins consumed by the U.S. coatings industry in 1987 was 1.2 million tons.¹⁹ The principal solvents used by the U.S. coatings industry are aliphatics, hydrocarbons, naphthenes (22%), toluene (15%), ketones and esters (25%), alcohols (12%), and xylene (11%). Almost two million tons of solvents were used by the U.S. coatings industry in 1987.

Because of a host of regulations on volatile organic compound (VOC) content of coatings, the amount of organic solvents used by the U.S. coatings industry is decreasing. The National Paint and Coatings Association (NPCA) has asked the U.S. Congress to adopt a national goal in its Clean Air Act in which the VOC emissions could be reduced by 25% over the next five years.²⁰ In addition to reduction of solvent content by the use of water-borne, powder, and higher solid coatings in order to meet regulations, attempts have been made to replace part of the organic solvent by carbon dioxide.²¹

The additional technology needed to produce compliance coatings, low profit margin, and acquisitions have reduced the number of coating producing firms. Some of these acquisitions include the following: Products Research Chemicals by Courtauld,²² Reliance Universal by Akzo, Tiszai Vegyr Kombirat by Akzo,²³ Whittaker Coatings by Sherwin-Williams, NL Industries (Spencer Kellogg) by Dainippon, U.S. Paint (Grow) Group by Nippon Oil and Fats, Whittaker's Ram Gel Division and Jamestown Coatings by Lilly, McCloskey by Valspar, Olympic and Lucite (Chlorox) by PPG, Kp-Coat by RPM, High Performance Coatings Division of Reliance Universal by Hemkel,²⁴ and Casco Nobel by PPG. DeSoto plans to sell its consumer paint business and concentrate on industry coatings. DSM is expanding its polyester powder coatings production to 10,000 tons at Athens, GA. ICI has joined with LNPO to create a coatings marketing center operation in Leningrad.

ICI, which is the world's leading figure in the worldwide \$1.4 billion annual can coating business is globalizing its activity.²⁵ The leading producers of can coatings in millions of liters are as follows: ICI (100), BASF (40), Midland (32), Valspar (30), Toyo Ink (20), PPG (20), Int Paint (15), and DNIC (12).

The annual U.S. production of 27 billion metal food cans is increasing.

Can coaters and automobile finishers are emphasizing water-borne coatings. Du Pont with annual sales of \$1 billion

to the automotive industry has established an automotive products laboratory at Troy, MI.²⁶

The presence of water soluble cellulose affects the grafting of polymers in latex systems.²⁷ The Mattiello Lecture in 1989 was presented by Marco Wismer who was responsible for the development of cationic electrodeposition coatings. The temperature of the cathode increases as the voltage is increased in this electrodeposition process.²⁸ Void containing latex particles, produced by core-shell emulsion techniques, can be characterized by disk centrifugation.²⁹ Good rubber-metal bonds have been produced in water-borne systems.³⁰ A new water based crosslinkable acrylic coating has been described.³¹ Tests for viscosity of water-borne coatings have been described³² and the crosslinking of water-borne acrylic coatings has been discussed.³³ BASF is producing water-borne coatings for automobiles at Sainte Therese P.Q. in Canada and is supplying comparable coatings for GM plants in St. Louis, MO and Spring Hill, TN.³⁴ Cationic electrodeposition of coatings which was first used for coating large appliances is now being used by the automobile industry.³⁵

The use of amino crosslinking agents in high solids coating systems has been described.³⁶ Alkaline stable water thinnable alkyds are available.³⁷ Nonaqueous dispersion of polymeric microgels are being used as film formers in architectural paints.³⁸

Powder coatings are more widely used in Europe than in Japan or the U.S. The predominant thin powder coatings are based on epoxy, epoxy-polyester and acrylic, and isocyanurates. PVC and nylon are used for thick powder coatings.³⁹ The use of organic coatings for aircraft has been reviewed.⁴⁰

Over 1.4 million tons of pigments and fillers were used by the U.S. paint industry in 1987.⁴¹ The percentage of these additives used by the U.S. paint industry is as follows: titanium dioxide (30%), calcium carbonate (19%), clay (16%), talc (10%), and silica (6%). It has been estimated that the sales volume of titanium dioxide will exceed \$20 billion by the year 2000.

The use of microcrystalline cellulose as a filler in coatings is being investigated at Eastern Michigan University. Microcaceous iron oxide which forms overlapping plates, which is mined in Arizona, is more finely divided than the European source which has been used to protect the Eiffel Tower against corrosion.⁴² The effect of fillers on the properties of coatings has been investigated.⁴³ The dispersibility of pigments is dependent on the character of their surfaces.⁴⁴

Kaolin, talc, and attapulgite are used as extenders and thickeners.⁴⁵ Flocculation gradient technology and infrared and scaling techniques have been used to determine the mean size and degree of dispersion for iron oxide pigments.⁴⁶ The effect of fumed hydrophobic silica on the properties of coatings has been investigated.⁴⁷

The accumulation of sulfur compounds below the primer layer in coatings, exposed to sulfuric acid, has been reported.⁴⁸ The lowering of VOCs of air drying alkyds by the incorporation of liquid crystalline groups has been investigated.⁴⁹ The rate of dissolution of thin methacrylic coatings was investigated by the use of laser interferometry.⁵⁰ CPVC and statistical formulation design data have been used to develop improved coatings formulations.⁵¹

Techniques for the characterization of functional groups and critical coagulation concentration of coating systems have been reviewed.⁵²⁻⁵³ Athey used data from swelling of 20 small film squares in seven different solvents to determine Hansen solubility parameters.⁵⁴

New information is available on the synergistic cosolvency and solution parameters of polyamide resins ($\delta=9.9$ H).⁵⁵ Chemiluminescence has been used as a quality assurance tool for thermosetting coatings.⁵⁶ The determination of intrinsic viscosity of acrylic acid copolymers has shown that a rigid rod structure exists at a pH of 8.7.⁵⁷

FTIR in conjunction with IR microscopy has been used to study coatings defects.⁵⁸ The cure of coatings has been monitored by a series of instrumental analytical techniques.⁵⁹

A new sputtering process has been developed by Nippon for coating organic polymer films with metals.⁶⁰ Transparent aluminum coatings have been deposited by use of plasma or electron beam techniques.⁶¹ A new antifouling marine coating has been developed.⁶²

A modified silicone coating, with a nonstick surface (Kiss Coat) which adheres to other coatings is available.⁶³ The bonding of polyethylene to metal substrates has been improved by the introduction of a mercaptoester group⁶⁴ and by passing the polyolefin through a fluorine-containing gaseous atmosphere.⁶⁵

The use of photoinitiators to promote ultraviolet radiation curing⁶⁶ and cationic radiation curing of epoxidized polybutadiene has been described.⁶⁷ Techniques for formulating hydroxyl-terminated polymers have been discussed.⁶⁸ The maximum lifetime of PVC plastisols has been shown to be 15-20 years.⁶⁹ Sherwin-Williams is investigating the in-mold coatings of two-component polyurethane moldings. This technique was demonstrated by Krauss-Maffie at the National Plastics Exposition.⁷⁰

An absorbent bandage, with a porous inner layer of polyurethane, has been described.⁷¹ The room temperature curing of epoxy/polyurethane and vapor curing of these systems have been reviewed.⁷²

A two-component polyurethane system is being used for 90%, 40%, and 10%, respectively, of the interior and exterior of new automobiles in Europe, Japan, and North America.⁷³ The 1989 model Ford LTD Crown Victoria and the Mercury Grand Marquis were coated with two coats of clear polyurethane finishes.⁷⁴

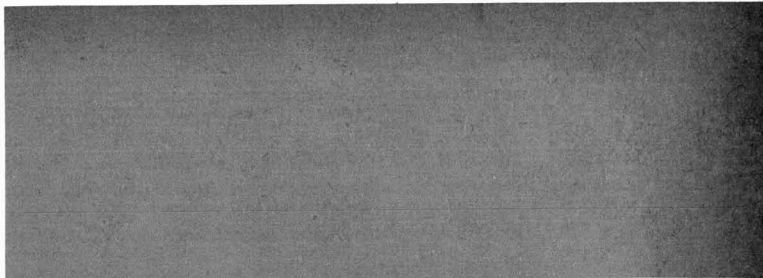
UV curable epoxy/silicone coatings⁷⁵ and fast curing epoxy coatings⁷⁶ have been described. Functionalized NBR elastomer has been used as a flexibilizer for amine-cured epoxy coatings.⁷⁷

The production of dispersion paints has been computer controlled.⁷⁸ Higher solid acrylic,⁷⁹ vinyl acetate water-resistant latices,⁸⁰ crosslinkable water based acrylics,⁸¹ and general purpose acrylic coatings have been described.⁸²

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Photofabrication

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Introduction

The ultraviolet radiation induced polymerization of polyacrylates has been an important industrial coatings process for more than 20 years, and involves the photogeneration of initiating species such as radicals or acids. The chemistry of the resins and monomers is acrylate or methacrylate for the free radical based processes, and alicyclic epoxy based for the cationic processes. Applications range from wood fillers and finishes, electronic potting compounds, micro-lithographic masks for computer chip generation, high gloss paper finishes, and printing inks, to reinforcement coatings for fiber optics.

It is of interest to note that this technology, which was originally developed for use in coatings, is now making its commercial debut in a new technology which is variously called: automatic modeling, optical shaping, steric polymerization, optical (photo) fabrication, or stereolithography. This process allows for the rapid construction of solid, complex shaped, three-dimensional objects without the need for molds, machine dies, or cutting tools.

Curing in three dimensions introduces some significant differences in the nature of the cured materials. Problems not encountered in two-dimensional curing, such as a gradient of cure with the thickness of the layer and shrink related distortion, are significant and must be addressed. The structures produced are incompletely cured initially and hence the "green strength" of the formed, but not post cured, objects becomes important. In the process of bringing a part into production, an area currently of signifi-

cant cost, but of potential savings, lies at the very beginning during the model and prototype manufacture. Back in the "good old days," a drawing was created by an engineer who then had the model shop make a rendering. This step actually is a loop because many design changes are made before a suitable model is designed. (This may account for 60-80% of the cost incurred in bringing a part into production.) The next step in the process usually involves making the prototype (a working model of the part) in the desired material. About 10% of the total cost lies in this step. Finally, the tool for commercial manufacture is created from the prototype. Traditionally, several weeks and up to \$20,000 (or more) are required for a prototype, and, if changes are required (and they normally are), it becomes even more costly.

The use of CAD/CAM allows rapid generation of a computer file which very accurately describes the dimensions and shape of a part. Normally, additional modifications are easily made by changing the file. If this file can be used to rapidly generate an actual solid part, the whole process could be of immense value. Unlimited possibilities and applications exist including the following: CAD/CAM files could be transmitted to a machine via modem; a blueprint could be entered into the computer; for medical applications, a reading from a magnetic resonance image or a "CAT scan" could be used; and holographic images can be digitized to create an artificial joint or model of almost anything from a picture.

Photofabrication of three-dimensional structures unites the sciences of CAD/CAM, a light source (sometimes a laser is used), and photopolymers. In principle, a three-dimensional model is constructed in a com-

puter file (CAD/CAM), sliced into cross-sectional elements or layers, and the computer then directs the light source (laser) to image each cross-sectional element, one on top of the other, in a resin tank to produce a solid laminated model of the computer image. *Figure 1* is a schematic illustration for producing a finished part, in this case a razor. The thickness being exposed in one cross-sectional element is approximately 10-20 mils. By using this technique for photofabrication of parts, the time requirements are reduced to a few hours and the costs are reduced to approximately \$2000 to \$4000. Further modifications are easily, rapidly, and inexpensively made.

Objective—Accurate Part

The objective of this technology is to produce a dimensionally accurate part. Although there are many elements which affect this objective, they can be summed up in the light source, the resin, and the exposure technique. These elements are interactive and can produce either a disaster or a desired result.

Light Sources

In many of the photofabrication methods, lasers are used as the light source (i.e., helium/cadmium lasers and argon ion lasers). Of concern to the making of parts via photochemistry are: wave length, power or intensity, and stability. The helium/cadmium lasers produce UV at 325 nm at powers of 10-30 mW (milliwatts). One problem with this type of laser is that the cadmium is consumed and, as a result, there is a limited useful life. A second problem has been that

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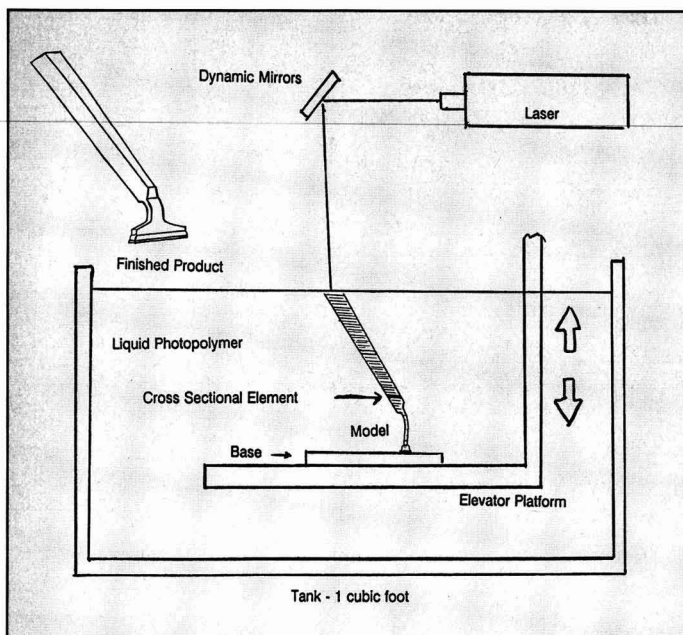


Figure 1—Schematic illustration of photofabrication

the mirrors used in the laser have a special coating which rapidly degrades.

Once the delivered power drops to below 6 mW, it is difficult, if not impossible, to make parts. The wavelength does not coincide with the maximum absorptivity wavelength for most useful photoinitiators.

The spot size produced by these lasers is quite small which is good for accurate part manufacture; however, the intensity of the light across the cross section is not uniform. This leads to undercure on the edges of lines drawn in a resin. An argon ion laser delivers tens of watts at 350 nm. The power and wavelength of argon ion lasers are better; however, they are more expensive. Since they involve a plasma tube, they also have a limited life (but are anticipated to be better than the helium/cadmium lasers).

Initial exposure to this technology is surprising when one discovers that lines, layers, or parts are far less than totally cured with exposures of two joules/sq cm. As a consequence, one is forced to study physical properties of samples which are less than cured. These "green properties" are of immense importance with respect to controlling distortion and will be discussed further. The intensity of the laser beam has a profound influence on green properties. At the same dose (different exposures or draw speeds), green tensile and modulus are higher for a laser output of 10 mW (vs a 20 mW output) (slower draw) as is the percentage extractables. This effect is reversed in the post cured properties.

The low conversion might be thought to be the result of low power; however, a few calculations show that the laser power in joules/sq cm is quite high. An alternate explanation involves the fact that gelation occurs quickly and thereafter the polymerization process is diffusion controlled. This raises the possibility of inhibitor diffusion into the gel from the surrounding uncured resin.

The third issue deals with the beam profile. Analysis of a single line conversion profile shows that, as one goes from the top to the bottom of the line, the cure somewhat drops off. However, this drop is not as great as is expected if Beer's Law were being followed. The same is true from the outside to the inside of the line. This deviation may be explained by nonhomogeneity of the power across the focused spot and by propagation factors.

A comparison of UV vs visible light cure also leads to very different results compared to what might be anticipated. Dye sensitization has much higher absorptivity, but lower quantum efficiency and, as a result, there is little difference between the degree of cure at the top of a line and at the bottom cured with visible light in the presence of dye sensitizers.

Resin Improvement

Currently, considerable work is being done on the synthesis and formulation of resins for photofabrication. The bulk of the

work is aimed at the reduction of distortion. Distortion is the result of not only shrinkage on curing, but also on the specific structural feature being examined (such as cantilevers). Figure 2 illustrates what is meant by shrink and distortion. A uniform shrinkage will result in a uniform reduction in size. If this is done in layers, the result is "curl." Curl is most pronounced on parts having an unsupported extension, or cantilever. The best analogy to use here is to picture what would happen if a rubber band were extended and, while extended, it is fastened to a piece of paper. The restraining forces of the paper (stiffness) would be overcome by the distorting forces (return to normal extension or shrink) of the rubber band and the entire assembly would curl. This is what happens with multilayers of photocurable resins.

What are some of the factors affecting distortion? To answer, both sides of the situation must be considered, that is, distorting forces are: shrinkage, weak green strength, and high crosslink density. Factors contributing to the restraining forces are: green strength, mass of the bottom layer, stiffness of the bottom layer, internal compensation (elastomeric materials), and delay of gel point so that higher conversion and stronger parts result. Increasing the molecular weight of the oligomer changes the conversion to the gel point, but gives a high viscosity which contributes to long processing times and can lead to drifting vectors (inadequately cured lines which are unattached). Reduction in the scan rate can give somewhat higher conversion and may improve restraining forces, but again the processing time is adversely affected. It is possible to keep the cure speed high and reduce the viscosity for faster flow and leveling, but this results in substantial distortion. Distortion can be controlled with proper drawing techniques.

Drawing Techniques

It is possible to control distortion simply by changing drawing techniques. In some cases, supports may be introduced into the structure and removed later after the part is thoroughly cured. An example of this would be a post under the cantilever which would in effect anchor the bottom layer and prevent it from distorting upward. Another approach would be what is called "multiscan." By using multiscan, a small dose applied to the resin results in a gel of some minimal strength and low conversion. It stops at this point in its polymerization because termination reactions are faster than diffusion of reactive groups into the structure. Allowing the gel some finite time to rest allows stresses to dissipate and reactive materials to once again get into position where they may react further. A second brief exposure gives higher conversion, stronger

structures, and less stress. (This is similar to the well known relaxation of internal stresses in radiation cured coatings by heating in order to improve adhesion.) Since it is not necessary to dip the part into the resin, multiscanning is very rapid, and since the total dose delivered is the same (or possibly even less), there is no increase in draw time per layer due to scanning. Normally this technique yields higher conversion, less curl, improved tensile and modulus, and less time to make a part.

Post Cure

The formed three-dimensional objects normally are less than 100% cured. The range of cure encountered usually can be as low as 60% and as high as 97%. This variation can be brought about by the resin system design, by the power of the laser, the photoinitiator system used, and by how the dose is delivered.

In order to have stable models, as well as models which are safe to handle hygienically, it is necessary to post cure the part. This is normally done by exposure for long periods of time to standard medium pressure mercury lamp radiation. It is obvious that in the event that the part is very thick, where Beer's Law will prohibit delivery of adequate radiation to the center of the piece, it may be impossible to attain total conversion via photochemistry. At this point, it may be necessary to saturate the model with a dilute thermal free radical catalyst and then elevate the temperature. If the part is exceedingly thick, a very large exotherm may ensue, resulting in cracking of the model. Thus, it is advantageous to control the rate of conversion to a slow process free of large exotherms.

Tooling

One of the great misconceptions regarding photofabrication concerns the anticipated physical properties of UV cured parts. ABS and nylon-like properties are frequently desired. Unfortunately, photocured systems consist of highly crosslinked molecules with very short chains between the crosslinks. Consequently, these are brittle materials. In order to gain some extensibility, viscosity and cure speed are compromised. In some processes the lower cure speeds are not critical; however, curing these with a laser in the mode of photofabrication can lead to very low conversion, weak structures, floating unattached lines, etc. If ABS is required, one must start with acrylonitrile, butadiene, and styrene. To get the engineered properties of ABS, it is necessary to formulate with fillers, lubricants, antioxidants, low profile agents, and many other additives.

In short, without a "philosopher's stone," transmutation of lead into gold is not really

probable; apple pie cannot be made starting with cherries, and acrylates will not give ABS.

A second misconception regarding photofabrication is its potential for commercial manufacturing of functional parts via so-called "table top manufacturing." The manufacture of prototypes via photofabrication requires hours of machine time per part. Injection molding takes a minute or two, extrusion takes a fraction of a minute, and stamping can take a few seconds. Photofabrication as practiced now is not a manufacturing tool. It is, however, a superb design research and prototype making machine.

Once a dimensionally accurate part has been made from an inferior material, the question is asked: What can be done with it so that the goal of massive production with suitable functional materials can be met? The answer lies in tooling so that injection molding, extrusion, stamping, or metal casting can be done. There really are quite a few options available.

For intermediate runs, spray metal mold manufacture is best. The prototype is sprayed with liquid metal (usually zinc or a suitable alloy) and then backed with a metal containing epoxy resin. At this time, the tool can be used to make up to 20,000 impressions with a suitable plastic, or it can be used to make a wax pattern for investment casting.

For long runs, it is necessary to construct a tool for making many plastic parts or wax patterns for investment casting. In this case, the prototype is imbedded in wax, then the wax pattern is investment cast in steel to make the tool for long runs.

It is possible to generate silicone molds from a complex prototype, and then the silicone rubber mold can be employed to make polyurethane resin parts.

If the final part is to be made of metal, investment casting is the most likely process. In this process, a wax pattern is given several coats of a ceramic material, dried, and then fired. The firing hardens the ceramic as the wax melts and flows out. The hardened and empty shell is then filled with molten metal to make the part. In large volume production, many wax patterns are made by injecting wax into a metal mold.

An alternate to wax is the use of a photofabrication resin specifically designed for investment casting. The goal to develop properties like a wax (a thermoplastic material melting at 56-58°C) in a UV cure system (a thermoset material sof-

tening at about 271°C) is quite a trick. In commercial practice (before firing), the ceramic shell is placed into a 200°F oven and baked until the wax has emptied out of the system and no residues remain. Under those conditions, UV-cured prototypes crack the ceramic. This leads to a realization that coefficient of expansion is a critical parameter. The coefficient of expansion (COE) above the T_g for UV-cured resins and that for an investment casting wax are approximately the same ($4-6 \times 10^{-5}$). Clearly, the properties of the wax are such that as it expands it also softens and finally melts so that it does not stress the shell. To achieve this property in investment castable UV resins, it is necessary to do two things. The structure has to contain a compatible low melting material which, upon heating, will give a swiss cheese-like structure. Further heating would then lead to expansion; however, the structure can collapse on itself in the presence of voids. If the additive is not too volatile, it can plasticize the structure resulting in great deformability. Furthermore, the rate at which this occurs must be controlled by ramping the temperature. Ultimately, the empty shell, is fired at 2000°F to vitrify the clay, resulting in a strong ceramic "bottle" into which metal may be poured. This approach has shown some commercial feasibility.

Commercial Status

There are many aliases and methods for the process of photochemically generating three-dimensional objects. Surprisingly, the earliest record of this concept in 1956 by

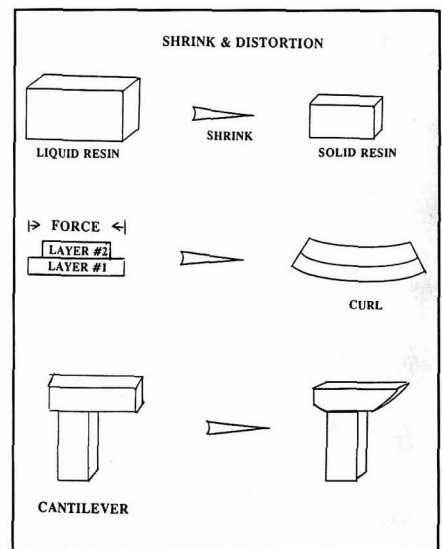


Figure 2—Shrink and distortion

Munz preceded the invention of the integrated circuit board computer as well as lasers. Munz called his process photo-glyph recording after the Greek work *glypho* (to carve). The process used masks, a light source, and a photoresist composition or a silver emulsion. The second oldest reference in the literature is a publication by H. Kodama. Kodama described a process using either a series of photo-masks or an x-y plotter driven fiber optic bundle to draw and stack crosslinked layers. The first reference to the use of a computer with a laser and photopolymer was in a paper by Herbert in 1982.

Many patents, both U.S. and foreign, have been written focusing on the idea of creating a three-dimensional object using light and a means of imaging. Y. Marutani, of Osaka Prefecture, describes a process of selective light irradiation while adjusting the depth of the fluid. This patent uses a platform in the resin vat, a computer, and a laser. C.W. Hull, of 3D Systems, describes a process called stereolithography wherein the platform is moved stepwise first below the surface of the liquid (to wet the walls of the part as they are formed) and then up to a predetermined small depth for further solidification. The key to making parts which have good surface finish is related to how thin the layers are. E.V. Fudim describes a process which uses a series of masks which he called "sculpting with light." In a second patent, Fudim describes the use of a light guide which is manipulated below the surface of the photocurable liquid and is gradually moved upward as the subsequent layers are added. N. Tokeida also avoids the use of a movable platform by the incremental addition of curable resin to the container and a movable light source (laser) to draw the layers. Fujitsu Ltd. adds liquid to the tank; the container bath is moved by an x-y plotter on a movable platform. W.E. Masters describes a novel system which involves the use of a device to "inject" or "spray" droplets of curable material in an image-wise fashion while being irradiated with UV light.

In addition to the patent literature, there have been numerous technical publications describing some of the previously mentioned references and also some processes which have not yet had patents issued. Carl Deckard describes a process which is called selective laser sintering or instant prototypes. This process, developed at the University of Texas, uses lasers, computers, and powdered polymers. A relative to this process was described by M. Feygan as laminated object manufacturing. A classical concept was proposed by N. Cabrera using two lasers of

differing wavelengths which intersect at a point in a reactive fluid to cure via a two photon process. Battelle (Columbus, OH) and Formigraphic Engine Corp. (Bolinus, CA) are also pursuing the dual laser system.

There are also a number of participants who have not widely published or have issued patents. Cubital, a division of Scitex Corp. in Israel, produces prototypes using a series of masks which are generated via computer in an electrographic process. The process also uses a water soluble supporting resin which is ultimately dissolved away after the photopolymer is hardened in a layer by layer process. This system appears to be well suited to the manufacture of large parts and can be made to work with a standard UV (nonlaser) light source, but is mechanically complex and creates a large volume of waste. The Cubital machine is called a Solider. A laser machine developed by Mitsubishi, which uses a UV laser, is called Soup (solid object ultraviolet plotter). Du Pont has made a machine which uses CAD/CAM and a laser which is called Somos. Sony calls their apparatus, which uses a laser, Solid Creation System. Quadrax Corp. (now owner of LaserFaire technology) has developed a machine which uses visible light lasers and does not use a movable platform or elevators.

Summary

Although radiation cure technology has been in use for over 20 years, adaption of this technology to the generation of three-dimensional solid methods was not without surprises. As the old joke goes: "Just as I got to know all of the answers, they changed the questions."

The first of these surprises dealt with the power delivered by the laser, yet the initially formed objects were undercured. The Beer-Lambert Law predicts that there should be a gradient of cure as one goes from the top to the bottom of a cured specimen. This is not ordinarily seen in coatings of thin cross section. Irradiation of a spot as opposed to blanket irradiation of the entire surface opens the door to heat exchange and diffusion of inhibitors in the partially cured specimen. The doses delivered ordinarily would produce total cure if conducted by total surface irradiation.

The properties of partially cured objects became important. The reason for this is that weak undercured specimens undergo shrink, with distortion, whereas strong undercured specimens have the ability to resist distortion with shrinkage. A variety of techniques of exposure or dose delivery, coupled with mechanical approaches and

chemistry, finally reduced some of the more difficult problems to a manageable stage.

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Society Meetings

BALTIMORE.....MAY

"Fire Safety"

Elected to serve as Society Officers for 1990-91 were: President—Gary Morgereth, of McCormick Paint Works; Vice President—Mary Lou Spurrier, of SCM Chemicals, Inc.; Secretary—James M. Smith, of Eastech Chemical Inc.; and Treasurer—John Kurnas, of C.M. Athey Paint Company.

Joseph D. Giusto, of Lenmar, Inc., will continue to serve his term as the Society Representative to the Federation's Board of Directors.

The meeting's technical speaker was Jesse Rossman, of Fireline Corporation. Mr. Rossman discussed "FIRE SAFETY."

The speaker presented a brief history of fire protection, beginning with the sand and water buckets of the past through the multipurpose dry chemical fire extinguishers and foam which presently is used in the industry. Mr. Rossman explained the use of foam to extinguish fires and various ways it can be stored. According to the speaker, one of the advantages of using foam is the low cost. A slide show was given in conjunction with the presentation.

GARY MORGERETH, *Vice President*

BIRMINGHAM.....MAY

61st General Meeting

The meeting featured the installation of Society Officers and Committee members for the upcoming year. Elected to serve as Officers for 1990-91 are: President—Graham C. Miles, of PPG Industries (UK) Ltd.; President-Elect—Robert McD. Barrett, of B.I.P. Chemical Ltd.; President-Elect Designate—D.A.A. Wallington, of Ferro/Drynamels Ltd.; Secretary—Peter Hassall, of Newtown Industrial Paints Ltd.; Treasurer—Bernard E. Myatt, of Worrall's Powders Ltd.; and Society Representative—Gerry J. Gough, of Holden Surface Coatings Ltd.

Immediate Past-President David Penrice, of Newtown Industrial Paints Ltd., invested Mr. Miles as President, presenting him with the Presidential Chain of office and the President's gavel and briefcase.

Members elected to serve on the Executive Committee include: Raymond B. Tennant, of Carrs Paints Ltd.; G.W. Jenkins, of Intercoat Ltd.; and M.J. Wright, of Holden Surface Coatings Ltd.

Roland L. Staples, of CWS Coatings Technology, was elected Chairman of the Society Technical Committee.

Retired Members appointed to serve as scrutineers are: J.N. Hitchin, J.R. Green, H.J. Clarke, and R.H. French.

Mr. Penrice introduced a proposed By-Laws change in regard to reducing the minimum number of Executive Committee Meetings from 8 to 6. The Motion that ARTICLE XI SECTION 11 be amended to "The Executive Committee shall meet not less than six times throughout the year" was proposed and carried.

A proposal to make the Meetings Secretary a member of the Executive Committee, proposed by S. John Mitchell, of Manders-Domolac, was approved by the Club membership.

Technical Committee Chairman Staples reported that the Committee's Museum Project, housing artifacts collected by the Technical Committee, was progressing.

D.A.A. WALLINGTON, *Secretary*

CHICAGO.....MAY

Awards Night

The new Officers for the 1990-91 year were introduced: President—Karl E. Schmidt, of Premier Coatings Company; Vice President—Theodore J. Fuhs, of General Paint and Chemical Company; Secretary—William W. Fotis, of Valspar Corporation; Treasurer—Gregory E. McWright, of Angus Chemical Company; Society Representative—Richard M. Hille, of General Paint & Chemical Company; Associate

Representative—Joseph J. Polak Jr., of Henkel Corporation; Associate Representative—Gerald Cuca, of Jensen-Sauder & Associates, Inc.; Membership Committee Chairman—Thomas Drucker, of Graham Paint and Varnish Company; and Education Committee Chairman—Lori Hilson-Gaede, of T.H. Hilson Company.

Patrick Gorman, of Hüls America, Inc., presented the Nuodex Gavel to President Karl Schmidt. Mr. Schmidt presented Immediate Past-President Kevin P. Murray, of DeSoto, Inc., with a Certificate of Appreciation for his years of Society service. Mr. Murray then presented Mr. Schmidt with the Society gavel.

The Society's Outstanding Service Award for 1990 was presented to Robert W. Zimmerman, recently retired from Valspar Corporation. Mr. Zimmerman was recognized for his many years of service to the Society and the paint and coatings industry.

A total of 16 Past-Presidents attended the banquet, including: Warren C. Ashley (1955); Carroll M. Scholle (1958); Richard G. Gohman (1960); James Patterson (1962); Victor M. Willis (1966); Edward W. Boulger (1968); Thomas J. Daly (1970); Kenneth W. Wilkinson (1973); Robert W. Zimmerman (1974); Gus W. Leep (1976); Walter J. Krason (1979); W.B. Bartelt (1980); Richard M. Hille (1981); Ross C. Johnson (1986); Evans Angelos (1989); and Kevin P. Murray (1990).

Seven new inductees into the Society's 25-Year Club were in attendance. Presented with their 25-Year Pins were: W.B. Bartelt, of Rust-Oleum Corporation; Robert C. Collins, of G.R. O'Shea Company; John N. Faklis, of Benjamin Moore & Company;



PAST-PRESIDENTS—Sixteen Past-Presidents of the Chicago Society were at the May meeting. **Sitting (l-r):** Carroll M. Scholle, Victor M. Willis, Richard G. Gohman, James Patterson, Jr., Edward W. Boulger, Warren C. Ashley, and Kenneth W. Wilkinson. **Standing:** Robert W. Zimmerman, Richard M. Hille, W. B. Bartelt, Thomas J. Daly, Walter J. Krason, Evans Angelos, Ross C. Johnson, Gus W. Leep, and Kevin P. Murray



OUTSTANDING MEMBER—Robert W. Zimmerman (I) receives the Chicago Society's Outstanding Service Award from Society Secretary William W. Fotis during ceremonies at the Society's May meeting

George J. Franicevic, Retired; John Gallagher, of Technical Products, Inc.; Edward L. Weller, of Central Chemical Company; and Telford C. Wolland, of Akzo-Reliance.

Not presented to receive their pins, however inducted into the quarter-century membership were: Leonard C. Afremow, of Dexter Corporation; and Charles M. Taubman, of Technical Coatings Company.

Three scholarships of \$1,000 each were awarded to: Christopher Drucker (monies from the Society's Educational Fund); and Erick Hindrichs and Hector Agdeppa (monies from the Joint Educational Fund of the Society and the Chicago Paint and Coatings Association).

CLIFFORD O. SCHWAHN,
Publicity

CLEVELAND APR.

"Corrosion"

Nominating Committee Chairman R. Edward Bish, of Jamestown Paint & Varnish Company, introduced the Committee's slate of officers for 1990-91: President—Richard J. Ruch, of Kent State University; Vice President—Ben J. Carozzo, of Tremco, Inc.; Secretary—Roy Glover, of Jamestown Paint & Varnish Company; Treasurer—Freidun Anwari, of Coatings Research Group, Inc.; Assistant Treasurer—Constance F. Williams, of The Glidden Company; and Member-at-Large—Robert L. Toth, of The Glidden Company.

By-Laws Committee Chairman Charles K. Beck, Retired, read a resolution to change the By-Laws to include a procedure to handle the receipt of unsolicited gifts. The amendment was passed by the Society membership.

The meeting's technical speaker was Brian S. Skerry, of Sherwin-Williams Company. Mr. Skerry's topic was "CORROSION—RADICAL RUST RESEARCH."

The speaker began his talk by defining corrosion and explaining the economic impact of corrosion. He estimated that corrosion will cost the U.S. approximately four or five percent of the gross national product (e.g., in 1990, the GNP will be in the range of \$5 trillion, yielding a cost of \$2 billion).

Dr. Skerry described the corrosion process and explained the complex mechanisms behind corrosion.

The speaker stated that the important thing to remember is coatings permeability to ions. He continued, saying that in formulating coatings for protection of metal, weathering and UV degradation resistance, as well as wet adhesion and flexibility are as important as the ability to inhibit the rusting process. Dr. Skerry said a complete systems approach, involving surface preparation, priming, intercoat, and topcoat are vital to combat corrosion.

According to the speaker, there are several drawbacks to using natural exposures for assessing coatings performance, including waiting several years for coatings degradation, the availability of mechanistic information, and the difficulty of knowing what is happening from hour-to-hour and day-to-day.

However, the biggest drawback is that results always lag empirical developments, stated Dr. Skerry. For this reason, coatings chemists always have sought accelerated testing to model environmental exposures.

The speaker explained the corrosion research program designed to give reliable information on the durability of coatings in corrosion service which he has spent the last three years developing. He has studied both the means that are used to acquire accelerated data, as well as laboratory test methods to gain reliable correlations to exterior exposure. Also, he has investigated the means to obtain quantitative data to help model the corrosion process, allowing for better predictions on the expected lifetime of a coating.

Dr. Skerry described the electrochemical processes important to corrosion. In addition, he discussed several techniques used to obtain quantitative data, work performed to obtain better correlation to exterior exposures, and studies on the morphology and chemical composition changes which occur during the corrosion process.

In conclusion, the speaker stated that improvements in correlation are possible, and the corrosion-weathering test gave the best correlatable results.

Q. Many controversies have existed over the past 25 years on QUV test methods as well as on B 117. Have you investigated various test methods and have you found any to be more correlatable than others in your current work?

A. Yes we have. The chemical degradation of a particular resin system is very de-

pendant on the choice of bulb used in the chamber. For some systems, it is crucial to pick one bulb over another. In others, it does not matter. The degradation chemistry of the resins is the driving force and different lamps can cause artificial degradation and should be avoided.

Q. Can you give us a step-by-step procedure for running your tests?

A. You would first run your prohesion test wet/dry cycle (one hour each) for whatever specified time you like (typically 200 hr). Then, run the QUV wet/dry cycle according to ASTM G53 for another period of time (200 hr), repeating the first step, and so on.

BEN J. CARLOZZO, Secretary

GOLDEN GATE MAY

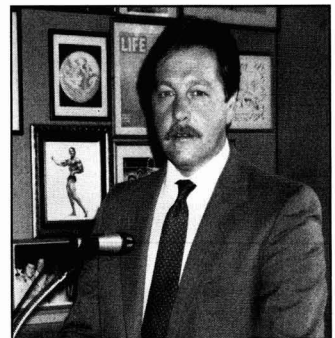
"Urethane Associatives"

A moment of silence was observed in memory of Society member Charles Miyada, of Reichhold Chemicals, Inc., who died recently.

Nominating Committee Chairman Timothy J. Donlin, of Pacific Coast Chemical Company, presented the slate of officers for 1990-91: President—Gordon Pioch, of Triangle Coatings, Inc.; Vice President—Jack Duis, of Pacific Coast Chemical Company; Secretary—Larry G. Sayre, of O'Brien Corporation; and Treasurer—Margaret R. Hartmann, of Dexter Corporation.

President Ernest Soldavini, of Huls America, presented plaques to Ernest "Bud" Harmon and Gordon Rook, Retired, in honor of their being elected to Society Honorary Membership.

The environmental report was given by Kendall E. Trautwein, of Frank W. Dunne Company. Mr. Trautwein announced that an October seminar on regulations affecting



MAY SPEAKER—Robert Dey, of Rheox, Inc., addresses the membership of the Golden Gate Society on "TYPE 2 URETHANE ASSOCIATIVES + LATEX PAINT = VALUE ADDED PERFORMANCE"

the paint industry in California will be presented. The scheduled speaker is attorney James Defore, who has made presentations for the California Chamber of Commerce.

Also, it was reported that the Bay Area Air Quality Management District is proposing a reduction of VOC to 65% maximum. Meanwhile, the South Coast Air Quality Management District was slated to suggest elimination of aerosol exemptions at their May meeting.

The meeting's first speaker was Robert Dey, of Rheox, Inc., who discussed "TYPE 2 URETHANE ASSOCIATIVES + LATEX PAINT = VALUE ADDED PERFORMANCE."

The speaker stated that poor flow, leveling, and film build properties of latex paints have been a concern since their introduction to the market place. He said the rapid recovery, pseudoplastic flow behavior of most conventional rheological additives used in latex coatings has done little to improve the overall rheology of the systems.

According to Mr. Dey, second generation polyether-urea-polyurethane associative additives provide the formulator with the means to balance the low, medium, and high shear viscosity properties of latex paints. Coatings now can be formulated to near alkyd-like film build; flow and leveling, while maintaining good sag control; package appearance properties; and reduced spattering.

The speaker reported that a simplified formulating approach is possible with these materials when used either as the sole rheological additive or in combination with conventional additives.

Q. With semigloss or gloss latex formulations using the Type 2 rheological controls, do you have to compensate by using a harder latex to get away from blocking problems?

A. No, you would compensate by blending with cellulosic. If the urethane associative thickeners were the only additives you were using, you might go to a different latex. However, generally you go to auxiliary thickeners.

Q. What about flocculation of the primary pigment?

A. I am not aware of flocculation. The biggest problems are with color acceptance. We have found that Type 2, particularly the subgroup to ICI modified type, is less prone to cause color acceptance problems.

The evening's second speaker was Technical Committee Chairman Robert Athey, of Athey Technologies. Mr. Athey's talk, "CORROSION INHIBITIVE WATER-BORNE COATINGS," has been presented to the National Association of Corrosion Engineers.

The speaker used three examples of successful water-borne systems (California bridges painted by Cal Trans, Society Technical Committee studies, and a cast-iron light

Constituent Society Meetings and Secretaries

BALTIMORE (Third Thursday—Snyder's Restaurant, Linthicum, MD). GARY MORGERETH, McCormick Paint, 3255 Lewis Ave., Rockville, MD 20851 (Society Vice-President).

BIRMINGHAM (First Thursday—Strathallan Hotel, Birmingham, England). D.A. TONY WALLINGTON, Ferro Drynamels Ltd., Westgate, Aldridge, West Midlands, England WS9 8YH.

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 Francisco). 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 Tlalneantla, 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. DeCHAIENE, 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 JOHANNESSEN, 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 Vogel/Komac, 1201 Osage St., Denver, CO 80204.

ST. LOUIS (Third Tuesday—Salad Bowl Restaurant, St. Louis, MO). STANLEY SOBLESKI, 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.

house) to explain how corrosion prevention may be accomplished: cathodic protection, barrier protection, and chemical inhibition. In addition, Dr. Athey offered several hints for formulating corrosive inhibitive waterborne coatings, including: eliminating sources of sulfate or chloride; eliminating fixed base neutralizers which remain hydrophobic in film; looking for dual purpose additives; choosing corrosion inhibiting chemicals as dispersants or surfactants; and making sure coalescent solvents are hydrophobic and the last to leave the film.

MARGARET HARTMANN, *Secretary*

LOS ANGELES MAY

"Latex Paints"

A moment of silence was observed in memory of Society members Chuck Miyada, of Reichhold Chemicals, Inc., and Al Arown, Society Honorary Member.

Ray DiMaio, of Kop-Coat, Inc. was called on to present a number of awards to the membership.

An Outstanding Service Award was presented to Henry J. Kirsch, of Trans Western Chem., Inc., for his many years of dedi-

cated service to the Society and its membership.

Posthumous Awards in honor of Society members Chuck Miyada, Bob Abrams, and Dave Kittredge were presented.

Fifty-Year Pins were awarded to Clyde L. Smith, Society Honorary Member, and Richard B. Pollack, of Lee Pharmaceuticals, for their one-half century membership in the Society.

Twenty-Five Year Pins were earned by: Richard W. Drisko, of Naval Civil Engineering Lab.; John A. Elliott, Retired; John D. Harper Jr., of Balvenie Chemicals; Robert R. Mikuta, of Varia Waste Management Company; Frank Spaeth, Retired; Jerome A. Woolf, Retired; and Roberta Stover, of Major Paint Company.

Donald I. Jordan, of Cargill, Inc., was elected to Society Honorary Membership by member of the Society.

A posthumous award of Society Honorary Membership was presented in behalf of Earl Smith.

Two of the three nominees for one of the Board of Directors positions were introduced: V.C. Bud Jenkins, of Ellis Paint Company and Dana Scarlata, of Life Paint Corporation. Dan A. Bernard, of Deft, Inc., the third nominee, was not in attendance.

Michael Gildon, of A&M Specialties, Inc., and Robert F. Koperrek, Retired, were introduced as candidates for the Society Representative position on the Board of Directors.

Vice President and Scholarship Committee Chairman James F. Calkin, of E.T. Horn Company, announced that the Society has awarded 24 scholarships totaling \$17,400 this year. The two special scholarship award winners are: Tania DeSilva, the Chuck Miyada Memorial Scholarship; and Jackie Calkin, the Dave Kittredge Memorial Scholarship.

It was voted upon to increase Society dues to the following: Active/Associate—\$60; Educator/Student—\$20; and Retired (with less than 15 years)—\$20.

The meeting's speaker was Robert Dey, of Rheox, Inc., whose topic was "TYPE 2 URETHANE ASSOCIATIVES + LATEX PAINT = VALUE ADDED PERFORMANCE."

The talk focused on the flow, leveling, and film build properties of latex paints and second generation polyether-urea-polyurethane associative additives.

SANDRA L. DICKINSON, *Secretary*

MONTREAL MAY

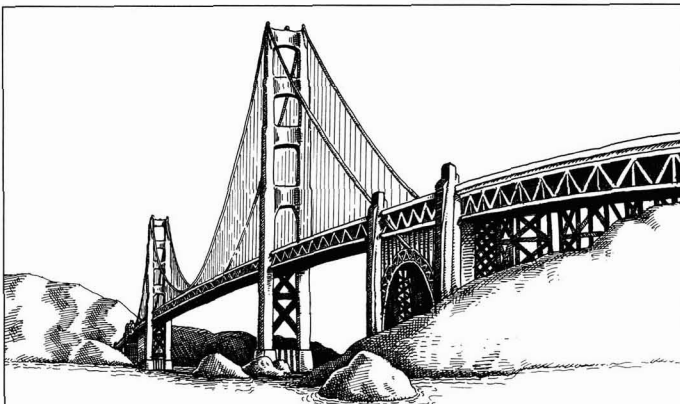
Past-Presidents' Night

The Nomination Committee submitted its list of candidates for the 1990-91 Executive Committee: President—Robert Benoit, of Kronos Canada Inc.; Vice-President—Bruce Bridges, of Reichhold Canada Inc.; Secretary—Richard Bordeleau, of Tioxide Canada, Inc.; Treasurer—Luc Pepin, of Sico, Inc.; Director—Louis Ayotte, of Monsanto (Canada) Ltd.; Director—Jacque Brouillette, of BAPCO; Director—Jean Brunet, of Van Waters & Rogers Ltd.; Director—Gordon L. Simpson, of Sico, Inc.; and Nominating Committee Chairman—Gilles Belisle, of National Research Council Canada.

Several Past-Presidents attended the meeting, including: G. Bernard (1949-59); Vagn R. Pedersen (1960-61); J. Gash (1972-73); R. Sheppard (1977-78); Bert Papenburg (1983-84); Eric Templeton (1987-88); and Robert Ferric (1988-89).

Two new members of the 25-Year Club were in attendance to receive their pins: Donald Connors, of Kronos Canada, Inc. and M.V. Gennys. Gilles Corbeil, of Sico, Inc., and Conrad Letourneau, of Kronos Canada, Inc., also are new members of the 25-Year Club, but were not in attendance at the meeting.

Vagn Pedersen, of Tioxide Canada, Inc., gave a brief summary of a survey conducted by the Society regarding the membership.



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The major points brought out by the study are: a need for more French content at the monthly meetings; a need for a strong Manufacturing Committee; and naming the locations and menus for the monthly meetings.

Mr. Pedersen said that a long-term Planning Committee will analyze the results of the survey.

Graham Hardman, of Environment Canada, discussed the new "ENVIRONMENTAL CHOICE PROGRAM."

The speaker said the program is designed to improve and maintain the quality of the natural environment. He covered the program's objectives, structure, operations, and some of the problems discovered. Mr. Hardman gave a description of the procedures for developing the criteria for the program's various product categories.

ROBERT FERRIE, *Vice President*

NEW YORKMAR.

"Semi-Bulk Systems"

Certificates of Merit were presented to members of the Society Technical Subcommittee for the paper, "Evaluation of Additives for High Solids/Low VOC Polyester Melamine Coatings," which was presented during the FSCT's 1989 Annual Meeting, in New Orleans, LA.

C.S. Alack, of Semi Bulk Systems, Inc., spoke on "SEMI-BULK SYSTEMS—POWDERS." The presentation focused on air-pallet containers for packaging, shipping, and unloading pigments, fillers, and other fine products in dust-controlled environments.

JEFFREY C. KAYE, *Secretary*

NEW YORKMAY

"Solubility Parameter Calculator"

A moment of silence was observed in memory of Society Honorary Member Fred Daniel, of Daniel Products Company, and John O. Lundquist, of Georgia Kaolin Company, who died recently.

Attending the meeting were Federation President-Elect Kurt F. Weitz, of Indusmin Division, Falconbridge, and Executive Vice President Robert F. Ziegler.

The new members of the 1990-91 Board of Directors are: President—Roger P. Blacker, of Whittaker, Clark & Daniels; Vice President—Jeffrey C. Kaye, of MacArthur Petroleum & Solvent Company; Secretary—Michael C. Frantz, of Daniel Products Company; Treasurer—Armand J. Stolte, of Rheox, Inc.; Society Representative—Richard J. Himics, of Daniel Products Company; and Board of Directors (term expiring in 1992)—Charles Chomali, of Reliance Uni-

versal, Inc.; Cary Grobstein, of Cardinal Color, Inc.; and A. Wayne Tamarelli, of Dock Resins, Inc.

Two Society members were presented with this year's PaVaC Award: George J. Dippold, of Whittaker, Clark & Daniels, Inc., and Herman J. Singer, Society Honorary Member.

The President's Service Award was presented to Arthur I. Nortman, of Nortman & Associates, Inc. Mr. Nortman was recognized for the extraordinary effort and work displayed over the years on behalf of the Society and the paint and coatings industry.

Installed as a new member in the Society 50-Year Club was Jesse Bellett, of Reichhold Chemicals.

Twenty-Five Year Pins were presented to: Edward Baird, of Wilson-Imperial Company; Richard E. Birdsall, of Distri-Chem, Inc.; James E. Borner, of Spraylat Corporation; Courland Briggs, of Rex Industrial Paint Works; Richard L. Bukowski, of Con-Lux Coatings, Inc.; Joseph S. Detriolo, of Solar Compounds Corporation; Raymond P. Gangi, of International Paint Company, Inc.; William L. Kenny, of TR-Metro Chemicals, Inc.; Roy B. Lowe, of C. Withington Company, Inc.; Richard M. Peterson, of Standard Coatings Corporation; E.C. Rothstein, of Leberco Testing Company; Marvin J. Schnall, of Troy Chemical Corporation; Howard F. Simka, of Fyn Paint & Lacquer Company, Inc.; Frances G. Smith, Consultant; Jude T. Smith, of Benjamin Moore & Company; Leonard Trinkman; and Morris B. Williams, of Amerstam Color Works, Inc.

The meeting's regulatory program speaker was Robert Olechowski, of U.S. EPA Region II. Dr. Olechowski discussed SARA Section 313 and reported on present deadlines.

The meeting's second speaker was Houston Society member Daniel N. King, of Exxon Chemical Company, who spoke on "SOLVENT PROPERTY AND SOLUBILITY PARAMETER CALCULATOR."

The speaker defined the calculator as an advanced computer tool which describes the interaction of solvents and plasticizer with resins and polymers, based on the solubility parameter theory.

According to Dr. Olechowski, the user-friendly calculator is designed to help the paint formulator to reduce the number of experiments by simulating the interaction between resins/polymer and solvents. The tool predicts miscibility of given systems and calculates other useful properties. The speaker also discussed other unique features of the calculator: large library of solvents and resins; an evaporation profile which takes into account resin interaction; and the

ability to predict dynamic effects on blend properties.

JEFFREY C. KAYE, *Secretary*

PITTSBURGHAPR.

Past-Presidents' Night

Federation Treasurer William F. Holmes, of National Pigments & Chemicals, Inc., and Executive Vice President Robert F. Ziegler attended the meeting.

Mr. Holmes spoke about the Federation and its priorities, including its number one priority—the education of its members.

Mr. Ziegler discussed the 1990 Annual Meeting and Paint Show scheduled for October 29-31, in Washington, D.C.; the Federation's budget; Federation publications; and the new headquarters office to be located in Blue Bell, PA. He congratulated the Society for its growth in membership.

The slate of nominees for Society Officer positions for 1990-91 is: President—Mary Carole Storme, of Valspar Corporation; Vice President—Joseph J. Powell, of Union Carbide Chemicals and Plastics Company, Inc.; Secretary—Kirt Smith, of KTA-Tator, Inc; and Treasurer—Jeffrey C. Sturm, of Kop-Coat, Inc.

Past-Presidents in attendance included: Guido R. Henry (1950); Gerry Ward (1963); Kenneth Luyk (1969); Carl Izzo (1970); James D. Hood (1972); Ed Brazet (1973); William Spangenberg (1977); John S. Dahl (1979); Raymond C. Uhlig (1981); Richard Trudell (1982); Michael Gillan (1984); Clifford Schoff (1985); Joseph L. Mascia (1986); Anthony J. Isacco (1987); and Richard Marci (1989).

A 25-Year Pin was presented to Allan C. Zoeller, of Allan C. Zoeller Company.

Educational Committee Chairman Anthony Isacco, of Puritan Paint & Oil Company, reported that the National College Fair will be held February 13-14, 1991, at the J.L. Lawrence Convention Center. Mr. Isacco will look further into participating and/or representing colleges with a coatings oriented program.

Environmental Affairs Committee Chairman Ed Threlkeld, of Ashland Chemical Company, announced that the Pennsylvania Department of Transportation regulations requiring a 24 hour telephone number and product information for shipments of hazardous material was to become effective on June 4. He said there is a hazardous material guidebook which can be used for these shipments. Also, he reported that seven states are considering household hazardous waste legislation, and that the EPA is conducting a survey on mercury in paints.

JOSEPH J. POWELL, *Secretary*

PICTORIAL STANDARDS OF COATINGS DEFECTS

Revised and updated edition of this manual (previously titled "Exposure Standards Manual") has been compiled in conjunction with the American Society for Testing and Materials, and includes definition, description, and photographic standards for each of the following defects: Adhesion; Blistering; Chalking; Checking; Cracking; Erosion; Filiform Corrosion; Flaking; Mildew; Print; Rust; Traffic Paint Abrasion and Chipping.

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Anthony L. DeGisi, Jr. has been named President/North American Operations for Kronos, Inc., Hightstown, NJ. In this position, Mr. DeGisi will have direct responsibility for sales, marketing, technical service, logistics, purchasing (non-ore related), and coordination of manufacturing activities in the United States and Canada. Mr. DeGisi most recently served as Vice President and General Manager of the Colorants and Additives Division of Hüls America Inc., Piscataway, NJ.

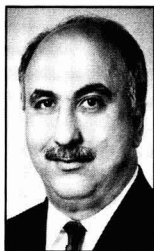
James R. Ungurait has been named Market Manager/Paper, Film, and Foil Coatings for Akzo Coatings Inc., Louisville, KY. Mr. Ungurait joined Akzo (then Reliance Universal Inc.) as a Salesman for paper, film, and foil coatings in 1986. Prior to joining Akzo, he worked in various research and sales position for Dayco, O'Brien Paint, and more recently Union Carbide.

W.L. (Les) Mercer has been elected President of the Institute of Metals, London, England. Dr. Mercer currently serves as HQ Director/Gas Research within the Research and Technology Division of British Gas plc.

Carl Zeiss, Inc., Thornwood, NY has announced the appointment of **Jerry L. Lehman** as Product Manager for transmission electron microscopes in the company's Electron Optics Division. Mr. Lehman's expertise lies in the field of electron microscopy.

G. Thomas Harrick has been assigned to the position of Vice President/Marketing for the Polyurethane Division of Mobay Corporation, Pittsburgh, PA. Prior to this appointment, he served as Vice President/Marketing for the Coatings Division. Succeeding Mr. Harrick in this capacity is **Nick T. Cullen**, who will return to the United States from Germany where he served on assignment at Mobay's parent company, Bayer AG.

Joseph R. Ambs has been named to the position of General Manager for Croda Inks Corporation's Dallas TX plant. Mr. Ambs joined Croda as a Sales Technical Representative in 1986. He previously served as Director of the Fluid Ink Division of Midland Color. Mr. Ambs replaces the retiring **Joseph G. Wanta**. Mr. Wanta served as General Manager of the Dallas facility since 1985.



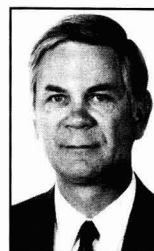
A.L. DeGisi, Jr.



J.R. Ungurait



A.M. Lietmann



D.W. Huemme

The election of **Alexander M. Lietmann** to President and Chief Executive Officer of Hüls America Inc., Piscataway, NJ, has been announced. Mr. Lietmann, formerly Executive Vice President/Administration, succeeds **Lawrence A. Wigdor**, who resigned earlier this year. Mr. Lietmann joined the West Germany headquartered chemical company in 1965.

In other related announcements, **Joern Stuehmeier** has been promoted from Vice President to Executive Vice President/Administration. Both he and **Lawrence Okun**, Executive Vice President/Coatings, were named to the Hüls America Inc. Board of Directors.

The Dow Chemical Company, Midland, MI, has appointed **Thayne Hansen** to the position of Market Group Manager for Dow Plastics' Coatings Group. Prior to this position, Mr. Hansen was Director of Communications for Dow Europe in Horgen, Switzerland.

Richard Luethke has joined the staff of KTA-Tator, Inc. as an Associate Consultant. He will be operating out of the company's west coast regional office located in Woodland Hills, CA.

The promotion of **Anthony Latella** to Marketing Manager has been announced by BASF Corporation's Performance Chemicals Business. Mr. Latella will be responsible for managing the market development of new as well as existing products to the consumer and industrial markets for surfactants, dispersants, defoamers, and polymers.

In addition, **Jay G. Otten** has been promoted to Manager of Research & Development for the Specialty Products Group in the Consumer Products and Life Science Division of BASF. He will provide support to the company's plants in Washington, NJ, and Whitestone, SC.

Douglas W. Huemme has been appointed President and Chief Operating Officer of Lilly Industrial Coatings, Inc., Indianapolis, IN. He replaces **E. James Dempsey** on Lilly's Board of Directors. Mr. Huemme has been employed by Whittaker Corporation as its Corporate Vice President responsible for Chemical Operations for the past 14 years. Prior to that, he held various managerial positions in PPG's Coatings and Resins Division for 13 years. Mr. Huemme is a member of the Los Angeles Society.

The Architectural Spray Coaters Association (ASCA) has elected **Robert S. Goodman**, of Porce-Len Inc., its President. He succeeds **Gerald D. Petz**, of Construction Specialties, Inc. Other officers elected were: Vice President—**James M. Smalleghan**, of Enamalum Corporation; Secretary/Treasurer—**Vicki Barrett**, of Linetec; and Directors—**Donald N. LeClare**, of O.O. McKinley Co., Inc. and **James McClatchey**, of Southern Aluminum Finishing Company. The new officers will serve through May 1991.

The Painting and Decorating Contractors of America (PDCA), Fairfax, VA has named **Lou Eggert** Director of Technical Services of its new Technical Division. The primary mission of the division will be to develop industry standards and specifications for the application of paints, coatings, and wallcoverings. It will also produce educational materials and seminars for PDCA contractors, write articles for PDCA publications, and provide technical support for other association activities. Mr. Eggert will be headquartered in Chicago, IL.

Dr. Kashmiri L. Mittal Named Recipient Of ASTM's Charles B. Dudley Award

Kashmiri L. Mittal, Senior Chemist at IBM U.S. Technical Education in Thorwood, NY, is the 1990 recipient of the American Society for Testing and Materials' (ASTM) Charles B. Dudley Award. Dr. Mittal was honored for his work on "STP 640, Adhesion Measurement of Thin Films, and Bulk Coatings."

The Charles B. Dudley Award was established in 1925 in honor of ASTM's first Chairman of the Board. It is presented once a year to an author or editor of a book, paper, standard, or series of books, papers, or standards published by ASTM.

A native of Kirodh, Haryana, India, and a resident of Hopewell Junction, NY, Dr. Mittal has authored 34 books dealing with surface contamination and cleaning, various aspects of adhesion, polyimides, and surfactants. He is the founding editor of an international journal, a worldwide lecturer and organizer of many international symposia. Dr. Mittal is listed in "American Men and Women of Science," "Who's Who in Frontier Science and Technology," and "Who's Who in Technology Today."

Pre Finish Metals Inc. (PFM), Elk Grove Village, IL, has named **Walter G. Culin** its Chairman of the Board. He has been President and Chief Operating Officer at PFM since 1982. Bringing more than 30 years experience in the manufacturing industry to this position, Mr. Culin has worked for Borg Warner, Continental Can, National Can, and Overmeyer Corporation.

In addition, **Gerald G. Nadig** has been appointed President and Chief Operating Officer. Joining PFM in 1989 as Executive Vice President, Mr. Nadig will be responsible for all operations and the ongoing development and implementation of the company's current activities.

James F. Mullooney has joined the sales staff of Dowd and Guild, Inc., San Ramon, CA. He will be responsible for sales of the company's line of raw materials and equipment in the central and southern California areas. Mr. Mullooney is a member of the Los Angeles Society.

The promotion of **John P. Knudtson** to Director of Research/European Operations has been announced by the Dexter Corporation's Packaging Products Division, Waukegan, IL. His primary responsibility will be to establish a polymer and coatings Research and Development Center to serve the division's European market. Mr. Knudtson will undertake his new responsibilities on September 1 at the division's Tournus, France complex. He is a member of the Chicago Society.

Raabe Corporation, Milwaukee, WI, has announced the promotion of **James Bruss** to the position of Marketing Projects Manager. He will be responsible for the implementation of the firm's marketing activities plan, which includes the development of the customer newsletter; direct mailings; trade shows; print advertising; and public relations.

The Titanium Products Business of SCM Chemicals, Baltimore, MD has named **Raymond F. Horath** to the position of District Sales Manager/Midwestern District. In this capacity, Mr. Horath will be responsible for the development and achievement of the district sales plan in support of established business and marketing objectives. He is a member of the Southern Society.

In addition, **Douglas J. Hellyar** was named District Sales Manager/Cleveland. Mr. Hellyar most recently served as Senior Sales Representative with the Resins Division of Monsanto Chemical Company.

National Starch and Chemical Company has announced the election of **Walter F. Schlauch** as a Director of the company. Mr. Schlauch currently serves as Group Vice President/Adhesives, Resins, and Specialty Chemicals located at the firm's Bridgewater, NJ headquarters.

Reichhold Chemicals, Inc., White Plains, NY, has announced the appointment of **William L. Veon** as Vice President/Purchasing and Transportation. Mr. Veon's responsibilities will include managing all purchasing and transportation activities for all divisions of the corporation. He will be located in the company's Raleigh/Durham, NC office.

Henkel Corporation, Gulph Mills, PA, has announced the selection of **Maria Del Carmen Laso**, a doctoral candidate at the University of California, Berkeley, as the first recipient of the company's fellowship in support of research in colloid and surface chemistry. The selection was made on the basis of Ms. Laso's academic record and her proposal for research to be carried out under the auspices of her fellowship. She graduated cum laude from the University of Virginia and plans to receive her Ph.D. in Chemical Engineering in May 1992.

John F. Boorman, a 25-year member of the Federation (Philadelphia Society), has retired from Van Horn, Metz & Co., Inc., Conshohocken, PA. He began his 36-year career with Alcoa's Chemical Division and spent the majority of his working years with Van Horn, Metz & Co. Mr. Boorman also served on the Board of Directors of the Philadelphia Paint and Coatings Association.

In moves coinciding with the retirement of Mr. Boorman, **Barrett C. Fisher III** and **A. Marshall Jones** were named Vice Presidents of the firm.

Northwestern Society Past-President **Don Pellowe** has retired from Frost Paint & Oil Corporation, Minneapolis, MN. Prior to his retirement, Mr. Pellowe was serving as the company's Technical Director. He has been with the company since 1981.

Also, **Calvin C. Henning**, and his wife, **Denise R. Henning** have joined the staff of Frost. Mr. Henning has assumed the position of President, as well as Chief Executive and Chief Operating Officer. Mrs. Henning has been appointed to the position of Technical Director. Mr. and Mrs. Henning have entered into an agreement to complete a purchase of the corporation. Until the purchase is completed, the current majority owner, **Frank Moore, Jr.**, will continue as Chairman of the Board.

Roy S. Berns Receives ISCC Macbeth Award

The recipient of the 1990 Inter-Society Color Council (ISCC) Macbeth Award is Roy S. Berns. The Macbeth Award was established in 1972 by Norman Macbeth, Jr., long-time Treasurer of the ISCC, in honor of his father, Norman Macbeth, Sr., a founding member of the ISCC and founder of the Macbeth Daylighting Corporation, now a part of Kollmorgen. It is presented every other year for outstanding recent contributions to the field of color.

ISCC's 1990 Nickerson Service Award to Joyce Davenport

Joyce S. Davenport, of Consolidated Research, Mt. Prospect, IL, has received the 1990 Nickerson Service Award for her distinguished and dedicated service to the ISCC. The award is named Dorothy Nickerson, who was very dedicated to this society and served as its first woman President in the early 1950s. The first woman to serve as President after Ms. Nickerson, some thirty years later, was Joyce Davenport.

SUNY to Offer Short Courses in Fall 1990 in Orlando, FL

"Advances in Polymer Colloids (Emulsion Polymers): Polymerization, Characterization, and Applications," and "Fundamentals of Adhesion: Theory, Practice, and Applications," are the topics of two fall courses to be sponsored by the Institute of Materials Science, State University of New York (SUNY), in New Paltz, NY. The "intensive" short courses will be held October 31-November 2, 1990 and November 12-14, 1990, respectively, in Orlando, FL.

The "Colloids" course is an introduction to the field and is designed primarily for the industrial researcher who is entering the industry. Emphasis will be on water-borne synthetic latexes which can be used in non-polluting paints, adhesives, printing inks, floor polishes, and many other applications.

Topics to be covered and instructors include:

"Emulsion Polymerization—Particle Formation"—R.M. Fitch;

"Emulsion Polymerization—Particle Growth"—R.M. Fitch;

"Characterization"—R.L. Rowell;

"Characterization"—M.A. Winnik;

"Control of Morphology"—D.C. Sundberg;

"Colloid Stability"—T.G.M. van de Yen;

"Movies of Colloidal Behavior"—

T.G.M. van de Yen;

"Microlatexes and Inverse Emulsion Polymerization"—F. Candau;

"Rheology Control and Industrial Applications"—I.M. Krieger; and

"Rheology Control and Industrial Applications"—D.R. Bassett.

The second course, "Adhesion," will present to the chemists, engineers, material scientists, and physicists the fundamentals of adhesion and the overviews of the latest developments in the science and technology of adhesion. The overviews will cover molecular forces, thermodynamics of adhesion, acid-based interaction, surface analytical techniques, and fracture mechanics of adhesive joints.

The program will include the following:

"Adhesion of Solids Derived from Van der Waals Forces"—L.H. Lee;

"Surface Characterization in Adhesion"—J.P. Wightman;

"New Developments in Structural Adhesives"—K.F. Drain;

"Acid-Base Interactions, Surface Energetics, and Wettability"—L.H. Lee;

"Strength Development of Polymer-Polymer Interfaces"—R.P. Wool;

"Theory and Practice of Adhesion Through Silane Coupling Agents"—E.P. Plueddemann;

"Physical Properties and Testing of Polymeric Adhesives and Sealants"—T.C. Ward;

"Mechanics Applied to Adhesives, Adhesive Joints, and Adhesive Science"—H.F. Brinson;

"Test Methods for Stress Analysis of Bonded Structure"—R.B. Krieger;

"Interface Structure and Bonding for Thin Film Adhesion"—J.E. Baglin; and

"High Temperature Polymers as Adhesives"—T.L. St. Clair.

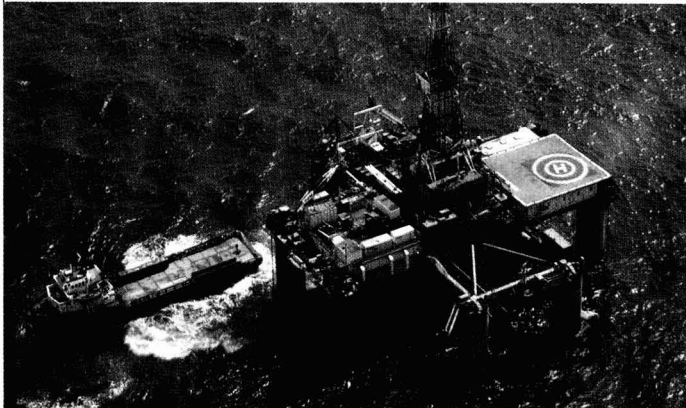
For more information on these and other SUNY courses for the fall of 1990, contact Institute of Material Science, CSB 209, State University of New York, New Paltz, NY 12561.

NACE Sponsors Symposium On Environmental Effects

The National Association of Corrosion Engineers (NACE), Houston, TX, is sponsoring the First International Symposium on Environmental Effects on Advanced Materials, June 19-21, 1991, at the Catamaran Resort Hotel in San Diego, CA. The ADVMAT/91 symposium is designed for scientists and engineers dealing with the development and application of advanced materials. Presentations will focus on effects of service environments as seen as critical for applications in the aerospace, automotive, chemical, and manufacturing industries. Topics will include the discussion of alloys, ceramics, and polymers.

Further details regarding the symposium are available from the NACE Customer Service Dept., P.O. Box 218340, Houston, TX 77218.

Cast off corrosion with SACI high-solids.



Do you need maintenance coatings that perform well in highly-corrosive environments?

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Based partly on modified sulfonate chemistry, these high-solids products have a high affinity to metals, so they require minimal surface preparation and resist undercutting.

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Because they're high-solids, they offer low VOC.

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Witco

Program Announced for Powder Coating '90

The program for Powder Coating '90, to be held October 9-11, Cincinnati Convention Center, Cincinnati, OH, has been announced. In addition to the technical presentations featured at the conference, intensive group workshops, and a 25,000 sq ft exhibition are also slated.

The program consists of the following presentations:

Session I—Kickoff: Gaining Ground on New Markets

"North American Market Overview"; "Clear Powder Coatings"; "Role of Custom Coater in the 90s"; "Powder Coating of Non-Metal Substrate"; "Powder Equipment Considerations for Coating Metal Blanks"; "The Use of Formable Powder Technology for Precoat Applications"; and "Appliance Powder Coatings for the 1990s."

Huddles: Powder Coating Workshops

"Pretreatment for Powder Coating"; "Worker Health and Safety Training for Powder Coating Operations"; "Measurement of Powder Coating Film Characteristics"; "Troubleshooting a Powder Coating System"; "Powder Coating System Design, Installation, and Start-Up"; and "Job Costing Techniques for Custom Coating Operations."

Session II—Second and Goal: Offensive Weapons for Improved Application

"Powder Coating System for the Appliance Industry"; "Powder Application Equipment for Smaller Volume Users"; "Curing Powder Coatings with High Intensity Infrared Radiation"; "Automation of Powder Application and Recovery Equipment"; "Planning and Implementing Statistical Process Controls on a Powder Paint Line for Aluminum Alloy Wheels"; and "Update on Health and Safety Aspects of Powder Coatings."

Session III—Touchdown: Scouting Reports on Powder's Successes

"Why Modine Manufacturing Company is Converting to Powder Coating"; "Operating a Large Powder System—The Second Year"; "Changing from Wet to Dry: Problems and Solutions"; "Conversion to Powder Case Study: Cal-Style Furniture"; "Conversion from Liquid to Powder—Cost Justification and Payback Analysis"; and "Powder Over E-Coat—Advantages and Limitations."

Powder Coating '90 is sponsored by the Powder Coating Institute and managed by Gardner Management Services, 6600 Clough Pike, Cincinnati, OH 45244.

EG&G Schedules Corrosion Symposium

EG&G Princeton Applied Research, Princeton, NJ, has announced plans for the fifth annual symposium and refresher course entitled, "Electrochemical Techniques for Corrosion Measurement." The symposium is slated for December 3-5, 1990, in St. Louis, MO. Practical applications for both DC electrochemical corrosion measurements and electrochemical impedance measurements will be covered. Papers dealing with coating evaluations, biological corrosion problems, and electrochemical impedance data interpretation will be presented.

An optional refresher/training course covering electrochemical methods is scheduled for Monday, December 3. Demonstrations using the latest computer-assisted instrumentation for electrochemical corrosion measurements will be provided.

Further information can be obtained by contacting Ruth M. Rearick, EG&G Princeton Applied Research Corp., P.O. Box 2565, Princeton, NJ 08543.

VOC Standards Training Course Offered by ASTM, Nov. 1-2

ASTM's Standards Technology Training will present a workshop titled "Measuring Paint Volatile Organic Compounds (VOC)," on November 1-2, 1990 at the Holiday Inn-Washington, D.C. The two-day workshop, which will include test demonstrations at the National Institute of Standards and Technology, in Gaithersburg, MD, is designed to sharpen skills on how to get meaningful VOC data from paints, inks, and related coatings.

The course is geared for those in the paint industry, such as chemists, government regulatory bodies, commercial laboratories, paint manufactur-

ers, and paint users, who use EPA tests to determine if paints or coatings meet VOC requirements.

Registration fee includes ASTM *Manual on Determination of Volatile Organic Compounds in Paints, Inks, and Related Coatings Products*; 10 ASTM Standards covered in the course; a workbook of lecture notes and visual aids; coffee breaks; and transportation to and from the laboratory demonstration site.

To obtain more information, contact Kathy Dickinson, ASTM, 1916 Race St., Philadelphia, PA 19103.

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Ink Jet Systems

Literature introduces personal computer software for use with a personal computer ink jet printing system. The software allows the user to integrate the system with any personal computer that is IBM compatible, with at least 512K memory, and has a floppy disk, and an available serial and parallel port. For more information on Telemark PC Software, write Marketing Services, Diagraph Corp., 3401 Rider Trail South, St. Louis, MO 63045.

Air Filter

A new high tech air filter suited for highly toxic dangerous substances or respiratory irritants is the subject of a product bulletin. The filter is designed to have a residual dust content of 10^{-4} mg/m³, and may be used for filtering and dust recovery from the coarsest to the finest dusts. Further details on the Anke High Tech Air Filter are available from Draiswerke, Inc., 3 Pearl Court, Allendale, NJ 07401.

Paint Additives

An eight-page booklet which describes a line of additives for improving paint bonding to substrates is in print. A series of photographs in the booklet highlight the coating improvement made on a number of substrates including rolled steel, galvanized steel, and aluminum, and illustrations of conical mandrel, crosshatch, and impact tests show improved adhesion and salt spray resistance. For a copy of the booklet, write Man-Gill Chemical Co., 23000 St. Clair Ave., Cleveland, OH 44117.

Spectrophotometers

A new, eight-page, full-color brochure which highlights a new accessory for a line of multi-range FTIR spectrophotometers has been published. The brochure contains optical diagrams, spectra, typical applications, and a removable section which describes the Raman effect, discusses advantages and shortcomings of conventional Raman, and concludes with the advantages derived from modern FT-Raman spectroscopy. A copy of the publication is obtainable from Bruker Optics Div., Manning Park, Billerica, MA 01821.

Organic Pigment

A blue shade red plastics grade pigment conditioned to give a soft product, as compared to the coatings grade, is the topic of literature. The pigment is available as a dry color and as a presscake. Write Sun Chemical Corp., P.O. Box 1302, 222 Bridge Plaza South, Fort Lee, NJ 07024 for details on Pigment Red 179.

Polymer Emulsions

A new, four-color brochure that lists a full line of polymer emulsions is now available. The literature walks the reader through a polymer chemicals business, providing specifics on products manufactured and markets served. "Polymer Emulsions: Quality-Driven Performance" can be obtained by writing Air Products and Chemicals, Inc., Polymer Chemicals Div., 7201 Hamilton Blvd., Allentown, PA 18195-1501.

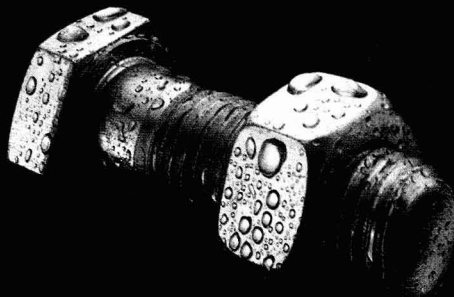
Coatings for Concrete

A brochure featuring coatings for concrete floors is in print. Included in the booklet are charts on the various products, with descriptions of repair and joint materials, stripping agents, primers, topcoats, and grit. Also included is a cross section of a restored concrete floor. For details on Chemglaze® coatings and a copy of brochure DS10-7020C, write Lord Corp., Industrial Coatings, 2000 W. Grandview Blvd., P.O. Box 10038, Erie, PA 16514-0038.

Filter Aids

A new data sheet describes the advantages of marine diatomite and how its filter aids are designed to offer efficiency and porosity. For a copy of the marine diatomite data sheet, FA-419, write Manville Product Information Center, P.O. Box 5108, Denver, CO 80217.

Say "Nuts!" to corrosion with SACI emulsions.



Do you need maximum corrosion protection where solvents or emissions are undesirable?

Then SACI® waterborne concentrates — the most effective water-based anti-corrosion products available — should be a major component of your coatings system.

They're ideal for applications ranging from temporary protection of metal stocks, such as nuts and bolts, to

permanent protection for rigorous automotive applications.

SACI emulsions can be formulated to yield oily, waxy, or hard, tack-free films.

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Birmingham Club Publishes 200-Year History

The Birmingham Paint, Varnish & Lacquer Club of the Federation of Societies for Coatings Technology has published a 59-page book, "The History of Paint Manufacture in the Midlands of the U.K." The book covers the earliest records of paint manufacture beginning in 1773 to present. Chapters include The Early Days; The Beginnings of the Paint Industry; The Energetic Eighties; Into the Twentieth Century; Varnishes and Varnish Making; Development of Raw Materials; and Paint and Ink Manufacture. Also included are Catalogues and Prices; Advertisements and Photographs; and Some Personal Recollections.

The publication of this book was initiated and developed by members of the Technical Committee of the Birmingham Club. They include: CHAIRMAN—G.J. Gough, of Holden Surface Coatings Ltd.; SECRETARY—B.E. Myatt, of Worrall's Powders

Ltd.; R.E. Arnold; H.J. Clarke (Honorary Member); C.W. Gilbert (Honorary Member); D. Penrice, of Newtown Industrial Paints Ltd.; R.L. Staples, of CWS Coatings Technology; and AUTHOR OF TEXT—D. Eddowes.

Copies of this publication are available at a price of £5.00 from Mr. Roland Staples, CWS Coatings Technology, Unit 2, Shaftmoor Lane, Birmingham, B28 8SP, United Kingdom.



Derek Eddowes (left), former Editor of the *Paint, Polymer Journal*, receives an inscribed silver salver from David Penrice, Birmingham Club's President, for his contributions in producing the book

Viscometer Software

A new viscometer software offering either a rotation or oscillation program is introduced in literature. The software is IBM personal computer compatible (MS/PC DOS with a minimum memory capacity of 640 KB RAM and a hard disk) and features a user-friendly window environment. Both programs are available on either 3.5 in. or 5.25 in. disks. For further details, write Fisons Instruments, 24911 Stanford, Valencia, CA 91355.

Thermal Spray Powders

A new, four-page brochure describes a line of thermal spray powders for coating applications. The publication provides an application reference guide for a line of ceramic powders. A copy of brochure 6232 is available from Karen Ramsey, Norton Co., Advanced Ceramics, P.O. Box 15008, One New Bond St., Worcester, MA 01615-0008.

Side-Entry Mixer

A low horsepower side-entry mixer is the focus of a product bulletin. The mixer contains a hinged pedestal designed to simplify seal replacement and maintenance, allowing the gearbox and motor to swing away from the pedestal with the removal of several bolts. Contact Jeff Caulfield, Mixing Equipment Co., 221 Rochester St., Avon, NY for additional information on the mixer.

Chroma Sensor

A product data sheet announces the increased measurement speed of a chroma sensor spectrophotometer to further meet quality control needs. The read time reportedly has been cut by nearly 50%. Information on the Chroma Sensor CS-3 can be obtained by writing Applied Color Systems, P.O. Box 5800, Princeton, NJ 08543.

Finishing Equipment

A new 32-page brochure highlights a full line of industrial finishing equipment, washers, ovens, and complete painting and powder coating systems. Machine details, feature/controls, electrocoating, and food/beverage can washer sections are included. For a copy of the publication, write Cincinnati Industrial Machinery, Div. of Eagle-Picher, 3280 Hageman St., P.O. Box 41027, Cincinnati, OH 45241.

Acrylic Emulsion

Literature introduces a new acrylic copolymer designed for use in premium roof coatings, and elastomeric wall coatings and mastics. The new product is compatible with commonly used extenders and paint additives. Write Air Products and Chemicals, Inc., Polymer Chemicals Div., 7201 Hamilton Blvd., Allentown, PA 18195-1501 for details on Flexbond® 471 acrylic emulsion.

Polyester Resin System

A new polyester resin system for fast-food containers and microwave packages with benefits for the environment is the subject of a bulletin. The system is designed with environmental friendly blowing agents and the polyester resins are recyclable. Details on the Petlite resin system are available from Polyester Div., Goodyear, Akron, OH 44316-0001.

Silicone Additives

New literature describes a line of silicone additives for the paint, ink, coating, and adhesives industries. The eight-page brochure includes a comprehensive product selection guide in chart form, offering formulators a reference on 25 silicone products, the systems in which then can be used, and the benefits which they deliver. For a copy of "Dow Corning® Additives—The Right Chemistry," write Dow Corning Corp., Dept. P005, Midland, MI 48686-0994.

Luster Pigment

A new, non-metallic, gold pearlescent luster pigment which is nontoxic, nonaring, and nontarnishing has been introduced in a technical bulletin. The pigment is offered in both a regular and exterior grade, and is recommended for plastics incorporation, surface coating, and printing ink applications, both water based and solvent. Technical data on Mearlin® Mayan Gold is available from The Mearl Corp., 41 E. 42nd St., New York, NY 10017.

Airborne VOCs

A newsletter which focuses on the control of airborne volatile organic compounds, fumes, and odor causing constituents is available. The quarterly publication covers a variety of applications for a regenerative thermal oxidizer system for use in the printing, coating, laminating, chemical processes, and food manufacturing industries. To receive a copy of "Perspectives," write Reeco, Box 600, 520 Speedwell Ave., Morris Plains, NJ 07950-2127.

Chemical Products

A new, 40-page chemical products brochure which outlines applications, specifications, and select properties is in print. The products include additives, amines, aromatics and derivatives, C₄ products, carbonates, glycols, intermediates, olefins, oxides, solvents, Surfonic® surface-active agents, and a urethane chemical line. A copy of the literature is available from A.W. Godfrey, General Manager—Sales, Texaco Chemical Co., P.O. Box 27707, Houston, TX 77227-7707.

Black Aqueous Dispersion

A new high pigment load aqueous dispersion in a non-ionic system is highlighted in a subject bulletin. The dispersion can be used in a variety of water-based flexo and gravure inks, as well as a variety of coatings applications. Samples of and information on BS 14583 can be obtained from CDI Dispersions, 27 Haynes Ave., Newark, NJ 07114.

Silicones

Literature introduces a new, pressure-sensitive adhesive and two new, UV-curable release coating products designed for manufacturers of pressure-sensitive tapes and labels. For additional details on PSA 610 pressure-sensitive adhesive, UV9315 release coating, or UV9320 controlled-release additive, write GE Silicones, Inquiry Handling Service—PR# COAT-01-90, P.O. Box 753, North Adams, MA 01247.

Scanning Tunneling Microscope

A scanning tunneling microscope which makes it possible to stimulate, measure, and observe electrochemical reactions is the focus of a technical bulletin. The microscope combines imaging hardware and computer technology with a built-in potentiostat and electrochemical cell. Information on the MicroView™ Scanning Tunneling Microscope is available from EG&G Princeton Applied Research Corp., P.O. Box 2565, Princeton, NJ 08543-2565.

Updated Catalog

The Society of Manufacturing Engineers (SME) announces the availability of its updated "1990 Catalog" which features more than 270 publications, videotapes, and software programs. The catalog is organized by topic and contains details on SME's certification program, Information on Technology in Manufacturing Engineering (IN-TIME). For a copy of the literature, write SME, Customer Service Center, One SME Dr., P.O. Box 930, Dearborn, MI 48121-0930.

Universal Measuring Fixture

A data sheet features a new universal measuring fixture with granite base for accurate, repeatable coating thickness measurements. The literature provides data for a fixture designed to measure a wide variety of small piece parts and accept a wide variety of probes both straight or right angle. For a copy of the literature, contact Chris Horvath, 2301 Arthur Ave., Elk Grove Village, IL 60007.

Experimental Kit

A product data sheet introduces a spray-vector experimental kit which can create humidification, atomization, or fogging—tailored specifically to application need. The kit contains a three-eighths inch Sprayvector body and three interchangeable brass nozzles allowing for the production of micron and submicron sprays suitable for humidification, dust suppression, evaporative cooling, moisturization, coating, and atomization. For more information on the Model 1700 Sprayvector Experimental Kit, write Application Engineering Dept., Vortec Corp., 10125 Carver Rd., Cincinnati, OH 45242-9976.

Bulk Container

A bulk container, available in 220 to 440 gallon sizes, has been introduced through literature. Supplied with either a flexible bag or high-density plastic blow-molded interior for difficult to hold products, the drum can be used to package a variety of products including chemicals, pharmaceuticals, inks, adhesives, resins, and food. Contact Ron Rakey, Sonoco Intermediate Bulk Container Div., 100 Alex St., Lavonia, GA 30553 for more information.

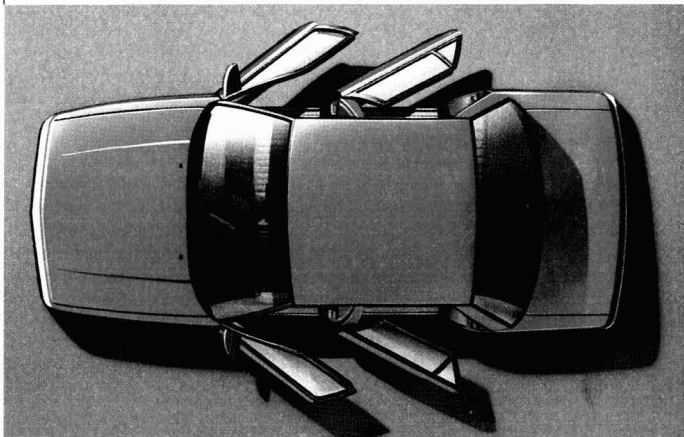
Software

The updated version of a current software package which reportedly allows for set up of any number of quality control (Q/C) tests with each formula and which tracks both target values and results through the production cycle has been introduced. The system runs on IBM-compatible PCs and local area networks. For further information on the Batchmaster PLUS+ Production Subsystem, contact Pacific Micro Software Engineering, 35-59th Place, Long Beach, CA 90803.

Crosslinker

A technical data sheet on a low-temperature crosslinker for water-borne coatings has been issued. The product is a multifunctional carbodiimide designed to be effective with a wide range of carboxylated polymers. It is supplied as a 50% active solution in propylene glycol monomethyl ether acetate. More information on UCAR-LINK™ Crosslinker XL-29 SE, including performance data, can be obtained from Union Carbide Chemicals and Plastics Co., Inc., UCAR Coatings Resins, Dept. L4489, 39 Old Ridgebury Rd., Danbury, CT 06817-0001.

Slam the door on corrosion with SACI hot-melts.



Do you need excellent corrosion inhibitors in hot-melt form?

Then SACI® should be a major component of your coatings system.

Coating systems based on SACI have been proven effective in tough automotive applications such as doors and underbodies.

Their hot-melt form makes them easy to apply.

A variety of grades allows versatility in your formulation.

Solvent-free SACI concentrates are easy to work with and are non-toxic.

Call our Sonneborn Division at 212-605-3922. Or write us at 520 Madison Ave., New York, NY 10022.

Witco

Autosampler

Random access programming, interchangeable sample trays, and the ability to use customized vessels and sample trays are some of the features of a recently introduced autosampler. The autosampler automates instrument calibration and sample analysis to reduce overall analysis time. Data on the AS-90 Autosampler is available from The Perkin-Elmer Corp., 761 Main Ave., Norwalk, CT 06859-0012.

Color Concentrates

New polyester-based, Food and Drug Administration-acceptable color concentrates in both crystallized and uncrystallized forms are highlighted in literature. Uses for the concentrates include food packaging, carpet and woven fibers, industrial strapping materials, and monofilament applications. For more details, write Spectrum Colors, 9101 International Parkway, Minneapolis, MN 55428.

Adhesion Tester

Technical data has been released on an adhesion tester that measures the adhesion bond strength of coatings by applying a new approach to the traditional methods of tensile adhesion testing. A swivel-mounted pressure gage on the unit permits testing from any position. Contact KTA-Tator, Inc., 115 Technology Dr., Pittsburgh, PA 15272 for more information on the HATE Mark VII Adhesion Tester.

Exterior Paint System

A paint system featuring a complete line of acrylic exterior house and trim paint products available in flat, satin, and gloss finishes is the subject of literature. The system is designed for application on a variety of properly prepared surfaces including wood, masonry, aluminum siding, brick, and concrete block. Write Sherwin-Williams Stores Group, c/o Robert Silverman Co., 1375 Euclid Ave., Cleveland, OH 44115.

Hydrophobic Silicas

A brochure which investigates the question of how hydrophobic properties can be measured is in print. The publication is illustrated and contains data tables, a bibliography, a glossary of special terms, and a table summarizing the physical-chemical data of the aerosils described. For a copy of "The Use of Hydrophobic Aerosil® in the Coatings Industry," write Degussa AG, Public Relations Dept., Postfach 11 05 33, D-6000 Frankfurt 11.

Finish Epoxy

A high performance catalyzed epoxy for use in severe atmospheric environments is the topic of recently released literature. The product is designed to provide maximum coatings protection against corrosion and chemical attack. Inquiries for additional information should be identified as "Bild and Finish Epoxy," and sent to The Sherwin-Williams Co., c/o Robert Silverman Co., 1375 Euclid Ave., Cleveland, OH 44115.

Waterborne Vinyl Resin

A waterborne vinyl resin dispersion, developed for ink, coatings, and adhesives is the subject of a recently released 24-page booklet. The product is described as an aqueous colloidal dispersion of solution-polymerized vinyl resin. Tables and applications are also included. Copies of the booklet, "UCAR® Waterborne Vinyl Resin Dispersion AW-875 for Inks, Coatings, and Adhesives," designated F-60864, are available from Union Carbide Chemicals and Plastics Co., Inc., UCAR Coatings Resins, Dept. L4489, 39 Old Ridgebury Rd., Danbury, CT 06817-0001.

Cationic Polymers

A new series of emulsion flocculants designed especially for use in industrial sludge dewatering and wastewater clarification is highlighted in a data sheet. The active products have been formulated to work at low dosages. Information on Drewfloc® 2400 is obtainable from Marketing Services, Drew Industrial Div., One Drew Plaza, Boonton, NJ 07005.

Viscosity Directory

An expanded directory of contemporary rheological literature has been published. The new directory encompasses over 80 titles, including 11 categories, and features papers of scientists and engineers from industrial countries around the world. "Technical Papers on Viscosity Measurement and Control," directory #091-C, is available from Brookfield Engineering Laboratories, Inc., Dept. NR-76, 240 Cushing St., Stoughton, MA 02072.

Small-Media Mills

Small-media mills, ranging in sizes from 2 to 60 gallons, are being introduced through literature. The mills reportedly provide continuous wet milling for aqueous and solvent slurries of all viscosities. For more information, contact Walt Stouger, Morehouse Industries, 1600 W. Commonwealth, Fullerton, CA 92633.

Inspection System

A new, automated, high-speed machine vision inspection system for glass container and can manufacturers is the topic of a product data sheet. The system is designed to detect flaws in glass bottoms and can ends at rates of 1400 to 1800 units per minute on single conveyor lines. Write Ball Industrial Systems Div., 3400 Gilchrist Rd., Moga-dore, OH 44260 for additional data on the FastTrack III system.

Bulk Handling

A 15-page brochure that contains guidelines on bulk storage and handling, addresses proper bulk materials management, and discusses the economic advantages of handling acrylic polymer materials in bulk has been introduced. For a copy of the brochure, contact S.C. Johnson Wax, Specialty Chemicals, Racine, WI 53403.

Coatings Properties

A new case study which focuses of the ideal properties of a coating, paint, or ink, and reviews the importance of sag resistance, good leveling and settling characteristics, and thixotropic recovery has been published. Evaluation of small sample volumes provides information required to predict product performance on the bench scale. Contact Laura Migliore, Bohlin Reologi, Inc., 2540 Rt. 130, #105, Cranbury, NJ 08512.

Surfactants Guide

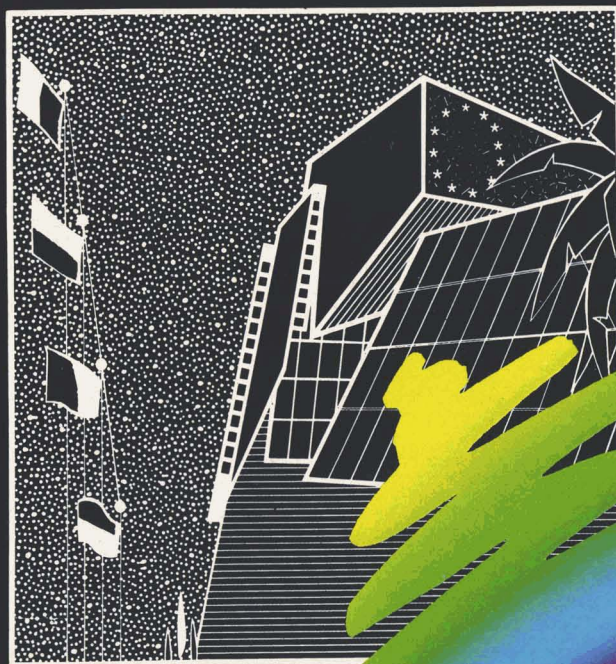
A new product guide describes a cross section of surface active agents available to help coating formulators improve the performance of their systems or solve specific problems. The literature provides information on typical properties, solubility, suggested use levels, functions, and applications for additives. A copy of "Surfactants for Paints and Coatings" is available from Organics Div., Witco Corp., 520 Madison Ave., New York, NY 10022.

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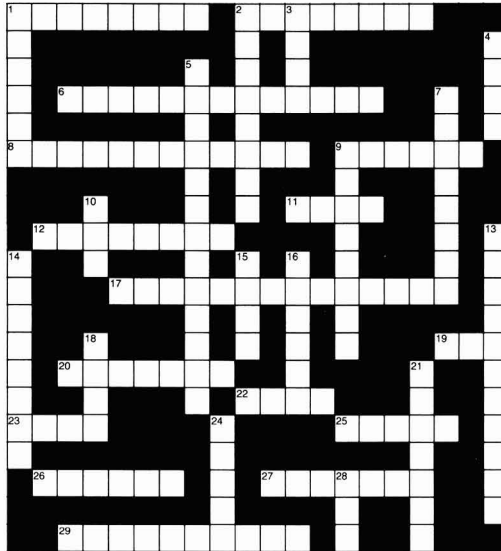
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by Earl Hill



Solution
to be
Published in
September issue

No. 37

ACROSS

1. Familiar reddish-brown wood stain color
2. Glass-like
6. Weather simulator
8. Having to do with color stimulus
9. Tom Miranda's company (Syn.)
11. Express (Syn.)
12. A change in the value of a quantity, e.g., pressure_____
17. Chemically inert portion of fats and resins
19. In at the finish, athletically speaking
20. A layered wooden substrate
22. A door's threshold
23. Super drying oil, nut derived
25. Business C_____
26. Having a reasonable chance of succeeding, e.g., a _____ alternative
27. A type of green
29. One who applies

DOWN

1. A surface, artistic or patterned
2. Speed; rapidity, e.g. (Syn.)
3. One of many adhesion tests
4. Linseed oil source
5. To settle
7. The application of force to something
9. A metal used in driers
10. Anti-blocking additive
13. Chemical structure present in dyestuffs
14. Class of pigments being frowned upon by ecologists
15. A hole; a space
16. Having to do with vision
18. Metal dross (in machine shop)
21. A skip; film defect
24. Something used in dispersion equipment
28. Deterioration often encountered with 20 Across

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

(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.

1992

(Oct. 21-23)—70th Annual Meeting and 57th Paint Industries' Show. McCormick Place, Chicago, IL.

1993

(Oct. 27-29)—71st Annual Meeting and 58th Paint Industries' Show. World Congress Center, Atlanta, GA.

SPECIAL SOCIETY MEETINGS

1991

(Feb. 6-8)—Southern Society. 18th Annual Water-Borne, Higher-Solids, and Powder Coatings Symposium. Co-sponsored by the Department of Polymer Science at the University of Southern Mississippi (USM), New Orleans, LA. (Robson F. Storey and Shelby F. Thames, Co-Organizers, WBHS&PC Symposium, Dept. of Polymer Science, USM, Southern Station, P.O. Box 10076, Hattiesburg, MS 39406-0076).

(Feb. 18-20)—Western Coatings Societies' 20th Biennial Symposium and Show. Hilton Hotel, San Francisco, CA. (Patricia Stull, Pacific Coast Chemicals, 2424—4th St., Berkeley, CA 94710).

(Mar. 13-15)—Dallas and Houston Societies. Southwestern Paint Convention. Dallas, TX.

(Apr. 3-6)—Southern Society Annual Meeting. The Peabody Hotel, Memphis, TN. (Vernon Sauls, McCullough & Benton, P.O. Box 272360, Tampa, FL 33688).

(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

(Aug. 19-24)—"Polymer Chemistry: Principles and Practice." Course sponsored by The American Chemical Society (ACS). Virginia Tech, Blacksburg, VA. (ACS, Dept. of Continuing Education, Meeting Code VPI9003, 1155 Sixteenth St., N.W., Washington, D.C. 20036).

(Aug. 21-25)—International Symposium on Surface Phenomena and Additives in Water-Based Coatings and Printing Technology. Symposium sponsored by Fine Particle Society. Sheraton Harbor Island, San Diego, CA. (M.K. Sharma, Research Laboratories, East-

man Chemical Co., P.O. Box 1955, Kingsport, TN 37662 or P.D. Berger, Witco Corp., 3230 Brookfield St., Houston, TX 77045).

(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. 12-14)—"Radiation Curing of Polymers." Symposium sponsored by the North West England Industrial Division of the Royal Society of Chemistry. University of Manchester Institute of Science and Technology, Manchester, England. (Mrs. E. Wellingham, Conference Secretariat, Field End House, Bude Close, Nailsea, Bristol BS19 2FQ, England).

(Sept. 12-14)—International Conference "Profitability through Partnership." Sponsored by Society of Dyers and Colourists. St. John's College, York, England. (Society of Dyers and Colourists, P.O. Box No. 244, Bradford, West Yorkshire, BD1 2JB, England).

(Sept. 13-15)—Canadian Paint and Coatings Association's 78th Annual Convention. Sheraton Hotel, Winnipeg, Manitoba, Canada. (CPCA, 9900 Cavendish Blvd., Ste. 103, St. Laurent, Quebec H4M 2V2, Canada).



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

(Sept. 17-18)—Second North American Tinplate Conference. Cosponsored by the American Iron and Steel Institute and the Tin Information Center of North America. Hyatt Regency O'Hare, Rosemont, IL. (William B. Hampshire, Conference Chairman, Tin Information Center of North America, 1353 Perry St., Columbus, OH 43201).

(Sept. 20-21)—"Towards a Greener Coatings Industry." Symposium sponsored by the Manchester Section of the Oil & Colour Chemists' Association (OCCA). University of Salford, England. (Terry Wright, OCCA, Priory House, 967 Harrow Rd., Wembley, Middlesex, England HA0 2SF).

(Sept. 23-25)—Finishing '90 Exposition & Conference. Co-sponsored by Society of Manufacturing Engineers (SME) and the Association for Finishing Processes of SME. Dr. Albert B. Sabin Convention Center, Cincinnati, OH. (Carol Vallykeo, Event Public Relations, SME, One SME Dr., P.O. Box 930, Dearborn, MI 48121-0930).

(Sept. 24-25)—"Powder Coatings" Symposium. Sponsored by the Paint Research Association (PRA) in Association with Chilworth Technology, Southampton. (PRA, 8 Waldegrave Rd., Teddington, Middlesex TW11 8LD, England).

(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. 25-27)—Fabtech West '90. Conference and Exhibition co-sponsored by the Fabricators & Manufacturers Association (FMA) Int'l. and Society of Manufacturing Engineers (SME). Anaheim Con-

vention Center, Anaheim, CA. (SME, One SME Dr., P.O. Box 930, Dearborn, MI 48121 or FMA, 5411 E. State St., Rockford, IL 61108).

(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 Coating Institute. Cincinnati Convention Center, Cincinnati, OH. (Gardner Management Services, 6600 Clough Pike, Cincinnati, OH 45244-4090).

(Oct. 10-12)—"Chemistry and Properties of High Performance Composites: Designed Especially for Chemists"; "High Performance Polymers: Chemistry, Properties, and Applications"; and "Fundamentals of Adhesion: Theory, Practice, and Applications." Short courses sponsored by State University of New York. Pearl River Hilton, Pearl River, NY. (Institute of Materials Science, State University of New York, New Paltz, NY 12561).

(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).

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(Oct. 14-19)—ISA/90. Conference and exhibition sponsored by The Instrument Society of America (ISA). New Orleans, LA. (Brian Duckett, ISA, 67 Alexander Dr., P.O. Box 12277, Research Triangle Park, NC 27709).

(Oct. 15-19)—"Introductions to Coatings Technology." Short course sponsored by Kent State University (KSU). Kent, OH. (Carl J. Knauss, Director, Cooperative and Continuing Education, Chemistry Dept., KSU, Kent, OH 44242).

(Oct. 17-19)—Airpol '90. Seminar sponsored by National Association of Corrosion Engineers (NACE). Galt House, Louisville, KY. (NACE, Education and Training, P.O. Box 218340, Houston, TX 77218).

(Oct. 25-26)—"Water in Exterior Building Walls: Problems and Solutions." Symposium sponsored by ASTM. Dearborn, MI. (Thomas A. Schwartz, Symposium Chairman, Simpson Gumpertz & Heger, Inc., 297 Broadway, Arlington, MA 02174).

(Oct. 31-Nov. 1)—"How Environmental Regulations in the United States Control the Paint and Coatings Industry." Course co-sponsored by the University of Oxford, Department of External Studies, and the University of California, Berkeley, Continuing Education in Engineering, University Extension. Oxford, England. (CPD Unit, University of Oxford, Department for External Studies, 1 Wellington Square, Oxford OX1 2JA, England).

(Oct. 31-Nov. 2)—103rd Annual Meeting of the National Paint and Coatings Association (NPCA). Washington, D.C. (NPCA, 1500 Rhode Island Ave., N.W., Washington, D.C. 20005).

(Oct. 31-Nov. 2)—"Advances in Polymer Colloids (Emulsion Polymers): Polymerization, Characterization, and Applications." Short course sponsored by State University of New York (SUNY). Orlando, FL. (A.V. Patsis, Institute of Materials Science, CSB 209, SUNY, New Paltz, NY 12561).

(Nov. 1-2)—"Measuring Paint Volatile Organic Compounds (VOC)." Training course sponsored by ASTM. Holiday Inn-Washington, Washington, D.C. (Kathy Dickinson, ASTM, 1916 Race St., Philadelphia, PA 19103).

(Nov. 9-11)—43rd Annual National Decorating Products Show. Sponsored by the National Decorating Products Association (NDPA). Indiana Convention Center, Indianapolis, IN. (Lillian Smysor, NDPA, 1050 N. Lindbergh Blvd., St. Louis, MO 63132-2994).

(Nov. 11-17)—"Basic Coating Inspection." Session I of the International Coating Inspector Training and Certification Program. Sponsored by the National Association of Corrosion Engineers (NACE), Sheffield, England. (NACE Europe, P.O. Box 251, Guildford, Surrey, GU1 3DJ, United Kingdom).

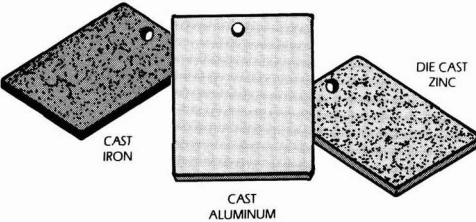
(Nov. 12-14)—"Fundamentals of Adhesion: Theory, Practice, and Applications." Short course sponsored by State University of New York (SUNY). Orlando, FL. (A.V. Patsis, Institute of Materials Science, CSB 209, SUNY, New Paltz, NY 12561).

(Nov. 25-30)—"Basic Corrosion." Course sponsored by the National Association of Corrosion Engineers (NACE), London, England. (NACE Europe, P.O. Box 251, Guildford, Surrey, GU1 3DJ, United Kingdom).

(Nov. 25-30)—"Corrosion Control in Oil and Gas Production." Course sponsored by the National Association of Corrosion Engineers (NACE), London, England. (NACE Europe, P.O. Box 251, Guildford, Surrey, GU1 3DJ, United Kingdom).

(Nov. 26-28)—ASE '90. The Fourth International Conference and Exhibition on Adhesives, Sealants, and Encapsulants. Amsterdam, The Netherlands. (ASE '90 Administration Office, Network Exhibitions & Conferences Ltd., Printers Mews, Market Hill, Buckingham MK18 1JX, United Kingdom).

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'Humbug' from Hillman

Correspondent Larry Kelly writes:

"I just read your recent issue (May) of Humbug's column and was very fascinated by your 15873 multiplying problem.

One of our computer wizards also told me that if you took 15873, added a zero, then repeated 15873 and then went through the multiplying process, you would even get a longer string of digits of the same type—in case you are collecting digits that is."

Humbug is happy to note that, thus, we are adding to the mental degradation of our readers. Please don't scream our name as they carry you away.

When a young child was asked what she learned at school that day, she responded, "We learned how to make babies." There was silence at the dinner table. Finally, her father bravely ventured, "How do you do that?" The child replied, "You just drop the y and add ies."

My very good friend Alvin Guttman of Montreal in addition to his aging prowess on the baseball field is also a bemused reader of things "Humbugian." Alvin has contributed the following for those to whom it applies:

For All Those Who Were Born Before 1945

WE ARE SURVIVORS! Consider the changes we have witnessed!

We were born before television, before penicillin and polio shots, before frozen foods, Xerox, plastic, contact lenses, Frisbees, and "The Pill."

We were before radar, credit cards, split atoms, laser beams, and ballpoint pens; before pantyhose, electric blankets, drip-dry clothes, and disposable diapers; before dishwashers, clothes dryers, air conditioners, microwaves . . . and before man walked on the moon.

We got married first and then lived together. How quaint can you be?

In our time, closets were for clothes and not for "coming out of." Bunnies were small rabbits and rabbits were not Volkswagons. Having a meaningful relationship meant getting along with our cousins.

We thought fast food was what you ate during Lent and outer space was back at the Riviera Theatre.

We were before house husbands, gay rights, computer dating, dual careers, and computer marriages. We were before day care centers, car pools, group therapy, and nursing homes. We never heard of FM radio, tape decks, electric typewriters, artificial hearts, word processors, yogurt, and guys wearing earrings. For us, time sharing meant togetherness—not comput-

ers or condominiums; a "chip" meant a piece of wood; hardware meant hardware and software wasn't even a word.

In 1940, "made in Japan" meant "junk" and the term "making out" referred to how you did on your exam. Pizza, "McDonald's," and decaffeinated were unheard of.

We hit the scene when there were 5 and 10 cent stores, where you bought things for five and ten cents. Ice cream cones were a nickel or a dime. For one nickel you could ride a street car, make a phone call, buy a Pepsi, or enough stamps to mail one letter and two postcards. You could buy a new Chevy Coupe for \$600 but who could afford one; a pity too, because gas was 11 cents a gallon.

In our day cigarette smoking was fashionable, GRASS was mowed, COKE was a cold drink, and POT was something you cooked in. ROCK MUSIC was a Grandma's lullaby and AIDS were helpers in the principal's office.

We were certainly not before the difference between sexes was discovered, but we were surely before the sex change; we made do with what we had. And we were the last generation that was so dumb as to think you needed a husband to have a baby.

No wonder we are so confused and there is such a generation gap today!

BUT WE SURVIVED! What better reason to celebrate?

Alvin's wife, Naomi, a very observant person, appropriately, adds these to our ever growing list of:

How to Know You're Getting Older

—The gleam in your eye is from the sun hitting your bifocals.

—You finally reach the top of the ladder and find it leaning against the wrong wall.

—You begin to outlive enthusiasm.

—You walk with your head high trying to get used to your bifocals.

—You're 17 around the neck, 41 around the waist and 96 (you wish) around the golf course.


—After painting the town red, you have to take a long rest before applying the second coat.

—You have too much room in the house and not enough in the medicine cabinet.

—You sink your teeth into a steak and they stay there.

—Herb Hillman
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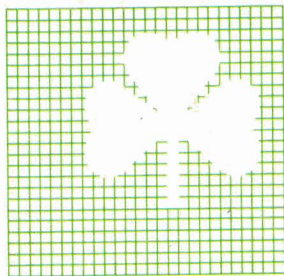
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