March 1998

JCT
JOURNAL OF COATINGS TECHNOLOGY

Special Issue Wood Coatings

Adhesion of Waterborne Paints to Wood

Microautoradiographic Studies of the Penetration of Alkyd Emulsion and Linseed Oil Coatings into Wood

Performance of Paints on Wood that is Chemically Modified by Acetylation

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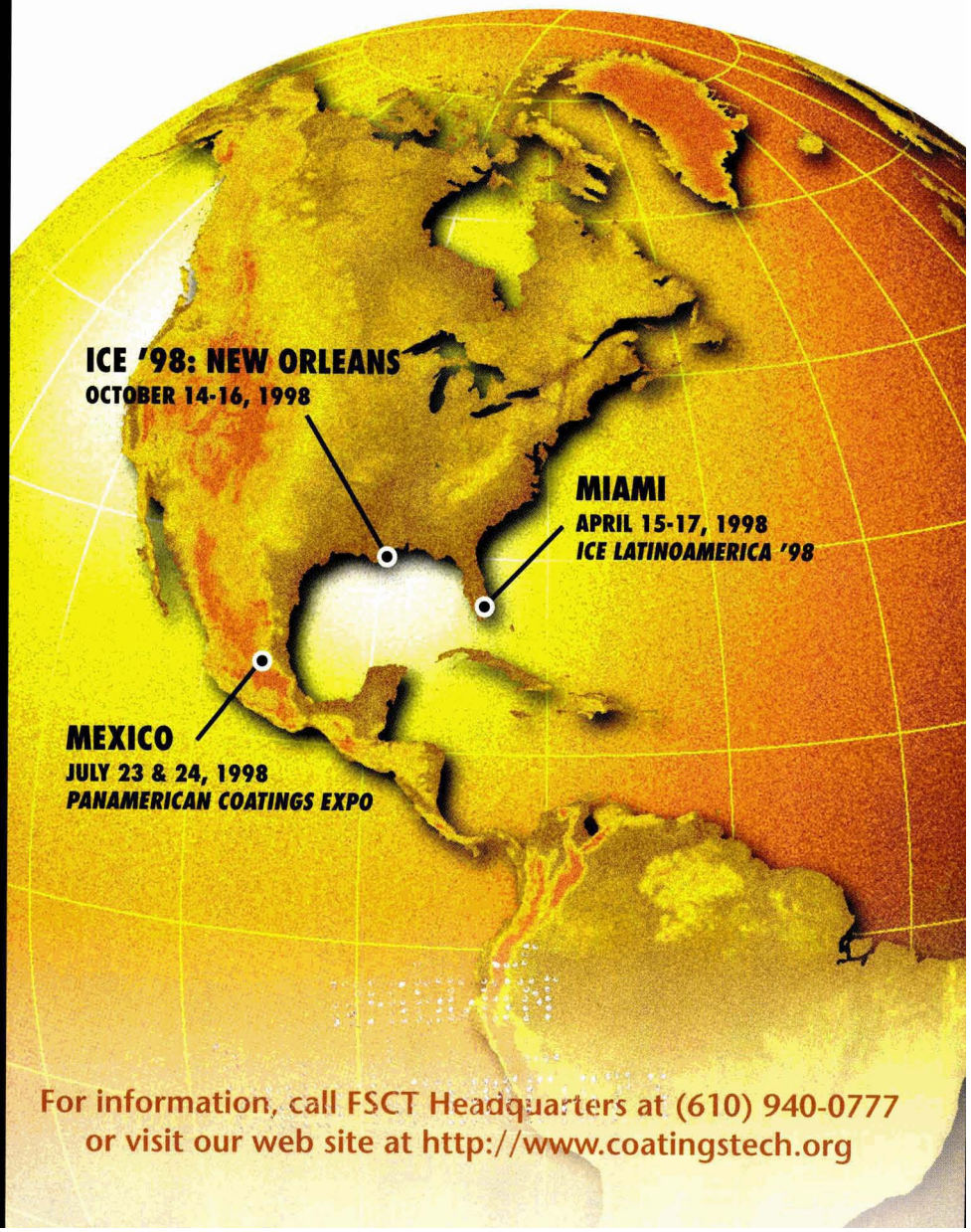

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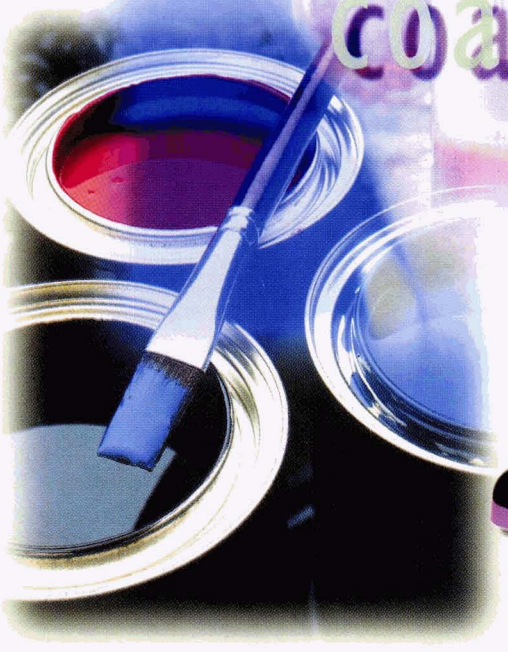

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JOURNAL OF COATINGS TECHNOLOGY

MARCH 1998 VOL. 70, NO. 878

Technical Articles

Federation News

Spotlight

Departments

The JOURNAL OF COATINGS TECHNOLOGY (ISSN 0361-8773) is published monthly by the Federation of Societies for Coatings Technology, 492 Norristown Rd., Blue Bell, PA 19422-2350, Phone (610) 940-0777; Fax: (610) 940-0292.

Periodicals postage paid at Blue Bell, PA and at additional mailing offices. POSTMASTER: Send address changes to JOURNAL OF COATINGS TECHNOLOGY, 492 Norristown Rd., Blue Bell, PA 19422-2350.

Canada Post International Publications Product Sales Agreement No. 1227238.

Subscription: U.S. and Canada – 1 year, $120; 2 years, $220; 3 years, $340. Europe (Air Mail) – 1 year, $180; 2 years, $340; 3 years, $520. Other Countries – 1 year, $150; 2 years, $280; 3 years, $440.

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The Federation of Societies for Coatings Technology is co-sponsoring with ANAFAPYT, the Mexico Paint and Printing Ink Manufacturers Association, the 1998 Panamerican Coatings Expo to be held on July 23-24, 1998 at the World Trade Center in Mexico City, Mexico. Mexico City's World Trade Center is a state-of-the-art facility and the newest location in Mexico City for hosting trade shows.

For exhibit information, please contact
FSCT Exhibit Management,
Steve Kettelkamp, EMI, 10425 Old Olive Street Rd.,
Ste. 103, St. Louis, MO 63141-5940;
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To date, the following exhibitors have reserved space in the 1998 Panamerican Coatings Expo (As of 3/2/98)

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Annual dues for Active and Associate Members of the Federation of Societies for Coatings Technology is $25.00. Of this amount, $16.75 is allocated to a membership subscription to this publication. Membership in the Federation is obtained through prior affiliation with, and payment of dues to, one of its 27 Constituent Societies. Non-member subscription rates are:

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When available, single copies of back issues of the JOURNAL OF COATINGS TECHNOLOGY are priced as follows: $10.00 each for current calendar year issues; $15.00 each for all other issues.

Publisher ..... *Robert F. Ziegler*
Editor ..... *Patricia D. Ziegler*
Technical Editor ..... *Ray A. Dickie*
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The JOURNAL OF COATINGS TECHNOLOGY has first rights to the publication of papers presented at the International Coatings Technology Conference of the Federation and at local and regional meetings of the Federation's Constituent Societies.

The JOURNAL OF COATINGS TECHNOLOGY is available on microfilm from University Microfilms, a Xerox Co., Ann Arbor, MI 48106.

FSCT Board of Directors—1997-98

COMMENT

Keeping Pace in a Changing Environment

"A horse never runs so fast as when he has other horses to catch up and outpace"—Ovid

In today's business environment, the ability to keep up, and even surpass your competition, is an ongoing challenge. This task becomes even more difficult as the coatings industry is continually confronted with the moving targets set by environmental regulations. How can you remain competitive when new legislation frequently forces you to change paths—searching for new materials and alternate technologies that are equal in performance and cost?

Obviously, knowledge of impending legislation is a key that can help turn the challenge of change into an opportunity for growth. One source of this information is the *Regulatory Update*, published monthly in the JOURNAL OF COATINGS TECHNOLOGY. Provided by the Washington, D.C.-based firm of Swidler & Berlin, the *Regulatory Update* now features an "update analysis" which focuses on issues of particular concern to the coatings industry. These issues are not exclusive to the United States and, with its newly expanded coverage, the *Regulatory Update* now provides valuable information on international regulations.

The international impact these regulations have on the South and Central American coatings industry will be the focus of ICE Latinoamerica '98, to be held on April 15-17 in Miami Beach, FL. Co-sponsored by the Federation of Societies for Coatings Technology and *Inpra Latina* magazine, ICE Latinoamerica '98 will combine a technical conference and coatings industry trade show.

The two-day coatings conference will focus on "Coatings for the Americas." An environmental session will examine the current state of regulations affecting the Latin American industry. Presentations will detail pending legislation and its potential effect on coatings companies operating in this growing region. A second session describes options in formulating regulatory-compliant coatings, with emphasis on waterborne technology. The Expo will feature the latest raw materials and equipment to help companies meet the new market demands. The trade show will be held in conjunction with "Plasticos de las Americas," a show directed to the plastics industry in Latin America. Full details on the conference program, booth descriptions and list of exhibitors are contained in this issue on pages 15-26.

The FSCT, through its educational programs and the JOURNAL OF COATINGS TECHNOLOGY, will continue to provide the kind of information its members and the industry need to keep pace with the ever-changing world of environmental regulations.

Patricia D. Ziegler
Director of Publications

Technical Abstracts

Adhesion of Waterborne Paints to Wood—S.L. Bardage and J. Bjurman

JCT, Vol. 70, No. 878, 39 (Mar. 1998)

Using a modified torque technique, statistically significant differences in adhesion values were detected for waterborne model paints on wood as a function of moisture content, waterborne preservative, and after fungal inoculation. Change in a paint constituent sometimes resulted in a significant change in the adhesion value. The adhesion values of the alkyd emulsion paints tested decreased after inoculation with a blue stain fungus. On the contrary, the adhesion values of the acrylic dispersion paints tested became significantly higher after inoculation.

Microautoradiographic Studies of the Penetration of Alkyd, Alkyd Emulsion and Linseed Oil Coatings Into Wood—R.M. Nussbaum, E.J. Sutcliffe, and A.-C. Hellgren

JCT, Vol. 70, No. 878, 49 (Mar. 1998)

The penetration of wood coating primer products into pine and spruce softwood was evaluated with microautoradiography. ^{14}C-labeled binders of alkyd and linseed oil were synthesized and used in eight different products.

The penetration front in wood is uneven due to a heterogeneous structure with different types of wood cells. It was demonstrated that conventional solventborne alkyd primers and waterborne alkyd emulsion primers have similar ability to penetrate into wood. Improved penetration was found for products with lower viscosity, such as an alkyd stain and a linseed oil coating. A priming oil had superior penetration. Generally better penetration was obtained for coatings applied onto sawn and rough surfaces as compared to planed and smooth surfaces.

Performance of Finishes on Wood that is Chemically Modified by Acetylation—E.P.J. Beckers, M. de Meijer, H. Militz, and M. Stevens

JCT, Vol. 70, No. 878, 59 (Mar. 1998)

Swelling and shrinkage of wood has a major effect on the performance of coatings applied to its surface. Altering the molecular structure of wood by a reaction with acetic anhydride is known to improve the dimensional stability of wood considerably. Such acetylation of wood was shown to have no effect on the drying characteristics and adhesion of applied coatings. Weathering performance of coatings was improved considerably. A color stabilizing effect was achieved with acetylated Scots pine with and without a clear coating.

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ICE '98 Attracts Early Exhibitor Attention; Booth Space 87% Sold to Date

With over seven months to go before ICE '98, early indications show a strong response from exhibiting companies. To date, over 243 have reserved nearly 83,100 sq. ft. of exhibit space in the FSCT-sponsored event, which will be held October 14-16 at the Ernest N. Morial Convention Center, in New Orleans, LA.

To be held in conjunction with the Federation of Societies for Coatings Technology's Annual Meeting and the International Coatings Technology Conference, the Expo will feature the products and services of supplier companies to the international coatings industry. *(For a full listing of current exhibitors, see page 12.)*

ICE Technology Conference

In 1998, the International Coatings Technology Conference will begin on Sunday, October 11 and run through Tuesday, October 13, prior to the opening of the International Coatings Expo.

Building on the success of the last two years, the ICE Technology Conference will offer four two-day and 11 one-day programs, in addition to an Executive Forum. These courses are designed for all levels of the coatings industry, from the newly hired technician to top level management. Each course is targeted for specific areas of an organization, and this year will feature "tie in" courses which can be followed for more comprehensive understanding of related topics. *(For a listing of the tentative program, see accompanying article.)*

There is an additional fee to attend the conference courses. Some of these courses will be limited in registration and early registration is encouraged.

FSCT Annual Meeting

The Federation's 76th Annual Meeting, scheduled for October 14-16, will offer a variety of technical program sessions on many aspects of coatings technology. New to the technical program this year will be a program on Understanding the Internet, a roundtable discussion on Coatings Specifications, expanded Poster Sessions, as well as Supplier Spotlights. In addition, the program will include sessions on Advanced Topics in Coatings Technology, APJ/Voss Award Competition papers, Roon Award Competition papers, International papers, Women in Coatings, Corrosion Committee Competition Submissions and papers on General Coatings Technology.

Highlights of the Annual Meeting will be the Mattiello Memorial Lecture and the Technical Focus Lecture—both scheduled to be presented on October 14.

Admittance to the Technical Program sessions is included in the ICE registration fee.

Hotels

Eleven hotels have reserved blocks of rooms for ICE '98. The New Orleans Marriott Hotel will serve as headquarters hotel. Other cooperating hotels will be the Doubletree New Orleans, Holiday Inn Crowne Plaza, Holiday Inn Select, Le Meridien, The Monteleone, New Orleans Fairmont, New Orleans Hilton Riverside (NPCA Headquarters), Omni Royal Orleans, Sheraton New Orleans, and Westin Canal Place.

Hotel reservation forms and housing information will be available in May.

Inquiries about exhibiting should be addressed to: Exposition Management, 10425 Old Olive St. Rd., Ste. 103, St. Louis, MO 63141-5940; (314) 994-9640; FAX: 314-994-9650. e-mail: expomanage @aol. com.

All other information on ICE '98 may be obtained by contacting FSCT Headquarters, 492 Norristown Rd., Blue Bell, PA 19422; 610-940-0777; FAX: 610-940-0292. e-mail: fsct@coatingstech.org.

Check the FSCT website at http://www.coatingstech.org for continuing updates.

FSCT Announces Preliminary Programs for '98: ICE Technology Conference & 76th Annual Meeting

The FSCT has developed tentative schedules for the 1998 ICE Technology Conference and Annual Meeting Technical Program.

ICE Technology Conference

The 1998 ICE Technology Conference will feature four two-day courses, 11 one-day programs and an Executive Forum. To be held Sunday, October 11 through Tuesday, October 13, the Technology Conference schedule is as follows:

Sunday, October 11, 1998

Global Commercialization (Day One)
Back to Basics: Resins, Pigments, Solvents and Additives (Day One)
Fundamental Ink Technology
Chemistry and Formulation of Powder Coatings
Spray Applications Workshop
Finance for the Nonfinancial Manager
Effective Negotiating Skills

Monday, October 12, 1998

Global Commercialization (Day Two)
Back to Basics: Resins, Pigments, Solvents and Additives (Day Two)
Introduction to Radiation Curing (Day One)
Crosslinking for the Coatings Chemist (Day One)
Bridge Coatings
Introduction to Management
Effective Technical & Scientific Writing Workshop

Tuesday, October 13, 1998

Introduction to Radiation Curing (Day Two)
Crosslinking for the Coatings Chemist (Day Two)
Surfactant Chemistry and Application
Marine Coatings
Executive Forum: New Product Development
Winning Technical Presentations

Annual Meeting Technical Program

The FSCT 76th Annual Meeting Technical program will feature 18 separate sessions over three days for the attendees. There is no additional charge for ICE attendees to participate in the Technical Program activities. The tentative schedule of events is as follows:

(Continued on page 14.)

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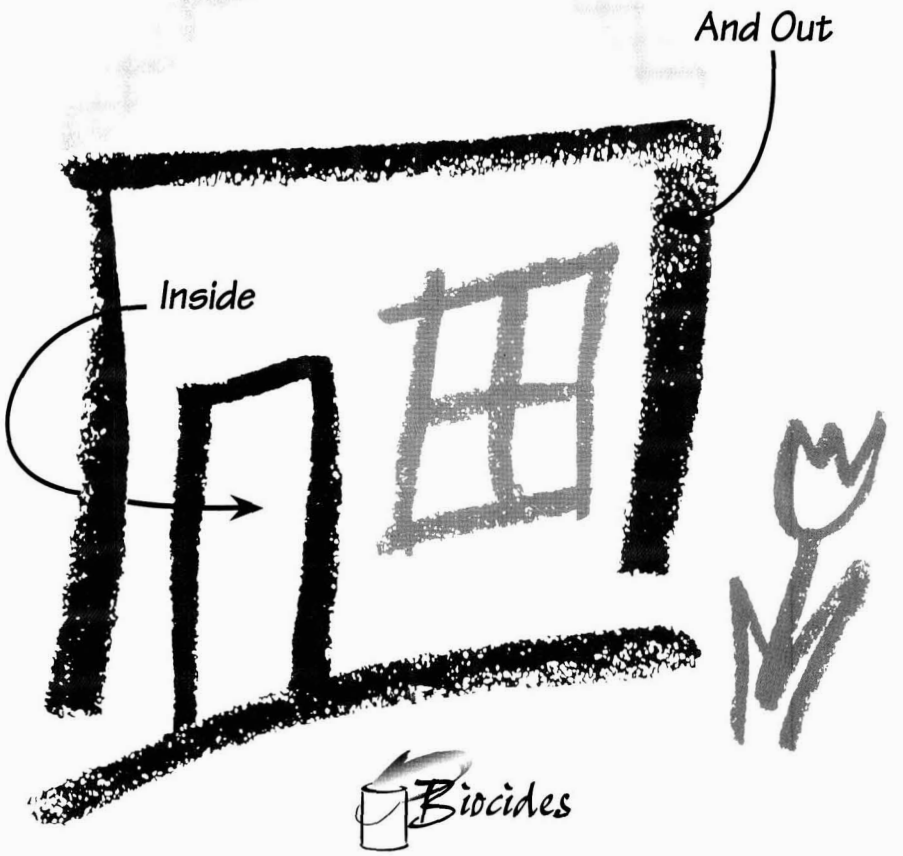

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Program Topics for 1998 PDC Educational Series

The Federation of Societies for Coatings Technology, through its Professional Development Committee, will conduct six educational courses in 1998. The courses are aimed at various levels of the coatings industry and provide information for both technical and sales/management personnel, and are part of the organization's overall mission to provide quality education to the coatings industry. The six courses are as follows: "Switching from Solvent-Based to Water-Based Coatings"; "Effective Technical and Scientific Writing Workshop"; "Experimental Design and Data Analysis"; "Winning Technical Presentations"; "Practical Rheology and its Application Properties"; and "Understanding Extender Pigments."

JUNE 1998

Switching from Solvent-Based to Water-Based Coatings

"Switching From Solvent-Based to Water-Based Coatings" is designed to give industrial coatings formulators, product development personnel, and bench chemists a better understanding of the needs, limitations, and requirements of applicators. This course will also educate formulators on the changes in formulation, application and manufacturing requirements and performance they will encounter when switching from solvent- to water-based coatings. Participants will learn the differences in formulations, how to identify the changes the switch will bring, how to have a better understanding of customer needs, the mechanics of film formation and the chemistry and physics involved in making the change.

Site: Chicago, IL

Effective Technical and Scientific Writing Workshop

A popular course at the ICE Technology Conference, "Effective Technical and Scientific Writing Workshop" is aimed at all levels of laboratory and R&D personnel, along with applicators and anyone with responsibility for writing memos, letters, reports, manuals, specifications and proposals on a routine basis. The one-day course includes in-class writing exercises designed for practical application and allows time for individual instructor attention. Participants are invited to submit writing samples in advance for confidential review by the instructor. Sal Iacone will again serve as the instructor for the course.

Site: Chicago, IL

SEPTEMBER 1998

Experimental Design and Data Analysis

"Experimental Design and Data Analysis" is aimed at chemists, R&D personnel, and technical managers and will allow them to develop an understanding of experimental design principles and their use in coatings formulation. This will be done through instruction and case studies. Participants will gain a greater understanding of the basics of statistics as applied to experimental design, the pros and cons of various experimental design methods, methods to extract conclusions or trends and how meaningful each one is to the project and the selection and effective use of available software.

Site: To be determined.

Winning Technical Presentations

A cornerstone of the ICE Technology Conference, "Winning Technical Presentations" has been created for laboratory and R&D personnel at all levels, in addition to marketing and sales staff and those responsible for delivering technical presentations. Attendees will learn how to design an effective technical presentation by learning how to develop effective visuals; proper speaking techniques and data organization; how to handle question and answer sessions; tips on transferring written information to speaking terms; and how to communicate clearly to all audiences. This program offers a combination of lecture, interaction and small group projects.

Site: To be determined.

NOVEMBER 1998

Practical Rheology and Its Application Properties

"Practical Rheology and Its Application Properties" is designed to provide formulating chemists, product development personnel, and technical service staffers with a better comprehension of how to use and understand rheology and analytical data, for both water-based and water-reducible coatings, and its relationship to application properties. Attendees will learn how to utilize rheology measurements, the basic principles of rheology, the effect of other formulating variables on rheology, how to overcome coatings defects using rheology modifiers and how to troubleshoot rheology problems.

Site: Orlando, FL.

Understanding Extender Pigments

Designed for coatings formulators and product development personnel, "Understanding Extender Pigments" will provide participants with information on the properties that extender pigments can impact. It will also provide a greater understanding of how to optimize coatings performance through the proper selection of extender pigments. Attendees will gain a greater understanding of the inherent properties of extender pigments, how they interact with other pigments and other paint ingredients, the effect of extender pigments on wet and dry film properties and durability, in addition to learning about the basic concepts of PVC and CPVC relationships and the parameters used to select the proper extender pigments.

Site: Orlando, FL.

For additional information, contact Michael Bell, Director of Educational Services, FSCT, 492 Norristown Rd., Blue Bell, PA 19422; (610) 940-0777.

ICE '98 Technology Conference & Annual Meeting Schedule

Continued from page 10

Wednesday, October 14, 1998

Mattiello Lecture
Technical Focus Lecture
Advanced Topics in Coatings Technology
Understanding the Internet
APJ/Voss Award Competition papers
Suppliers Spotlight
Coatings Specification Roundtable

Thursday, October 15, 1998

Roon Award Competition Papers
Poster Session Papers
Understanding the Internet
Suppliers Spotlight
Women in Coatings

Friday, October 16, 1998

Understanding the Internet
International Papers
Outstanding Corrosion Paper Competition Submissions
General Coatings Technology Papers

For additional information on these courses, contact FSCT Headquarters.

Federation of Societies for Coatings Technology &
Inpra Latina Magazine
present

ICE LATINOAMERICA '98

A US-Latin America Coatings Conference & Exposition

April 15-17, 1998

Miami Beach Convention Center
Miami Beach, Florida

The following pages contain program information, list of exhibitors, floor plan, and descriptions of exhibits.

ICE LATINOAMERICA '98

A US-Latin America Coatings Conference & Exposition
April 15-17, 1998
Miami Beach Convention Center
Miami Beach, Florida

Sponsored by the Federation of Societies for Coatings Technology and *Inpra Latina Magazine*, **ICE Latinoamerica '98** will be held at the Miami Beach Convention Center, 1901 Convention Center Drive, Miami Beach, Florida. Combining a conference with a coatings-related exposition, ICE Latinoamerica '98 is being held in conjunction with "Plasticos de las America"—a show directed to the Latin American plastics manufacturing industry.

"Coatings for the Americas" is a two-day Coatings Conference Program that will explore the current state of environmental regulations, what their effects will be on Latin America industry and what the future may hold in this important area. The second part of the program studies what options there are in formulating regulatory compliant coatings and managing change in the R&D function to accomplish goals.

The Expo featyures first-hand advancements in **Production Equipment, Raw Materials, Testing and Analytical Instruments, and Specialized Services** that will help your company meet the new market demands.

Expo hours will be Wednesday, April 15—11:00 a.m. - 6:00 p.m.; Thursday, April 16—11:00 a.m. - 6:00 p.m.; and Friday, April 17—11:00 a.m. - 3:00 p.m.

Conference Program

"Coatings Across the Americas"—Program

Wednesday, April 15, 1998
9:00 AM - 12:00 Noon

ENVIRONMENTAL SESSION

This session will look into the future at what to possibly expect in regulatory issues facing the paint and coatings industry in Central and South America. The program is for company administrators and managers, technical directors and R&D managers.

Moderator: Jim Berry, Berry Environmental, Raleigh, NC

- **Company Perspective**
  Addresses how the Clean Air legislation has affected resin development, coatings formulation and possibly the manufacturing processes, in addition to providing some insight into how regulatory issues continue to frame the future of R&D programs.
  Speaker: Doug Wicks, Director of Research, Bayer Corp., Pittsburgh, PA

- **Existing Regulatory Framework**
  A review of the existing regulatory framework in the United States, focusing on recent legislative and regulatory developments and how they might have relevance for coatings companies operating in Central and South America.
  Speakers: Robert Steinwurtzel and Priscilla Whitehead, Swidler & Berlin, Washington, D.C.

- **Future Regulatory Perspective**
  A look into the future (five, ten and 25 years) to speculate on the impact of regulations on the paint and coatings industry. This talk will consider pending legislation and its potential effect.
  Speaker: Dick Wilson, Acting Assistant Administrator, Environmental Protection Agency, Washington, D.C.

Thursday, April 16, 1998
9:00 AM - 12:00 Noon

WATERBORNE COATINGS SESSION

This session will provide information on how to manage change in the R&D function to develop new waterborne coatings. This will also consider the advances in raw materials to formulate these coatings.

- **Formulating Waterborne and High-Solids Coatings**
  This presentation will address the practical issues related to the formulation of high-solids and waterborne coatings. Attendees will systematically review the proper methods and techniques to ensure a smooth operation from formulation to the actual coatings manufacturing process. Additionally, the environmental benefits of waterborne and high-solids coatings will be addressed.
  Speaker: Rich Johnson, Sierra Corp. and TK Products, Minnetonka, MN

- **Using Statistical Methods to Correlate Studies of Waterborne Finishes**
  Dr. Patel uses the example of durability testing to provide information on how statistical data analysis can assist companies in correlating testing results to actual performance. Waterborne finishes have presented particular correlation problems. Here, the use of statistical data analysis reveals limitations in correlating testing to actual performance. Dr. Patel discusses both the methods used in the study and analyzes the results, providing insight on how companies can reevaluate the tests that they currently employ.
  Speaker: Dr. Prashant Patel, BFGoodrich, Cleveland, OH

- **Next Generation Water Based Epoxy Systems**
  Waterborne epoxy resins have been used for a variety of applications in coatings for cementitious and metal substrates. This presentation will emphasize recent innovations in waterborne epoxy resin and amine-functional curing agent technology. Basic material characteristics and coating formulating information will be presented. Attendees will also learn the influence various formulation parameters have on the performance properties of coatings developed with these materials.
  Speaker: Julia Rodrigues-Cayro, Shell Chemical Co., Houston, TX

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Only Corob® colorant dispensers allow you to dispense quantities as small as 1/384 fl. oz. That means you can please customers who want a little paint as well as those who need a lot. Plus, it allows you to tint quickly more colors accurately. And that means less mis-tints which saves you time and money.

But the implications for future savings are even greater! The ability to dispense in such small quantities can lead the way to very concentrated colorants. That will save on transportation and inventory costs. It will help reduce technical problems. And, it will allow you to do more on site.

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COROB-NORTH-AMERICA@WORLDNET.ATT.NET
www.corob.com

Please visit our booth #2101 at ICE Latinoamerica '98 in Miami, April 15-17, 1998.

Circle No. 273 on the Reader Service Card

Registration Information

To register in advance, complete the form below and fax (if paying by credit card) or mail (if paying by check) to:

FSCT, ICE Latinoamerica '98,
492 Norristown Rd., Blue Bell, PA 19422; Fax 610-940-0292

Registration Fees [T.]:

❑11 Regulatory/Coatings Conference ..... $295 (U.S.)
❑13 ICE Latinoamerica '98 Expo ..... (Free)

❑ Enclosed is Check #_____ payable in U.S. Funds on a U.S. Bank to "ICE Latinoamerica"

❑ Charge $ _____(U.S.) to the following card: ❑MC ❑VISA ❑AMEX

Card No. _____

Expiration Date _____

Signature _____

Please print Cardholder's Name _____

Please complete below information for badge.

Name _____

Nickname (for Badge) _____

Company _____

Address _____

City _____ State ____ Zip _____

Phone _____ FAX _____

Please Check One Block in Each of the Two Columns Below:

Company [Z.]

1 ❑ Manufacturers of Paints, Varnishes, Lacquers, Printing Inks, Sealants, etc.
2 ❑ Manufacturers of Raw Materials
3 ❑ Manufacturers of Equipment and Containers
4 ❑ Sales Agents for Raw Materials and Equipment
5 ❑ Government Agency
6 ❑ Research/Testing/Consulting
7 ❑ Paint Consumer/Applicator
8 ❑ Other _____

Position [O.]

11 ❑ Management/Administration
12 ❑ Manufacturing and Engineering
13 ❑ Quality Control
14 ❑ Research and Development
15 ❑ Technical Sales Service
16 ❑ Sales and Marketing
17 ❑ Consultant
18 ❑ Other _____

EXPO HOURS

Wednesday, April 15
11:00 a.m. - 6:00 p.m.

Thursday, April 16
11:00 a.m. - 6:00 p.m.

Friday, April 17
11:00 a.m. - 3:00 p.m.

Hotel & Travel Information

Call Travel Planners toll free at 1-800-221-3531 (In NY call 212-532-1660) or fax 212-779-6101 for special ICE Latinoamerica '98 hotel, airfare, and ground transportation discounts. *(Mention that event is in conjunction with Plasticos de las Americas.)*

HOTELS: (Rates *[single/double]* do not include taxes and are available only through Travel Planners, Inc.)

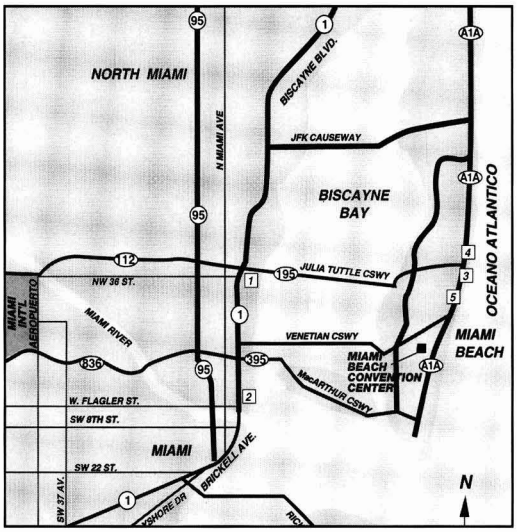
Hotel Inter-Continental Miami
100 Chopin Plaza, Miami
$139/$139

Doubletree Grand Hotel
1717 North Bayshore Drive, Miami
$109/$119

The Shelbourne Beach Hotel
1801 Collins Avenue, Miami Beach
$139/$139

South Beach Hotel
2201 Collins Avenue, Miami Beach
$105/$105

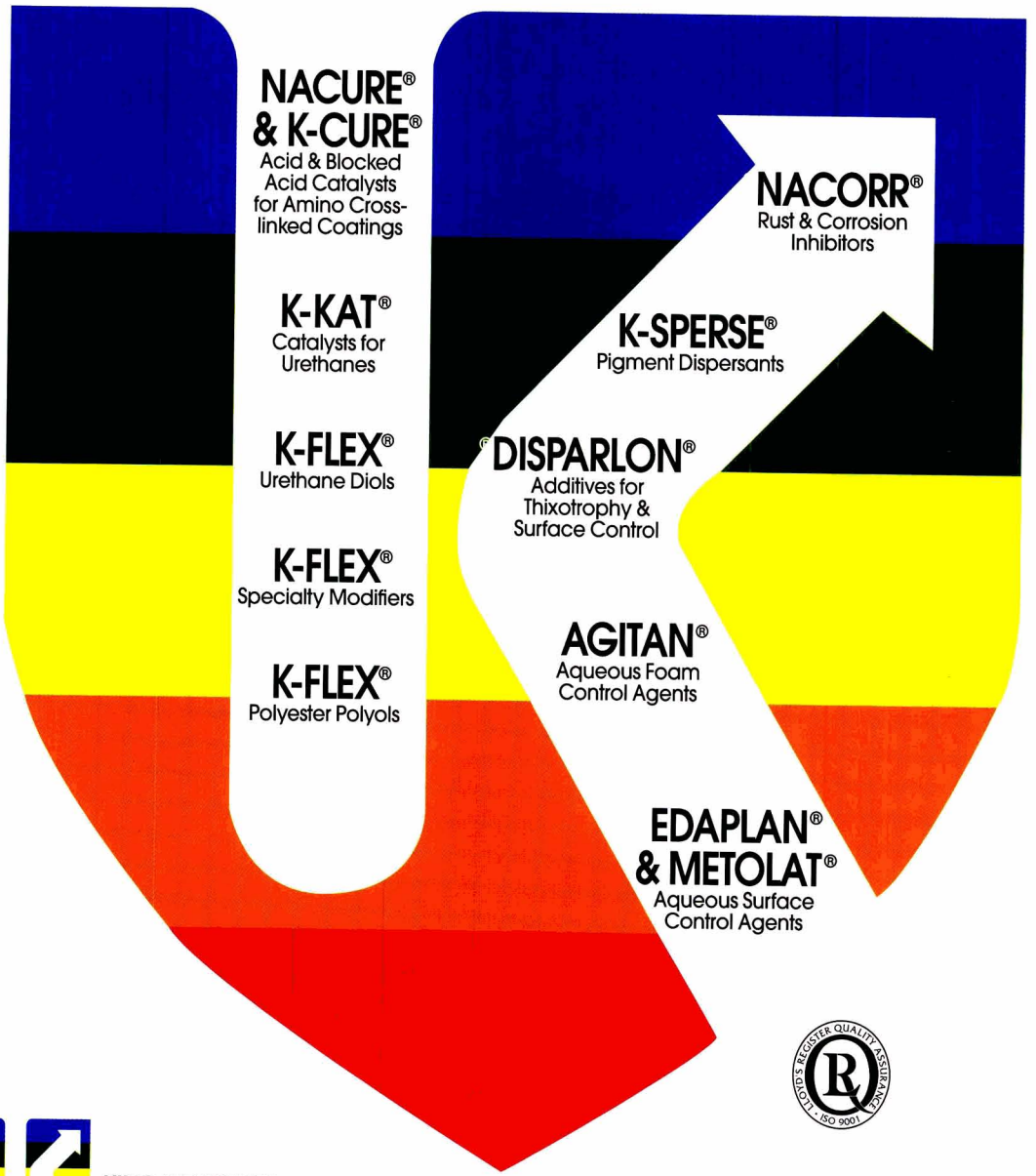
Sol Miami Beach Hotel
3925 Collins Avenue, Miami Beach
$99/$99 (City View)
$125/$125 (Ocean View)



Hotel Key

1—Doubletree Grand Hotel
2—Hotel Inter-Continental Miami
3—South Beach Hotel
4—Sol Miami Beach Hotel
5—The Shelbourne Beach Hotel

High Performance Coatings Additives



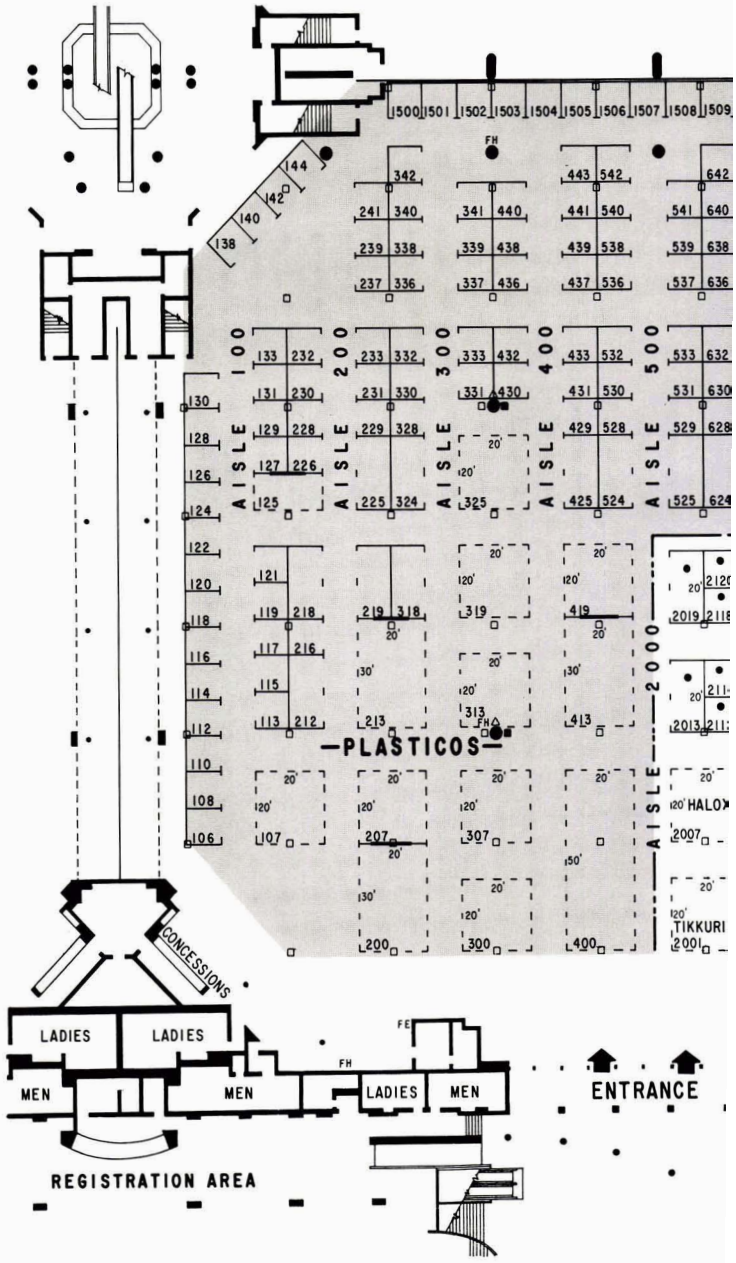
LLOYD'S REGISTER QUALITY ASSURANCE LTD. ISO 9001

KING INDUSTRIES
USA Science Rd. Norwalk, CT 06852 (203) 866-5551 FAX: (203) 866-1268
EUROPE Noordkade 64, 2741 EZ Waddinxveen, The Netherlands Tel: (0) 182-631360 FAX: (0) 182-621002

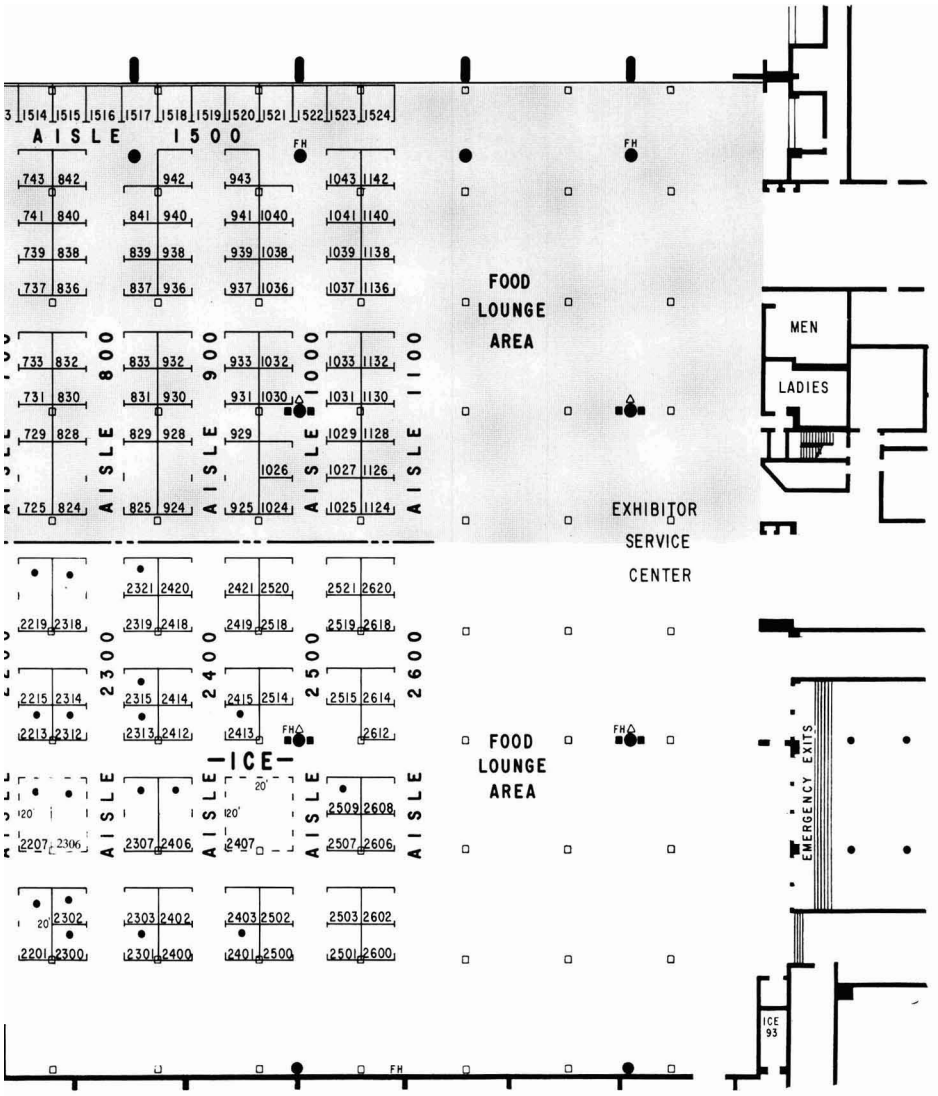
See us at Booth 2509 at ICE Latino America

ICE LATINOAMERICA '98

Floor Plan of Exhibitors as of 3/6/98



Akzo Nobel Resins	2207	Eiger Machinery, Inc.	2119
Ashland Chemical Co.	2109	Falcon Chemical Corp., Inc.	2219
BYK-Gardner, Inc.	2120	Federation of Societies for Coatings Technology	2406
Ciba Specialty	2307	Fluid Management	2213
Corob North America Div.	2101	GretagMacbeth	2201
Creanova Inc. (Huls America Inc.)	2013	Halox Pigments	2007
Eastman Chemical Co.	2312	William Harrison Corp.	2121
Ebonex Corporation	2112		



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JAN. 26, 1998

EXPOSITION MANAGEMENT, INC.
10425 OLD OLIVE ST. RD. - SUITE 103
ST. LOUIS, MO. 63141-5940
(314) 994-8640

ICE LATINOAMERICA '98 AND PLASTICOS DE LAS AMERICAS

APRIL 15-17, 1998

MIAMI BEACH CONVENTION CENTER MIAMI, FLORIDA

Heisler Industries, Inc.	**2208**	**Macbeth**	**2201**
HERO Industries Limited	**2019**	**Myers Engineering**	**2115**
Hockmeyer Equipment Corp.	**2313**	**Red Devil Equipment Co.**	**2318**
Inmark, Inc.	**2220**	**Reichhold Chemical Co.**	**2306**
International Specialty Products (ISP)	**2300**	**Ronningen-Petter**	**2401**
Kelly Chemical Corp.	**2302**	**Tikkurila Inc. (Kemira)**	**2001**
Kenrich Petrochemicals, Inc.	**2321**	**Western Equipment Company**	**2301**
King Industries, Inc.	**2113**	**X-Rite Incorporated**	**2114**

ICE Latinoamerica '98 Exhibitors
Booth Descriptions

AKZO NOBEL RESINS 2207
P.O. Box 37510
4730 Crittenden Dr.
Louisville, KY 40233-7510
Phone: (502) 367-6111
Fax: (502) 375-5477

In addition to its full line of compliant resin technologies and automotive OEM & refinish systems, Akzo Nobel Resins is featuring many of its very unique new resin technologies. These include: non-isocyanate primer and topcoat systems, water based diisocyanate systems, a fast drying 100% solids alkyd, stable alkyd dispersions and a self crosslinking latex.

ASHLAND CHEMICAL COMPANY 2109
Industrial Chemicals & Solvents Division
International Business Group
200 N.E. 181st St.
Miami, FL 33162
Phone: (305) 770-7135

Ashland Chemical Company's Industrial Chemical & Solvents Division is a full-service supplier to the paint and coatings industry. We offer a complete range of formulation ingredients produced by the world's leading manufacturers. In addition, we also offer environmental services, recycling, custom solvent blending, reformulation guidance and expert technical support. Our products include: coalescents, drying oils, monomers, pigments, pigment dispersions, plasticizers, resins/dispersions/hardeners, silicones, solvents, surfactants and dispersants, thickeners and additives.

BYK-GARDNER USA 2120
9104 Guilford Rd.
Columbia, MD 21046
Toll Free: (800) 343-7221
Fax: (301) 483-6555

BYK-Gardner will be exhibiting color and gloss testing instruments that measure total appearance qualities of coatings. BYK-Gardner will also have a sampling of our classical physical test equipment line.

CIBA SPECIALTY CHEMICALS 2307
Pigments
CH4002 Basle
Switzerland
Phone: 00-44-1625-888-729
Fax: 00-44-1625-888-701

Pigments Division is one of the world's leading pigment producers of high performance colorants for coatings applications. Featured are: Irgazin 2000 Series, a new generation of pigments for industrial coatings applications; Unisperse-E, a complete range of aqueous pastes for indoor and outdoor applications; and for Powder Coatings, a comprehensive color range for all types of systems.

COROB NORTH AMERICA 2101
13315 G. Carowinds Blvd.
Charlotte, NC 28273
Phone: (704) 588-8408
Toll Free: (888) GO-COROB
Fax: (704) 588-8471
E-Mail: corob–north–america@worldnet.att.net

Corob® North America will be displaying its automatic colorant dispensers, the Tatocolor™, the AC 10000™ and the Giant™. Also displayed are their high speed paint mixers/shakers, the VCM™ and the GCM™. Technical assistance is available to present Corob® software and answer any questions you may have.

CREANOVA INC. 2013
(formerly Hüls America Inc.)
220 Davidson Ave.
Somerset, NJ 08873
Toll Free: (888) 661-7675
Fax: (732) 560-6386

Creanova Inc., a Hüls Group company headquartered in Somerset, NJ, is a major manufacturer of colorants, biocides, raw materials and additives for architectural and industrial coatings; intermediates and fine chemicals for the pharmaceutical, cosmetic, photographic, agricultural and food industries; engineering thermoplastics; specialty polymers for adhesives and coatings; methacrylate monomers and polymers; surfactants and heat transfer fluids. With annual revenues of $550 million, the company has operations in the United States, Canada, Mexico, Australia, the Netherlands, and Asia.

EASTMAN CHEMICAL LATIN AMERICA, INC. 2312
2333 Ponce de Leon Blvd.
Coral Gables, FL 33134
Phone: (305) 461-8240
Fax: (305) 671-1301

Eastman will be presenting its specialty products for coatings, inks, and resins markets. Featured products will be Texanol coalescing aid, NPG Glycol, CPO adhesion promoters, cellulose esters for paint rheology, and specialty solvents.

EBONEX CORP. 2112
2380 South Wabash
P.O. Box 3247
Melvindale, MI 48122
Phone: (313) 388-0060
Fax: (313) 388-6495
E-Mail: ebonex@flashnet

Ebonex Corporation offers a unique specialty black pigment unlike traditional carbon blacks. Cosmic Black pigments are non-toxic, do not contain polyaromatic hydrocarbons, are non-conductive, suitable for paints and coatings where electrical current factors are important, and are dispersed in both water and solvents. They produce a high quality jet masstone but have the capability of toning colors without inhibiting the initial pigment. Ebonex Corporation provides Cosmic Black pigments in dry and aqueous dispersed forms. We also carry a line of aqueous carbon black dispersions. Cosmic Black FCG-1 meets Food Chemical Codex and FDA standards.

EIGER MACHINERY INC. 2119
888 E. Belvidere Rd., Unit 214
Grayslake, IL 60030
Phone: (847) 548-0044
Fax: (847) 548-0099

Eiger will exhibit laboratory and production horizontal bead mills, dispersers and mixers. Included will be the Mini Mill, an industry standard for laboratory research, development, quality control and technical service. A 20-liter Production Direct Drive Horizontal Bead Mill with high intensity internal baffle system will also be shown. New equipment displayed will be a Variable Speed Lab Disperser, Twin Pillar Pilot and Production Disperser. Information on the above, along with Eiger's other process equipment, will be available along with representatives to discuss your applications or upcoming projects.

Quality, Time-Tested Equipment, To Meet Your Exposure Testing Needs

OUTDOOR EXPOSURE TEST EQUIPMENT

Aluminum Construction

- Thirty-Five Years serving the paint and coatings industry with our durable, long-lasting, and versatile aluminum outdoor exposure test equipment.
- From standard paint panel and siding panel exposure testing, to sophisticated under glass testing, we manufacture the products to satisfy your needs.
- Wherever your exposure site is located—on the ground, on the roof, from a wall, or even on an offshore oil rig—our equipment fits any situation.
- ASTM, SAE, GM, and AATCC are among the standards organizations that reference our apparatuses.
- *Union Carbide, Rohm and Haas Co., Eastman Chemical Co., Troy Chemical Corp., SC Johnson Polymer, Heraeus DSET Laboratories, Inc., Ciba-Geigy Corp., BASF Corp., Dow Chemical, 3M Co., Huls America Inc., Reichhold Chemicals Inc., BFGoodrich Co., The Q-Panel Co., South Florida Test Service, The Sherwin-Williams Co., and PPG Industries, Inc. are just a few from a long list of our valued clients that we have served.*
- Whether your product is paint, coatings, inks, plastics, glass, masonry, or automotive parts, etc., we will custom tailor our fixtures to attain the proper mounting for exposure that your specifications require.

WILLIAM HARRISON CORPORATION

4595 E. 10th Court, Hialeah, FL 33013, U.S.A.

(305) 681-8381 • Fax: (305) 685-0407

FALCON CHEMICAL CORP. 2219
2722 SW 37 Ave.
Miami, FL 33133
Phone: (305) 442-8525
Fax: (305) 442-8426

Falcon Chemical, a Miami-based raw material distributor for the paints & coatings industry in the Caribbean, Central and South America, offers complete technical and formulation support. Falcon is the exclusive distributor for a pioneering polysaccharide resin technology, manufactured by Lorama Chemicals, that is being adopted across the Caribbean and Latin America. Falcon will also be displaying other principals which it represents: Rheox/Elementis (rheology modifiers); Engelhard (calcine clays); Mearl (pearlescent pigments); Cook Composites & Polymers (CCP) (alkyd resins).

FEDERATION OF SOCIETIES FOR COATINGS TECH. 2406
492 Norristown Rd.
Blue Bell, PA 19422
Phone: (610) 940-0777
Fax: (610) 940-0292
e-mail: FSCT@coatingstech.org

The Federation, cosponsor of ICE Latinoamerica and 1998 Pan American Coatings Expo in Mexico will highlight its publications offerings and educational programs. The FSCT is an international, member-driven, not for profit organization providing technical and professional development to its members and the industry. Publications include references such as the *Coatings Encyclopedic Dictionary* and the *Pictorial Standards of Coatings Defects*. The Federation's *Series on Coatings Technology* covers various phases of coatings technology and manufacture, authored by leading experts in the industry. As a free benefit of membership, FSCT members receive the monthly magazine voted "most useful in their work"*—the JOURNAL OF COATINGS TECHNOLOGY (also available by subscription).

*Independent survey taken at ICE '97 by Exhibit Surveys Inc., Middletown, NJ.

FLUID MANAGEMENT 2213
1023 Wheeling Rd.
Wheeling, IL 60090
Phone: (847) 537-0880
Fax: (847) 537-5530

On display will be a full range of manual and automatic fluid metering and mixing equipment, as well as engineered systems. Fluid Management supplies both volumetric and gravimetric solutions for architectural and industrial applications in the coatings and ink manufacturing areas. In combination with our business partners, the company provides full custom color systems. Fluid Management is supported by an extensive network of sales and service locations, including Porto Alegre, Brazil, and Mexico City.

GRETAGMACBETH 2201
(formerly known as Macbeth)
617 Little Britain Rd.
New Windsor, NY 12553
Phone: (914) 565-7660
Fax: (914) 565-0390
E-Mail: mselsa@msn.com

GretagMacbeth presents a range of color solutions for the coatings industry that enable the control of color from product concept through production. An array of visual color standards and light booths provide designers with tools for consistent color specification. Spectrophotometers and software systems let laboratory and production areas accurately measure and predict color in as little as one hit. A full range of product services and training keep systems in compliance with ISO requirements for certification and job training.

HALOX 2007
1326 Summer St.
Hammond, IN 46320
Phone: (219) 933-1560
FAX: (219) 933-1570

Halox will feature a new flash-rust inhibitor, Flash-X, which prevents flash rust on both steel and galvanized. Halox will also be demonstrating their line of corrosion and tannin stain inhibitors with new work done in each category.

WILLIAM HARRISON CORP. 2121
4595 E. 10th Ct.
Hialeah, FL 33013
Phone: (305) 681-8381
Fax: (305) 685-0407

William Harrison Corp., celebrating its 38th year in the outdoor exposure test equipment business, displays four different exposure test rack adaptations. One rack features the testing of rows of standard paint and coatings panels. Another rack shows the mounting of siding panels. Two racks, different in design but similar in function, used for the exposure of plastics, glass, paints, etc., are also featured. All racks are of anodized aluminum construction.

HEISLER INDUSTRIES, INC. 2308
224 Passaic Ave.
Fairfield, NJ 07011
Phone: (973) 227-6300
Fax: (973) 227-7627

Complete filling and packaging lines will be featured. From concept to design, manufacturing, integration, and installation, Heisler Industries can do it all. Heisler designs and manufactures five gallon pail and one gallon container handling equipment including: denesters, lid placers/closers, casepackers, palletizers, and Bail-O-Matics (puts handles on paint cans). Through our APG Company, we offer robotic palletizers, robotic pick & place units, automatic gantry palletizers, case erectors and casepackers. Custom designed equipment is also a specialty.

HERO INDUSTRIES 2019
2719 Lake City Way
Burnaby, B.C. V5A 2Z6
Canada
Phone: (604) 420-6543
Toll Free: (800) 494-4376
Fax: (604) 420-8725

Hero Industries presents airless spray equipment, tint dispensers, paint shakers, hulp spray equipment, and power washers.

HOCKMEYER EQUIPMENT 2313
P.O. Box 113
Harrison, NJ 07029
Phone: (973) 482-0225
Fax: (973) 484-6114

Hockmeyer Equipment demonstrates the superior performance of their basket milling technology. Details of the potential this design offers include better grind, particle separation and reduced production time. The company's tank washing and mixing equipment will also be presented.

INMARK, INC. 2220
220 Fisk Dr., S.W.
Atlanta, GA 30336
Phone: (404) 267-2020
Fax: (404) 267-2021

Inmark is a major manufacturer and distributor of packaging for hazardous materials to include packaging for paint and paint related materials. When shipping international and domestic, there are many times that UN packaging is required either by law or by the carrier. Inmark offers the right packaging systems for your needs.

ISP **2300**
1361 Alps Rd.
Wayne, NJ 07203
Phone: (973) 628-3825
FAX; (973) 872-1583

Environmentally safe solvents, such as M-Pyrol® NMP and prepackaged ShipShape® will be exhibited, as well as monomers for radiation curing such as Sapi-Cure® and V-Pyrol® and V-Cap®, which are versatile reactive diluents for free radical radiation curable coatings.

KELLY CHEMICAL CORP. **2302**
9F., No. 155, Sec. 1, Keelung Rd.
Taipei, 141 Taiwan
Phone: 886-2-27621985
Fax: 886-2-27666298
E-Mail: chem@kelly.com.tw

Kelly Chemical Corporation was founded in 1965, with over 33 years of professional manufacturing experience, and has a complete range of colorants—solvent dyes, intermediates, and pigment. We have three plants in Taiwan and China, and own a very strong sales network worldwide. Kelly Chemical Corp. is a specialty chemical manufacturer supplying world class quality and service.

KENRICH PETROCHEMICALS, INC. **2321**
140 E. 22nd St.
Bayonne, NJ 07002-0032
Phone: (201) 823-9000
Fax: (201) 823-0691

On display are: Ken-React titanate, zirconate and aluminate coupling agents for non-toxic anticorrosion, chemical resistance, adhesion, viscosity reduction, pigment dispersion, catalysis in waterborne, high solids and powder coatings. Newly patented Ken-Stat combined trineoalkoxy zirconate antistats—permanent, transparent, non-blooming and non-moisture dependent. Kenplast reactive and non-reactive diluents.

KING INDUSTRIES, INC. **2113**
Science Rd.
Norwalk, CT
Phone: (203) 866-5551
Fax: (203) 866-1268

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Circle No. 237 on the Reader Service Card

Louisville Society Announces Program for "Spectrum of Coatings 1998"

Current formulating information and problem solving approaches for chemists, lab technicians, sales, marketing, and manufacturing personnel will be discussed during the Louisville Society's "Spectrum of Coatings 1998." Scheduled for April 15 at the Executive West Hotel, in Louisville, KY, this symposium will feature two concurrent sessions focusing on various topics including pigments, rheology, additives, instruments, resins, solvents, and manufacturing. The following papers will be presented:

Room One

"Pigment Intermix Systems for Industrial Coatings"—Romesh Kumar, Clariant Corp.;

"New Chemical Modification Technology Offers Breakthrough in Black Pigments for OEM Coatings"—Mary Heithaus, Cabot Corp.;

"The Chemistry and Protection of Metal Surfaces from the Costly Effects of Electrochemical Corrosion"—Walter J. Conti Jr., Buckman Laboratories International Inc.;

"Analytical Sciences and Customers, Conundrums and You"—Keith Cannon, Red Spot Paint and Varnish Co., Inc.;

"Challenges of Obtaining an Alkyd Paint Rheology with Waterborne Latex Paint"—Mark Zody, Süd Chemie;

"Silicone Additives in Coatings Applications"—Lori Stark-Kasely and Kim Kucinski, Dow Corning Corp.; and

"Improved Paint Film Fungicide Performance with the Use of Potentiators"—Amanda L. Harkins, Buckman Laboratories International Inc.

Room Two

"Crosslinker Blends in Two-Component Waterborne Polyurethane Coatings Systems"—William O. Buckley, Air Products;

"New Two-Component Wood Coatings Comprised of a Hydroxy Functional Acrylic Emulsion and a Water-Dispersible Polyisocyanate"—Vic Stanislawczyk, BFGoodrich;

"Veova Vinyl Esters for Latex Coatings"—Ed Hoozemans, Shell Corp.;

"Rapid Circulation Milling for Pigment Dispersion"—Herman H. Hockmeyer II, Hockmeyer Equipment Corp.;

"Zinger Mill Technology: Breakthrough in Media Acceleration, Distribution, and Particulate Reduction"—Mitch D. Newton and Stewart Rissley, Epworth Morehouse-COWLES;

"Filtration Management"—Dan Koats, NorthEast Filter & Equipment Co.; and

"Filtering and Flow-Thru Principles"—John Edwards, Russell-Finex Inc.

The advance registration fee is $55 (before March 31). Contact Ilona Nemes-Duvall, Red Spot Paint & Varnish, 1107 E. Louisiana St., Evansville, IN 47711; Phone: (812) 467-2337.

St. Louis and Kansas City Societies' 45th Annual Meeting Slated for June 5-6

The 45th annual meeting of the St. Louis and Kansas City Societies for Coatings Technology is scheduled for June 5-6, 1998, at Lake of the Ozarks, MO.

In recognition of the 45 years of the two Societies collaborating on educational seminars, the meeting will focus on the theme "Team Missouri."

The meeting will begin with a presentation of both the St. Louis and Kansas City Societies' web sites. The current and future value to the members will be discussed.

The following topics will also be presented:

"Optimizing Lightfastness of Organic Pigments through Particle Size Control"—Romesh Kumar, Clariant Corp.;

"History and Development of Epoxy Acid Chemistry"—Delano Eslinger, CCP;

"High Temperature Resistant Coatings"—a speaker from Dow Corning;

"Correlation of Salt-Fog Testing with Electrochemical Evaluation"—James Stoffer, University of Missouri-Rolla;

"Discussion of the Use of Mill Media; In-Line Strainers as Filtration Devices"—Morton Myers, Morton-Myers Co.;

"Product Liability"—David Raymond, Law Firm of Blackwell, Sanders, Matheny, Weary, and Lombardi.

Other activities that have been planned in conjunction with the meeting include a dinner cruise on Lake of the Ozarks and a golf outing.

The registration fee for the meeting is $95.

Contact Randy Ehmer, Walsh & Associates, Inc., 500 Railroad Ave., N. Kansas City, MO 64116; (816) 842-3014; FAX: (816) 842-0077, for more information, or visit The Kansas City Society website at www.kcsct.org/lake.htm.

Baltimore Society to Conduct Eight Week Coatings Course

A course designed for technicians, chemists, and production personnel will be conducted by the Baltimore Society for Coatings Technology in conjunction with the Community Colleges of Baltimore County.

"Intermediate Coatings Technology" will address the theory and methods of formulating, testing procedures, and research and development techniques. In addition, it will introduce industry newcomers to the formulation of paints. Other topics to be discussed include: formulating latex coatings, formulating solvent-based coatings, testing coatings, and research and development.

The course will meet on eight Wednesday evenings beginning March 25, concluding on May 20. The course will be conducted at Catonsville Community College. The cost of the course is $205 and includes materials.

For more information, contact Julie Bennett at (410) 455-6120 or Bill Sutton at (410) 675-4800.

Detroit Society's FOCUS Conference to Explore "Innovative Coatings" on April 21, 1998

On April 21, 1998, the Detroit Society will sponsor the 23rd Annual FOCUS Conference at the Michigan State University Conference Center, in Troy, MI. This year's event will address "Innovative Coatings: Practical Solutions for Global Demands."

The conference will feature two Keynote Speakers. Darlene Brezinski, of *Paint & Coatings Industry Magazine* will discuss "Driving Forces for Coatings Industry Globalization," and David Cole, of the University of Michigan, Transportation Research Institute, will present "The Auto Industry of the Future: A World of Vanishing Boundaries."

Other presentations scheduled for the two-track format include the following:

Track One

"Analytical Techniques to Measure Automotive Paint Film Degradation"—Trish Oberg, BASF Corp.;

"Catalysis of the Isocyanate Hydroxyl Reaction"—Werner Blank, King Industries, Inc.;

"The LEPC Powder Clearcoat Experience"—Mark Bindbeutel, Chrysler Corp., Keith Gifford, Ford Motor Co., and Robert Mowers, GM Corp.;

"Two-Pack Polyurethane Coatings Systems for Plastic"—Claus Kobusch, Bayer AG;

"Scanning Probe Microscopy Investigation of Mechanical Properties of Polymer Coatings"—Weidian Shen, Eastern Michigan University;

"Aspects of Latex Film Formation"—Charles Kan, The Dow Chemical Co.; and

"Globalization of Automotive Specifications"—Douglas Hart, GM Corp.

Track Two

"Phosphate Coatings: Basic and Practical Concepts"—Michael Petschel, Henkel Surface Technology Group;

"Key Attributes of Paint Filters"—James Schmitz, Parker-Hannifin;

"More Guidelines for Selecting Spray Equipment"—Jason Stevens, Universal Spray Technology;

"Current Status of UV-Curable Powder Coatings"—David Bargmann, Nutro Corp.;

"Filtration and Your Spray Booth"—Dan McNamara, Alar Engineering;

"A Universal Communications Network Serving the Paint and Coatings Industry"—Clarke Steigerwald, Midwest Information Systems, and William Mayhew and Matt Ahrends, Inspec, Inc.; and

"Comparison of Air Caps for Paint Atomizers by Air Volume and Velocity Profile"—John Moore, DuPont Automotive.

In addition, this year's FOCUS will feature a separate tutorial short course "Painting and Processing Plastics," presented by Aaron Ford and Rose Ryntz. The tutorial will cover processing techniques, key processing variables, processing problems, molding effects on paintabil-ity, adhesion principles, adhesion promotion, problems encountered in painting of plastics, chemistry of plastics additives, paint types utilized, and VOCs and HAPs regulations and considerations.

The early bird registration fee, which is due by April 3, is $65. The cost includes the tutorial short course; however, pre-registration is required for the course.

For more information, contact Rosemary Brady, Akzo Nobel Coatings Inc., (248) 637-8565.

Norman Roobol to Serve as Guest Speaker During Eastern Training Conference and Show

The Philadelphia Society-sponsored Eastern Training Conference and Show, slated for May 11-14, at the Valley Forge Convention Center, Valley Forge, PA, will feature Norman Roobol as the guest speaker. Dr. Roobol will discuss "Application Techniques" on May 13. In addition, he will be available through the exhibition to offer advice on paint-related problems.

Dr. Roobol has served the paint and coatings industry as a university professor, an author, and as a consultant for 28 years. He has written two books: *Industrial Painting—Principles and Practices* and *Painting Problems: Solved*.

For more information on the Eastern Training Conference and Show, contact Wayne Kraus, Hercules Incorporated, Research Center, 500 Hercules Rd., Wilmington, DE 19808; (302) 995-3435, or visit the FSCT web site: www.coatingstech.org.

Atlas Releases Weather-Ometer Workshop Schedule

Atlas Electric Devices Co., Chicago, IL, has announced the 1998 schedule for its Weather-Ometer® Workshop. Intended for operators of the Atlas Ci35, Ci65, Ci4000, and Ci5000 Weather-Ometers, the program features three hands-on training courses:

Weather-Ometer Workshop—This two-day course features hands-on instruction with operational Ci65A Weather-Ometers and covers a brief history of accelerated testing, installation procedures and requirements, operating systems, calibrations, routine maintenance, and trouble-shooting techniques. The course is designed for equipment operators, quality assurance and control personnel, laboratory technicians, and anyone who is responsible for equipment operation, maintenance, and calibration. Course tuition is $875 and includes a get acquainted welcoming reception, continental breakfast, lunch and refreshments for both days and all course materials. The course will be held on May 21-22, August 19-20, and November 19-20.

Advanced Ci35 and Ci65 Weather-Ometer Workshop—The one-day workshop provides extended, in-depth training on Ci35A and Ci65A Weather-Ometers. As a continuation of the standard Weather-Ometer Workshop, the advanced workshop is designed to provide hands-on training in programming controllers, wiring diagram comprehension, and detailed troubleshooting, as well as a step-by-step explanation of the operator's manual. Course tuition is $525 and includes course materials, continental breakfast, lunch, and refreshments. Dates for the Advanced Ci35 and Ci65 Workshop are March 20 and August 21.

Ci4000/Ci5000 Weather-Ometer Workshop—This one-day course is designed for operators of the Ci4000 and Ci5000 Weather-Ometers. Using operational Weather-Ometers, this comprehensive course will demonstrate operation, calibration and maintenance to both experienced and inexperienced personnel. Course tuition is $525 and includes course materials, continental breakfast, lunch, and refreshments. Dates for the Ci4000/Ci5000 Workshop are May 20 and November 18.

For more information, contact Amy J. Benson, Atlas Electric Devices Co., 4114 N. Ravenswood Ave., Chicago, IL 60613; (773) 327-4520.

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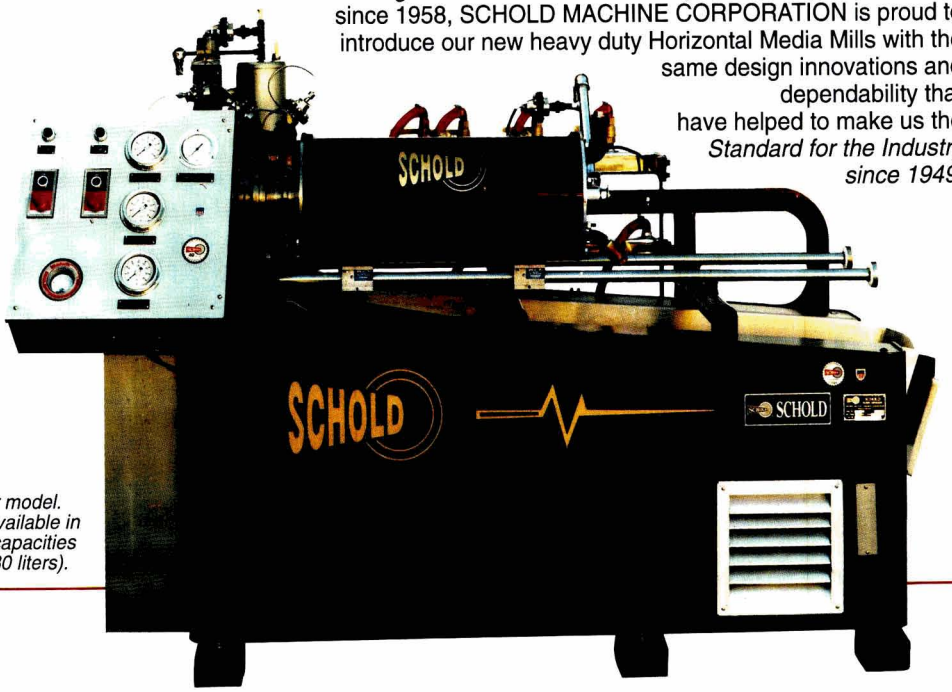

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Circle No. 252 on the Reader Service Card

Southern Society to Convene March 30-April 1 for 62nd Annual Meeting in Point Clear, AL

Formulation, research, and production are three areas to be explored during the Southern Society for Coatings Technology's 62nd Annual Convention and Meeting. The convention, scheduled for March 30-April 1 at the Marriott's Grand Hotel and Resort, Point Clear, AL, is titled "Technology Tools for Tomorrow."

The topics to be discussed during the technical sessions include the following:

Tuesday, March 31

Keynote Address—Robert Lochhead, The University of Southern Mississippi (USM);

"Analysis of Components of an Architectural Coating"—Eric Hayri, Huber Engineered Minerals;

"Alternatives to Cellulosic Thickeners-HASE Rheology"—Joseph Tanzer, Rohm and Haas;

"Specialty Additives in Coatings Science"—Nancy Cliff, Ciba Additives;

"New Polymers for Exterior Application"—Rick Minor, Union Carbide;

"Water-Based Epoxies—Today and Tomorrow"—Ernie Galgoci, Shell Chem.;

"Pigments for Industrial Paint Intermix Systems"—Romesh Kumar, Clariant Corp.;

"Wax Additives for Coatings: An Overview"—Tom Daquilla, Daniels Corp.; and

"Bacterial Contamination Control in Plant Equipment"—Tim Savage, Troy Chemical.

Wednesday, April 1
Session A—Technology

"Technology of Pigmentation"—Kevin Davis, USM;

"Solventless Emulsion Coatings"—Shelby Thames, USM

"Powder Coating Formulation for Practical Application"—James Rawlins, USM; and

"Coating Analysis by Optical Microscopy"—Richard S. Brown, MVA Inc.

Session B—Equipment

"Latest Advancements in Dispersion Equipment"—Jerry Tippett, Sr., Schold Machine Co.;

"Media and Media Mill Selection"—Tom Weiss, Quackenbush Co.;

"Mixing of Viscous Fluids"—Andre Bakker, Chemineer Corp.; and

"Conveying Technology for Pigment Powders"—Richard Ambs, The Young Industries Inc.

Various social activities, including a golf and tennis tournament, have been planned for attendees. A tour of Bellingrath Gardens and Mobile, AL is also available.

The registration fee for FSCT members is $120. The nonmember fee is $150. There are additional charges for the social activities.

Contact Peg Harshfield, 5375 Fox Hill Dr., Norcross, GA 30092, for more information.

Eight RCRA Seminars Planned for 1998

McCoy and Associates, Inc., Golden, CO, will conduct eight RCRA seminar programs during 1998. These seminars, designed for individuals who must comply with federal hazardous waste regulations, provide useful, easy-to-understand guidance toward RCRA compliance.

The seminars will be held on the following: March 30-April 3, Houston, TX; May 4-8, Williamsburg, VA; June 15-19, Seattle, WA; August 10-14 and December 14-18, Denver, CO; September 21-25, San Diego, CA; October 19-23, Chicago, IL; and November 16-20, Orlando, FL.

Each seminar consists of five one-day sessions covering the following topics: "RCRA Fundamentals," "Avoiding the Most Common Mistakes in Waste Identification," "Generator Issues," "Advanced RCRA Topics," "RCRA Land Disposal Restrictions," "Step-By-Step Compliance," and "Applied RCRA Concepts: A Workshop." The five-day format allows participants to select any or all of the sessions they wish to attend. Costs for the seminars are $500 for one session, $900 for two sessions, $1200 for three sessions, $1440 for four sessions, and $1600 for all five sessions.

For more information about the seminars, contact McCoy and Associates, Inc., 25107 Genesee Trail Rd., Ste. 200, Golden, CO 80401; (303) 526-2674.

Kent State to Conduct Four Coatings Short Courses

The Professional Development Institute and KSU Conference Bureau at Kent State University, Kent, OH, are conducting coatings short courses designed for industrial coatings and polymer employees. The courses are: "Introduction to Coatings Technology," April 14-17; "Applied Rheology for Industrial Chemists," April 20-24; "Adhesion Principles and Practice for Coatings and Polymer Scientists," May 4-8; and "Dispersion of Pigments and Resins in Fluid Media," May 11-15.

The "Introduction to Coatings Technology" course will be presented by Ben J. Carlozzo, of DCA Coatings. The course will discuss the composition of coatings, formulation principles, manufacture, application, and emerging technologies for architectural and industrial finishes.

The rheology program will introduce fundamentals followed by instrument selection and meaningful rheological measurements. Lecturers will discuss polymer melt rheology application of rheology to processing and performance problems; relevance of rheology to application, surface defects, and quality control for coatings. Flow modification; thermal mechanical properties analysis; rheology of latexes, dispersions, and thermosets; control and measurement of crosslink density; and the application of rheology to engineering problems will be presented.

The adhesion course will outline surface chemistry and rheology relevant to adhesion, deformation, and fracture of glassy adhesives, surface preparation, plasma treatment, and adhesion promoters. Topics will include plastic to plastic adhesion, tack, surface analysis, release coatings, structural adhesives, and bond durability. Other subjects include adhesives in the web form and adhesive application methods.

The dispersion course will first introduce surface chemistry fundamentals, followed by lectures on dispersant selection; dispersion of inorganic, organic, silica, and carbon black pigments and the evaluation of dispersion quality by rheological means. Experts will discuss dispersion equipment and selection of mixers; ball, sand and other media mills, high viscosity dispersion equipment and particle size analysis for evaluating processing results will be presented.

These programs should be of interest to research and development personnel who especially have interest in coatings, adhesives, elastomers, inks, and composites. Information can be obtained from Carl J. Knauss, Professional Development Institute, P.O. Box 1792, Kent, OH, 44240; (330) 673-6993.

Regulatory Update

Federal Regulations
State Regulations
International Activity
Update Analysis

March 1998

This summary of current regulatory activity of interest to the coatings industry is published to inform readers of actions that could affect them and their firms, and is designed to provide sufficient data to enable those interested to seek further information. Material is supplied by the law firm of Swidler & Berlin, Chartered, in Washington, D.C. Although reasonable steps have been taken to ensure the reliability of this Regulatory Update, the FSCT and Swidler & Berlin cannot guarantee its completeness or accuracy.

Federal Regulations

Environmental Protection Agency
January 16, 1998 - 63 FR 2726
Action: Direct Final Rule
Subject: Identification of ozone areas where the one-hour standard is no longer applicable

EPA has identified ozone areas where the one-hour National Ambient Air Quality Standard (NAAQS) for ozone is no longer applicable. This includes all areas which are not currently in violation of the one-hour standard (based on 1994-96 data). For all other areas, the one-hour standard will continue to apply. The Agency is taking this action to assist in the phasing-out of the one-hour standard since the recently promulgated new 8-hour standard, which is more protective of public health, is now in effect. EPA also intends to publish a subsequent notice in early 1998 which takes similar action to revoke the one-hour standard in additional areas which are not in violation of the standard based on 1995-97 data, and to continue to publish such revocation notices on an annual basis thereafter. The current revocations will become effective on March 17, 1998, unless adverse or critical comments addressing the technical correctness of these determinations were received by February 17, 1998, in which case the revocations on which adverse comments have been received will be withdrawn.

For further information, contact Annie Nikbaht (policy) or Barry Gilbert (air quality data), Office of Air Quality Planning and Standards, Air Quality Strategies and Standards Division, Ozone Policy and Strategies Group, MD-15, Research Triangle Park, NC 27711, phone: (919) 541-5246/5238.

Food and Drug Administration
January 23, 1998 - 63 FR 3463
Action: Final Rule
Subject: Amendment of food additive regulations to provide for use of optical brightener in polymers and adhesives in contact with food

The FDA is amending its food additive regulations to provide for the safe use of 2,2'-(2,5-thiophenediyl)-bis(5-tert-butylbenzoxazole) as an optical brightener in pressure sensitive adhesives and in all polymers used in contact with food. It is taking this action in response to a petition filed by Ciba-Geigy Corp., notice of which was published August 18, 1995 (60 FR 43157). Based on its evaluation of data in the petition and other relevant material, the FDA concludes that the proposed uses of the additive are safe, and that the additive will have the intended technical effect, and it is therefore amending the regulations on colorants for polymers (21 CFR 178.3297) and pressure-sensitive adhesives (21 CFR 175.125) to permit these uses of the additive. The amendments became effective January 23, 1998; those adversely affected could request a hearing by February 23, 1998.

For more information, contact John R. Bryce, Center for Food Safety and Applied Nutrition (HFS-215), Food and Drug Administration, 200 C St. S.W., Washington, D.C. 20204, phone: (202) 418-3023.

Environmental Protection Agency
January 23, 1998 - 63 FR 3393
Action: Final Rule
Subject: Significant new use rules

On January 23, 1998, EPA issued significant new use rules (SNURs) under the Toxic Substances Control Act (TSCA) for 163 industrial chemicals. The rules become effective March 23, and will trigger TSCA's export and import notification requirements. If EPA receives adverse comments on a SNUR by February 23, it will withdraw the rule for that chemical and issue a proposed rule for the chemical. Frequently, SNURs require that workers wear protective equipment and obligate manufacturers to limit waste water discharges of the chemical or conduct certain toxicological testing in order not to exceed a specified production volume limit.

For more information, contact Susan Hazen, Director, Environmental Assistance Division, Office of Pollution Prevention and Toxics, Room 543-B, 401 M St. S.W., Washington, D.C. 20460, phone (202) 554-1404.

Environmental Protection Agency
February 5, 1998 - 63 FR 5891
Action: Delegation of authority
Subject: Delegation of authority to New Mexico for NSPS and NESHAP programs

U.S. EPA is approving the delegation of authority to the State of New Mexico to implement and enforce the federal New Source Performance Standards (NSPS) and National Emission Standards for Hazardous Air Pollutants (NESHAP). The provisions of full authority apply to all of the NSPS and NESHAP promulgated by EPA from April 1, 1996 through July 1, 1997; all new and amended standards promulgated after these dates are covered by partial authority. This delegation of authority does not apply to: sources located in Bernalillo County (which are covered under authority delegated to the City of Albuquerque's Environmental Health

Department); sources located on Indian Lands; the NSPS for residential wood heaters under 40 CFR part 60, subpart AAA; and NESHAP radionuclide standards specified at 40 CFR part 61.

For further information, contact Ken Boyce, Air Planning Section (6PD-L), EPA, 1445 Ross Avenue, Suite 700, Dallas, TX 75202, phone: (214) 665-7259.

Environmental Protection Agency
February 9, 1998 - 63 FR 6489
Action: Final Rule
Subject: Approval of changes in Maricopa County, Arizona (Phoenix area) rules regarding VOC emissions

Effective March 11, 1998, EPA is finalizing the approval of revisions to the Arizona State Implementation Plan (SIP) proposed in the Federal Register on December 17, 1997 (62 FR 66043). The revisions incorporate into the federally approved SIP certain rules of the Maricopa County Environmental Services Department (MCESD) relating to the regulation of emissions of volatile organic compounds (VOCs). The approved MCESD rules include: Rule 331, Solvent Cleaning; Rule 337, Graphic Arts; Rule 338, Semiconductor Manufacturing; Rule 342, Coating Wood Furniture and Fixtures; Rule 346, Coating Wood Millwork; and Rule 351, Loading of Organic Liquids.

For further information, contact Andrew Steckel, Rulemaking Office (AIR-4), Air Division, U.S. Environmental Protection Agency, Region IX, 75 Hawthorne Street, San Francisco, CA 94105, phone: (415) 744-1185.

Proposed Regulations

Environmental Protection Agency
February 5, 1998 - 63 FR 5915
Action: Extension of Comment Period and Clarification for Amended Proposed Rule
Subject: Amended proposed rule on test guidelines for hazardous air pollutants

On June 26, 1996, the U.S. EPA proposed a rule under section 4(a) of the Toxic Substances Control Act (TSCA) that would require manufacturers and processors of 21 specified hazardous air pollutants (HAPs) to test those HAPs for certain health effects. An amendment to this original proposal, updating the TSCA health effects guidelines and making various other changes and clarifications, was published December 24, 1997 (62 FR 67466) (See the February 1998 Regulatory Update for further information on the amended proposed rule). The Agency has now extended the deadline for public comments on the proposed rule as amended from February 9, 1998 to May 11, 1998. The deadline for submission of proposals for enforceable consent agreements (ECAs) for HAPs test rule chemicals has also been extended from February 9, 1998 to March 11, 1998. In addition, EPA is clarifying Unit III.C of the amended proposed rule, "Persons Required to Test," to indicate that initial compliance with the HAPs testing rule would be required only of those manufacturing or importing at least 25,000 pounds of a given HAP chemical at any facility.

For further information, contact Susan B. Hazen, Director, Environmental Assistance Division (7408), Rm. ET-543B, Office of Pollution Prevention and Toxics, U.S. EPA, 401 M St. S.W., Washington, DC 20460, phone: (202) 554-1404; e-mail: TSCA-Hotline@epamail.epa.gov.

Notices

Consumer Product Safety Commission
January 22, 1998 - 63 FR 3310
Action: Notice of Approval of Guidance Document
Subject: Issuance of guidance document on lead in consumer products

The CPSC has issued a guidance document for manufacturers, importers, distributors, and retailers of consumer products that may contain lead, with the aim of protecting children from hazardous exposure to lead in consumer products. In the guidance, the CPSC identifies the major factors that it considers when evaluating products that contain lead, and informs the public of its experience with products that have exposed children to potentially hazardous amounts of lead. The guidance states that household products that expose children to hazardous quantities of lead under reasonably foreseeable conditions of handling or use are "hazardous substances" as defined under the Federal Hazardous Substances Act, and as such require precautionary labeling even if not intended for children.

For further information, contact Laura Washburn, Office of Compliance, CPSC, Washington, D.C. 20207, phone: (301) 504-0400, ext. 1452.

Environmental Protection Agency
January 28, 1998 - 63 FR 4259
Action: Notice of Availability
Subject: Issuance of final test guidelines for chemical fate, transport and transformation

U.S. EPA has issued final test guidelines for Series 835 - Fate, Transport and Transformation. These final guidelines are for the Office of Pollution Prevention and Toxics (OPPT) and have been harmonized with test guidelines of the Organization for Economic Cooperation and Development (OECD). The draft guidelines were published in the Federal Register April 15, 1996 (61 FR 16486). Changes to the guidelines include a new guideline on Biodegradability in Sea Water (OPPTS 835.3160) and several clarifications to other guidelines. EPA is retaining a guideline on Anaerobic Biodegradability of Organic Chemicals in the final guidelines despite several negative comments received on the method; the Agency intends to revisit this method when certain technical issues are resolved, and major revisions are currently being considered by several other standards-making bodies (ASTM, ISO and OECD). Fate and transport studies required under FIFRA or TSCA which are initiated after March 16 should be performed in accordance with these final guidelines. The guidelines are available in ASCII and PDF formats on the World Wide Web at http://www.epa.gov/epahome/research.htm under the heading "Researchers and Scientists/Test Methods and Guidelines/Harmonized Test Guidelines."

For further information, contact Robert Boethling, EPA, at (202) 260-3912.

Environmental Protection Agency
February 3, 1998 - 63 FR 5517
Action: Notice of public meetings
Subject: Toxics Release Inventory reporting form

U.S. EPA has announced that it will hold approximately nine public meetings to solicit comments relating to the Toxics Release Inventory (TRI) reporting form, Form R. The purpose of the meetings is to obtain

comments from stakeholders on ways to improve the type of right-to-know information available to communities and to help streamline right-to-know reporting to ease the paperwork burden for businesses affected by the requirements. These meetings are also intended to provide an opportunity for affected entities to participate in the development of a rule clarifying the Pollution Prevention Act reporting requirements currently contained in Section 8 of the Form R. The first three such meetings were held in November 1997. The current notice announces two additional meetings: in Dallas, Texas on February 24, 1998 and at EPA Region II headquarters in New York City on April 2, 1998.

For further information, contact Michelle Price, Mail Stop 7408, U.S. EPA, 401 M St. S.W., Washington, D.C. 20460, phone: (202) 260-3372.

To register to speak via conference call or in person, contact Debra Jones at (301) 907-3844.

Environmental Protection Agency
February 12, 1998 - 63 FR 7167
Action: Announcement of training courses
Subject: EPCRA and Pollution Prevention Act

EPA has announced that it will offer a series of free training courses on the reporting requirements mandated by § 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA) and by § 6607 of the Pollution Prevention Act. These courses will be held in the spring of 1998 in 13 different cities.

For further information, contact Michael Hart, (202) 260-1576, or Tascon, Inc. (301) 907-9655.

Environmental Protection Agency
February 12, 1998 - 63 FR 7155
Action: Notice of revisions to list of hazardous air pollutant source categories
Subject: List of source categories under Section 112 of the Clean Air Act

In this notice, EPA publishes revisions which have been made or proposed to the list of categories of sources of hazardous air pollutants and the corresponding schedule for the promulgation of emission standards. The source category list and the schedule for standards are required under Section 112 of the Clean Air Act and constitute a significant part of the Agency's agenda for regulating stationary sources of air toxics emissions.

For further information, contact David Svendsgaard, Emissions Standards Division (MD-13), U.S. EPA, Office of Air Quality Planning and Standards, Research Triangle Park, N.C. 27711, phone: (919) 541-2380; e-mail: svendsgaard.dave@epamail.epa.gov.

Federal Legislation

See the Update Analysis article for a discussion of the outlook for environmental issues in the second session of the 105th Congress, which convened January 27, 1998.

Current News and Upcoming Federal Developments

Report of Advisory Panel on Endocrine Disruption Proposes Chemical Screening Priorities

EPA's Endocrine Disruptors Screening and Testing Advisory Committee released a draft report February 3 that proposes a method of setting priorities for screening and testing all chemicals in commerce for hormone effects. The scheme proposed in the report involves sorting chemicals into three categories based on the amount of data available: an initial sorting category for all chemicals in commerce, a category for chemicals with extensive existing toxicity data, and a category for polymers manufactured after 1979. The report specifically recommends screening polymers with a molecular weight of less than 1,000 for their potential endocrine activity.

National Toxicology Program Announces the Addition of 14 Substances to Carcinogen List

The National Toxicology Program has announced that it will add 14 substances to the listings of substances known or reasonably anticipated to be human carcinogens in the upcoming eighth edition of its Report on Carcinogens. NTP listing often triggers regulatory action by federal, state or international agencies. The only chemical added to the list of known carcinogens is cyclosporin. The thirteen chemicals added to the list of those reasonably anticipated to be human carcinogens include: azacitidine; p-chloro-toluidine and its HCl salt (used to produce dyes and as an intermediate in pigment production); chlorozotocin; Danthron or 1,8-dihydroxyanthraquinone (used as a dye intermediate); 1,6-dinitropyrene; 1,8-dinitropyrene; Disperse Blue 1, or 1,4,5,8-tetraaminoanthraquinone (used as a dye for fabrics and plastics); furan; o-nitroanisole (used in dye manufacturing); 6-nitrochrysene; 1-nitropyrene; 4-nitropyrene; and 1,2,3-trichloropropane (used as a polymer crosslinking agent, as a solvent, and as a paint and varnish remover).

Battery Council Petitions EPA for Modification of Lead Values in Superfund Site Scoring

The Battery Council International (BCI) submitted a petition to EPA January 8 asking the agency to modify the human toxicity factor for lead currently used in the Hazard Ranking System (HRS) used to score sites for listing on the Superfund National Priorities List. Citing a consultant's analysis of EPA's Integrated Exposure Uptake Biokinetic Model, which the Agency uses to assess lead exposure risks in other contexts, BCI asked that the agency reduce the human toxicity factor used in the HRS from its current level of 10,000 to no more than 1,000.

State Regulations

ALASKA

Air Quality (Proposed Rule)—The Alaska Department of Environmental Conservation (DEC) is proposing to amend its regulations at 18 AAC 50 and the State Implementation Plan (SIP) to obtain full approval from the U.S. EPA for Alaska's air quality operating permit plan. A hearing is scheduled for March 12, 1998 and comments are due March 16, 1998. For further information, contact Bill Walker, DEC, Air Quality Maintenance, 410 Hilloughby Avenue, Juneau, AK 99801, phone: (907) 465-5124, fax: (907) 465-5129.

CALIFORNIA

Air Quality (Proposed Rule)—The Bay Area Air Quality Management District (BAAQMD) is conducting a

public workshop on proposed amendments to Regulation 8, Rule 16, Solvent Cleaning Operations. The substantive revisions being considered include: adopting the federal NESHAP on halogenated solvent cleaners by reference to eliminate duplicative regulatory control by the District; elimination of recordkeeping for federally exempt solvents; and a proposed standard requiring aqueous cleaning solutions for parts washers in repair and maintenance cleaning operations. The workshop is scheduled for March 3, 1998. For further information, contact Thomasina Mayfield, BAAQMD, (415) 771-6000.

Occupational Safety & Health (Final Rule)—The California Occupational Safety and Health Agency (Cal/OSHA) has amended 8 CCR Section 5207, Appendix A, governing exposure to cadmium. The amendments became effective February 12, 1998. For further information, contact Anita Caines, Cal/OSHA, (916) 322-3640.

CONNECTICUT

Air Quality (Proposed Rule)—The Connecticut Department of Environmental Protection (DEP) has proposed revisions to the SIP which would streamline and consolidate the process by which DEP gathers emissions data from source owners and operators for inclusion in its annual inventory of actual source emissions. Comments were due March 5, 1998. For further information, contact DEP, 5th Floor, Holcombe Room, 79 Elm Street, Hartford, CT 06134-0308, phone: (806) 424-3027.

Air Quality (Final Rule)—DEP has revised the definition of volatile organic compound at CAC 22a-174-1. The revised definition became effective December 22, 1997. For further information, contact Ellen Walton, DEP, Bureau of Air Management, Planning and Standards Division, 79 Elm Street, Hartford, CT 06106-5127.

Hazardous Material Transportation (Final Rule)—The Connecticut Department of Public Safety (DPS) has updated regulations governing the Connecticut Hazardous Chemicals Code for the safe storage and transportation of hazardous materials at CAC Sections 29-337-1b through 29-337-3b. The updated regulations became effective December 23, 1997. For further information, contact Janet K. Ainsworth, Attorney, DPS, Division of Fire, Emergency and Building Services, 1111 Country Club Road, P.O. Box 2794, Middletown, CT 06457-9294, phone: (860) 685-8380.

FLORIDA

Air Quality (Final Rule)—The Florida Department of Environmental Protection (DEP) has amended its regulations at FAC Chapter 62-210 on stationary sources to establish generic air permitting exemption criteria and expand the list of existing categorical exemptions. The amended regulations became effective February 5, 1998. For further information, contact Larry George, DEP, (850) 488-0114.

Air Quality (Final Rule)—The DEP has modified its rules at FAC Section 62-212.400 to reflect recent EPA rule amendments and guidance relating to pollutants subject to Prevention of Significant Deterioration (PSD) review. The amended regulations became effective February 5, 1998. For further information, contact Larry George, DEP, (850) 488-0114.

ILLINOIS

Air Quality (Proposed Rule)—The Illinois Pollution Control Board (PCB) has proposed to establish new volatile organic material emission standards and limitations for the Chicago area, to be codified at 35 IAC 218.840. Comments were due February 23, 1998. For further information, contact the Clerk of the PCB, (312) 814-6931.

Hazardous Materials (Final Rule)—The Illinois Emergency Management Agency (EMA) has amended its regulations at 29 IAC Chapter 620 which require the EMA, in its capacity as the State Emergency Response Commission (SERC), to designate emergency planning districts and to organize and supervise a local emergency planning committee (LEPC) within each such district. The regulations also require the SERC and the LEPC to prepare a comprehensive state and local hazardous materials emergency response plan designed to protect against the harmful effects potentially resulting from an accidental release of an extremely hazardous substance. The amended regulations became effective January 1, 1998. For further information, contact Dean Schlee, Manager, Hazardous Materials, EMA, (217) 782-4694.

Water Quality (Final Rule)—The PCB has modified the state Water Quality Standards for the Lake Michigan Basin to be as protective as the U.S. EPA's final water quality guidance for the Great Lakes System. The PCB has also amended the Water Quality Standards rules to: revise the antidegradation provisions; provide for a phase-out of mixing allowances for certain compounds that bioconcentrate in organisms; promote pollution prevention practices; and establish additional numerical water quality standards and procedures for the derivation of criteria. The revised standards and rules became effective December 24, 1997. For further information, contact Dorothy Gunn, PCB, (312) 814-4295.

IOWA

Air Quality (Proposed Rules)—The Environmental Protection Commission of the Iowa Department of Natural Resources (DNR) has proposed amendments to rules regarding: emission standards for air contaminants; excess emissions; measurement of emissions; ambient air quality standards; qualification in visual determination of the opacity of emissions; and nonattainment areas. Comments were due February 13, 1998. For further information, contact DNR, Wallace State Office Bldg., 900 East Grand Ave., Des Moines, IA 50319-0034, fax: (515) 242-5094.

LOUISIANA

Air Quality (Proposed Rule)—The Louisiana Department of Environmental Quality (DEQ) has proposed amendments to its regulations at LAC 33:III.551 to implement a state program under Section 112(g) of the federal Clean Air Act, requiring that new major sources of air toxics make a case-by-case Maximum Achievable Control Technology (MACT) determination when no federal MACT emission standard has been established. The proposed amendments implement the MACT determination requirement and provide affected facilities with direction and instruction regarding applicability

determinations, application requirements, and administrative procedures. Comments are due March 5, 1998; a hearing was scheduled for February 27, 1998. For further information, contact Patsy Deaville, Investigations and Regulation Development Division, DEQ, (504) 765-0399.

MARYLAND

Occupational Safety & Health (Final Rules)—The Division of Labor and Industry (DLI) of the Maryland Department of Labor, Licensing and Regulation (DLLR) has revised its rules on exposure to Air Contaminants at COMAR 09.12.31 to incorporate recent federal standards by reference. The revised rules became effective January 26, 1998. For further information, contact John P. O'Connor, Commissioner of Labor and Industry, DLI, (410) 767-2225.

MINNESOTA

Air Quality (Final Rules)—The Minnesota Pollution Control Agency (MPCA) has amended its air rules at MCAR Chapters 7007 and 7019 concerning enforceable limitations assumed to avoid being subject to new source review program and permittee requirements. The amendments became effective January 17, 1998. For further information, contact MPCA, (612) 296-7338.

Air Quality (Proposed Rule)—The MPCA has proposed a general permit governing stationary manufacturing sources. Comments were due February 25, 1998. For further information, contact MPCA, (612) 296-7810.

MISSISSIPPI

Air Quality (Final Rules)—The Mississippi Department of Environmental Quality (DEQ) has amended APC-S-1, Rules 6.3 and 8, governing New Sources of Air Emission and Hazardous Air Pollutants. The amendments adopt additional federal New Source Performance Standards (NSPS) and National Emissions Standards for Hazardous Air Pollutants (NESHAP) and provide for MACT standards. The amendments became effective February 27, 1998. For further information, contact Dwight Wylie, DEQ, (601) 961-5171.

MONTANA

Water Quality (Proposed Rule)—The Montana Board of Environmental Review (BER) has proposed action to rules at ARM 17.30.716 pertaining to categorical exclusions for categories of activities that cause nonsignificant changes in water quality. Comments were due February 27, 1998; a hearing was scheduled for February 18, 1998. For further information, contact BER, (406) 444-2544.

Air Quality (Final Rule)—The BER has made amendments to the rules governing the air quality operating permit program at ARM 17.8.1201, 17.8.1210 and 17.8.1213. The amendments were necessary to obtain U.S. EPA approval for the program. The amendments became effective January 16, 1998. For further information, contact BER, (406) 444-2544.

NEW HAMPSHIRE

Air Quality (Proposed Rule)—The New Hampshire Department of Environmental Services (NHDES), Air Resources Division, has proposed amendments to its rules on regulated toxic air pollutants, including a revision of its List of Regulated Toxic Air Pollutants. Comments are due March 5, 1998; a hearing was scheduled for February 26, 1998. For further information, contact Pamela G. Monroe, Program Specialist, NHDES, Air Resources Division (603) 271-7874.

NEW YORK

Water Quality (Final Rule)—The New York State Environmental Board on January 27 approved water quality regulations to bring the state into compliance with the federal Clean Water Act and the Great Lakes Initiative. The regulations (Ch. 10, Parts 700-706 NYCRR 6), which take effect 30 days after they are filed with the New York Department of State, add or revise 182 ambient water quality standards for 129 substances. The regulations also revise groundwater effluent limits and revise procedures for establishing ambient water quality standards.

OHIO

Water Quality (Proposed Rules)—The Ohio Environmental Protection Agency (OH EPA) has proposed action to surface water regulations at OAC 3745-1-05 and 3745-1-50 to 3745-1-54, including those regarding: antidegradation; wetland definitions; wetland narrative criteria; numeric chemical criteria for discharges of wastewater to wetlands; wetland use designations; and wetland antidegradation. For further information, contact Mick Micacchion, OH EPA, (614) 644-2327.

PENNSYLVANIA

Water Quality (Final Rule)—The Pennsylvania Environmental Quality Board has amended its water quality standards regulations to incorporate requirements of the federal Great Lakes Initiative Water Quality Guidance. The amended rules became effective December 27, 1997.

For further information, contact Edward R. Brezina, Chief, Division of Water Quality Assessment and Standards, Bureau of Watershed Conservation, (717) 787-9637.

TEXAS

Air Quality (Announcement)—The Texas Natural Resource Conservation Commission announced on January 27, that it is considering new options for controlling ground-level ozone within the state. The options could include new regional controls on large businesses and major industrial sources in central and east Texas. The options will be used to design a new air pollution control strategy for the state's nonattainment areas (Houston-Galveston, Dallas-Fort Worth, Beaumont-Port Arthur, and El Paso). As the agency continues work of the new strategy, it will publicize its options in detail and actively seek public comment.

UTAH

Air Quality (Proposed Rule)—The Utah Department of Environmental Quality has proposed to amend its air rules to update testing and monitoring procedures related to air emission standards for process vents and equipment leaks. Comments were due February 2, 1998. For further information, contact Susan Toronto, DEQ, (801) 538-6776.

International Activity

BRAZIL

First Environmental Protection Law Passed

After seven years of debate, the Brazilian Congress approved the country's first environmental protection law on January 28. Previously, environmental matters were dealt with through a number of separate laws and the government's enforcement powers were limited. The Environment Law, as it is called, establishes stiff fines and jail terms for environmental crimes. Brazil's President has 30 days in which to sign the legislation.

CANADA

Ontario Voluntary Ozone Control Plan

The Ontario government announced on January 20 a voluntary ozone control plan designed to cut emissions of nitrogen oxide and volatile organic compounds by 45 percent by 2015. Forty-four companies, industrial associations and environmental groups have already signed on to take part in the voluntary program. The Ontario government made clear that if the voluntary program falls short of reaching the ozone reduction goal, the province may enact regulations forcing compliance.

Division of Environmental Responsibilities

Canada's federal, provincial, and territorial governments (except Quebec) signed an agreement on January 29 to begin dividing up environmental responsibilities among the jurisdictions. Under the Canada-Wide Accord on Environmental Harmonization, each government will retain its existing authorities, but will use them in a coordinated manner to achieve improved environmental results. The government entities will now work to decide how the responsibilities should best be allocated.

COLOMBIA

Ten-year Environmental Program

The Colombian Environment Ministry announced in January a ten-year plan for its environmental programs. The plan will focus in part on the treatment of industrial wastes in water and will improve the country's environmental permit program. The plan will also establish a national system of protected areas to expand ecological reserves and will establish environmental taxes on water and forest use.

EUROPEAN UNION

Organic Solvent Legislation

The EU has drafted legislation designed to reduce health and environmental risks from industrial use of organic solvents. The legislation cleared first reading in the European Parliament on January 14 and will now go to the Council of Ministers for further action. The proposal covers 30 now unregulated industrial and craft activities, and would impose compliance requirements on an estimated 400,000 firms. Under the proposal, EU member state governments that do not have VOC reduction programs in place would be required to develop such plans with the overall aim of reducing VOC emissions by 67 percent from 1990 levels, with a 2007 compliance deadline. The proposal seeks sector-specific emissions limits covering, among other industries, industrial painting, surface coating, manufacture of coatings and adhesives, and printing.

Legal Actions

The European Commission has initiated a series of legal actions against European Union member states for their failure to implement or enforce EU environmental laws. The actions have been initiated against Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Portugal, and Spain. The EU environmental laws that allegedly have not been implemented or enforced by these countries include laws relating to waste management (France, Germany, Spain), incineration of hazardous waste (Austria, Belgium, Denmark, Ireland, Italy), and packaging and packaging waste (Belgium, Finland, Portugal).

MEXICO

VOC regulations under development

Mexican environmental authorities recently announced that they are in the process of developing VOC regulations for several industrial categories. The government intends to regulate smaller industries through normal mandatory regulations; larger industries would be subject to "voluntary" standards that will become mandatory through their inclusion in facility operating licenses. A VOC standard for the furniture painting process is currently being negotiated. Other industrial sectors for which Mexico is developing VOC standards include production and import of air-dried paints; storage of organic liquids; paint and printing processes for cans; and graphic arts processes.

UNITED KINGDOM

New Groundwater Protection Regulations

The U.K. Department of the Environment, Transport, and the Regions announced on January 12 new regulations to increase the protection of groundwater from pollution by dangerous substances. Under the regulations, activities that may lead to indirect discharge to groundwater would be subject to an "investigation" by the Environment Agency. The Agency may prohibit such activities or may authorize them subject to conditions. The regulations will be finalized at some time after a "consultation period" that ends on May 14.

Update Analysis: 1998 Environmental Legislative Outlook

This special Update Analysis summarizes the prospects for environmental legislation in the United States Congress in 1998. This summary is based in part on recent conversations with House and Senate staff and with sources at EPA. Generally, although Congress will target several environmental issues in this session, sources believe there is little chance for significant substantive action this year, due in part to the election-year shortened legislative schedule and due to competing legislative issues.

1. Superfund

There is little chance for enactment of comprehensive Superfund reform this year. There will, however, be some action on pending bills in both chambers during this congressional session. In the event key players eventually concede that comprehensive reform cannot move forward, there is some chance that more limited Superfund legislation will be considered.

a. The House

In the House, Republican staff for the Commerce Committee remain committed to fundamental reforms (for example, in the areas of remedy and liability). However, Democratic staff are adamantly opposed to such reforms, and there is a belief that the Speaker is too adroit to allow a partisan bill to move forward. Therefore, the chances of a comprehensive bill appear dim at best in this Committee.

There are additional reasons why action on comprehensive Superfund reform is unlikely in the House this year. Perhaps most important, given the position of the oil companies on reinstating the Superfund tax, there is a belief that Ways and Means Chairman Bill Archer will block any effort to renew that tax.

Under the circumstances, some House staffers are surprised that industry continues to pursue a comprehensive bill. They note that roughly 80% of all RODs are slated to be completed this year, and wonder why industry isn't interested in simply letting the program wind down. They also note that several current bills would allow the states to add numerous new sites to the Superfund list. In fact, one staffer believes this state provision is a real "sleeper" that has the possibility to revive Superfund with a vengeance — this time with the states using federal money to run cleanups under state law at hundreds of new sites.

Some House staffers believe there is a small chance that a slimmed-down Superfund bill might receive consideration in the event the comprehensive effort is abandoned. For example, they point to H.R. 2485, a bill introduced last fall by Reps. Stupak, Goodling, and others. This bill is limited to such issues as Brownfields, landfills, and innocent landowners. Enacting a limited bill similar to H.R. 2485 would give both Republicans and Democrats the opportunity to claim credit for a few common sense adjustments to Superfund designed to avoid hurting "little people."

b. The Senate

Republican staffers on the Environment and Public Works Committee are not optimistic that comprehensive reform can be enacted in the Senate this year. Negotiations over the Smith-Chafee bill broke down last fall and have not been renewed. And although Senator Smith has scheduled a Committee markup and might be willing to force a party-line vote in the Committee in order to report the bill, Senator Chafee is reluctant to do so. At the same time, Senator Lott recognizes the danger that any purely Republican bill runs the risk of being characterized as "anti-environment" by the Democrats. For these reasons, the chances for a comprehensive bill are slim.

Senate action on comprehensive Superfund reform this year is unlikely for another reason: there are other, substantial, environmental/public works bills that are already in line for consideration. These bills include the Intermodal Surface Transportation and Efficiency Act ("ISTEA") reauthorization, which is likely to occupy several weeks of the Senate's time. In addition, the Senate will consider the Endangered Species Act ("ESA"), which has already been reported by the Environment Committee.

As is the case in the House, there remains some chance that the Senate could turn to a more limited Superfund bill in the event the comprehensive reform effort is put on hold. Senator Lautenberg has been a chief proponent of such an approach. Of course, both Senator Chafee and Senator Smith have adamantly opposed such "piecemeal" Superfund legislation in the past; it remains to be seen whether the Senate Republicans will conclude that something is better than nothing on the Superfund front after the comprehensive effort collapses.

2. RCRA

Given that key members in both the House and the Senate have stated their intention to enact certain limited "rifle-shot" reforms, the outlook for some sort of RCRA legislation this year is reasonably good.

a. The House

Rep. Oxley attended the press conference held last fall by several Senators to announce their plans to enact legislation that would correct the problems posed under RCRA with respect to "remediation waste." Presumably, Rep. Oxley is therefore prepared to push a rather limited RCRA reform bill through the Commerce Committee this year.

There appears to be agreement on the part of Democratic staff for the Commerce Committee that a limited RCRA bill to correct the remediation waste problems makes sense. However, at least one key Democratic staffer has made it clear that the bill will be strongly opposed if it becomes loaded up with any significant quantity of other RCRA "fixes." In this regard, while it is obvious that various industry groups are eager to fold their issues (such as exemptions for certain wastes) into such a bill, it may be less obvious that environmental groups also are likely to be eager to jump in as well. For example, environmental groups are quite interested in regulating both oil and gas wastes and so-called "Industrial D" wastes under the RCRA umbrella.

b. The Senate

Senate Republicans have circulated to EPA a first draft of a bill that would reform the RCRA corrective

action program by shifting authority to states and streamlining the permitting process. The draft bill is seen as a starting point for negotiations with EPA and environmental groups. The bill is expected to be similar to a bill introduced by Senator Lott in 1996 under which cleanup remedies would be decided on a site-specific basis pursuant to state-approved remediation action plans, and remediation wastes would be exempt from RCRA Subtitle C treatment and disposal requirements.

As is the case in the House, the key question in the Senate will be whether the staff will be able to limit the scope of any RCRA bill to issues that are largely non-controversial. Key Republican staffers for the Environment Committee have been fielding calls from groups interested in adding specific provisions to the bill.

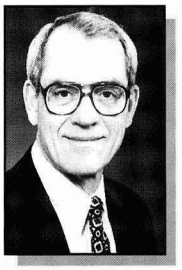
3. Other Issues

• As a result of pressure from Senator Kempthorne and other western interests, there is a realistic chance that the Congress could enact a revised Endangered Species Act this year. In the House, Representative George Miller is sponsoring the key ESA bill in the House. This bill is similar in many respects to Senator Kempthorne's bill; however, there are several significant differences having to do with tax incentives and private property rights. At this stage, it is too early to predict whether the House will enact a version of the Miller bill. In the Senate, the Senate Committee on Environment and Public Works reported the Kempthorne ESA bill by a very comfortable margin last fall. Although some environmental groups oppose this bill, Senator Kempthorne is working diligently to compile sufficient votes for Senate passage.

• Regulatory reform bill language intended as a substitute for the Regulatory Improvement Act (S. 981) introduced last year, was released on February 4. The bill would require regulatory agencies to perform risk assessments and cost-benefit analyses on all major rules having an economic impact of $100 million or more. The new language makes clear that nothing in the bill is intended to supersede any existing health, safety or environmental standard or to allow the use of cost-benefit analyses or risk assessments to dictate the outcome of a rule.

Loren W. Hill to Receive 1998 Tess Award During 216th Annual Meeting of ACS in August

The Officers and Award Committee of the Division of Polymeric Materials: Science and Engineering of the American Chemical Society have announced that Dr. Loren W. Hill of Solutia, Inc., Springfield, MA, will receive the Roy W. Tess Award in Coatings for 1998. Dr. David J. Lohse, Chair of the PMSE Division, will present the award on Tuesday, August 25, 1998 during the 216th meeting of the American Chemical Society in Boston, MA. Dr. Hill will present an Award Address at that time.



L.W. HILL

The award will be given in recognition of the valuable contributions Dr. Hill has made to the understanding of curing mechanisms in thermoset coatings. This recipient was the first to develop practical techniques for performing dynamic mechanical analysis on free coatings films. He also developed straightforward methods for calculating theoretical crosslink density. Using these values for measured and theoretical crosslink density with spectroscopic methods, Dr. Hill related polymer chemistry to empirical coatings properties, and used these insights to develop optimal materials and formulations.

In other work on the rheology and morphology of water-reducible coatings, Dr. Hill explained the processes which occur during loss of water, and this paradigm remains the standard for water evaporation. Additionally, his studies of crosslinking have illustrated how kinetic considerations set limits on the maximum possible pot life for a coating designed to cure at a given time and temperature. This fundamental work led to new chemistry which has found commercial application in environmentally benign high solids coatings for automobiles.

Dr. Hill holds a B.S. Degree from North Dakota State University and a Doctorate Degree in Chemistry from Pennsylvania State University. As a member of the faculty at North Dakota State University from 1965 to 1980, he rose from Assistant Professor to Professor in the Polymers and Coatings Department. In 1980, Dr. Hill joined the Speciality Resins Division of Solutia (formerly Solutia) as a Research Fellow, and was later appointed to his present position of Senior Fellow in 1987.

Before attaining his present position, Dr. Hill won a first prize Roon Award in 1981, and in 1985 served as Chair of the Gordon Research Conference on Coatings and Films. In 1991, he presented the Mattiello Lecture, "Structure-Property Relationships of Thermoset Coatings" at the Federation's Annual Meeting in Toronto. Currently, Dr. Hill is an active member of the New England Society and serves on the Editorial Review Board of the JOURNAL OF COATINGS TECHNOLOGY as well as *Progress in Organic Coatings*. Valued for his skill in getting to the essence of a complex subject and explaining it understandably, Dr. Hill is the author of "Mechanical Properties of Coatings," a monograph in the *FSCT Series on Coatings Technology*, as well as more than 40 technical papers, and is a sought-after lecturer on the chemistry of thermosetting resins in Europe, Asia, and the U.S.

Inoue Names Chem/Serv as Northern U.S. Agent

Inoue USA, Inc., Jacksonville, PA, has appointed Chem/Serv, Minneapolis, MN, as exclusive agents and representatives for the Northern U.S. including Minnesota, North Dakota, South Dakota, Wisconsin, northern Iowa, and the northern peninsula of Michigan.

Chem/Serv will represent Inoue USA's line of dissolvers, mixers, kneaders, and the balance of its process equipment line.

Ciba Specialty Chemicals' Pigments Division Receives ISO 14001 Registration

The Pigments Division of Ciba Specialty Chemicals, Newport, DE, has been registered under the ISO 14001 International Environmental Management System.

ISO 14001 is an internationally recognized, environmental management standard which parallels the ISO 9001 quality management standard. To become registered, a business must have developed a comprehensive capability of documenting and managing environmental processes and activities over which they would be expected to have control. The business must then pass a comprehensive audit by an accredited third party registrar. The Pigments Division audit was conducted by Intertek, the registrar for both the ISO 14001 and ISO 9001 certifications.

Through the ISO 14001 standard, organizations must document and measure their environmental activities in order to improve their performance. "Since 1990, we have continually reduced our natural resource consumption and air emissions," said Jean Schaeflé, President of the U.S. Pigments Division. "We have reduced air emissions by 90% and our organic load in the wastewater by 40%."

According to Mr. Schaeflé, the next step will be the integration of safety and health into the management system.

Lubrizol Purchases Brazilian Coatings Additives Business

The Lubrizol Corporation, Wickliffe, OH, has acquired the Brazilian coating additives business of BetzDearborn. The business primarily includes a line of defoamers, pigment dispersants, and biocides for use in architectural water-based coatings. Sales for 1997 were approximately $3 million, most of which were in Brazil.

Elementis plc Acquires Rheox from NL Industries

Elementis plc has completed the acquisition of the Rheox rheological additives business, from NL Industries Inc. of the USA, for $465 million.

Rheox produces organoclay rheological additives. Other markets served by Rheox include inks, greases and lubricants, oil drilling, adhesives, sealants, construction, household, and personal care products.

The Rheox business represents an extensions of Elementis Specialties. This business group comprises: Zinc Products, Catalysts, and Carboxylates (all based at Durham, UK); Colorants and Additives; Performance Polymers (formerly Hardman); and 50% interest in the Akcros joint venture—and now Rheox.

Colorants and Additives was formed through acquisition in 1996 of leading U.S. specialty color dispersion and additives business of Daniel Products, complemented last September by the purchase of Systeem Chemie. The Netherlands-based company makes machine dispensable colorants and dispersions for architectural and industrial coatings.

Elementis Specialties is one of three business groups in the portfolio of Elementis Performance Chemicals. The others are Elementis Chromium—producer of chromium chemicals; and Elementis Pigments —producer of synthetic iron oxide pigments and dispersions for the coatings, specialty chemical, and construction industries.

ACT Laboratories Names Authorized Test Panel Source

ACT Laboratories, Hillsdale, MI, is pleased to announce that Henkel Corporation—Surface Technologies Group (formerly Henkel Corporation, Parker Amchem Group) has permitted ACT to identify itself as the only official seller of test panels treated with Bonderite® coating chemicals. Bonderite is a registered trademark of Henkel Corporation.

Price Adjustments

Henkel Corp.
Ambler, PA
PRODUCT: Selected Versamine® polyamine, Versamid® polyamide, Genamid® amidoamine epoxy curing agents and Versamid® and Gax® thermoplastic polyamide ink resins and lamination ink resins.
INCREASE: $.05 per pound
EFFECTIVE: February 1, 1998

PRODUCT: Solvent-cut polyamide epoxy curing agents
INCREASE: $.03
EFFECTIVE: February 1, 1998

Millennium Inorganic Chemicals
Hunt Valley, MD
PRODUCT: Tiona® titanium dioxide
INCREASE: $.05 and C$.09
EFFECTIVE: February 1, 1998

Study Predicts Three Percent Growth Through 2001 for Organic Pigments

SRI Consulting, Menlo Park, CA, has assessed the changes and challenges facing the pigments industry for the next decade. According to the "Pigments" installment of SRI Consulting's *Chemical Economics Handbook* program, some of the most important challenges for pigment producers will include: coping with the rapidly changing globalization of the business; adapting to the maturing markets in some applications and regions; managing the continued oversupply of classical pigments; and maintaining observance of ever-increasing environmental regulatory pressures.

Driven primarily by the development of the printing inks, paints and coatings, and plastics industries, worldwide markets for pigments are expected to grow more or less in line with GDP during the next five years. In Western Europe and Japan, the demand for pigments is expected to grow only slightly, with a stronger growth expected in the United States. In Asian countries other than Japan, primarily the People's Republic of China and India, demand for pigments will grow significantly, particularly in surface coating applications but also for printing inks.

During 1996-2001, colored organic pigment consumption in the U.S., Western Europe, and Japan will grow up to 3.0% per year by volume. The highest growth rate will be in plastics applications, where the development and use of specialty high-performance organic products continues to increase.

In 1996, the world market value for colored pigments (inorganic and organic) reached $7.0 billion—$2.7 billion for inorganic color pigments and $4.3 billion for organic pigments, of which high-performance organic pigments accounted for $1.1 billion.

With a 33% market share, Western Europe is the largest colored pigments consuming region, followed closely by North America with 30%. Asia (including Japan) accounted for a still modest 23% of the total market in 1996; however, this share is expected to grow significantly over the next decade.

OM Group to Acquire Auric Corp.

OM Group, Cleveland, OH, has announced the completion of the acquisition of Auric Corp., Inc.

Auric Corp., which will conduct business under the name OMG Fidelity, is headquartered in New Jersey and produces electroless nickel, electroplating chemicals, and metal concentrates. Fidelity has international production capabilities with plants located in New Jersey and Malaysia.

OMG's principal product lines include metal carboxylates, metal salts, and metal powders sold to diverse industries including catalysts, ceramic, coatings, electronics, magnetic tapes, petroleum refining, plating, plastics, pressed metal parts, and other specialty chemicals.

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Adhesion of Waterborne Paints to Wood

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Using a modified torque technique, statistically significant differences in adhesion values were detected for waterborne model paints on wood as a function of moisture content, waterborne preservative, and after fungal inoculation. Change in a paint constituent sometimes resulted in a significant change in the adhesion value. The adhesion values of the alkyd emulsion paints tested decreased after inoculation with a blue stain fungus. On the contrary, the adhesion values of the acrylic dispersion paints tested became significantly higher after inoculation.

INTRODUCTION

The adhesion of surface coatings to wood is important for its long-term performance and is a subject of great interest to scientists and to the paint industry. Adhesion is an interfacial phenomenon where physical and chemical forces operate.[1] The degree of success achieved in forming a coating with good adhesion depends not only on the nature of the paint but also on the way the surface was prepared.[2-6] Painted wood has been described as a three-component system consisting of paint, wood, and the paint/wood interface. According to Brown and Garnishe[7] and Williams et al.,[8] the critical factor for maintaining long-term paint performance is the interface.

Holloway and Walker[9] developed a technique for measuring the adhesion force between a paint film and wood that has been broadly accepted and used (torque method). The technique was modified by Ahola[10] for measuring the adhesion between paint and a machine planed wood substrate. Low percentages of adhesion failure at the fracture zone have been previously reported when measuring adhesion of paint to wood.[8,11-13] Mechanical anchoring is probably very important for the adhesion of paints to wood, as has been shown for coated paper.[14] The mechanical adhesion due to penetration of paint into wood has also been suggested as an important factor.[15] However, the interlocking of surfaces caused by surface roughness of wood prepared by mechanical means is complex and not easy to define.[16] For a painted sawn wooden surface, high percentages of wood and cohesive paint failures as opposed to adhesion failures may be closely related to a strong mechanical anchoring at the surface.

Blue stain fungi are known to colonize wood and wood surface coatings,[17-18] and to penetrate into the paint/wood interface.[20] Blue stain fungi are also considered to be an important cause of deterioration of paint films.[18,20] The adhesion of paint films to wood has been shown to decrease with increasing moisture levels.[21]

Preservative treated wood has been considered to be a good substrate for coating.[22-26] If a specific wood preservative which provides efficient protection against microorganisms also could increase the adhesion between paint and wood, the long-term performance of the painted preservative treated wood should improve.

The objective of this investigation was to study the adhesion of different well-specified waterborne paints on hand planed wood. The use of hand planed wood was expected to result in reduced mechanical anchoring of paint films to the wood surface. The effects of moisture, waterborne wood preservatives, or infection by a blue stain fungus on the adhesion of paints were also studied.

EXPERIMENTAL

Painted Wood Samples

Rectangular wood samples of Norway spruce (*Picea abies*) sapwood were cut tangentially to the growth rings. The outer flat surface of the samples was hand planed with a sharp surgical knife. The samples were 1 to 2 mm thick and of variable size, and were planed just before painting to ensure a fresh surface. Samples were painted twice with a brush with a drying period of two days in between.

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Table 1—Some Characteristics of the Paints Tested

Paints	Characteristics
Alkyd emulsion paints	
E1	Anionic surfactant (Elfan NS242)
E2	Nonionic surfactant (Berol 542) 5%
E3	Nonionic surfactant (Berol 542) 10%
Acrylic dispersion paints	
L1	Particle size 0.1 μm
L2	Particle size 0.4 μm

Waterborne Paints

Three alkyd emulsion paints and two acrylic dispersion paints of known composition were made by The Institute of Surface Chemistry (YKI), Stockholm, Sweden, in collaboration with the paint manufacturers. All paints contained TiO_2. The pigment volume concentration (PVC) was 20%.

The model alkyd emulsion paints were made with a resin based on the alkyd S78/70N, consisting of 73% tall oil fatty acids and 19% isophthalic acid. One paint was made using the anionic surfactant sodium laurylmyristylether (2) sulphate C12/C14 from Akzo (Elfan NS242). Two other paints were made using the nonionic surfactant ethoxylated fatty alcohol C11/C12 (Berol 542): one with 5% surfactant and the other with 10%. Some important characteristics of the alkyd emulsion paints are given in *Table* 1.

The two model acrylic paints contained an acrylic binder made of a copolymer of butylacrylate-methylmethacrylate-methacrylic acid (49% - 49% - 2%). The anionic surfactant sodium dodecylsulphate (1.2%) was used for dispersion. The solid content was 40.3%. Both dispersions were comparable to the commercial dispersion Multilobe 200 but varied with regard to particle size (*Table* 1).

Inoculation with a Blue Stain Fungus

A set of painted samples was exposed to the blue stain fungus *Sclerophoma pityophila* (Corda) v. Höhnel. Pure cultures of *S. pityophila* were grown on solid nutrient medium (1.5% w/v malt extract - 2.5% w/v agar) in petri dishes for 15 days. The painted samples were immersed in deionized water for one minute for uptake of moisture and placed in the petri dishes on top of the fungal cultures. The petri dishes were sealed with a plastic film (Parafilm "M" - American National Can) and incubated at 23 (±2) °C for five weeks.

Table 2—Some Characteristics of the Basic Composition of the Wood Preservatives Tested

Preservatives	Characteristics
P1	Copper and quaternary ammonium compounds
P2	bis-(N-Cyclohexyldiazeniumdioxid)-copper (Cu-HDO)
P3	Triazol
P4	Copper and Triazol
P5	Copper-, chrome- and arsenic (CCA)

Preservative Treated Samples

A set of samples was impregnated with five waterborne preservatives approved by the Nordic Wood Preservation Council (NWPC) for above ground use in Sweden (*Table* 2). The samples were left to soak in the preservative solutions for two days. After the soaking period 90% vacuum (10 kPa) was applied for 30 min followed by a pressure period of 30 min with a pressure of 10 bar (1 MPa). The samples were allowed to dry at room temperature for one week prior to painting with the alkyd emulsion paint E3 containing 10% nonionic surfactant. The samples were 1 to 2 mm thick and were hand planed, as described, just before painting to ensure a fresh surface.

Measurement of Adhesion

The adhesion between the paint film and the hand planed wood surface was determined by means of a torque method modified from Holloway and Walker[9] as described by Ahola.[10] In this shear technique, studs were glued on the painted samples using a solvent-free dual-component epoxy glue. After the glue was dried, a slot was drilled in the paint film around the studs until the wood surface was reached. The stubs were then removed using a recording torque wrench. The failure load was noted and the type of failure (glue, adhesion, wood failures, and cohesive paint failure) estimated visually as a percentage of the total area covered by the stud. Measurements for which glue failure exceeded 10% were rejected. The shear stress (adhesion value) was calculated using the equation $T = (16I)/(\pi d^3)$ where I is the measured torque (Nm), and d is the diameter of the stud (12.5 mm). A minimum of six replicate values was used for the calculation of each mean adhesion value. Adhesion values are given in MNm^{-2}.

The painted samples were conditioned at 65% RH for two weeks prior to the adhesion test. The samples were tested in two modes:

Dry: Taken directly from the conditioning room (65% RH)

Wet: Taken from the conditioning room and immersed in deionized water at 20°C for 25 min before testing.

Further Assessment of the Samples

After completion of the adhesion test, samples were taken from the failed surfaces, dried, mounted on studs, coated with gold, and examined using a Cambridge S150 scanning electron microscope.

Computerized image analysis was used to determine the percentage of adhesion failure of the paints on preservative treated wood samples. The software used was Image-Pro Plus for Windows™, Version 1.0A, purchased from Media Cybernetics.

A *t*-test was used for statistical evaluation of the significance of the results.

Table 3—Adhesion Values of the Paints Tested at 65% RH and after Immersion in Water for 25 Minutes

Paints	Adhesion Values					
	Dry Mode			*Wet* Mode		
	Mean (MNm^{-2})	S.D.	n	Mean (MNm^{-2})	S.D.	n
Non-Infected Samples						
E1	5.0	1.0	13	3.1	0.7	15
E2	3.5	1.1	8	1.4	0.5	19
E3	2.8	0.3	14	1.9	0.5	14
L1	9.0	1.0	15	3.3	0.8	15
L2	6.6	1.1	12	3.0	0.6	16
Blue Stain Infected Samples						
E1	3.9	1.4	11	3.0	1.2	12
E2	1.6	0.4	9	0.7	0.3	9
E3	2.8	0.5	8	1.7	0.6	10
L1	11.7	1.7	8	9.7	2.3	7
L2	—	—	—	6.8	3.0	7

S.D. = Standard deviation; n = number of replicates.

RESULTS

The adhesion values of the paints tested varied depending on the type of paint and moisture conditions. Results are summarized in *Table* 3. The number of determinations used for the calculation of a mean value varied from 7 to 19. In the *dry* mode the acrylic dispersion paints tested showed the highest values. The acrylic paint L1, with 0.1 µm particle size, showed the highest adhesion value, 9.0 MNm^{-2}. Paint E3, the alkyd emulsion paint with 10% nonionic surfactant showed the lowest value, 2.8 MNm^{-2}. In the *wet* mode the adhesion values of the alkyd emulsion paints and of the acrylic dispersion paint L2 decreased with almost 50%, and for the acrylic dispersion paint L1 with 70%. The statistical significance of the results is shown in *Table* 4. The mean values of the type of failure are summarized in *Table* 5. In the *dry* mode the predominant type of failure for the acrylic dispersion paints and for the alkyd emulsion paints containing an anionic surfactant was adhesion failure. The alkyd emulsion paints with nonionic surfactant showed predominance of cohesive paint failure. All paints showed increased adhesion failure in the *wet* mode with only 1% cohesive paint failure for the alkyd emulsion paint E1, and the acrylic dispersion paints L1 and L2.

After exposure of the samples to cultures of *S. pityophila* the adhesion values of the alkyd emulsion paints decreased (*Table* 3). In contrast, the acrylic dispersion paints showed increased adhesion values. After fungal infection the acrylic paint with a particle size of 0.1 µm showed the highest adhesion value in the *dry* mode, 11.7 MNm^{-2}. No data is available for paint L2 with particle size 0.4 µm due to high percentage of glue failure resulting from the cuping and twisting of samples after conditioning at 65% RH. The alkyd emulsion paint containing five percent nonionic surfactant showed the lowest adhesion value. The adhesion values of the alkyd emulsion paints with nonionic surfactants were even lower in the *wet* mode. The adhesion values of the acrylic dispersion paints increased after infection. Very fine hyphae were seen growing from the wood substrate towards the paint film at the wood-paint interface (*Figure* 1a). Hyphae were also seen emerging from the walls of wood tracheids (*Figure* 1b), and growing within the paint film (*Figure* 1c). The film structure of the acrylic dispersion paints L1 and L2 is illustrated in two SEM micrographs (*Figures* 2a and 2b). Hyphae were also seen growing vigorously at the wood-paint interface of samples painted with the alkyd emulsion paints E1, E2, and E3 (*Figure* 1d). No hyphae penetrating or growing within these paint films were detected. Sporulating hyphae were seen at the interface zone of samples painted with paint E2.

The types of failure of inoculated samples are summarized in *Table* 6. The acrylic dispersion paint with particle size 0.1 µm showed predominance of wood failure both in the *dry* mode and in the *wet* mode. The acrylic dispersion paint with particle size 0.4 µm showed predominance of adhesion failure in the *wet* mode. No data concerning the *dry* mode is available for this paint. The alkyd emulsion paints showed predominance of adhesion failure both in the *dry* and *wet* mode, with exception of paint E3 which showed high percentage of cohesive paint failure in the *dry* mode.

Table 4—Statistical Analysis of the Variance of the Adhesion Values Obtained for the Paints Tested Assuming Unequivalence of Results

Analysis of Variance

Modes	Paints				
	E1	E2	E3	L1	L2
Dry and Wet	***	***	***	***	***
Dry inf. and Wet inf.	**	***	**	ns	NT[a]
Dry and Dry inf.	ns	***	*	*	NT[a]
Wet and Wet inf.	ns	**	ns	***	*

Significance levels: $P < 0.05$ = * ; $P < 0.01$ = ** ; $P < 0.001$ = *** ; Non-significant = ns; NT = Not Tested

(a) No data is available for paint L2 with particle size 0.4 µm due to the high percentage of glue failure resulting from the cuping and twisting of samples after conditioning at 65% RH.

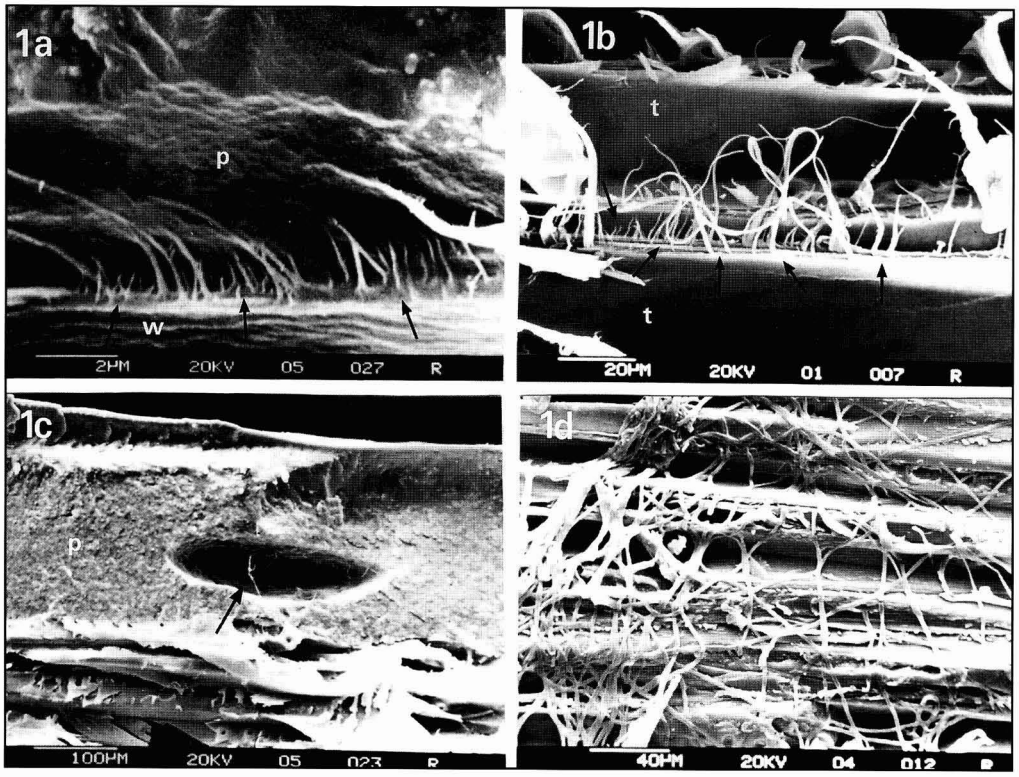

Figure 1—SEM views of samples infected with Sclerophoma pityophila: (a)—transversal cryo-fracture of a sample painted with the acrylic dispersion paint with particle size 0.1μm. The arrows point to fine hyphae growing from the wood substrate (w) into the paint film (p); (b)—surface of wood painted with the acrylic dispersion paint with particle size 0.1μm after detachment of the paint film. The arrows point to hyphae emerging from the cell walls of the wood tracheids (t); (c)—transversal section of a sample painted with the acrylic dispersion paint with particle size 0.1μm. The arrow points to hyphae growing in a cavity within the paint film (p); (d)—surface of wood after detachment of a paint film of an alkyd emulsion paint with anionic surfactant. Hyphae can be seen growing at the paint/wood interface.

The adhesion values obtained from the preservative treated samples painted with the alkyd emulsion paint E3 were similar to the adhesion values obtained for paint E3 painted on non-preservative treated wood samples (*Table* 7). The number of accepted replications giving a mean value varied from 14 to 23.

Types of failure results for the painted preservative-treated wood samples are summarized in *Table* 8. Cohesive paint failure was the predominant type of failure among the samples in the *dry* mode. In the *wet* mode, adhesion failure increased for all painted preservative treated samples with the exception of the samples treated

Table 5—Visual Evaluation of the Types of Failure Produced During the Measurement of Adhesion Value Between Paint and Wood

	Dry Mode Type of Failure (%)			*Wet* Mode Type of Failure (%)		
Paints	Adhesion	Paint	Wood	Adhesion	Paint	Wood
Alkyd Emulsions						
E1	82	11	4	99	0	0
E2	13	79	7	91	8	0
E3	0	98	0	22	70	0
Acrylic Dispersions						
L1	99	0	1	99	0	1
L2	77	0	18	99	0	0

Table 6—Visual Evaluation of the Types of Failure Produced on Blue Stain Infected Samples During the Measurement of Adhesion Value Between Paint and Wood

	Infected Samples					
	Dry mode Type of failure (%)			*Wet* mode Type of failure (%)		
Paints	Adhesion	Paint	Wood	Adhesion	Paint	Wood
Alkyd Emulsions						
E1	80	6	0	96	2	0
E2	86	13	0	67	33	0
E3	24	72	0	62	36	0
Acrylic Dispersions						
L1	29	3	64	31	1	68
L2	—	—	—	76	3	14

with preservative P1 (copper and quaternary ammonium compounds). The percentages of adhesion failure were determined by means of computerized image analysis (*Table* 9). Similar values were determined visually (*Table* 8).

Some interesting features of the preservative treated samples were observed with SEM. Parts of the tracheid cell walls of the samples treated with P4 (Cu + Triazol) remained adherent to the surface of the paint film after detachment (*Figure* 3a). *Figure* 3b shows imprints of the wood structure left on the surface of the paint film of samples treated with P1 (copper and quaternary ammonium compounds).

By examining the samples with SEM after detachment of the paint films with the torque method, damages on the tracheid cell walls of samples painted with the two acrylic dispersion paints L1 and L2 were observed. Influence of the twisting motion of the torque method was revealed (*Figures* 4a and 4b). Sparse mechanical anchoring of the paint film was observed on the samples painted with the alkyd emulsion paints tested (*Figure* 4c).

DISCUSSION

Adhesion of paint films to wood has been evaluated by different methods including peeling, pull-off, and shear tests.[8,9,12,21,27-30] Some of these methods evaluate differences in the adhesion strength over a painted surface. The torque method used in this study is one of the methods that measures the force needed to detach a paint film from a wooden surface, which can be expressed in MNm^{-2}.

The main aim of the present study was to measure differences in the adhesion strength of five model paints as a function of moisture content and paint composition. In order to decrease the contribution of mechanical anchoring, hand planed wood surfaces were used.

Typical adhesion values obtained from earlier studied alkyd emulsion paints and acrylic dispersion paints applied on machine planed wooden panels were 13 MNm^{-2} and 14 MNm^{-2} respectively at 65% RH, and 10 MNm^{-2} and 11 MNm^{-2} respectively at 90% RH.[21] The adhesion values obtained in this study for painted hand planed samples equilibrated at 65% RH were 5 MNm^{-2} or less for the three alkyd emulsion paints, and 9 MNm^{-2} or less for the two acrylic dispersion paints tested. Although these results are not really comparable because of differences in panel preparation, the lower adhesion values obtained in this study could be due to the smoother wood surface produced by careful hand planing. For coated paper, up to 80% of the adhesion value has been shown to depend on mechanical anchoring.[14] It is likely that mechanical anchoring due to surface roughness of wood might also be important for the adhesion of paints to wood. However, by using a smooth hand planed surface, it was thought that other components that influence adhesion could be studied. The results in this study accordingly showed higher percentages of adhesion failure.

Table 7—Adhesion Values for Preservative Treated Wood Painted with Alkyd Emulsion Paint E3

	Dry Mode			*Wet* Mode		
Preservatives	Mean (MNm^{-2})	S.D.	n	Mean (MNm^{-2})	S.D.	n
P1	1.8	0.4	16	2.0	0.6	15
P2	2.5	0.5	16	2.9	0.6	15
P3	2.4	0.4	23	1.8	0.5	20
P4	3.1	0.9	18	2.6	0.7	19
P5	2.8	0.9	18	2.7	0.6	21
Paint E3 on Untreated Wood	2.8	0.3	14	1.9	0.5	14

S.D. = Standard deviation; n = number of replicates.

Table 8—Visual Evaluation of the Types of Failure Produced During the Measurement of Adhesion Value Between Paint and Wood on Preservative Treated Samples Painted with Alkyd Emulsion Paint E3

	Dry mode Type of failure (%)			*Wet* mode Type of failure (%)		
Preservatives	**Adhesion**	**Paint**	**Wood**	**Adhesion**	**Paint**	**Wood**
P1	2	96	0	2	96	0
P2	7	87	1	44	54	2
P3	14	84	1	58	47	0
P4	4	93	0	18	76	3
P5	14	69	3	33	58	1
Painted E3 on Untreated Wood	0	98	0	22	70	0

The alkyd emulsion paints have lower adhesion values than the acrylic dispersion paints. The adhesion values obtained for the alkyd emulsion paints with the same basic composition but with different type and quantities of surfactant also differed. The use of the anionic surfactant sodium laurylmyristylether (2) sulphate C12/C14 from Akzo (Elfan NS242) resulted in higher adhesion values compared to the adhesion values of a paint with the same basic composition but containing the nonionic surfactant ethoxylated fatty alcohol C11/C12 (Berol 542). The most common type of failure for the paints with the nonionic surfactant was cohesive paint failure. These results indicate that the type of surfactant could influence the adhesion between coats or the intermolecular forces within the paint film. Adhesion between coats is known to be influenced by bulk and surface properties of the paint.[2]

After infection with *Sclerophoma pityophila* the adhesion values of the alkyd emulsion paints decreased, which is in accordance with the previous notion that fungal infection by blue stain fungi could cause paint disfigurement.[15,16,19,31] SEM observations showed hyphae growing vigorously at the paint/wood interface of the samples painted with the alkyd emulsion paints. This could be due to the weak adhesion of the paint films to the wood surface, which was confirmed by the adhesion measurements, thereby allowing hyphae to grow freely at the paint/wood interface. The initial moisture uptake prior to the exposure of the samples to *S. pityophila*, and the subsequent growth of the fungus might cause an increase in moisture content at the paint/wood interface which weakens the bond between the paint film and the wood surface.

The adhesion values of the two acrylic dispersion paints tested, which had the same basic chemical composition, were much higher than the adhesion values for the alkyd emulsion paints regardless of the particle size. Damage to the tracheid cell walls was visible with SEM after applying the torque method to wood painted with these paints. However, immersing samples painted with these two acrylic dispersion paints in water before testing resulted in lower adhesion values. These values are comparable to the adhesion values obtained from samples painted with the alkyd emulsion paint with anionic surfactant. The paint with particle size 0.1 μm gave an adhesion value of 9.0 MNm^{-2} and the paint with particle size 0.4 μm gave 6.6 MNm^{-2} at 65% RH. It thus seems that the particle size influences the adhesion of these acrylic paints. SEM micrographs of the internal structure of the paint films showed that the internal structure varied significantly depending on particle size. The structural differences between the acrylic dispersion

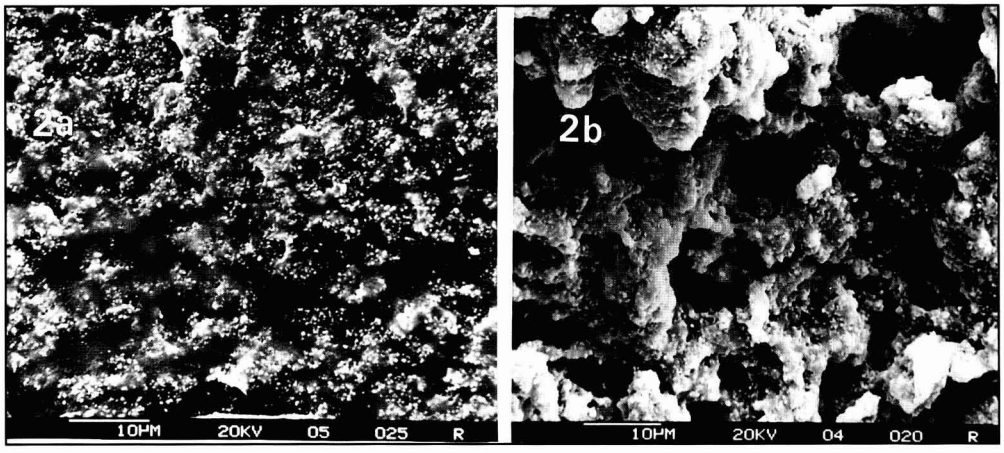

Figure 2—SEM views of cryo-fractures of an acrylic dispersion paint with particle size 0.1μm (a), and of an acrylic dispersion paint with particle size 0.4 μm (b).

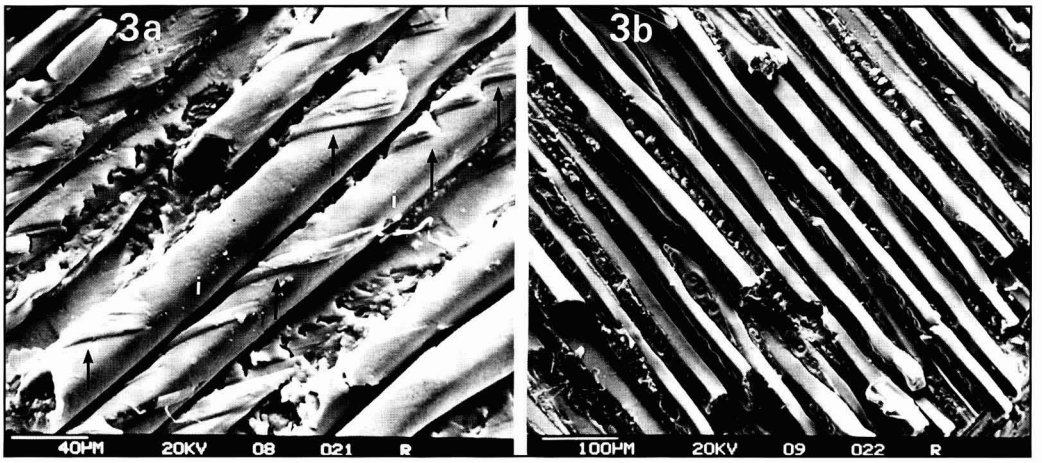

Figure 3—SEM views of the surface of paint films that have been in contact with preservative treated wood surfaces: (a)—Paint film detached from a sample pre-treated with the preservative containing copper and Triazol. The arrows point to parts of the tracheid cell walls that still adhere to the wood imprints (i) left on the paint film after detachment with the Torque method; (b)—Imprints of the wood structure left on the surface of the paint film of sample treated with the preservative containing copper and quaternary ammonium compounds.

paints with particle size 0.1 and 0.4 µm also might explain in part the differences in growth of discoloring fungi on these two paints and the differences in their moisture dynamic characteristics.[32,33] Somewhat surprisingly, the adhesion values of the two acrylic dispersion paints increased after infection with *S. pityophila*. This might be due to fungal growth from the wood into the paint films which could give an additional mechanical anchoring or due to interaction of paint film, wood, and substances produced by the fungus. As a consequence of the resulting decrease in adhesion failure, and of a possible effect of the fungus on the wood strength, a higher percentage of wood failure was recorded.

The differences in adhesion value for the acrylic paints with particle size 0.1 and 0.4 µm might be explained by differences in penetration and/or structure of the paints. However, the importance of surface coatings penetration into wood for the adhesion of paints is a matter of some controversy. Most scientists have considered penetration of surface coatings into wood to be of less importance for adhesion only causing unnecessary depletion of valuable binder.[3,18,34,35] On the other hand, some scientists have considered deep penetration to be useful because it enables the binder to interact with a larger contact area that should be beneficial to adhesion.[15,18]

The pretreatment of wood samples with waterborne wood preservatives prior to painting with the alkyd emulsion paint with 10% nonionic surfactant did not increase the adhesion value between paint and wood at 65% RH when compared to samples painted without pretreatment. Unfortunately, this paint showed low adhesion values when painted on untreated wood specimens if compared with the other test paints. The results could have been different if a paint with better adhesion properties had been used. However, some influence on the type of failure was observed with the preservative containing copper and quaternary ammonium compounds (P2). The pretreatment of samples with this preservative resulted in high percentages of cohesive paint failure which remained unaffected by the change in moisture level. This could be an effect of dimensional stabilization of the wood surface by the preservative.[21] The good quality of the imprints of the wood structure left on the surface of the paint film of samples treated with this preservative, as revealed by SEM, also indicates that the wettability of the paint on the treated wood might have been high during the formation of the paint film. These results imply that valuable information could be obtained by conducting a careful analysis of the type of failure, and surface conditions at the fracture zone, with the aid of SEM. Formulations containing copper and quaternary ammonium compounds have also resulted in improved paint performance in lap joint trials.[36] A preservative containing a combination of Cu and Triazol resulted in sporadic but strong adhesion sites between the paint film and the tracheid cell walls, as was clearly indicated by portions of the tracheid cell walls adhering to the paint film after the adhesion test. The results in this study indicate that wood preservatives may play a role in stabilizing the adhesion between paint and wood. If a specific wood preservative, which provides efficient protection against micro-organisms, also could increase the adhesion between paint and wood, particularly when subjected to moisture, the long-term performance of painted preservative treated wood would be expected to improve.

CONCLUSIONS

The results in this study revealed differences in the adhesion values of model waterborne paints to wood which were related to paint composition, moisture conditions,

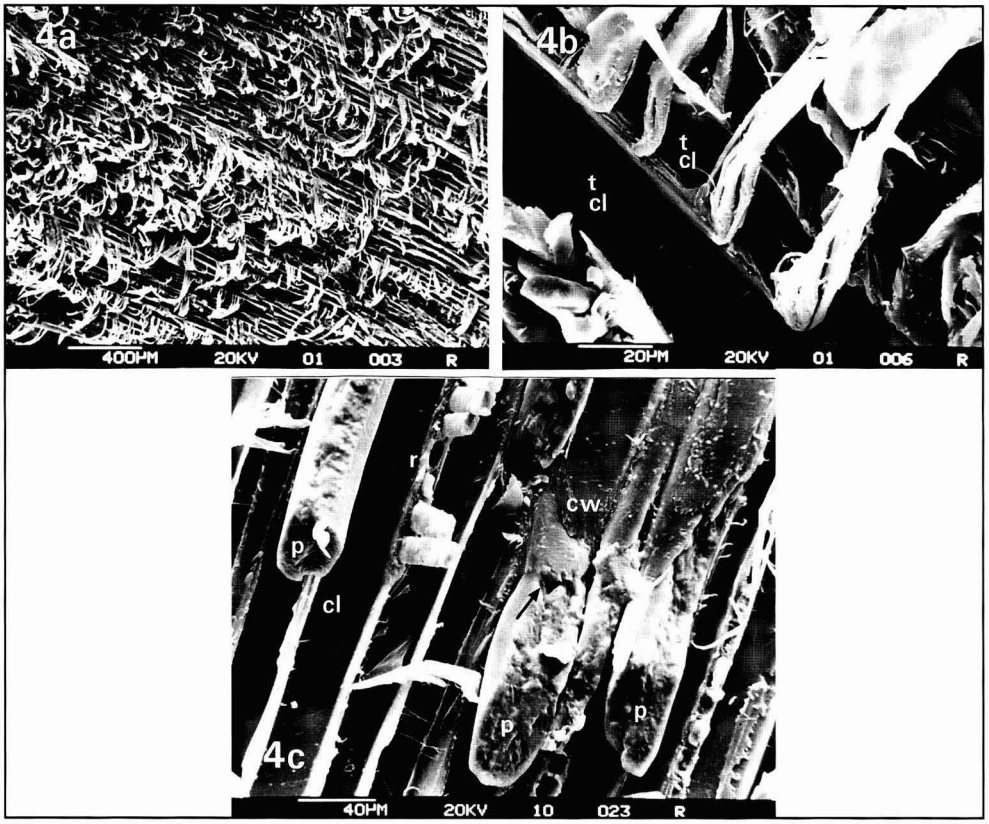

Figure 4 —SEM views of the wood surface of samples after detachment of the paint films with the torque method: (a)—Damages to the tracheids cell walls as an influence of the twisting motion of the torque method of samples painted with the acrylic dispersion paint with particle size 0.1µm infected with S. pityophila; (b)—Detail of the damages to the tracheid (t) cell walls of the sample viewed in Figure 4a. Cell lumen (cl); (c)—View of sparse mechanical anchoring of the paint film of the alkyd emulsion paint with 10% non-ion surfactant after detachment. Paint fragments (p) are seen emerging from the cell lumen (cl) of tracheids. Paint is also seen emerging from a ray (r). The arrow (central part of figure) points to the anchoring induced by the still remaining tracheid cell wall (cw).

and pretreatment with waterborne preservatives. In order to decrease the influence of mechanical anchoring, hand planed wood was used. Valuable information could be gained by characterizing the type of failure with SEM following the adhesion test. According to the results the adhesion values of the alkyd emulsion paints were much lower than the adhesion values of the acrylic dispersion paints under dry conditions. The presence of the anionic surfactant improved the adhesion of an alkyd emulsion paint. The adhesion values were higher for a small particle acrylic dispersion paint than for another with the same chemical composition but with larger particles. This might be related to improved penetration of the small particle paint into wood and/or to an increased contact area between this paint film and the wood substrate due to a more ideal packing of the particles. Under high moisture conditions the adhesion values of the acrylic dispersion paints decreased to a high extent. When painted wood was colonized by a blue stain fungus the adhesion values of the acrylic dispersion paints increased,

Table 9—Computerized Evaluation of Percentages of Adhesion Failure Produced During the Measurement of Adhesion Value Between Paint and Wood on Preservative Treated Samples Painted with Alkyd Emulsion Paint E3

Image Analysis

	Adhesion Failure (%)	
Preservatives	*Dry* mode	*Wet* mode
P1	2	2
P2	11	48
P3	16	58
P4	5	17
P5	13	33
Paint E3 on untreated wood	0	21

particularly under wet conditions, while the adhesion values of the alkyd emulsion paints decreased. Among the waterborne preservatives tested a preservative containing copper and quaternary ammonium compounds improved the adhesion between a paint film and wood resulting in high frequency of cohesive paint failure after the adhesion test under wet conditions.

ACKNOWLEDGMENTS

The present work has been carried out as part of the project "Microbial Susceptibility of Painted Wood" within the research program on wood quality *Träkvalitet*. This program is financed by The Swedish Council for Forestry and Agricultural Research (SJFR), Swedish National Board for Industrial and Technical Development (NUTEK), The Swedish Sawmill Industries, and *Södra skogsägarna*.

The authors also wish to thank the EC COST ACTION E2 "Wood Durability" for additional financial support for a Short Term Scientific Mission to VTT - Technical Research Centre of Finland which enabled the realization of this study. The authors especially wish to thank Dr. Pirjo Ahola and MSc. Riitta Mahlberg for critical reading of the manuscript.

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Microautoradiographic Studies of the Penetration of Alkyd, Alkyd Emulsion and Linseed Oil Coatings Into Wood

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The penetration of wood coating primer products into pine and spruce softwood was evaluated with microautoradiography. ^{14}C-labeled binders of alkyd and linseed oil were synthesized and used in eight different products.

The penetration front in wood is uneven due to a heterogeneous structure with different types of wood cells. It was demonstrated that conventional solventborne alkyd primers and waterborne alkyd emulsion primers have similar ability to penetrate into wood. Improved penetration was found for products with lower viscosity, such as an alkyd stain and a linseed oil coating. A priming oil had superior penetration. Generally better penetration was obtained for coatings applied onto sawn and rough surfaces as compared to planed and smooth surfaces.

INTRODUCTION

Wood is a challenging material when used as a substrate for coatings in exterior applications. The fact that wood is an anisotropic and hygroscopic material will inevitably lead to severe strain on any type of coating as well as the wood material itself. The key to extended wood/coating durability can be attributed to (1) the freshness of the wood surface to be coated, i.e., a non-degraded, "high-energy" surface[1-3] and (2) favorable primer coating characteristics in terms of penetrability and moisture dynamic behavior.[4,5] An effective wood primer should thus present optimal anchorage and act as a hydrophobic protective layer.

Solventborne alkyd coatings are known as excellent exterior wood primers and have for years dominated in the Scandinavian market. Due to the environmentally unfavorable organic solvents used in these coatings, the trend today is towards waterborne systems such as alkyd emulsions, which have now gained widespread use in several areas of application including decorative exterior paints and industrial factory priming.

The fact that the binder in an alkyd emulsion coating is made up of rather large emulsion droplets (0.5 - 1.0 µm in diameter) in contrast to the free molecules present in a solventborne alkyd coating, has caused the penetration ability of these alkyd emulsion coatings to be questioned.

Penetration of wood by a fluid can be separated into gross penetration and cell-wall penetration. The former relates to liquid flow into the gross openings in the wood structure, e.g., the cell lumina, and is mostly governed by capillary action. The latter relates to penetration into interstitial voids of the cell-wall ultrastructure. The three-dimensional structure of softwood with its main cell-types is shown in *Figure* 1.

Several methods have been used for detecting substances penetrating into wood, such as scanning electron microscopy combined with energy dispersive X-ray analysis (SEM-EDS), fluorescence microscopy and microautoradiography. A recent study by Nussbaum, including references to most of the techniques used, demonstrated that microautoradiography is a sensitive technique well suited for gross penetration studies of binders into wood.[7] By using microautoradiography, where a radioactive tracer isotope is introduced in the molecule to be studied, the physical and chemical properties of the molecule are not changed as opposed to most other methods. The study showed that 50% solutions of solventborne alkyd and waterborne alkyd emulsion binders had similar penetration patterns when applied onto softwood surfaces.

The present study evaluates and compares the gross penetration of fully formulated solventborne alkyd coat-

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ings, alkyd emulsion coatings, and a linseed oil coating by using microautoradiography. The coating viscosity and particularly the pigment volume concentration (PVC) are factors which may affect the penetration. Alkyd coating formulations are therefore varied regarding the PVC or the amount of thickening agent.

Different surface roughness due to varying wood machining is an important factor known to affect the adhesive strength between a coating and a wood substrate.[1] It may also affect the penetration. A comparison between sawn and planed surfaces is therefore included in this study.

EXPERIMENTAL

Radioactivity Labeled 80% Oil Length Alkyd Resin

To a 100 ml two-necked, round-bottomed flask was added pentaerythritol (13.6 g) and a solution of 59.0 g tall oil fatty acid containing 4.5 mCi [1-^{14}C] linoleic acid (55 mCi/mmole) in toluene (Amersham Life Sci.). The round-bottomed flask was equipped with a scrubber tube, thermometer, and magnetic stirrer. Nitrogen was bubbled through the reaction mixture throughout the duration of the experiment.

The reaction mixture was heated to 260-265°C for a period of two hours. During this time all the toluene was removed from the reaction mixture. After two hours the mixture was cooled to below 165°C and 11.0 g of isophtalic acid was added. The mixture was heated to 260-265°C for an additional 1.5 hr at which time the acid value had fallen to 13-14 mg KOH/g. The reaction mixture was then cooled and was found to have the following properties: acid value = 13.7 mg KOH/g, molecular weight (Mw) = 5702, molecular weight number average (Mn) = 1853. The molecular weight of the alkyd was determined by gel permeation chromatography. The columns used were calibrated with polystyrene standards with known molecular weight. A stock of 66 g alkyd resin with a final ^{14}C-activity of 58 μCi/g was produced.

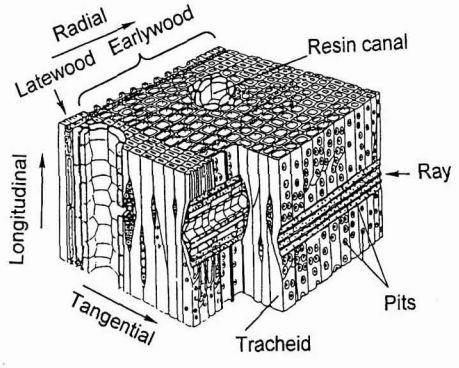


Figure 1—A schematic three-dimensional structure of softwood with its main cell-types. The hollow interior of a tracheid is called lumen. The length of a side is roughly 0.75 mm (from reference 6).

Radioactivity Labeled Linseed Oil

A diglyceride of linseed oil was obtained from the corresponding triglyceride by reacting one gram of cold pressed linseed oil with the enzyme *Rhizo mucor miehi lipase*, supplied as lyophilized powder, and a small drop of water at room temperature.[8] The reaction was monitored by thin layer chromatography (TLC). Duration of reaction was typically eight hours. The reaction mixture was purified by gradient chromatography in hexane/ethyl acetate/acetic acid. The diglyceride product was identified with nuclear magnetic resonance (^{1}H-NMR) and was found to be >95% pure (reactive OH).

[1-^{14}C]linoleic acid, 55 mCi/mmole, was dissolved in CH_2Cl_2 and converted to the acid chloride with an excess of oxallyl chloride in the presence of catalytic amount of dimethyl formamide. The product was evaporated to dryness and 2.2 mg of the acid chloride was redissolved in dry toluene. Ten milligrams of the diglyceride was also dissolved in dry toluene. To this mixture was added 0.15 mg dimethyl amino pyridine (DMAP) as catalyst. A two-fold excess of diglyceride to acid chloride was used in order to avoid unreacted acid chloride in the product mixture. The acid chloride solution was injected into the sample flask together with 1.2 μl triethyl amine and the reaction was continued for 24 hr at room temperature under a nitrogen atmosphere. After this time, no free acid or acid chloride could be detected by TLC or ^{1}H-NMR in the reaction mixture. The product was evaporated to dryness and used without further purification.

Coating Formulation

Eight coating products were made from the ^{14}C-labeled material: four of solventborne alkyd, three of waterborne alkyd emulsions, and one of linseed oil. All of the formulations were composed of representative standard raw materials commonly used in exterior wood coatings. The main components of all products are given in *Table* 1 along with some important physical properties.

The solventborne alkyd products were all prepared by mixing the ^{14}C-labeled alkyd stock directly with the other components to final quantities ranging from 7 to 17 g.

The alkyd emulsions were prepared in the following way: the ^{14}C-labeled alkyd (51.0 g) was transferred to a beaker and heated to 80°C and 3.0 g of a nonionic emulsifier (Berol 542) was added under stirring. To this solution 53.1 g tap water, with a temperature of 80°C, was slowly added while stirring with a propeller at 600 rpm. After the addition of water, the coarse emulsion was stirred for an additional 12 min. The coarse emulsion was heated to 80°C and homogenized, using a microfluidizer homogenizer, at a pressure of three bar until constant droplet size was obtained. The resulting ^{14}C-labeled alkyd emulsion was characterized as having an average droplet diameter of 2.71 μm (Malvern Master-

Table 1—Main Coating Components and Physical Properties

Abbreviation	Pigmented Solventborne Alkyd Primer A1	Pigmented Solventborne Alkyd Primer A2	Low-Pigmented Solventborne Alkyd Stain AS	Unpigmented Solventborne "Priming Oil" PO	Pigmented Solventborne Linseed Oil Primer L	Pigmented Waterborne Alkyd Emulsion Primer AEM1	Pigmented Waterborne Alkyd Emulsion Primer AEM2	Pigmented Waterborne Alkyd Emulsion Primer AEM3
Alkyd, % (Bergvik S 78)	34.6	27.0	56.3	15.0	—	—	—	—
Alkyd emulsion (50%), %	—	—	—	—	—	52.5	52.0	41.7
Linseed oil, %	—	—	—	—	31.1[a]	—	—	—
Pigment, % (Bayertitan R-KB-2)	37.5	49.0	13.0	—	56.6[b]	25.3	25.0	36.1
Thickening agent, % (Acrysol RM 8)	—	—	—	—	—	2.0	3.0	2.7
White spirit, %	25.8	22.3	27.3	84.9	10.0	—	—	—
Water, %	—	—	—	—	—	18.2	18.0	17.8
PVC	21	30	5	—	29	20	20	31
Dry matter, weight-%	73.2	76.9	70.9	15.0	88.6	53.1	53.2	59.5
Dry matter, volume-%	57.4	58.2	63.0	12.4	76.4	39.8	39.9	40.6
Density, g/cm^3	1.25	1.42	1.00	0.80	1.45	1.24	1.24	1.39
Viscosity, mPa·s (Brookfield)	—	—	—	—	440	2100	5800	13400
^{14}C-activity, µCi/g	20	16	33	9	18	15	15	12
Applied amount, g/m^2	173	223	106	200-300	193	242	242	303

Component content in weight-%.
(a) 20.7% raw linseed oil + 10.4% standoil 20.
(b) 52.1% Bayertitan R-KB-2 + 4.5% zinc oxide.

sizer) and a nonvolatile solids content of 50%. The alkyd emulsion was then mixed with the other components to prepare three alkyd emulsion coatings of 50 g each.

The linseed oil coating was prepared by dissolving 15 mg of the ^{14}C-labeled linseed oil residue in 1.5 g of white spirit and mixing it with 13.5 g of unlabeled (i.e., no ^{14}C isotope) solvent-free linseed oil coating.

In addition to the components listed in *Table* 1, the solventborne alkyd primers and the alkyd stain contained a drier and antiskinning agent, the priming oil a drier and the waterborne alkyd emulsion primers a drier, a dispersing agent, a defoamer, an antiskinning agent and a fungicide. Pigment was added as pigment paste. Alkyd primers A1 and A2 differ from each other mainly by the PVC and alkyd emulsion primers AEM1 and AEM2 by the thickening agent content. Because of the small amounts of material involved, direct viscosity measurements of the solventborne alkyd coatings were not possible. It was apparent though that primer A1 had lower viscosity than A2 and that the stain AS had substantially lower viscosity than A1 and A2. It should be pointed out that the consistency of these three coatings corresponded to that of representative commercial products. A set of all eight coating products were prepared with unlabeled binders as a reference material.

The amount of binder applied to the wood specimens (see the following) was kept constant at 60 g/m^2 for all coatings except the priming oil, where 30-45g/m^2 of binder was applied. Therefore the total amounts of coating applied were varied according to *Table* 1.

Wood Material

Since wood is a heterogeneous material which may exhibit large variability even within the same tree, a total knowledge and control of the selected test material is indispensable. Also, tests should be repeated with specimens of different origin.

The wood material was selected from straight-grained, defect-free, thick boards of pine sapwood (*Pinus silvestris*) and spruce (*Picea abies*), which had earlier been carefully stored and dried. Unlike pine, sapwood and heartwood of spruce are not markedly different from each other and therefore were not separated during the sample preparation. Test specimens free from visible cracks were prepared in three groups regarding the upper horizontal surface to be coated:

(a) tangential with the annual rings parallel to the surface;

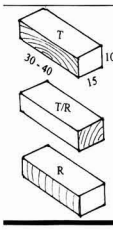
(b) radial with the annual rings perpendicular to the surface; and

(c) tangential/radial with the annual rings in 45° to the surface.

Sketches and dimensions of the test specimens are shown in *Table* 2 together with the number of specimens treated with the different labeled coating products. The surface of specimens having a tangential surface always consisted of earlywood of at least 1 mm in thickness. The spruce material used in the tests was of seven different origins and the annual ring densities were in the range of one to six rings per 10 mm. Corresponding data for pine were six origins and two to seven annual rings per 10 mm. All direct comparisons between different coating products were made with specimens with positions adjacent to each other in the original board.

Most test surfaces had a finely sawn structure. For the examination of the impact of the surface roughness, tangential specimen surfaces with a planed structure were also included. The surface roughness comparison was

Table 2—Test Specimen Dimensions (in mm) and Number of Replicates with the Same Coating Product. Annual Rings are Marked Out on End-Grain Surfaces. T = Tangential Surface; R = Radial Surface (For abbreviations see *Table* 1)

		Coating Product						
	A1	A2	AS	PO	L	AEM1	AEM2	AEM3
								
Spruce	11	3	3	7	3	8	2	2
Pine sapwood	10	3	3	4	3	6	2	2
Spruce	5	2	2	2	3	3	1	1
Pine sapwood	4	2	2	1	3	1	1	1
Spruce	1	—	—	1	—	1	—	—
Pine sapwood	1	—	—	1	—	1	—	—

performed with all coating products except the linseed oil coating.

Penetration was restricted to one direction by sealing the four vertical sides with a silicone rubber compound (Shin-Etsu, KE 45 RTV). In order to protect the top surface from any silicone contamination the sealing procedure was performed with a clean glass slide tightly pressed to the surface. The specimens were stored from 3 to 60 days at 20°C and 65% RH before the coatings were applied with new, small and rather stiff, paint brushes. The coatings were allowed to dry for at least three weeks at room temperature.

Microautoradiography

Detection of binder penetration into wood was made according to basic microautoradiographic procedures,[9] which involves several steps. After removal of the sili-

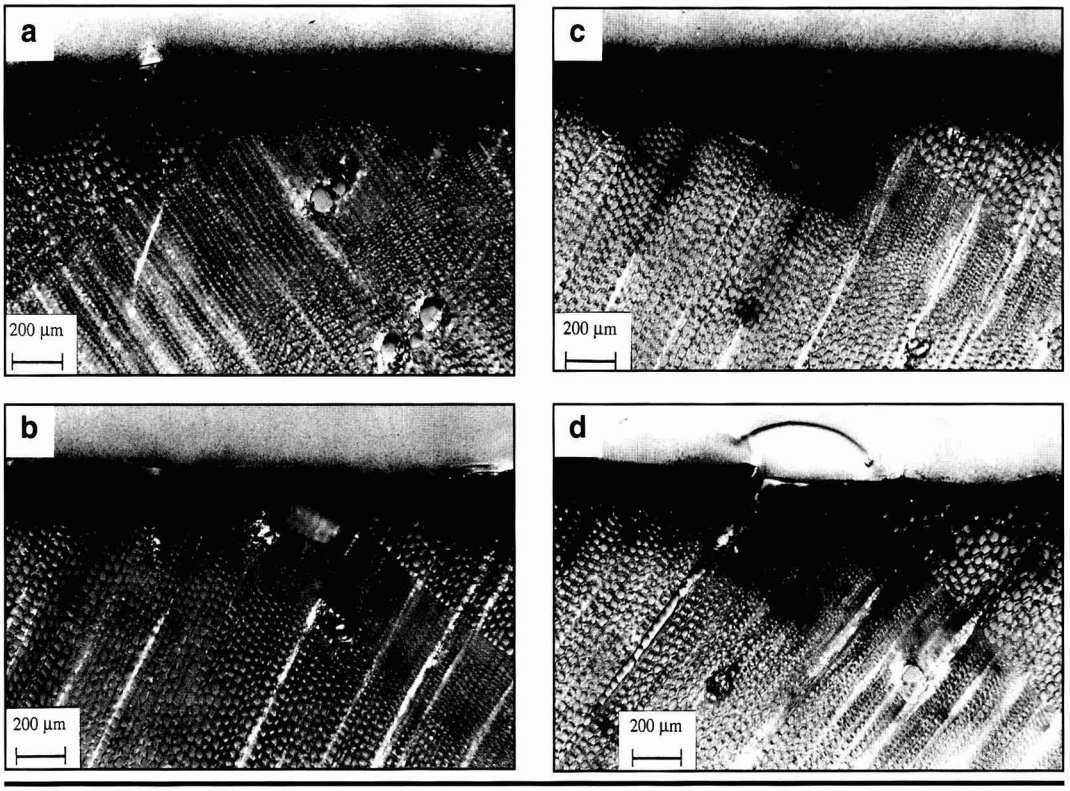


Figure 2—Autoradiomicrographs showing cross sections, including one annual ring border, with the radial/tangential penetration of solventborne coating products into sawn pine sapwood. (a) = alkyd primer A1, PVC=21; (b) = alkyd primer A2, PVC=30; (c) = alkyd stain AS; and (d) = linseed oil coating L.

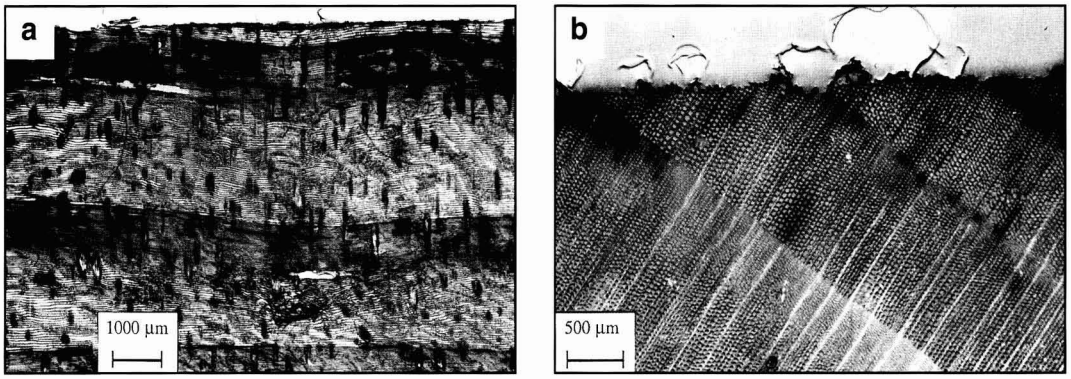


Figure 3—Autoradiomicrographs showing the penetration of priming oil PO into (a) sawn pine sapwood, radial section showing three annual ring borders; (b) sawn spruce, cross section (three ring borders). Note that the ray cells, running perpendicular to the top surface in 3a, often appear as short fragments.

cone sealer, the coated specimens were cut in 25-40 µm thick sections by a microtome knife moved at an angle of 45° to the coated surface. The sections were then mounted on glass slides with a gelatine/chrome alum solution. From each specimen, 6 to 10 replicate sections were made. Air trapped in the wood cell lumen was removed by impregnating the dry sections with water under vacuum. The slides were then dipped into a light-sensitive photographic nuclear emulsion coating (Ilford, K5), dried, and stored in the dark at 4°C. Any beta-particles emitted from the radioisotope then strike the nuclear emulsion coating and lead to silver grain formation. This grain formation increases with increasing storage time, i.e., increasing exposure. After a standard photographic development process, the localization of the radioisotope and thus of the binder was revealed by the dark areas caused by grain formation in the otherwise transparent nuclear emulsion. After initial tests on sections of several coating products, where the exposed nuclear emulsion was developed after 14, 35, and 70 days, a period of 35 days was chosen as an appropriate exposure time. Sections with unlabeled coating products were consistently included in the tests. The sections were finally photographed in a light microscope.

RESULTS AND DISCUSSION

The results of the penetration study are shown as autoradiomicrographs for some representative wood sections in *Figures* 2-6, where the binder penetration is evident as black areas. A section with an unlabeled reference coating is shown as comparison in *Figure* 7.

A general and expected result is the unevenness of the penetration front due to the differentiated cell structure in the wood. A typical example is a deeper penetration into the radial ray cell structure, which in itself consists of two to three different cell types, when compared with the rather superficial penetration into the longitudinal (axial) tracheids as shown most clearly from the radial sections (see *Figures* 4 and 6). The structure of the ray cells, in particular the so called ray tracheids, permits an easier radial penetration than the longitudinal tracheids. Whereas the interconnecting pits in the longitudinal tracheids are mostly irreversibly closed in dried wood, the pits in the ray cells are not closed to the same extent and therefore permit penetration more easily.

The preference for penetration into the radial ray cells was also apparent for coating products applied onto radial surfaces. Analyzing the surface prependicular to the painted radial surface, i.e., a tangential surface, where the ray cell cross sections are outlined as small ellipses, revealed several ellipses with dark spots where penetration accordingly had occurred (not shown in any figure).

The following direct comparisons are all based on the relevant overall results for each coating product, including all replicates of all wood sample origin.

Coating Viscosity and PVC

No significant differences in penetration patterns were found between the two solventborne alkyd primers A1 and A2 in spite of their different PVC (21 and 30, respectively). Comparing these alkyd primers with the two other solventborne products, i.e., the alkyd stain, AS, and the linseed oil primer, L, showed a substantially better penetration for the latter ones. AS and L had similar penetration patterns. The comparisons are shown for cross sections of pine sapwood in *Figure* 2.

The binder penetration in the longitudinal tracheids is generally restricted to the 2 to 10 outermost tracheids for most products, which corresponds to a depth of about 0.08-0.5 mm, whereas the penetration into the radial ray cells may well exceed a depth twice of that. The considerably lower PVC and viscosity of the alkyd stain and the lower viscosity of the linseed oil coating may well explain the better penetration of these two products (see *Figure* 2).

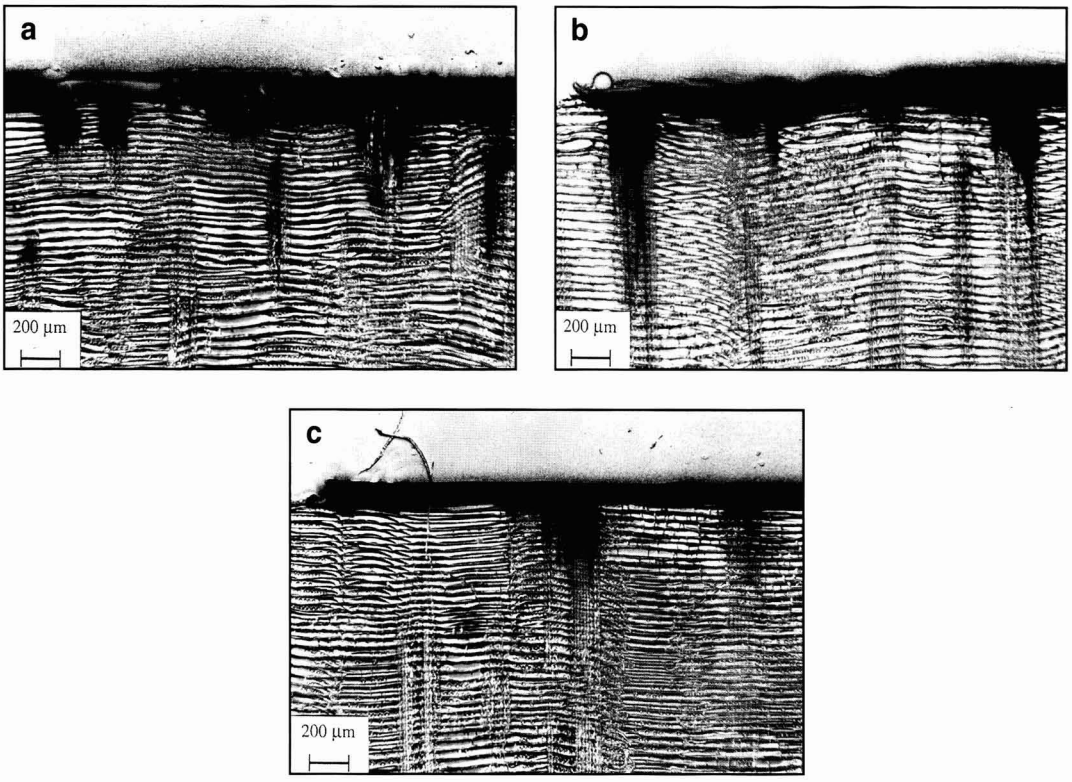


Figure 4—Autoradiomicrographs showing radial sections with the penetration of waterborne alkyd emulsion primers into planed pine sapwood. (a) = alkyd emulsion AEM1, η=2 100 mPas; (b) = alkyd emulsion AEM2, η = 5 800 mPas; and (c) = alkyd emulsion AEM3, η = 13 400 mPas.

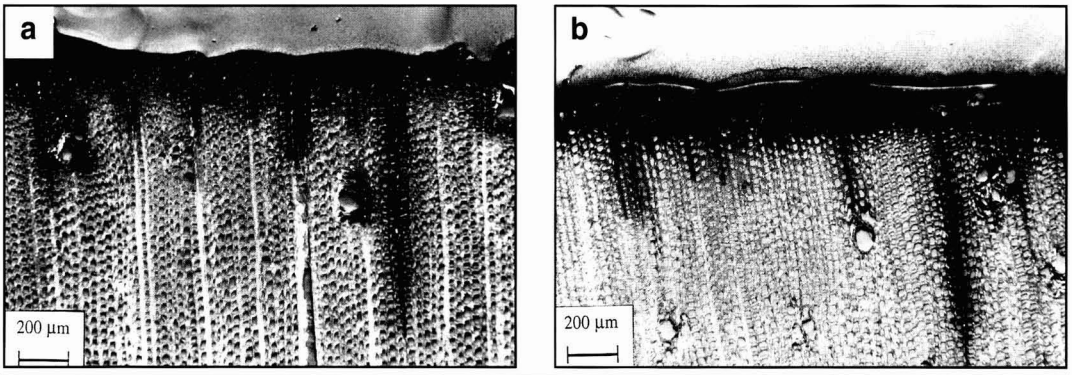


Figure 5—Autoradiomicrographs showing cross sections with the penetration of (a) waterborne alkyd emulsion AEM1; (b) solventborne alkyd A1, into sawn pine sapwood.

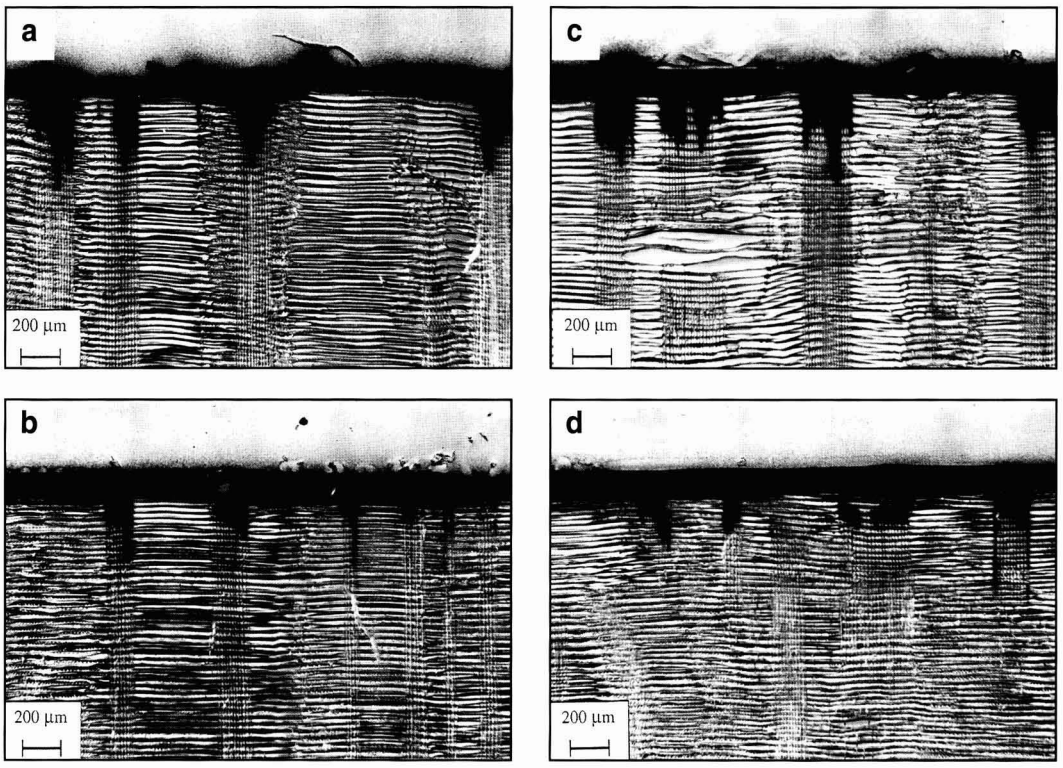


Figure 6—Autoradiomicrographs showing radial sections with penetration into planed and sawn surfaces. (a) = sawn spruce, alkyd emulsion AEM1; (b) = planed spruce, alkyd emulsion AEM1; (c) = sawn spruce, solventborne alkyd A1; and (d) = planed spruce, solventborne alkyd A1.

Generally lower alkyd coating penetration, restricted to merely one to three tracheids, has recently been reported by de Meijer et al.[10] The fact that the molecular weights of their alkyds were higher than 50,000 may partly explain the reduced penetration.

A comparison of the penetration into the thin-walled earlywood versus the thick-walled latewood show some interesting differences between the two categories of solventborne coatings. While the penetration of the two alkyd binders A1 and A2 is better in the earlywood than in the latewood, the opposite is the fact for the alkyd stain (AS) and the linseed oil coating (L), (see *Figure* 2). This may be explained by the fact that the latewood generally contains more open (unaspirated) pits than the earlywood. Fluids of relatively low viscosity, like AS and L, may well utilize the higher frequency of unaspirated pits and thus penetrate deeper into the latewood whereas for more viscous fluids, like A1 and A2, the unaspirated pits are only of secondary importance. Instead the thicker latewood cell-wall and the smaller tracheid cavity (lumen) seem to be determining factors preventing the penetration into the latewood. The fact that low-viscosity products predominantly penetrate into the latewood is also verified by the penetration pattern of the priming oil shown in *Figure* 3. The priming oil penetrates several annual rings into pine sapwood. This is far deeper than any of the pigmented products. The priming oil is present in both latewood ray cells and tracheids as compared to earlywood where presence in the ray cells clearly dominates.

A direct comparison between the three alkyd emulsion products reveals similar penetration for the two emulsions with the lowest viscosity, AEM1 (η=2,100 mPas) and AEM2 (η=5,800 mPas). The microautoradiographs in *Figure* 4 show that these two alkyd emulsions penetrate into three to four of the outermost longitudinal tracheids and that they are also found in the ray cells. The alkyd emulsion with the highest viscosity, AEM3 (η=13,400 mPas), has a generally lower penetration ability and is merely found in the ray cells. Hence, minor changes in the normal viscosity range of alkyd emulsion primers seem to have little effect on the penetration. A more marked increase in viscosity will, however, undoubtedly result in reduced penetration.

The preferential location of coating binders in the ray cells, besides the cell structural differences already mentioned, may also be attributed to differences in hydrophilic/hydrophobic character between different wood cells. Whereas the pure lignocellulosic longitudinal tracheids may be characterized as highly hydrophilic, the

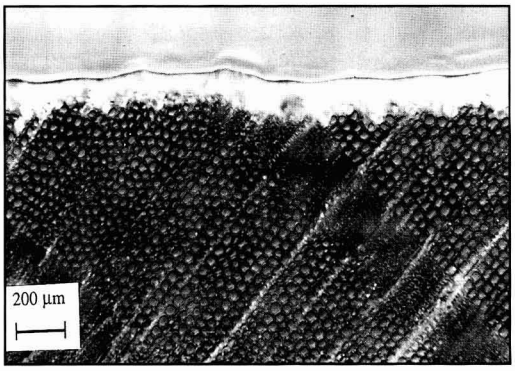


Figure 7—Micrograph of an unlabeled alkyd emulsion reference (cross section of sawn pine sapwood).

ray cells, which also contain resins and fats, can be described as more hydrophobic. Thus the hydrophobic character of an alkyd, a linseed oil binder, or white spirit may well be a factor of some importance when considering their preferential location in the ray cells.[11] The deep penetration of the priming oil, which predominantly occurs via the ray cells, may be attributed to pure solvent property effects such as polarity, viscosity, and surface tension. In the light of the surprisingly small penetration into the surface tracheid cells of such a priming oil (see *Figure* 3a), its function and contribution to the moisture barrier of multicoat wood coating systems should therefore be questioned.

Solventborne Alkyd vs. Waterborne Alkyd Emulsion

Solventborne alkyd primers and waterborne alkyd emulsion primers have similar penetration when primers within the same viscosity range are compared (see *Figures* 5 and 6). This result is in line with earlier findings where 50% binder "solutions" were compared.[7] It is not shown how in fact the penetration of the alkyd emulsion products proceeds. On one hand, the relatively large sized emulsion droplets, which in this study were even larger than in normal commercial alkyd emulsions, will not easily penetrate the openings in the pits in the ray cells, which are roughly of the same size as the droplets themselves. On the other hand, if the penetration would not start until some stage of the "breaking" of the alkyd emulsion, i.e., after evaporation of water when coalescence of the emulsion droplets takes place, the viscosity would then inevitably become markedly increased making penetration more difficult.

A good penetration ability is assuredly an essential wood primer property. From a penetration point of view, waterborne alkyd emulsion primers may be recommended as an environmentally more favorable alternative to solventborne primers. However, when the important moisture dynamic behavior factor of a wood/coating system is taken into account, the alkyd emulsion primers appear slightly less favorable than the solventborne primers. This is probably due to the content of hydrophilic surface active agents in alkyd emulsions.[5]

Wood Material and Wood Machining

All coating products have significantly better penetration into pine sapwood than into spruce. For pine sapwood the penetration of a given product occurs more into the longitudinal tracheids as well as deeper into the ray cells. The fact that spruce wood is less penetrable than pine sapwood regarding liquid penetrability is well known and often explained by the much larger cross-section area of the ray tracheids and the less complete aspiration of the pits in pine.[12] A very clear difference between pine sapwood and spruce was found for samples treated with the low-viscosity priming oil (see *Figure* 3). While the penetration into pine sapwood is deep and distinguished, the penetration into spruce is more indistinct and on a surprisingly low level. Although the autoradiographic results in this study are mainly qualitative, the total presence of priming oil in spruce seems to be at an inexplicably low level.

A comparison between wood samples of different origin did not reveal that the annual ring width had any effect on the penetration. However, since annual ring width was not of primary interest in this study, further investigation is needed before any final conclusion can be drawn.

The effect of the machining method on the penetration may not appear decisive when planed and sawn surfaces are compared as in *Figure* 6. The fact that the penetration continues into a few additional tracheids may nevertheless be of great importance. It is likely that the improved penetration results in a better surface stabilization which may be a key to extended performance of exterior painted wood.[13] Penetration into the longitudinal tracheids is therefore probably more important for the wood/coating interaction and thus the coating anchorage than the generally deeper penetration into the ray cells. However, by also taking microbiological aspects into account, ray cell penetration is certainly important since in this way coating fungicides may be introduced deeper into the wood.

CONCLUSIONS

Microautoradiography has been proven to be a useful technique well suited for studying the gross penetration of different coating products into wood.

The radial penetration front was uneven due to a heterogeneous structure with different types of wood cells. The important penetration into the longitudinal tracheids varied between 0.08 and 0.5 mm for pigmented products. Penetration into pine sapwood was significantly better than into spruce.

Coating viscosity seemed to have no major effect on the penetration when the same type of alkyd primers representing a conventional viscosity range were compared. For products with lower viscosity, an alkyd stain with low PVC and a linseed oil coating, the penetration was improved. A priming oil type product had superior penetration into pine sapwood.

Solventborne alkyd primers and waterborne alkyd emulsion primers of comparable viscosity had similar ability to penetrate into wood.

The penetration was improved for coatings applied onto sawn and rough wood surfaces as compared to planed and smooth surfaces.

ACKNOWLEDGMENT

Appreciation is expressed to the Swedish Council for Forestry and Agricultural Research (SJFR) for financial support. The authors wish to thank Dr. Eva Malmström, Polymer Technology, Royal Institute of Technology for the enzymatic diglyceride preparation and Ms. Katarina Nordman-Edberg, Trätek and Ms. Karén Olsen, Dyno Industrier for skillful technical assistance. Mr. Gudbrand Rødsrud is acknowledged for his valuable contribution in the initial phase of this study.

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Performance of Finishes on Wood that is Chemically Modified by Acetylation

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Swelling and shrinkage of wood has a major effect on the performance of coatings applied to its surface. Altering the molecular structure of wood by a reaction with acetic anhydride is known to improve the dimensional stability of wood considerably. Such acetylation of wood was shown to have no effect on the drying characteristics and adhesion of applied coatings. Weathering performance of coatings was improved considerably. A color stabilizing effect was achieved with acetylated Scots pine with and without a clearcoating.

INTRODUCTION

Many properties of wood are a result of interactions with substances (e.g., water) or organisms in its immediate surroundings. The dimensions of wood change due to water absorption and desorption of the wood when the relative humidity of the surrounding air changes. Furthermore, wood is degraded by UV light. The durability of both opaque and transparent paints is largely influenced by the dimensional changes of wood. With transparent finishes, the UV degradation of the timber has an extra influence on its durability. The wood processing industry tries to minimize these effects of less favorable properties by using wood species, mainly tropical hardwoods, which have a high dimensional stability of their own.

In the past decade, increasing interest world-wide within wood science can be observed for chemical modification of wood.[1-9] By chemically modifying woods the molecular structure of the cell wall components is altered. Mainly involved in these processes are those parts of the cell wall components (hydroxyl groups) which are primarily involved in biodegradation processes and water absorption and desorption. By chemical modification of wood, material properties can be improved considerably. One of the aims of wood modification is to improve the dimensional stability of low quality timber species.

Of all treatments to modify wood, acetylation with uncatalyzed acetic anhydride has been studied the most and shown to be one of the most promising methods.[1,2] During the reaction of wood with acetic anhydride, hydroxyl groups of the cell wall polymers are converted into acetyl groups producing acetic acid as a by-product (*Figure* 1). Dimensional changes of wood can be reduced by up to 80% by acetylation compared to untreated wood.[10-12] This is thought to be a result of the lower moisture content of the wood because hydrophilic hydroxyl groups are substituted by more hydrophobic side groups of the cell wall polymers. Secondly, acetylation has a permanently ultrastructural bulking effect, also increasing dimensional stability.

Cell wall modification has been studied for its effectiveness in reducing the degradative effects of outdoor and accelerated weathering due to ultraviolet radiation and water. In accelerated weathering, southern pine modified with butylene oxide or methyl isocyanate gave no more protection than untreated controls.[13] A similar treatment, followed by lumen polymer fill with methyl methacrylate showed no surface erosion and was very effective in reducing the effects of ultraviolet and water degradation. A similar study was performed on acetylated wood.[14] Compared to that of untreated wood, the rate of moisture sorption of aspen acetylated to 18 weight percent gain (WPG) was greatly reduced as was the extent of swelling in liquid water. Erosion due to accelerated weathering was reduced 50%. A combined treatment of acetylation followed by methacrylate impregnation was the most effective in reducing the rate and extent of swelling and reducing erosion caused by accelerated weathering (85%).

The purpose of this research was to determine the effect of hydrophobation of Scots pine by acetylation on coating performance and color stability.

EXPERIMENTAL

Acetylation

For the adhesion tests, spruce (*Picea abies*) samples of 10 mm × 70 mm × 150 mm (radial × tangential × longitudinal)

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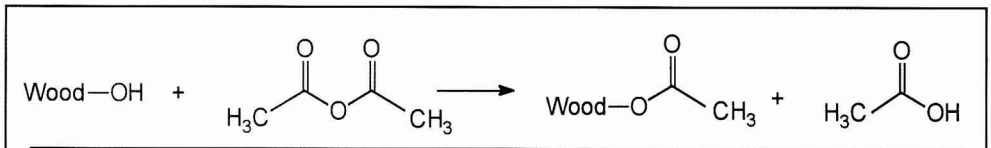

Figure 1—Acetylation of wood with acetic anhydride.

were acetylated using uncatalyzed acetic anhydride. Vacuum pressure impregnation was performed for 90 min followed by drainage of surplus anhydride and a reaction step of three hours at 120°C. After reaction a final vacuum was applied for two hours while an elevated temperature was maintained to remove nonreacted acetic anhydride and by-product acetic acid. Half of the acetylated samples were dried in an oven at 103°C to remove all residual acetic acid.

For weathering performance tests, Scots pine (*Pinus sylvestris*) sapwood samples of 12 mm × 80 mm × 1000 mm were acetylated using a somewhat different process. The test specimens were placed in a stainless steel reactor and impregnated under vacuum with acetic anhydride, which was preheated to 90°C. After one hour the vacuum was released and the anhydride was heated further to 120°C. After two hours the reactor was drained and a vacuum was applied to remove all unreacted acetic anhydride and formed acetic acid. Part of the acetylated samples were then placed in an oven at 103°C to remove all residual acetic acid.

Adhesion and Drying

Untreated and acetylated spruce samples, with and without residual acetic acid, were painted by brush with six different white primers. These products were two waterborne acrylic dispersions, two solventborne alkyd paints, a fast drying solventborne alkyd paint, and a waterborne alkyd emulsion. The amount of coating used on each board ranged between 110 and 130 g/m^2 per paint layer.

Each combination of paint and wood drying time on wood was compared to that on glass. Drying time was determined according to a modified DIN 53150. The dustfree time was determined by dropping a swatch of cotton wool from a height of 5 cm on the paint film. Dustfree time was recorded as the time at which the cotton did not stick to the paint film when the glass or wood panel was turned upside down. Subsequently a cotton swab was placed on the paint film and pressed for 10 sec with a weight of 1 kilo. Tack-free time was recorded as the time at which no cotton was found adhering to the paint film after removal of the weight.

The adhesion was determined according to the cross-hatch method (ASTM D 3359-Part A). The scale for evaluating the adhesion runs from 5 to 0. A value of 5 stands for a perfect adhesion, whereas a value of 0 represents a complete flaking of the paint. The difference in wood substrate is of minor influence on the intercoat adhesion, but was nevertheless recorded.

Accelerated Weathering

Xenon Weatherometer: Ten of the dried pine samples were cut into smaller sections of 10 mm × 70 mm × 147 mm. The edges of the front of these panels were rounded. Six types of finishes were applied to the front and edges, i.e., two solventborne alkyd paints (black and white), one solventborne alkyd stain (teak), two waterborne acrylic paints (black and white), and one waterborne acrylic stain (teak). All products are commercially available. Chemically modified panels, as well as untreated samples, were coated with a 120 μm thick dry film of stain or paint.

These panels were put in a Xenon weatherometer for 30 weeks. One-fifth of the panels were kept behind as a control. For this artificial weathering an Atlas weather-ometer Ci 35 containing a Xenon lamp of 3000 W and a quartz-borosilicate filter combination was used. The light intensity was 0.35 W/m^2 by 340 nm with a total energy level of 450 W/m^2. Only the finished surface was sprayed with water.

Artificial weathering with test programs, which include a higher humidity level, generally show a more significant degradation compared to tests with a lower air humidity.[15] Artificial weathering was performed according to an aging cycle used previously by Van Acker et al.[16] and Bravery and Dickinson.[17] It is a combination of two cycles namely the Xenon-test of the

Table 1—Adhesion Test of Coatings on Untreated and Acetylated Spruce According to the Cross-hatch Method

Paint System	Untreated		Acetylated + AcOH		Acetylated	
	Coating-Substrate	Intercoat	Coating-Substrate	Intercoat	Coating-Substrate	Intercoat
Waterborne acrylic dispersion	4	3-4	2	2-3	3	4
Solventborne alkyd paint A	4	2	3	2-3	3	3
Solventborne alkyd paint B	2	2	3	2-3	3	3
Acrylic dispersion A	3	4-5	4	4-5	4	4
Acrylic dispersion B	4-5	5	3-4	5	4-5	5
Alkyd emulsion	2-3	3	3-4	3-4	3-4	3

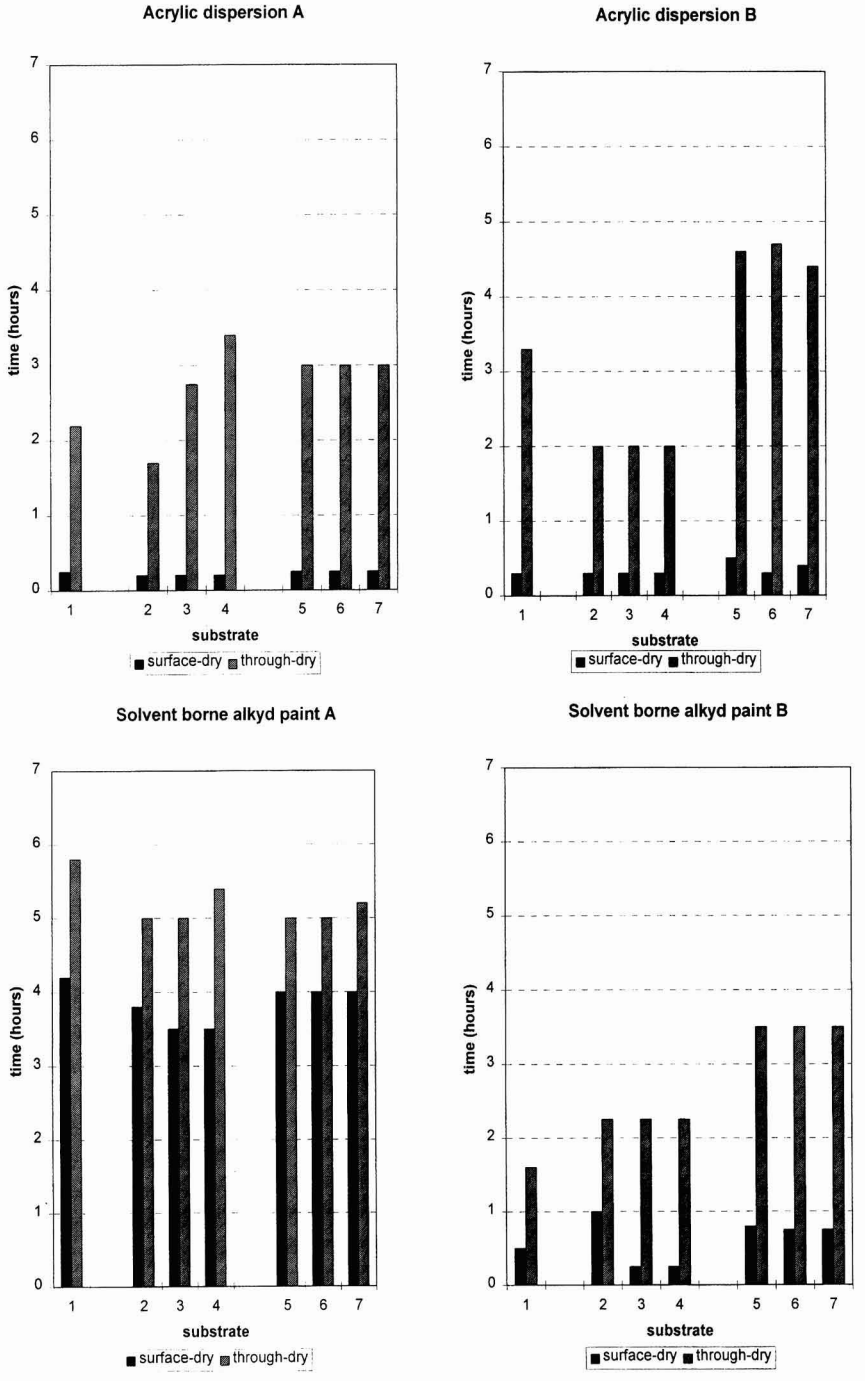

Figure 2a—Drying of paint on untreated and acetylated spruce.

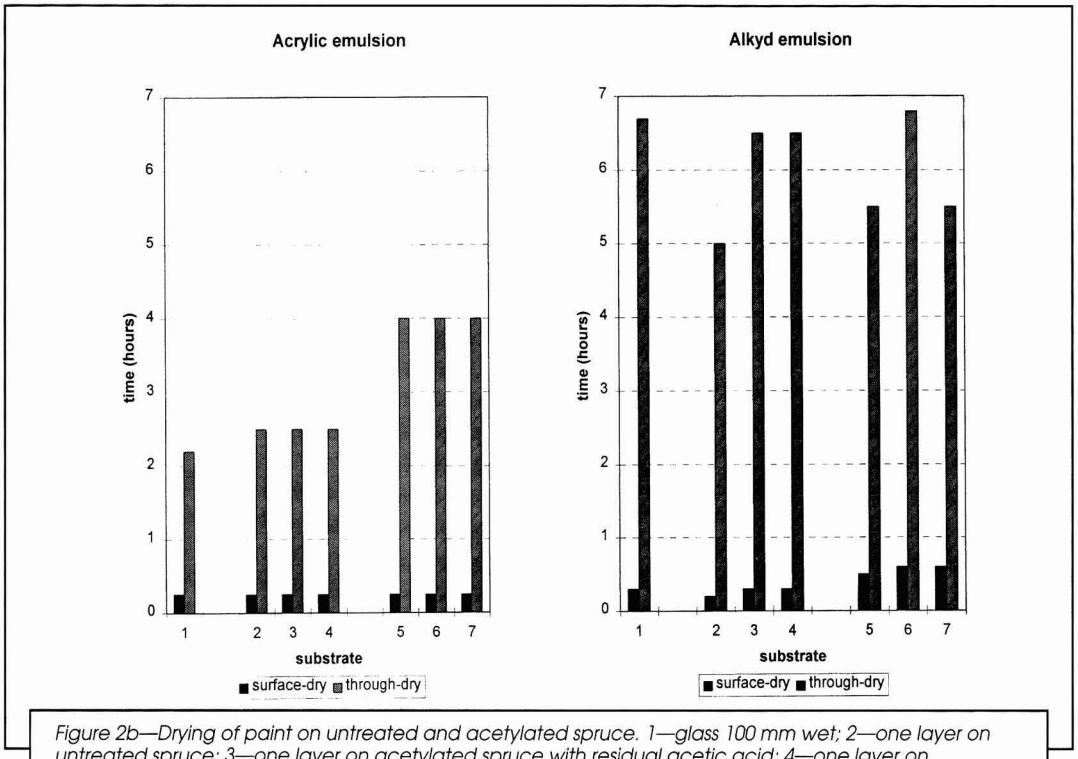

Figure 2b—Drying of paint on untreated and acetylated spruce. 1—glass 100 mm wet; 2—one layer on untreated spruce; 3—one layer on acetylated spruce with residual acetic acid; 4—one layer on acetylated spruce (no residual acid); 5—two layers on untreated spruce; 6—two layers on acetylated spruce with residual acetic acid; 7—two layers on acetylated spruce (no residual acetic acid)

Bundesanstalt für Materialprüfung (Cycle A) and the Atlas-cycle from Technological Institute Denmark (Cycle B).

Cycles A and B consist of :

	Cycle A	Cycle B
	4 hr light + spray	102 min light
	2 hr light	18 min light + spray
	10 hr light + spray	
	2 hr light	
	5 hr light + spray	
	1 hr darkness	
Total hours light per 24 hr:	23	24
Total hours spray per 24 hr:	19	3.5

A unity weathering cycle of two weeks is based on both cycles A and B with the following constitution:

- 144 hr (6 days) cycle A
- 24 hr refrigerator (+4°C)
- 144 hr (6 days) cycle B
- 24 hr freezer (-15°C)

The combination of different conditions of humidity, light irradiance, and temperature seems to be essential for the simulation of the dimensional movements of wood treated with finishing systems.[16]

After every weathering cycle of 14 days, a visual evaluation of the wood surfaces was made. Supplementary, microscopic inspection was carried out with a stereo microscope (magnification 30X). Weathering rating scores used for visual examination were:

0—no changes compared to unweathered condition

2—small aesthetic losses, e.g., color changes, loss of gloss

4—small erosion of the surface, e.g., fine line shaped erosion in vessel lines (small cracks). Repair easily possible.

6—moderate erosion of the surface, e.g., spotwise erosion of film

8—substantial surface degradation, e.g., spotwise erosion of film and heterogeneous flaking for less than 50% of total surface; occurrence of cracks in film and small checks in wood surface. Difficult to repair.

10—strong erosion, e.g., overall degradation of coating film with heterogeneous flaking for more than 50% of the surface, substantial checking of the wood surface. Repair nearly impossible; full renovation (removal of film) required.

After 6, 8, 20, and 30 weeks, one of the samples was removed and used for an adhesion test. For this purpose two double crosscuts were made along the painted surface

Table 2—Performance of Untreated and Acetylated Pine Panels with Various Types of Wood Paints and Stains after Accelerated Weathering in a Xenon Weatherometer. Rating was Done on a Scale of 0 to 10 (0 = Unaffected; 10 = Heavily Degraded)

Paint	Treatment	Number of Weeks										
		6	8	10	12	18	20	22	24	26	28	30
Alkyd teak	Untreated	1	2	3	3	3	3	4	5	5	5	6
Stain	Acetylated	1	1	2	2	2	3	3	3	3	3	4
Acrylic teak	Untreated	1	2	3	3	3	3	4	5	5	5	5
Stain	Acetylated	0	2	3	3	3	3	3	3	3	3	3
Alkyd black	Untreated	3	3	3	3	3	3	3	4	4	4	5
Paint	Acetylated	1	2	2	2	2	2	2	2	3	3	3
Acrylic black	Untreated	2	3	4	4	4	4	4	4	5	5	5
Paint	Acetylated	2	2	2	2	2	2	2	3	3	3	3
Alkyd white	Untreated	2	2	2	2	2	2	2	2	2	2	3
Paint	Acetylated	1	1	1	1	1	2	2	2	2	2	2
Acrylic white	Untreated	1	1	2	2	2	2	2	2	2	2	2
Paint	Acetylated	1	1	2	2	2	2	2	2	2	2	2

of the samples according to ASTM D 3359-Part B. The rating represents an average of the individual rating per double crosscut.

QUV Test: Acetylated pine samples and a same amount of untreated pine samples were cut into smaller sections of 12 mm × 80 mm × 285 mm. Next to unfinished wood, three types of clear finishes were applied to samples: (1) a solventborne alkyd stain with UV absorber; (2) a waterborne acrylic stain with UV absorber; and (3) a waterborne acrylic stain without UV absorber.

All products are industrial stains except the third one. Chemically modified panels, as well as untreated samples were coated with 120 µm of stain. Unlike the panels for the Xenon test, which were only coated on the front, these samples were coated all around. For each coating system, part of the samples were put in an artificial hail test to imitate a possible damage to the coating after a hail storm. This caused small cracks in the stain film prior to weathering. Samples were submitted to artificial weathering in a QUV. Half of the samples were hail-damaged, and unfinished wood was included as well. The test cycle and visual rating was identical to the ones used for the weatherometer test. Instead of a Xenon lamp, UV type A lamps were used in the QUV which was equipped with a water spray option allowing water spray and UV radiation simultaneously. Each week all samples of the QUV test were visually graded and photographed.

Color Measurements

Color of the UV-weathered pine samples was measured with a Minolta CM -500 spectrophotometer according to ISO 7724 with standard illuminent D 65 (natural daylight). Both percentage light reflection (R%) in the range of 400 to 700 nm and CIE 1976 L*, a*, b* color coordinates were recorded. The data presented averages five measurements. The differences between weathered and unweathered samples were used to calculate CIELAB color differences.

RESULTS AND DISCUSSION

Drying and Adhesion Before Weathering

Results of the drying characteristics and adhesion test prior to weathering are shown in *Figure* 2 and *Table* 1. For

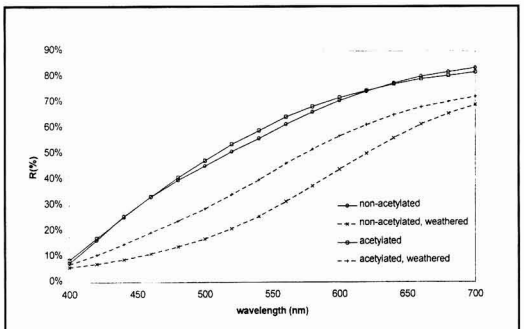

Figure 3—Effect of acetylation on the visible light reflection of pine sapwood with an alkyd clearcoat.

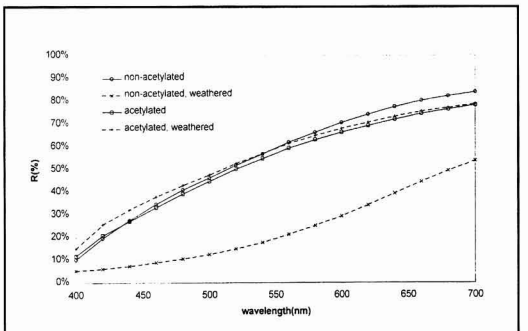

Figure 4—Effect of acetylation on the visible light reflection of pine sapwood with an acrylic clearcoat.

Table 3—Adhesion of Paint on Untreated and Acetylated Pine after Artificial Xenon Weathering

Paint	Treatment	Number of Weeks			
		0	8	20	30
Alkyd teak	Untreated	5	4	4	4
	Acetylated	5	4	4	4
Acrylic teak	Untreated	5	5	5	4
	Acetylated	5	5	5	5
Alkyd black	Untreated	4 1/2	4	4 1/2	4
	Acetylated	5	4	4 1/2	4
Acrylic black	Untreated	4	4	4	4
	Acetylated	4	4	4	4
Alkyd white	Untreated	5	5	-	5
	Acetylated	5	5	-	5
Acrylic white	Untreated	4	3 1/2	4	3 1/2
	Acetylated	4	4	4	4

drying time and adhesion, no significant difference could be observed between acetylated wood and untreated wood for most of the finishes applied. Surface dry time was considerably shorter for solventborne alkyd paint B on acetylated wood. Dry time of acrylic dispersion A was significantly influenced by acetylation. The dry time of this paint on acetylated wood was twice as long compared to untreated wood. An amount of residual acetic acid reduced this dry time to about one and a half times that on untreated wood. Dry time of the alkyd emulsion was also influenced by acetylation and extended from 5 to 6 1/2 hours, for both acetylated wood with and without residual acetic acid. Dry time of a second layer of alkyd emulsion was only extended on the acetylated wood with residual acetic acid. No problems with decreased wettability of the acetylated wood were observed. Pecina and Parzycki[19] showed that the wettability of acetylated wood was significantly different compared to untreated wood, but was lost after 30 sec of wetting.

Accelerated Weathering

Xenon Weatherometer Results: Results are presented in *Table* 2. Weathering performance proved to be better for the acetylated wood, especially for both teak pigmented stains and both black pigmented paints.

All panels were unfinished on the back. As a result, all untreated samples showed cracks in the wood after eight weeks of weathering. Growth rings of the wood used were nearly parallel to the finished surface. Usually a 45° angle is used to prevent this cracking. It is nearly impossible, though, to make samples of this size which consist completely of pine sapwood. Therefore, this failure of the wood was not included in the marking of the samples as mentioned in *Table* 2. The numbers mentioned represent the performance of the paint or stain itself. After 30 weeks of weathering most finishes were still reasonably intact and the highest rating was only a 6. Similar tests done in the past, most of which failed after 10 weeks, are mainly done with stains and usually have a lower film thickness. The samples used here had three layers of paint or stain with a total thickness of 120 µm.

Unfinished, untreated samples showed a clear darkening of their surface caused by degradation of lignin by UV light. The acetylated wood kept its original color. After a few weeks, the surface of the untreated wood was degraded, and loose white fibers were washed from the surface during spraying. The acetylated wood was

Table 4—Performance of Various Types of Wood Stains on Untreated and Acetylated Pine Panels after Accelerated Weathering in a QUV. Rating was Done on a Scale of 1 to 10. Rating of Adhesion was Done on a Scale of 5 to 0

Stain	Treatment	Art. Hail Damage	Number of Weeks Weathering and Cycle (A or B)												Adhesion After Week	
			1 A	2 B	3 A	4 B	5 A	6 B	7 A	8 B	9 A	10 B	11 A	12 B	0	12
Alkyd	Untreated	-	1	2	2	3	4	5	6	—	6	7	—	7	4	4/3
		+	1	3	3	4	5	6	6	—	7	7	—	10		4/2
	Acetylated	-	0	1	2	2	2	3	3	—	3	5	—	6	4	3
		+	0	1	2	2	2	2	2	—	2	3	—	4		4
	Acet. + AcOH	-	0	1	1	2	2	2	2	—	2	3	—	4	4	4
		+	1	2	3	3	3	3	3	—	3	3	—	5		3
Acrylic + UV-absorber	Untreated	-	1	2	2	3	4	4	6	—	6	7	—	8	5	4 1/2
		+	1	2	3	4	6	6	6	—	6	7	—	7		5
	Acetylated	-	0	1	1	2	2	2	2	—	2	2	—	2	5	4
		+	0	1	2	2	2	2	2	—	2	2	—	3		5
	Acet. + AcOH	-	0	1	2	3	2	2	2	—	3	3	—	3	5	4
		+	0	1	2	2	2	2	2	—	2	2	—	3		5
Acryl - UV abs.	Untreated	-	2	3	3	5	6	8	9	—	10	10	—	—	5	—
		+	2	4	4	6	7	8	9	—	10	10	—	—	—	—
	Acetylated	-	0	1	2	2	7	8	8	—	10	10	—	—	5	—
		+	1	3	8	8	8	9	9	—	10	10	—	—	—	—
	Acet. + AcOH	-	3	7	8	8	9	9	9	—	10	10	—	—	5	—
		+	3	4	8	8	10	10	10	—	10	10	—	—	—	—

Table 5—CIELAB Color Coordinates, Standard Deviations between Brackets

Coating	Treatment		L*	a*	b*	ΔE
Uncoated	Untreated	t_0	81.77 (0.40)	3.44 (0.21)	24.72 (0.66)	
		t_{12}	77.58 (0.64)	2.07 (0.30)	5.72 (0.34)	19.50
	Acetylated	t_0	82.64 (0.73)	1.88 (0.09)	22.23 (1.35)	
		t_{12}	85.28 (1.02)	1.54 (0.29)	8.79 (1.86)	13.70
Alkyd clearcoat	Untreated	t_0	81.76 (0.53)	3.02 (0.14)	33.15 (0.84)	
		t_{12}	62.95 (0.55)	15.55 (0.42)	40.20 (0.65)	23.67
	Acetylated	t_0	82.89 (0.06)	0.72 (0.10)	34.57 (0.36)	
		t_{12}	72.70 (0.57)	7.89 (0.45)	38.87 (0.33)	13.18
Acrylic clearcoat	Untreated	t_0	82.01 (0.22)	2.84 (0.13)	31.18 (0.36)	
		t_{12}	53.60 (2.34)	14.04 (0.55)	31.26 (1.07)	30.53
	Acetylated	t_0	80.48 (0.87)	1.69 (0.30)	29.81 (0.31)	
		t_{12}	81.66 (0.43)	1.99 (0.24)	25.66 (0.50)	4.33

degraded much later (loose white fibers) but after 30 weeks of exposure a thicker layer of the acetylated wood was degraded and washed away compared to the untreated wood.

The adhesion test of the weathered samples showed minimum differences between acetylated and untreated samples and between acrylic and alkyd paints (*Table* 3).

QUV Test: Results of the QUV weathering are presented in *Table* 4. Acetylation of wood considerably improves weathering performance of clear stains for both acrylic and alkyd systems. In general, weathering performance of the applied acrylic stain was better compared to the alkyd stain. Stain damage and graying of the wood on the sharp edges of the wood samples was especially less for the acrylic wood stain as compared to the alkyd wood stain. Even artificial hail damage had no significant effect on weathering performance of an alkyd or acrylic stain on acetylated wood. Feist et al.[20] found contrary results in their study on weathering and finish performance of acetylated aspen fiberboard. The penetrating finishes they used (semitransparent oil-based stains) performed better on untreated fiberboard as compared to acetylated fiberboard. Those stains could not penetrate the treated surface and were weathered with a three times higher spreading rate of the finish. Film-forming finishes (paints and solid-color stains) performed equally well on acetylated and untreated fiberboard after outdoor exposure for two years. This period of outdoor weathering is relatively short for non- or semi-transparent finishes. In our research on Scots pine, film-forming clear finishes were used for accelerated weathering. The film thickness of the stains on both acetylated and untreated wood was equal and the only variable consisted of modification of the wood. Results show that in such a case, acetylation of wood improves weathering performance of applied finishes considerably.

The stain from which the UV absorber was removed failed on all substrates. This occurred first on acetylated samples with some residual acetic acid left in the wood. After three weeks, blisters appeared in the film layer. The same occurred after six weeks of accelerated weathering to this stain on both the acetylated wood and untreated wood without residual acid. Removing the UV absorber obviously causes degradation of the polymers within the paint itself. This results in loss of adhesion of the paint to the wood irrespective to which type of wood it is applied.

Adhesion of the stain on the wood after artificial weathering was good and nearly the same for all stains applied.

The unfinished samples showed results which were comparable to those from the Xenon weathering. Erosion of the surface was not extensive, but weathering had only been done for 12 weeks instead of the 30 weeks of the weatherometer test.

Color Measurements

The color of the untreated wood was clearly affected by UV degradation. Both the acrylic and the alkyd stain could not prevent the wood from darkening considerably. Acetylating the wood, on the other hand, has a very good effect on the durability of the wood against UV degradation (see *Figure* 6). The samples with the acrylic stain and solventborne alkyd stain even became brighter after several weeks of weathering.

The L*, a*, b* values of the different samples and the color change ΔE are given in *Table* 5. Due to the acetylation, the color of the wooden substrate was slightly changed because of the lower degree of redness (a*-value) of the acetylated wood both with and without a transparent

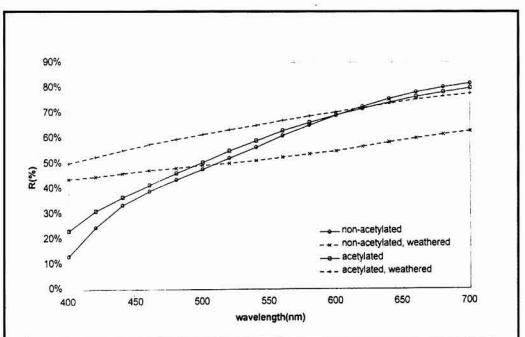

Figure 5—Effect of acetylation on the visible light reflection of uncoated pine sapwood.

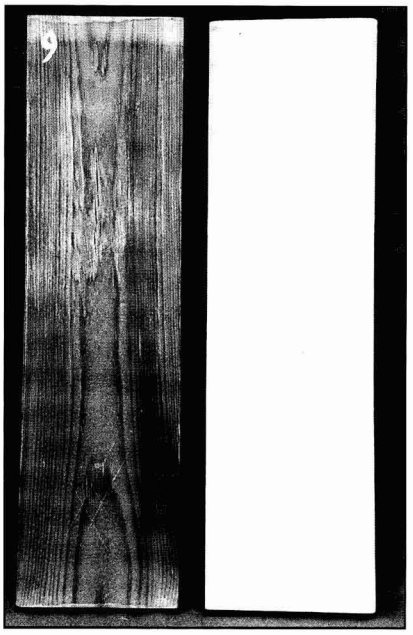

Figure 6—Untreated (left) and acetylated (right) pine sapwood after 12 weeks of UV weathering.

coating. Differences in either lightness or yellowness are negligible.

After weathering, the improvement in color retention of the coated acetylated wood is remarkably good. The typical darkening and yellowing of transparently coated wood is strongly reduced by acetylation. Uncoated acetylated wood still shows a strong color change because the top layer of the acetylated wood degrades under influence of the combination of UV light and water. This causes the development of a white to gray layer of cellulose fibers covering the wood surface. The layer directly underneath this layer, which contains both cellulose and the highly photochemical active lignin fractions, retains a more yellow color compared to the more brownish untreated wood.

More detailed information is given in *Figures* 3-5 which show the light reflection data. Before weathering the uncoated wood shows basically the same reflectance spectrum with and without acetylation. After weathering, the reflectance of light with a wavelength below 600 nm is strongly increased, which is not surprising keeping in mind the more white appearance. After weathering, the uncoated acetylated wood has a 5 to 15% higher light reflectance. The wood coated with an alkyd clearcoat shows the same spectra before weathering for both acetylated and untreated wood. After weathering, there is a decrease in reflectance for both acetylated and nonacetylated wood, although the latter is less pronounced. Most likely the decrease in reflectance will come mainly from the photodegradation of the alkyd resin itself.

The results of the combination of acetylated wood and an acrylic clearcoat are most striking since virtually no changes in reflectance are observed even after 1,728 hours of QUV weathering. This can be explained by a very good resistance of both coating and substrate against photodegradation. The nonacetylated wood still shows a strong decrease in reflectance because of the degradation of the wood itself.

The acetylation of wood in combination with the application of a fully transparent coating can prevent discoloration or failure of the coating even after severe artificial weathering. The best prevention against weathering is found in combination with the acrylic clearcoat. Discoloration can only be prevented by a combination of chemical modification of the wood and the application of a coating because of the synergistic effects of light and water in the wood weathering process. The initial photodegradation of lignin in the wood is initiated by light but subsequent leaching of the degradation products increases the rate of degradation.[21,22] The results of this study show that acetylation can prevent this degradation process as long as the surface is protected by a coating. The coating can protect the wood in two ways: first by preventing water to leach degradation products, and second, by filtering certain wavelengths from the UV spectrum. Why the coating is only effective in combination with acetylation is not clear yet. This will be studied in future work. Hon[23] stated that acetylation is not effective in long-term color stabilization. This idea is partly supported by our results as far as uncoated wood is concerned but seems not to hold for acetylated wood finished with a transparent coating. Acetylated wood gives new opportunities for finishing wood with clear unpigmented coatings since coating durability is strongly improved.

CONCLUSIONS

Within research on material properties of acetylated wood, several tests on coating performance were done. Acetylating spruce samples had no effect on adhesion and required drying time for paint applied to the wood. Performance of paints and stains was much better on acetylated pine compared to untreated samples. Acetylation of wood strongly reduces cracking and flaking of an applied coating when exposed to weathering. This is mainly caused by the improved dimensional stability of the wood by acetylation, which decreases the stresses applied to the coating that originate from the dimensional changes of the substrate. An artificial hail test had no effect on the appearance of a stain on acetylated wood, while similar damage to a stain on untreated wood caused the finish to crack and fail in an artificial weathering test. The UV resistance of acetylated wood was proven by an accelerated UV degradation of wood with transparent stains. It showed that acetylation improves the natural resistance of wood against UV degradation, particularly in combination with a transparent coating. The untreated wood discolored because of weathering while the acetylated wood kept its original color. Removal of the UV absorber from the stain caused degradation of the polymers within the paint itself and loss of adhesion of the paint from the wood.

ACKNOWLEDGMENTS

The authors would like to express their gratitude to the European Commission for partially financing this research within the AIR programme of DG XII.

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Phenolic Resins
Polyester Resins
Rosin Esters
Styrene Resins

Chemicals Incorporated
12321 Hatcherville Rd.
Baytown, TX 77520
Phone: (281) 576-5000
Fax: (281) 576-5712
E-Mail: emr@chemicalsinc.com
Ash Moza, President; Ernie Ramirez, Dir. Sales/Marketing; Mahmoud Kheidec, Technical Mgr.
Acrylic Resins
Oleoresinous Varnishes
Phenolic Resins
Styrene Resins

Clarence Resins & Chemicals, Inc.
8171 Main St.
Williamsville, NY 14221
Phone: (716) 632-6100
Fax: (716) 632-8706
Alkyd Resins
Bitumens
Epoxy Resins
Hydrocarbon Resins
Maleic Resins
Misc. Type Resins
Natural Resins
Phenolic Resins
Rosin Esters
Styrene Resins

Condea Vista Company
900 Threadneedle
Houston, TX 77079
Phone: (281) 588-3000
Fax: (281) 588-3119
E-Mail: dloughlin@cvcnet.com
Misc. Type Resins
Vinyl Resins

Cook Composites and Polymers
Coatings Resins Div.
919 E. 14th Ave.
P.O. Box 419389
Kansas City, MO 64116
Phone: (816) 391-6000
Fax: (816) 391-6141
E-Mail: www.ccponline.com
Mike Kaza, Business Mgr., Coatings Resins; Yasmin Sayed-Sweet, Marketing Mgr., Coatings Resins
Acrylic Resins
Alkyd Resins
Epoxy Resins
High-Solid Resins
Oleoresinous Varnishes
Phenolic Resins
Polyester Resins
Rosin Esters
Silicone Polyester
Silicone Resins
Urethane & Polyurethane Resins

CPS Chemical Company, Inc.
123 White Oak Ln.
P.O. Box 162
Old Bridge, NJ 08857
Phone: (732) 607-2700
Fax: (732) 607-2562
Howard Stevenson, Business Mgr.
Acrylic Resins
Epoxy Resins
Ultraviolet Curing Resins

CREANOVA, INC.
220 Davidson Ave.
Somerset, NJ 08873
Phone: (732) 560-6800
Epoxy Hardeners-Chemicals
Methacrylic Monomers and Polymers
Polyamide Resins
Polyester Resins
Silanes
Urethane Crosslinkers

CVC Specialty Chemicals, Inc.
2980 Rt. 73 North
Maple Shade, NJ 08052
Phone: (609) 482-0800
Fax: (609) 667-8270
John Cech, General Mgr.
Epoxy Resins

CYRO, Inc.
100 Enterprise Dr., 7th Fl.
Rockaway, NJ 07866
Phone: (201) 442-6000
Fax: (201) 442-6117
Dolores Artz
Acrylic Resins

Cytec Industries, Inc.
Five Garret Mountain Plaza
West Paterson, NJ 07424
Phone: (201) 357-3469
Fax: (201) 357-3055
Alkyd Resins
Amino Resins
Epoxy Resins
High-Solid Resins
Melamine & Melamine Type Resins
Phenolic Resins
Polyamide Resins
Urethane & Polyurethane Resins

Daubert Chemical Co., Inc.
4700 S. Central Ave.
Chicago, IL 60638
Phone: (708) 496-7350
Fax: (708) 496-7367
Mike Dwyer, President; Dick Bramwell, Director of Sales; Glenn Bilek, Director Business Development
Epoxy Resins

Degen Oil and Chemical
200 Kellogg St.
Jersey City, NJ 07305
Phone: (201) 432-1192
Fax: (201) 432-8483
E-Mail: degen@eclipse.net
Paul Varga, V.P.; Felipe Martin, V.P.Alkyd Resins
Oleoresinous Varnishes

Degussa Corp.
Performance Materials Group
65 Challenger Rd.
Ridgefield Park, NJ 07660
Phone: (201) 641-6100
Fax: (201) 641-2270
E-Mail: www.degussa.com
Christopher J. Avallone, Marketing Mgr., Organosilanes; Ted Herz, Business Dir.
Silanes

Dianal America Inc.
9675 Bayport Blvd.
Pasadena, TX 77507
Phone: (281) 474-7777
Fax: (281) 474-2757
Shoichi Usui, Executive Vice President; Gary Warehime, Mgr., New Business Development
Acrylic Resins

Dock Resins Corp.
1512 W. Elizabeth Ave.
Linden, NJ 07036
Phone: (908) 862-2351
Fax: (908) 862-4015
A. Wayne Tamarelli, Ph.D., Chairman; Philip I. Barbanel, President; Joseph Barbanel, General Mgr.; Jeffrey M. McKeon, Dir. of Sales
Acrylic Resins
Alkyd Resins
Amino Resins
Epoxy Hardeners-Chemicals
High-Solid Resins
Hybrid Resins
Misc. Type Resins
Styrene Resins
Urethane & Polyurethane Resins

The Dow Chemical Co.
Emulsions Polymers Div.
2040 Dow Center
Midland, MI 48674
Toll Free: (800) 447-4369
Acrylic Resins
Styrene Resins

Dow Corning Corp.
P.O. Box 0994
Midland, MI 48686-0997
Toll Free: (800) 252-9899
Fax: (517) 496-4586
E-Mail: inquiry@concentric.net
Customer Service Dept.
Silanes
Silicone Resins

DSM Resins U.S., Inc.
Augusta Riverfront Ctr-Ste. 580
One 10th St.
Augusta, GA 30901
Phone: (706) 849-6717
Fax: (706) 849-6777
Richard M. Sligh, President; Levonne Burnett, Customer Service Coordinator; Stewart McKenzie, Sales Mgr.; Steve Jenkins, Wet Resins Acct. Exec., Manuel Tyler, Tech. Service Mgr.
Amino Resins
Epoxy Resins
High-Solid Resins
Misc. Type Resins
Phenolic Resins
Polyester Resins
TGIC Resins
Ultraviolet Curing Resins
Water-Thinned Resins

Eastman Chemical Co.
P.O. Box 431
Kingsport, TN 37662
Phone: (423) 229-1212
Fax: (423) 229-1194
Cellulose Derivatives

Echo Resins and Laboratory
Rt. 3
Box 359
Versailles, MO 65084
Phone: (573) 378-5565
Ultraviolet Curing Resins

Elf ATOCHEM North America, Inc.
2000 Market St.
Philadelphia, PA 19103-3222
Toll Free: (800) 225-7788
Phone: (215) 419-7000
Fax: (215) 419-7930
E-Mail: www.elf-atochem.com
Gerry Gimbarski
Acrylic Resins
Maleic Resins
Methacrylic Monomers and Polymers
Polyamide Resins
Polybutadienes
Polyester Resins
Styrene Resins

Empire State Varnish Co., Inc.
38 Varick St.
Brooklyn, NY 11222
Phone: (718) 388-5450
Fax: (718) 388-6385
Richard Stark, President; Robert Stark, V.P., Sidney J. Rubin, Customer Service & Technical Sales
Alkyd Resins
Epoxy Resins
Ester Gums
Hydrocarbon Resins
Oleoresinous Varnishes
Urethane & Polyurethane Resins

Engineered Polymer Solutions, Inc.
1400 N. State St.
Marengo, IL 60152
Toll Free: (800) 654-4242
Fax: (815) 568-4145
Steve Lindberg, President; Chuck Piske, National Sales Mgr.; Bruce Johnson, Technical Dir.; Ken Stewart, Operations Mgr.
Acrylic Resins
Alkyd Resins
Epoxy Resins
High-Solid Resins
Misc. Type Resins
Oleoresinous Resins
Polyester Resins
Styrene Resins
Vinyl Resins
Water-Thinned Resins

Enviro Resins & Additives
77 Milltown Rd.
East Brunswick, NJ 08816
Phone: (732) 390-1700
Fax: (732) 254-6063
Acrylic Resins
Polyester Resins
Urethane & Polyurethane Resins

Estron Chemical, Inc.
Highway #95
Calvert City, KY 42029
Phone: (502) 395-4195
Fax: (502) 395-5070
Roger Luthenauer, Sales Mgr.
Acrylic Resins
Epoxy Hardeners-Chemicals
Polyester Resins

Farboil Co.
8200 Fischer Rd.
Baltimore, MD 21222-3609
Phone: (410)477-8200
Fax: (410)477-8995
Epoxy Resins
Hybrid Resins
Polyester Resins
TGIC Resins
Urethane & Polyurethane Resins

Focus Chemical Corp.
875 Greenland Rd.
B9 Orchard Park
Portsmouth, NH 03801-4122
Phone: (603) 430-9802
Fax: (603) 431-5390
E-Mail: focuschm@nh.ultranet.com
Donald R. Derby, Sales Mgr.
Hydrocarbon Resins
Phenolic Resins
Polybutadienes
Rosin Esters
Urethane & Polyurethane Resins

H.B. Fuller Co.
3530 Lexington Ave., N.
St. Paul, MN 55126
Phone: (612) 481-1835
Fax: (612) 481-1804
Tom Kuzara, Industry Mgr.
Acrylic Resins
Misc. Type Resins
Styrene Resins
Urethane & Polyurethane Resins
Vinyl Resins

GCA Corp.
916 13th St., W.
Bradenton, FL 34205
Phone: (941) 748-6090
Fax: (941) 748-0194
Graham W. Wright, President
Epoxy Resins
TGIC Resins

Genesee Polymers Corp.
P.O. Box 7047
G-5251 Fenton Rd.
Flint, MI 48507
Phone: (810) 238-4966
Fax: (810) 767-3016
E-Mail: ipiskoti@compuserve.com
Irene M. Pisoti, V.P./Marketing
Amino Resins
Epoxy Resins
Methacrylic Monomers and Polymers
Silicone Resins
Vinyl Resins

Georgia-Pacific Resins, Inc.
55 Park Place, 19th Floor
Atlanta, GA 30303
Phone: (404) 652-8617
Fax: (404) 230-7478
Rich Stregowski, Marketing Mgr., Coating; Loren Filion, Customer Service Mgr.; Caryn King, Market Communication Mgr.
High-Solid Resins
Phenolic Resins
Rosin Esters
Rosin Salts
Water-Thinned Resins

BFGoodrich Co.
Coatings Div.
9911 Brecksville Rd.
Cleveland, OH 44141
Phone: (216) 447-5000
Fax: (216) 447-5770
John J. Falsone, Senior Marketing Mgr.; Jim Papenfuss, Marketing Mgr.
Acrylic Resins
Misc. Type Resins
Oleoresinous Varnishes
Styrene Resins
Urethane & Polyurethane Resins
Urethane Lacquers
Vinyl Chloride & Vinylidene Chloride Polymer Emulsions
Vinyl Resins
Water-Thinned Resins

The Goodyear Tire & Rubber Co.
Chemical Div.
1452 E. Archwood Ave.
Akron, OH 44306-3299
Phone: (330) 796-7300
Fax: (330) 796-4910
E-Mail: acallahan@goodyear.com
Amy Callahan, Sales Rep.
Acrylic Resins
Hydrocarbon Resins
Styrene Resins

Hampshire Chemical Corp.
55 Hayden Ave.
Lexington, MA 02173
Phone: (617) 861-9700
Fax: (617) 861-0135
Frederick Drauschke, Product Technical Specialist; Ann Schoen, Product Mgr.
Styrene Resins
Vinyl Chloride & Vinylidene Chloride Polymer Emulsions
Vinyl Resins

Hardman, a Div. of the Harcross Chemical, Inc.
600 Cortlandt St.
Belleville, NJ 07109
Phone: (973) 751-3000
Fax: (973) 751-8407
Epoxy Hardeners-Chemicals
Epoxy Resins
Urethane & Polyurethane Resins

Henkel Corp.
300 Brookside Ave.
Ambler, PA 19002
Phone: (215) 628-1152
Fax: (215) 628-1111
Dave W. Brown, Market Mgr., Architectural Additives, Coatings & Inks Div.
Epoxy Hardeners-Chemicals
Epoxy Resins
Ester Gums

Hercules Incorporated
Aqualon Div.
1313 N. Market St.
Wilmington, DE 19894-0001
Phone: (302) 594-5000
Fax: (302) 594-6660
Claude Lajoie, Sales Mgr., Western Region & Latin America; Jeffrey Wolff, Sales Mgr., Eastern Region
Cellulose Derivatives
Nitrocellulose

I.C. Trading Co., Inc.
146-46 29th Ave.
Linden Hill, NY 11354-1439
Phone: (718) 886-6466
Fax: (718) 886-6531
E-Mail: www.ic-trading.com
Janusz Kololowski, President
Epoxy Resins
Nylon Resins
Phenolic Resins
Polyamide Resins
Polyester Resins
Silicone Resins

ICI Polyurethanes
6555 Fifteen Mile Rd.
Sterling Heights, MI 48312
Phone: (810) 826-7660
Fax: (810) 826-7733
Michelle J. Schroeder, Industry Marketing Specialist; Bernie DiPietrantonio, Sales Mgr.
Urethane & Polyurethane Resins

Industrial Copolymers Ltd.
Primrose Hill
London Rd.
Preston, Lanc. PR1 4LT
England
Phone: 1772 201 964
Fax: 1772 883 570
E-Mail: ljd@incorez.co.uk
L.J. Daniels
Epoxy Hardeners-Chemicals
Urethane & Polyurethane Resins

International Paper Arizona Chemical Div.
Two Manhattanville Rd.
Purchase, NY 10577
Phone: (800) 223-1268
Fax: (914) 397-1650
- Ester Gums
- Maleic Resins
- Phenolic Resins
- Rosin Esters

International Resources, Inc.
Rivers Business Commons
8945 Guilford Rd., Ste. 100
Columbia, MD 21046-2620
Phone: (410) 381-8290
Fax: (410) 381-8295
E-Mail: intlresources@worldnet.att.net
David T. Osborne, Ph.D, Technical Dir.
- Alkyd Resins
- Epoxy Hardeners-Chemicals
- Misc. Type Resins
- Urethane & Polyurethane Resins

International Specialty Products (ISP)
1361 Alps Rd.
Wayne, NJ 07470
Phone: (973) 628-3000
Fax: (973) 628-4111
Sotini Papoulias, Marketing Director; Ellen Werner, Marketing Director
- Urethane & Polyurethane Resins
- Vinyl Resins

SC Johnson Polymer
8310 - 16th St.
P.O. Box 902
Sturtevant, WI 53177-0902
Toll Free: (800) 231-7868
Fax: (800) 437-3266
Customer Service Dept. (800) 231-7868
- Acrylic Resins

K & S Industries Ltd.
73 Redding Rd.
P.O. Box 297
Georgetown, CT 06829
Phone: (203) 544-9887
Fax: (203) 544-9988
Ken E. Dempsky; Robert K. Dempsky
- Epoxy Resins
- High-Solid Resins
- Phenoxy Resins
- Polyamide Resins
- Rosin Esters
- TGIC Resins

Kane International Corp.
411 Theodore Fremd Ave.
Rye, NY 10580
Phone: (914) 921-3100
Fax: (914) 921-3180
David Quinlan
- Natural Resins
- Rosin Esters
- Urethane & Polyurethane Resins

Kinetics Corp.
2 Boulder Ave.
Magnolia, MA 01930
Phone: (508) 525-2415
Fax: (508) 525-2417
T. Philip Comenos, President
- Hydrocarbon Resins
- Maleic Resins
- Rosin Esters

KING INDUSTRIES, INC.
Science Rd.
P.O. Box 588
Norwalk, CT 06852
Phone: (203) 866-5551
Fax: (203) 866-1268
Steve Knight, Sales Mgr.; Bob Coughlin, Technical Service Mgr.
- **Polyester Resins**
- **Urethane & Polyurethane Resins**

Lawter International
8601 95th St., One Terra Way
P.O. Box 343
Kenosha, WI 53142
Phone: (414) 947-7300
Fax: (414) 947-7328
E-Mail: lawter.com
Dana Johansen, GM Coatings Technology; Henry Brooks, Dir. Ink Sales, North America
- Acrylic Resins
- Alkyd Resins
- High-Solid Resins
- Hydrocarbon Resins
- Maleic Resins
- Oleoresinous Varnishes
- Phenolic Resins
- Polyamide Resins
- Polyester Resins
- Rosin Esters
- Styrene Resins

Lonza, Inc. Specialty Anhydride, Additives
17-17 Rte. 208
Fair Lawn, NJ 07410
Phone: (201) 794-2000
- Epoxy Hardeners-Chemicals
- Epoxy Resins
- Maleic Resins
- Melamine & Melamine Type Resins
- Misc. Type Resins
- Natural Resins
- Phenolic Resins
- Polyamide Resins

Lorama Chemicals, Inc.
221 Nipissing Rd.
Milton, Ont. L9T 1R3
Canada
Phone: (905) 878-2833
Fax: (905) 878-7732
E-Mail: www.loramachemicals.com
Pat Amiel, President
- Polysaccharide Resins

Mace Adhesives & Coatings Co.
Roberts Rd.
P.O. Box 37
Dudley, MA 01571
Phone: (508) 943-9052
Fax: (508) 943-6527
James F. Gilloran, President; Robert A. Fitzgerald, V.P. Sales/Marketing
- Hybrid Resins
- Ultraviolet Curing Resins
- Urethane & Polyurethane Resins
- Urethane Crosslinkers
- Urethane Lacquers

Mantrose Bradshaw Zinsser Group
1175 Post Rd., E.
Westport, CT 06880
Toll Free: (800) 344-4229
Phone: (203) 454-1800
Fax: (203) 227-0558
Jeffrey C. Flath, Dir. Sales/Marketing; Steve Santos, Technical Dir.
- Natural Resins

McWhorter Technologies
400 E. Cottage Place
Carpentersville, IL 60110
Phone: (847) 428-2657
Fax: (847) 428-2653
Jeff M. Nodland, President and Chief Operations Officer; Patrick Heffernan, Sr. Vice President Liquid Coatings Resins
- Acrylic Resins
- Alkyd Resins
- Amino Resins
- Epoxy Resins
- High-Solid Resins
- Melamine & Melamine Type Resins
- Misc. Type Resins
- Oleoresinous Varnishes
- Polyester Resins
- Silicone Polyester
- Silicone Resins
- Ultraviolet Curing Resins
- Urethane & Polyurethane Resins

Morton International
100 N. Riverside Plaza
Chicago, IL 60606
Phone: (312) 807-2000
Fax: (312) 807-2010
- Acrylic Resins
- High-Solid Resins
- Styrene Resins

Mitsubishi Chemical America
1 North Lexington Ave.
White Plains, NY 10601
Phone: (914) 286-3600
Fax: (914) 681-0760
Kozo Hayashi, Mgr.Business Development; Paul Kreiter, Mgr. Business Development
- Acrylic Resins
- Amino Resins
- Maleic Resins
- Melamine & Melamine Type Resins
- Phenolic Resins
- Polyamide Resins
- Polybutenes
- Polyester Resins
- Polyethylene Resins
- Polypropylene Resins
- Styrene Resins
- Urethane & Polyurethane Resins
- Urethane Crosslinkers
- Vinyl Chloride & Vinylidene Chloride Polymer Emulsions
- Vinyl Resins

Nacan Products Ltd.
60 West Dr.
Brampton, Ont. L6T 4W7 Canada
Toll Free: (800) 333-9483
Phone: (905) 454-4466
Fax: (905) 454-3401
Jim Wise, Sales Mgr.; Alan Blackie, Marketing Mgr.
- Acrylic Resins
- Vinyl Resins

Nagase America Corp.
500 Fifth Ave., Rm. 840
New York, NY 10110
Phone: (212) 354-3140
Fax: (212) 398-0687
E-Mail: gen@nagase-nam.com
Gen Hirao, Mgr. Chemicals Sales; Rick Uchida, Mgr. Chemicals Sales
- Epoxy Resins

Occidental Chemical Corp.
P.O. Box 809050
Dallas, TX 75380-9050
Phone: (972) 404-4198
Fax: (972) 448-6676
David F. Graham, Business Mgr.
- High-Solid Resins
- Phenolic Resins
- Water-Thinned Resins

Ohio Polychemical Co.
1920 Leonard Ave.
P.O. Box 369004
Columbus, OH 43219
Phone: (614) 253-8511
Fax: (614) 253-6327
Richard Olson,Vice President, General Mgr.; Arnie Mohar, Technical Director
- Alkyd Resins
- Epoxy Resins
- Misc. Type Resins
- Polyester Resins
- Styrene Resins
- Urethane & Polyurethane Resins
- Water-Thinned Resins

Pelmor Laboratories, Inc.
Liquid Products Div.
401 Lafayette St.
P.O. Box 309
Newtown, PA 18940-0309
Phone: (215) 968-3334
Fax: (215) 968-6415
E-Mail: pelmr@aol.com
E. William Ross, Jr., V.P.
- Misc. Type Resins

Phenoxy Specialties
800 Cel River Rd.
Rock Hill, SC 29730
Toll Free: (800) 331-7721
Fax: (803) 328-3827
Stephen M. Lustig, General Mgr.; Mark Huang, Technical Service Mgr.; Chris Digby, Sales Mgr.
- Epoxy Resins
- High-Solid Resins
- Misc. Type Resins
- Phenoxy Resins

Plast-O-Meric, Inc.
W227 N6225 Sussex Rd.
Sussex, WI 53089
Phone: (414) 246-0344
Fax: (414) 246-0391
D.E. Krans, Sales
- Urethane & Polyurethane Resins
- Vinyl Chloride & Vinylidene Chloride Polymer Emulsions
- Vinyl Resins

PolySat, Inc.
7240 State Rd.
Philadelphia, PA 19135
Phone: (215) 332-7700
Fax: (215) 332-9997
Darryl Manuel, President
- Acrylic Resins
- Epoxy Hardeners-Chemicals
- Hydrocarbon Resins
- Misc. Type Resins
- Styrene Resins
- Water-Thinned Resins

K.J. Quinn & Co., Inc.
135 Folly Mill Rd.
Seabrook, NH 03874
Phone: (603) 474-7177
Fax: (603) 474-9170
Jeannine Derba, Customer Service Administrator; Rick Ackerman, Business Mgr.
- Urethane & Polyurethane Resins

R.I.T.A. Corp.
1725 Kilkenny Ct.
P.O. Box 1487
Woodstock, IL 60098
Phone: (815) 337-2500
Fax: (815) 337-2522
James W. Cook, Vice President Sales/Marketing
- Acrylic Resins
- Polyethylene Resins

Ranbar Technology, Inc.
1114 Wm. Flinn Hwy.
Glenshaw, PA 15116
Phone: (412) 486-1111
Fax: (412) 487-3313
E-Mail: Ranbar@Ranbar.com
Raymond D. Kushner, V.P., General Mgr.; Randall L. Russell, Dir. Corporate Services
- Alkyd Resins
- Epoxy Resins
- Polyester Resins
- Urethane & Polyurethane Resins

Raven Lining Systems
1024 North Lansing
Tulsa, OK 74106
Phone: (918) 584-2810
Fax: (918) 582-4311
E-Mail: www.ilnet.com/raven
Joanne Hughes, V.P.; Stewart Nance, President
- Epoxy Resins

Reichhold Chemicals, Inc.
2400 Ellis Rd.
P.O. Box 13582
Durham, NC 27709
Phone: (919) 990-7500
Fax: (919) 990-7922
Lisa Oldham, Corporate Marketing & Communications
- Acrylic Resins
- Alkyd Resins
- Amino Resins
- Epoxy Resins
- High-Solid Resins
- Hybrid Resins
- Polyester Resins
- Styrene Resins
- Urethane & Polyurethane Resins
- Vinyl Resins
- Water-Thinned Resins

Revelli Chemicals, Inc.
35 Mason St.
Greenwich, CT 06830
Phone: (203) 661-4040
Fax: (203) 661-4332
Robert Revelli, V.P.
- Hydrocarbon Resins

Rhone-Poulenc, Inc.
CN 7500
Prospect Plains Rd.
Cranbury, NJ 08512
Phone: (609) 860-4000
Fax: (609) 860-0795
Rhone-Poulenc Information Center
- Polyamide Resins
- Silicone Resins
- Water-Thinned Resins

Ricon Resins Inc.
569 241/4 Rd.
Grand Junction, CO 81505
Phone: (970) 245-8148
Fax: (970) 245-4348
E-Mail: rnalepa1@aol.com
Ray Nalepa, Technical Support
- Hydrocarbon Resins
- Maleic Resins
- Methacrylic Monomers & Polymers
- Misc. Type Resins
- Styrene Resins
- Ultraviolet Curing Resins

Rit-Chem Co., Inc.
P.O. Box 435
Pleasantville, NY 10570
Phone: (914) 769-9110
Fax: (914) 769-1408
Wayne J. Ritell, Vice President Sales; Gary S. Ritell, Vice President Marketing Development
- Hydrocarbon Resins

ROHM AND HAAS CO.
Independence Mall West
Philadelphia, PA 19106
Phone: (215) 592-3000
Fax: (215) 592-6909
Andrew Crane, Industrial Coatings; Debbie Zimmer, Architectural Coatings
- **Acrylic Resins**

Royce Associates
35 Carlton Ave.
East Rutherford, NJ 07073
Phone: (201) 438-5200
Fax: (201) 438-5207
A. Jay Royce, III, President; Wylie Royce, V.P.
- Epoxy Hardeners-Chemicals
- Epoxy Resins

Royce International
35 Carlton Ave.
East Rutherford, NJ 07073
Phone: (201) 438-5200
Fax: (201) 438-5207
E-Mail: HANAND@Interserv.com
Harry Anand, President
- Epoxy Hardeners-Chemicals
- Epoxy Resins

Ruco Polymer Corp.
New South Rd.
Hicksville, NY 11802
Phone: (516) 931-8100
Fax: (516) 931-8179
Tony Mazzarella, Sales Director; John McLafferty, Vice President Technology
- Polyester Resins
- TGIC Resins
- Urethane & Polyurethane Resins
- Water-Thinned Resins

San Esters Corp.
342 Madison Ave., Ste. 710
New York, NY 10173
Toll Free: (800) 337-8377
Fax: (212) 972-4625
Mark K. Smith, Sales Mgr.; Taka Nagashima, Vice President Marketing
- Methacrylic Monomers and Polymers
- Ultraviolet Curing Resins

SARTOMER CO.
502 Thomas Jones Way
Exton, PA 19341
Toll Free: (800) SARTOMER
Fax: (610) 363-4140
- **Hydrocarbon Resins**
- **Ultraviolet Curing Resins**

Schenectady International, Inc.
Polymer Div.
P.O. Box 1046
2750 Balltown Road
Schenectady, NY 12301
Phone: (518) 370-4200
Fax: (518) 382-8129
John Fisher, Product Mgr.
- Alkyd Resins
- Phenolic Resins

Scott Bader, Inc.
1592 Georgetown Rd.
Hudson, OH 44236
Phone: (216) 650-5000
Fax: (216) 528-0184
Bill Fitzgibbons, President; Erika Seyfried, Technical Sales Associate; Sue Spurlock, Office Mgr.
- Acrylic Resins
- Styrene Resins
- Vinyl Chloride & Vinylidene Chloride Polymer Emulsions

SEMicro Corp.
15817 Crabbs Branch Way
Rockville, MD 20855
Phone: (301) 975-9798
Fax: (301) 975-9653
E-Mail: semicro@aol.com
Jon Massey, Laboratory Mgr.; Laura Estok, Asst. to President
- Epoxy Resins

Sentry/Custom Services Corp.
RR 5, Box 5491
East Stroudsburg, PA 18301
Phone: (717) 421-2574
Fax: (717) 421-2511
E-Mail: infocia@coatings.org
David W. Crookall, President; Susan Rightmeyer, V.P.
- Epoxy Resins
- Melamine & Melamine Type Resins
- Nitrocellulose
- Urethane & Polyurethane Resins
- Water-Thinned Resins

Sequa Chemical, Inc.
One Sequa Dr.
Chester, SC 29706
Phone: (803) 385-5181
Fax: (803) 581-6212
Kim Deacon, Business Unit Dir.; Clarence Huntington, Technical Rep.
- Acrylic Resins
- Amino Resins
- Melamine & Melamine Type Resins
- Polyamide Resins
- Styrene Resins
- Ultraviolet Curing Resins
- Vinyl Resins
- Water-Thinned Resins

Shell Chemical Co.
910 Louisiana
Houston, TX 77002
Toll Free: (800) USA-SHELL
Fax: (713) 241-1606
E-Mail: www.shellchemical.com
Acrylic Resins
Epoxy Resins
High-Solid Resins
Polyester Resins

SKW Chemicals, Inc.
1509 Johnson Ferry Rd., Ste. 150
Marietta, GA 30062
Phone: (770) 971-1317
Fax: (770) 971-4306
Craig Fish, Sr. Sales Rep.
Epoxy Hardeners-Chemicals

Soluol Chemical Co., Inc.
Green Hill and Market Streets
P.O. Box 112
West Warwick, RI 02893
Phone: (401) 821-8100
Fax: (401) 823-6673
Warren J. Simmons, President & CEO; Cliff Tishler, V.P.; J. George Nathanson, V.P.; John Reisch, Technical Dir.
Urethane & Polyurethane Resins
Urethane Crosslinkers

SOLUTIA INC.
10300 Olive Blvd.
St. Louis, MO 63141
Justine MacDonald; Steve Zollmann; Marilyn Grolitzer
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High-Solid Resins
Melamine & Melamine Type Resins

Stanchem Inc.
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East Berlin, CT 06023
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Fax: (860) 828-3297
W. Casey West, V.P. Sales/Marketing
Acrylic Resins
Melamine & Melamine Type Resins
Misc. Type Resins
Urethane Lacquers
Vinyl Resins

Tego Chemie Service USA
914 E. Randolph Rd.
P.O. Box 1299
Hopewell, VA 23860
Toll Free: (800) 446-1809
Fax: (804) 541-2783
James P. Yosh, Jr., Business Mgr.; Robin Reinhardt, Technical Service Mgr.
Silicone Resins

Texas Resin Co.
2728 Empire Central
Dallas, TX 75220
Phone: (214) 353-1678
Fax: (214) 350-7624
Bruce Bridges, Sales Mgr.
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Alkyd Resins
High-Solid Resins
Polyester Resins
Urethane & Polyurethane Resins

Thibaut & Walker Co., Inc.
49 Rutherford St.
P.O. Box 296
Newark, NJ 07101
Phone: (201) 589-3331
Fax: (201) 589-7231
Steve Holland, Executive V.P.
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Alkyd Resins
Silicone Resins
Urethane & Polyurethane Resins

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4 Headquarters Plaza, N. Tower, Ste. 203
Morristown, NJ 07963
Phone: (201) 984-0900
Fax: (201) 984-5666
Judith Przybylski, Product Mgr., Resins
Natural Resins

U.S. Polymers, Inc.
300 E. Primm St.
St. Louis, MO 63111
Phone: (314) 638-1632
Fax: (314) 638-3100
Rogert Heitland, President; Mary Kalbfleisch, Office Mgr.; Robert Gaal, Technical Director
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Alkyd Resins
Epoxy Resins
High-Solid Resins
Oleoresinous Varnishes
Polyester Resins

UCB Chemicals Corp.
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Smyrna, GA 30080
Phone: (770) 434-6188
Fax: (770) 434-8314
Michel Philips, Marketing Mgr.; Dennis Nack, General Sales Mgr.
Ultraviolet Curing Resins

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Danbury, CT 06817-0001
Toll Free: (800) 335-8550
Phone: (203) 794-5300
Fax: (203) 794-3170
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Misc. Type Resins
Polyethylene Resins
Polypropylene Resins
Ultraviolet Curing Resins
Vinyl Chloride & Vinylidene Chloride Polymer Emulsions
Vinyl Resins
Water-Thinned Resins

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Lyndhurst, NJ 07071-3608
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Fax: (201) 507-1506
E-Mail: umccorp@sprynet.com
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Epoxy Hardeners-Chemicals
Epoxy Resins
Methacrylic Monomers and Polymers
TGIC Resins

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Plano, TX 75074
Phone: (214) 423-1120
Fax: (214) 423-1291
Craig J. Brennan, Vice President
Nitrocellulose
Phenolic Resins

Vianova Resins Inc.
4331 Chesapeake Dr.
Charlotte, NC 28216
Phone: (704) 559-6737
Fax: (704) 559-6699
E-Mail: slockil@ches.hcc.com
A. Slocki, V.P. Technology & Marketing; M. O'Shaughnessy, V.P. Sales
Acrylic Resins
Alkyd Resins
Amino Resins
Epoxy Hardeners-Chemicals
Epoxy Resins
High-Solid Resins
Melamine & Melamine Type Resins
Misc. Type Resins
Phenolic Resins
Polyamide Resins
Polyester Resins
Ultraviolet Curing Resins
Urethane & Polyurethane Resins
Urethane Lacquers

Wabash Gilsonite Blends, Inc.
707 E. Fayette Street
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Effingham, IL 62401
Phone: (217) 342-9755
Fax: (217) 342-9827
E-Mail: wabashoil@ccipost.net
John Bredenkamp, President; Clyde Parrish, Quality Control
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Adrian, MI 49221-9397
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Fax: (517) 264-8246
Nick Salchert, Team Leader; Gudrun Windfuhr, Marketing Mgr.
Silicone Resins

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Wilmington, MA 01887
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100 Jericho Quad
Jericho, NY 11753
Phone: (516) 681-9600
Fax; (516) 681-9604
R. Hunter Lewis, Natl. Accts. Mgr.
Bitumens

Silicone Resin

DOW CORNING CORP.

Dow Corning® 1-0543 resin, a silanol functional resin, has been specially formulated for high temperature powder coatings. The 100% silicone resin reportedly improves heat stability and weatherability in powder coatings for barbecue grills, wood-burning stoves, and other finished products that must withstand high temperatures or ultraviolet radiation exposure. It can be used as a blending resin in solvent-based formulations.

Circle No. 61 on Reader Service Card

Resimene Crosslinkers

SOLUTIA INC.

Three new Resimene amino crosslinkers are now available from Solutia Inc. Resimene 7111 and 7112 are formulated to improve cure response in solventborne and high-solids coating systems in the OEM auto plastics, general metal, coil, and exterior container industries. Resimene 7102 is a high performance crosslinker with optimized low viscosity. It may be used in a variety of general metal coatings and for coatings specifically in the OEM auto and metal office furniture industries.

Circle No. 62 on Reader Service Card

Eco-Friendly Resins

VIANOVA RESINS

Vianova Resins brings a full line of eco-friendly resins for metal, concrete, wood, and plastic coatings to the global marketplace. Beckopox™ systems are designed to reduce the time it takes to prime and topcoat concrete from 30 days to as little as eight hours; and paints based on Resydrol® reportedly exhibit a small particle size so it can penetrate wood and require minimal surface preparation for recoat

Circle No. 63 on Reader Service Card

High Temperature Resins

HYCOMP INC.

Thermally stable resins in either standard or custom formulations are available in bulk from HyComp Inc. of Cleveland. Alcohol-based polyimide resins that can be obtained from this company include PMR-15, AMB-21, and AFR-700B. These resins are available in either liquid or powder form. In addition, these resins come in whatever quantity is required, from prototype to high production, for 300-700°F applications in the adhesives, coatings, electronics, and plastics industries.

Circle No. 64 on Reader Service Card

Liquid Epoxy Resin

DOW CHEMICAL CO.

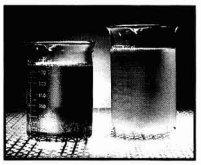
D.E.R.™ 353 liquid epoxy resin provides formulators with the benefits of a low viscosity resin, without the resin crystallization that can occur in many other standard or diluted low molecular weight epoxy resins. Introduced by Dow, this product can be used in civil engineering applications, including industrial flooring, grouts, adhesives, and high-solids coatings. Because of the lower viscosity of D.E.R. 353 resin (600-900 cPs @ 25°C), there is less need for solvents or diluents in end-use formulations.

Circle No. 65 on Reader Service Card

Non-HAP Waterborne Resins

SHELL CHEMICAL CO.

Shell Chemical Company's line of Epi-Rez waterborne resins and Epi-Cure® curing agents offer a variety of performance and compliance options for coatings. This non-HAP system is based on Epi-Rez 5525 and Epi-Cure 8295. These materials are designed as alternatives for Epi-Rez 5522-WY-55 and Epi-Cure 8290-Y-60 in high performance masonry and metal primer applications that require non-HAP formulations. Epi-Rex 5525 is a solid epoxy resin dispersion that is HAP-free and multifunctional, while Epi-Cure 8295 is a HAP-free solution of a water-reducible, high-molecular weight amine adduct.



Circle No. 66 on Reader Service Card

Anti-Graffiti Resin

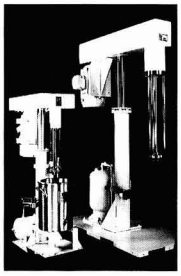
TEGO CHEMIE SERVICE

Tego Chemie Service offers Tego® LA 391, a modified two-pack polyurethane system with anti-graffiti resins as co-binders. This system reportedly allows for easy removal of graffiti by using simple cleaning methods. This modified hydroxy-functional siloxane is recommended for mat clearcoats and pigmented systems; it has a TSCA registration.

Circle No. 67 on Reader Service Card

PreMax Rotor/Stator Mixer

CHARLES ROSS & SON CO.



The new Ross PreMax offers processors a high-speed alternative for pre-mixing. The rotor/stator design (patent pending) draws solids into the high-shear zone. Dispersions routinely measure between 5 and 7 on the Hegman gauge, often eliminating one to two passes through a media mill.

Circle No. 68 on Reader Service Card

CHICAGO—JANUARY

"Fundamentals of Weathering"

Educational Committee Chair Susan DiSantis, of Fitz Chem Corp., reported that she has received several applications for the CSCT and Joint Education Committee Merit Scholarships and Grants-in-Aid.

It was announced that candidates for the Warren C. Ashley Outstanding Service Award are being sought.

Allen Zielnik, of Atlas Electric Devices Co., discussed "THE FUNDAMENTALS OF WEATHERING."

Mr. Zielnik focused on standard testing techniques, including various outdoor natural and accelerated exposure methods. In addition, he compared these and a variety of artificial laboratory procedures.

VIC WILLIS, *Publicity*

CHICAGO—FEBRUARY

"Wollastonite"

Educational Committee Chair Susan DiSantis, of Fitz Chem Corp., announced a call for Grant-in-Aid Scholarship candidates.

In addition, CSCT Past-President Marcy Nichols, of Tru-Serv, announced that recipients for the Warren C. Ashley Outstanding Service Award are being sought. The deadline for application submission is March 15.

The evening's technical presentation was delivered by Sara Robinson, of NYCO Minerals. She discussed "WOLLASTONITE."

Ms. Robinson spoke on wollastonite and the enhancement of film properties relative to moisture resistance and corrosion control. She stated that special milling achieves the correct particle size and blend of shapes plus surface treatment to facilitate wetting. Binders become synergistic in the final coating performance.

VIC WILLIS, *Publicity*

FSCT 50-YEAR MEMBERS

Gordon Schreiner *(Houston Society)*

John N. Hitchin *(Birmingham Club)*

CLEVELAND—JANUARY

Joint CSCT and CPCA Meeting

A moment of silence was observed for the passing of William Fisher, a past CSCT member.

President James Currie, of Jamestown Paint Co., announced that CSCT's Symposium "Waterborne Coatings: Sink or Swim II" is scheduled for April 22-24 at the Cleveland Airport Marriott.

Bob Purrier, of Harrison Paint, who will replace Bob Toth as the Society's representative to the Ohio Paint Council (OPC), discussed the OPC's background. He urged all those interested to attend the general membership meetings to promote the interests of the paint and coatings industries in Ohio and to monitor the actions of the legislators.

Camille E. Soriano, of the National Association of Chemical Distributors (NACD), spoke on "THE RESPONSIBLE DISTRIBUTION PROCESS."

Ms. Soriano discussed how RDP was developed, who the members of NACD are, their customers, and how RDP has raised the credibility and reputation of its members by their continuous efforts to improve performance in protecting health, safety, and the environment.

The speaker covered the nine facets of the Code of Management Practices and stated that these were areas where all members were required to have written policies. These areas include risk management, compliance training, carrier selection, handling and storage, job procedures, waste management, emergency response and public preparedness, community outreach, and product stewardship.

Ms. Soriano stated that since RDP was a continuous improvement process, the next logical phase for NACD would be implementation of an on-site verification program. This phase of RDP would guarantee that members were doing what their policies and procedures stated. NACD hopes to have a portion of this phase implemented by the second half of 1998.

The speaker stated that a large benefit of the RDP and the next phase On Site Verification, is the potential savings in insurance dollars to chemical distributors and the some 750,000 customers they serve.

PATRICIA WAGLE, *Secretary*

During the January meeting of the Baltimore Society, President Colin D. Crowley (left), of Chemcentral, was presented with the Hüls Gavel by Tom Mitchell, of Creanova, Inc.

Sue Free (left), of Sherwin-Williams, and Melinda Rutledge, of Rheox, attended the November meeting of the Golden Gate Society.

New members in attendance at the January meeting of the Chicago Society (from left): Karl Sheffer, Consultant; Greg Kunzik, Valspar; Inna Borozin, Coronado Paint; Diana Rieck, Finishes Unlimited; Jay Brandt, Sherwin-Williams; Michael Orzech, Neville Chemical; and James Faunce, Stephan Chemical.

1997-98 Society Officers

CDIC SOCIETY (from left): Vice President—John Imes, Society Representative—William Hollifield, President—Teresa Case, Treasurer—Joseph Schinner, Secretary—Brian Marzano

CHICAGO SOCIETY (from left, back row): Technical—Keith Moody, Membership—Thor Jondahl, Past-President—David Stromberg, Associate Member—Frank Leo, Society Representative—Evans Angelos. Front row: Secretary—Susan Simpson, Treasurer—Michael Beland, President—Gerry Noren, By-Laws—Natu Patel, and Vice-President—William Bellman

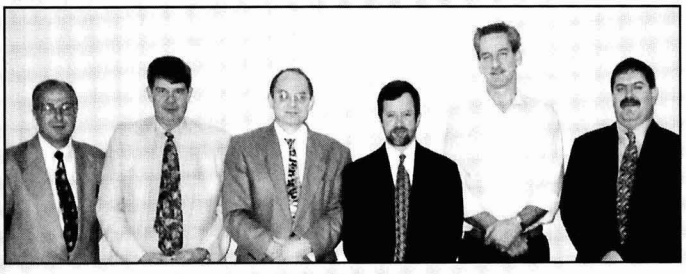
DETROIT SOCIETY (from left): Naomi Suss, Treasurer—Raymond S. Stewart, and President—Jan Spalding-Hammond

GOLDEN GATE (from left): Society Representative—Patricia Shaw, Vice President—Harold R. Harlan, III, President—Don Mazzone, Secretary—Timothy G. Specht, and Treasurer—Gene F. Arbatin

***LOS ANGELES SOCIETY** (from left): Philip Bremenstuhl, President—Sandra Dickinson, Society Representative—James Hall, Secretary—Darin Everhart, Treasurer—Joseph Reilly, Bud Jenkins, Vice President—Arthur Lorenz*

***MONTREAL SOCIETY** (seated, from left): Archivist—Robert Benoit, President—Jean Pierre Cote, Vice President—Paul-Emile Sequin, and Treasurer—Luc Pepin. Standing: Past- President—Ralph C. Weberbauer, Special Events Chair—Jean J. Brunet, Director—Sylvain Belisle, Technical Chair—Rene Decary, Educational Chair—Marc Gagnon, and Society Representative—Horace Philipp*

***NEW ENGLAND SOCIETY** (from left): Treasurer—Daniel F. Scanlon, Vice President—Richard Twomey, President—Gene C. Anderson,and Secretary—Gary J. Small*



***PIEDMONT SOCIETY** (from left): Society Representative—Gary Marshall, Vice-President—Clarence "Dutch" Hoffman, President—Alex Blahnik, Secretary—Randolph Cox, Treasurer—Charles D. Dean, and Past-President—Roy Modjewski*

FSCT Publications

Publication Title	Item #	Member Price	List Pr
ACS Style Guide: A Manual for Authors & Editors	ACS-SG1	$26.95	$26.9
Basics of Technical Communicating	ACS-TC1	$36.95	$36.9
Benchmarking: The Search for Industry Best Practices That Lead to Superior Performance	ASQC-BSPI	$34.95	$34.9
Coatings Encyclopedic Dictionary			
Hard Cover	TV1-H	$105.00	$135.0
Soft Cover	TV1-S	$80.00	$105.0
Fluid Mixing & Gas Dispersion in Agitated Paints	MH-FM1	$73.00	$73.0
Functional Index Series - 3 Titles			
1. Index of Solvents	GOW-SO1	$150.00	$150.0
2. Index of Anti-Microbials	GOW-AM1	$150.00	$150.0
3. Index of Flame Retardants	GOW-FR1	$150.00	$150.0
Glossary of Color Terms	TV3	$12.00	$20.0
Handbook of Paint & Coating Raw Materials			
2-Volume Set	GOW-RM1	$425.00	$425.0
CD-ROM	GOW-RMCD1	$495.00	$495.0
Industrial Surfactants Handbook	GOW-IS1	$450.00	$450.0
Infrared Spectroscopy Atlas for the Coatings Industry	TV2	$150.00	$200.0
The Internet: A Guide for Chemists	ACS-IG1	$25.95	$25.9
ISO 9000 Guidelines for the Chemical and Process Industries, 2nd Ed.	ASQC-ISOG2	$27.00	$27.0
ISO 9000 Implementation for Small Business	ASQC-ISOSB1	$38.00	$38.0
Let's Work Smarter, Not Harder: How To Engage Your Entire Organization in the Execution of Change	ASQC-WS1	$26.00	$26.0
Paint & Coatings Testing Manual	ASTM-QC1	$220.00	$220.0
Paint Problem Solver	PDCA-PS1	$70.00	$70.0
Painting and Decorating Craftsman's Manual	PDCA-PD1	$140.00	$140.0
Pictorial Standards of Coating Defects	PS-CPM	$100.00	$100.0
Principles and Practices of TQM	ASQC-TQM1	$28.00	$28.0
The Quality Audit Handbook	ASQC-QAH1	$45.00	$45.0
Remedies for Common Paint Problems	PDCA-RP1	$50.00	$50.0
SciQuest	SCIQUEST	$750.00	$800.0
SPC Essentials and Productivity Improvement	ASQC-MA1	$35.00	$35.0
TQM: A Step-by-Step Guide to Implementation	ASQC-TQMI1	$39.00	$39.0
Understanding Chemical Patents, 2nd Ed.	ACS-CP1	$31.95	$31.95
Writing the Laboratory Notebook	ACS-LN1	$26.95	$26.95
FSCT Series on Coatings Technology			
Full Series	FS	$405.00	$675.00
Adhesion Aspects of Polymeric Coatings	FS26	$15.00	$25.00
Aerospace and Aircraft Coatings	FS14	$15.00	$25.00
Application of Paints and Coatings	FS9	$15.00	$25.00
Automotive Coatings	FS7	$15.00	$25.00
Cationic Radiation Curing	FS16	$15.00	$25.00
Coating Film Defects, 2nd Ed.	FS8	$15.00	$25.00
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Introduction to Pigments	FS19	$15.00	$25.00
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Metal Surface Characteristics Affecting Organic Coatings	FS21	$15.00	$25.00
Methodologies for Predicting Service Lives	FS24	$15.00	$25.00
Organic Pigments, 2nd Ed.	FS10	$15.00	$25.00
Painting of Plastics	FS20	$15.00	$25.00
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Jesus Camacho, ANAFAPYT, Gabriel Mancera 309,
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LOUISVILLE—JANUARY

Past-President's Night

President Dan Fortney, of American Dispersions, Inc., presented Andy Traister, of Courtaulds Coatings, Inc., with a Past-President's Pin.

The following Louisville Society Past-Presidents were in attendance: Joe Bauer, of Porter Paint Co. (1969); Herb Wilson, of Reliance Universal (1975); Paul Nilles, of Hy-Klas Paints (1976); Kirk Menefee, of Hy-Klas Paints (1981); John Lanning, of Porter Paint Co. (1984); Larry Pitchford, of Reynolds Metals (1989); Tim Fortney, of American Dispersions, Inc. (1994); Bill Leightner, of C.L. McGuire (1996); and Andy Traister (1997).

President Fortney recognized the members involved in the Society's paper that was entered in the APJ/Voss Award Competition. The following were recognized: Ilona Duvall, of Red Spot Paint & Varnish; Bill Leightner, of C.L. McGuire Co.; Jim Flanagan, of C.L Zimmerman Co.; Richard Melton; Abel Gaspar-Rosas, of Paar Physica; Rich Powell, of Argus Co., Inc.; Chris Lockhart, of American Dispersions, Inc.; Ron Prebys, of Color Corp. of America; Kyle Jones, of Red Spot Paint and Varnish; and James Riedenour.

Educational Committee Chair Bill Leightner reported that approximately 12 applications have been received for the Education Grant. Mr. Leightner thanked Courtaulds Coatings for donating $500 toward the grant.

In addition, Mr. Leightner announced that science fair judges are being sought.

CAROL WINSLOW-RAPP, *Secretary*

MONTREAL—FEBRUARY

"The Internet"

The evening's presentation was "INTERNET: MORE THAN E-MAIL! DO YOU REALLY KNOW INTERNET?

The speaker gave a chronological history of the development of the Internet beginning in 1969 at the Department of Advanced Research Agency. In 1997, it was reported that 72 million users were now on board.

The speaker also highlighted terminology, including acronyms. Details on accessing to intranet and extranet were also discussed.

HORACE PHILIPP, *Society Representative*

Constituent Society Meetings and Secretaries

BALTIMORE (Third Thursday—Martin's West, Baltimore, MD). STEPHANIE ROTHENBERG, Thomley Co., 1500 E. Newport Pike, Ste. 204, Wilmington, DE 19804.

BIRMINGHAM (First Thursday—Strathallan Hotel, Birmingham, England). GRAHAME W. FOWKES, Technivelopments Co., 14 Wells Close, Chippenham, Wilts. SN14 0QD, England.

CDIC (Second Monday—Location alternates between Cincinnati, Columbus, Dayton, and Indianapolis). BRIAN P. MARZANO, Sun Chemical Corp., 5020 Spring Grove Ave., Cincinnati, OH 45232.

CHICAGO (First Monday—The Ambassador Restaurant, Elmhurst, IL). SUSAN A. SIMPSON, Chemcept Services, 2 South 902 Heritage Glen Ct., Batavia, IL 60510-5100.

CLEVELAND (Third Tuesday—Monthly meeting site to TBA). PATRICIA WAGLE, The Flood Co., 1212 Barlow Rd., Hudson, OH 44236.

DALLAS (Second Thursday following first Wednesday—Dallas Medallion Hotel, Dallas, TX). JOSEPH HILBUN, The Sherwin-Williams Co., 2802 W. Miller Rd., Garland, TX 75041.

DETROIT (Second Tuesday—meeting sites vary). NAOMI SUSS, PPG Industries, Inc., 5875 New King Ct., P.O. Box 3510, Troy, MI 48007.

GOLDEN GATE (Monday before third Wednesday—alternates between Francesco's in Oakland, CA, and Bertolucci's in S. San Franscisco, CA). TIMOTHY G. SPECHT, Flecto Co., 1000 45th St., Oakland, CA 94608.

HOUSTON (Second Wednesday—Medallion Hotel, Houston, TX). STEVEN RAGSDALE, Intercoastal Paint, P.O. Box 38114-433, Houston, TX 77238.

KANSAS CITY (Second Thursday—Cascone's Restaurant, Kansas City, MO). THOMAS HILTON, Weskem-Hall, Inc. 1424 Atlantic Ave., N. Kansas City, MO 64116.

LOS ANGELES (Second Wednesday—Maggie's Pub, Santa Fe Springs, CA). DARIN EVERHART, Behr Process Corp., 3400 W. Barry St., Santa Ana, CA 92704.

LOUISVILLE (Third Wednesday—Executive West Motor Hotel, Louisville, KY). CAROL WINSLOW RAPP, Dar-Tech, Inc., 101 Glenmill Rd., New Albany, IN 47150.

MEXICO (Every fifteen days—Gabriel Mancera, Mexico City, Mexico). MANUEL MAESTRO NAVARRO, DuPont, S.A. de C.V., Km. 9.5 Via Dr. Gustavo Baz, Col. Barrientos, 54110 Tlalnepantla, Edo de Mexico, Mexico.

MONTREAL (First Wednesday— Restaurant Le Bifthèque, St. Laurent, Quebec). ROBERT BENOIT, Kronos Canada Inc., 3390 Marie Victorin, Varennes, Que., J3X 1T4 Canada.

NEW ENGLAND (Third Thursday—Best Western TLC, Waltham, MA). GARY SMALL, Zeneca Resins, 730 Main St., Wilmington, MA 01887-3366.

NEW YORK (Second Tuesday—Landmark II, East Rutherford, NJ). E. ROBERT CARDIN, Rohm and Haas Co., 16 Meadowview Dr., Colts Neck, NJ 07722.

NORTHWESTERN (Second Tuesday—Jax Cafe, Minneapolis, MN). ROBIN L. NORCUTT, George C. Brandt, Inc., 2975 Long Lake Rd., St. Paul, MN 55113.

PACIFIC NORTHWEST (PORTLAND SECTION—Tuesday before third Wednesday—Saylors Old Country Kitchen; SEATTLE SECTION—Third Wednesday—All City Diner; VANCOUVER SECTION—Thursday after third Wednesday—Abercorn Inn, Richmond, B.C.). KELVIN HUGET, Imasco Minerals, Inc., 19287 98A Ave., Surrey, B.C. V4N 4C8, Canada.

PHILADELPHIA (Second Thursday—Doubletree Guest Suites, Plymouth Meeting, PA). NEIL R. SHEARER, Andek Corp., P.O. Box 392, Moorestown, NJ 08057.

PIEDMONT (Third Wednesday—Woman's Club of High Point, High Point, NC). RANDOLPH G. COX, Akzo Nobel Coatings Inc., 1431 Progress St., P.O. Box 2124, High Point, NC 27261.

PITTSBURGH (Second Monday—Montemurro's Restaurant, Sharpsburg, PA). JOHN GILLEN, J.M. Gillen Co./Van Horn, Metz & Co., 681 Millers Run Rd., P.O. Box 428, Cuddy, PA 15031.

ROCKY MOUNTAIN (Monday following first Wednesday—DelMonico Hall, Denver, CO). GEORGETTE SIPARSKY, TDA Research, 12345 W. 52nd Ave., Wheat Ridge, CO 80033.

ST. LOUIS (Third Tuesday—The Salad Bowl Restaurant, St. Louis, MO). NICHOLAS HALL, U.S. Paint Corp., 831 S. 21st St., St. Louis, MO 63103.

SOUTHERN (GULF COAST SECTION—third Tuesday; 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). DALE KENKNIGHT, Akzo Nobel Coatings Inc., 6369 Old Peachtree Rd., Norcross, GA 30071-1780.

TORONTO (Second Monday—Speranza Restaurant & Banquet Hall Convention Centre, Brampton, Ont., Canada). FRANS GROOTVELD, Ciba Pigments, 6860 Century Ave., Mississauga, Ont., L5N 5N3, Canada.

Western New York—Marko Markoff, 182 Farmingdale Rd., Cheektowaga, NY 14225.

Baltimore

(Apr. 16)—"Organic Silicone Paint Additives"—Kimberly Kucinski, Dow Corning Corp.
(May 21)—Manufacturing—Speaker to be Announced.

Birmingham

(Apr. 3)—"Powder Coating Resins"—Garry Kubera, McWhorter
(Apr. 19)—Ladies Night Dinner and Dance.
(May 1)—68th Annual General Meeting.

Chicago

(Apr. 6)—"A Comparison of Waterborne Epoxy and Solvent Epoxy Systems"—Jim Aloye, Henkel Crop.; and "Formulating Waterborne Epoxies"—Ernie Galgoci, Shell Chemical Co.
(May 8)—Annual Awards Banquet.

Cleveland

(Apr. 21)—"Water Reducible Resins and Their Application in Industrial Systems"—Rikki Gogna, Schenectady Chemicals Canada.
(May 19)—"Colorful Art Painting"—Kenneth Be, Cleveland Museum of Art.

Golden Gate

(Apr. 13)—"Comparative Mills—How They Work, Who Should Use Them"—Mark Drunkenbrod, CB Mills.
(May 18)—"Performance Enhancements Through Control of Special Inter-Pigment Phenomena"—Edward Orr, BYK-Chemie.

Kansas City

(Apr. 9)—"Interaction of Associative Thickeners with Surfactants in Latex Paints"—Harold Haag, Aqualon.
(May 14)—Education Night.
(June 5-6)—Joint Meeting with St. Louis Society. Holiday Inn, Lake of the Ozarks, MO.

Los Angeles

(Apr. 8)—"Comparative Mills—How They Work, Who Should Use Them"—Mark Drunkenbrod, CB Mills.
(May 13)—"Performance Enhancements Through Control of Special Inter-Pigment Phenomena"—Edward Orr, BYK-Chemie.

Montreal

(May 6)—"Post-Consumer Paint: Status on Proposed Legislation"—CPCA.

Phoenix

(May 12)—"Performance Enhancements Through Control of Special Inter-Pigment Phenomena"—Edward Orr, BYK-Chemie.

Pacific Northwest

Portland Section

(Apr. 14)—"Comparative Mills—How They Work, Who Should Use Them"—Mark Drunkenbrod, CB Mills.
(May 19)—"Performance Enhancements Through Control of Special Inter-Pigment Phenomena"—Edward Orr, BYK-Chemie.

Seattle Section

(Apr. 15)—"Comparative Mills—How They Work, Who Should Use Them"—Mark Drunkenbrod, CB Mills.
(May 20)—"Performance Enhancements Through Control of Special Inter-Pigment Phenomena"—Edward Orr, BYK-Chemie.

Vancouver Section

(Apr. 16)—"Comparative Mills—How They Work, Who Should Use Them"—Mark Drunkenbrod, CB Mills.
(May 21)—"Performance Enhancements Through Control of Special Inter-Pigment Phenomena"—Edward Orr, BYK-Chemie.

Rocky Mountain

(Apr. 6)—"Comparative Mills—How They Work, Who Should Use Them"—Mark Drunkenbrod, CB Mills.
(May 11)—"Performance Enhancements Through Control of Special Inter-Pigment Phenomena"—Edward Orr, BYK-Chemie.

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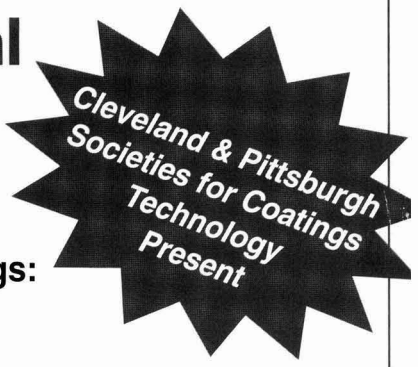
(June 5-6)—Joint Meeting of the St. Louis and Kansas City Societies. Lake of the Ozarks, MO. (Randy Ehmer, 500 Railroad Ave., N. Kansas City, MO 64116; (816) 842-3014).

41st Annual Technical Symposium



April 22, 1998—Manufacturing Day
April 23 & 24, 1998—Waterborne Coatings: Sink or Swim II

Cleveland Airport Marriott
Cleveland, OH

Registration Application

Please Print (for badge)

Name_____

Company_____

Address_____

City_____ State/Province _____ Postal Code_____

Phone Number _____ Fax_____

Registration Fees

Please check the programs you wish to attend.

Manufacturing Day (April 22, 1998) ..... $65.00 _____
Registration includes dinner ($75.00 after March 10th)

Please check one of the following dinner choices ❑ Chicken Mardi Gras ❑ Seaside Ravioli

Waterborne Coatings: Sink or Swim II (April 23 & 24, 1998) ..... $150.00 _____
Registration is limited to 200. ($190.00 after March 10th)
Registration includes two lunches, breaks, reception, and bound copy of the talks (including alternates).

Please check one of the following lunch choices:

Day one: ❑ Carved Roast Top Round of Beef ❑ Vegetarian Lasagna

Day two: ❑ Chicken Teriyaki ❑ Vegetarian Tortellini

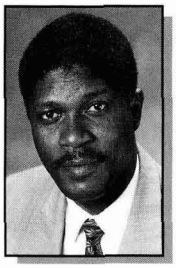
Both Symposia ..... $200.00 _____
($250.00 after March 10th)

Total amount due $ _____

Make checks payable (in U.S. funds) to: **Cleveland Society for Coatings Technology**

Send registrations to: Jim Miller, Jim Miller & Associates, 3057 Kent Rd., Silver Lake Village, Stow, OH 44224-3850

Host Hotel: Cleveland Airport Marriott, 4277 W. 150th St., Cleveland, OH 44135; (216) 252-5333. Please make reservations directly and ask for the CSCT rate of $88.00. Complimentary airport transportation is available 24 hours.



P. Forbes

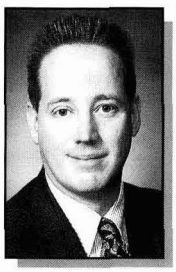
Former plant manager of Hüls Colorants plant in Brampton, Ontario, **Probyn Forbes**, has been named Plant Manager for Creanova Inc.'s new colorants plant in Lockland, OH. In this position, Mr. Forbes will be responsible for the startup and operations of the new facility. Mr. Forbes is a member of the CDIC Society.

The E.W. Kaufmann Co., Southampton, PA, has appointed **Wallace Berry** to their New England sales force. Mr. Berry's territory will include Maine, Massachusetts, New Hampshire, Vermont, Rhode Island, and part of Connecticut. Mr. Berry is a member of the New England Society.

Engelhard Corp., Iselin, NJ, has named **George Wattman** the Director of Marketing—Specialty Pigments and Performance Additives. Mr. Wattman will lead cross-functional, market segment teams in developing and implementing global business plans for such industries as automotive, cosmetics, coatings, inks, rubber, and plastics. His focus in managing the growth of various pigment and additive areas includes: color pigments and dispersions; pearlescent pigments; specialty films; kaolin-, attapulgite- and mica-based products; and acquisition development.

Gerald G. Nadig, President and CEO, has been elected Chairman of the Board of Directors of Material Sciences Corp., Elk Grove Village, IL. Mr. Nadig succeeds **G. Robert Evans**, who retired.

Micro Powders, Inc., Tarrytown, NY, has named **John McAllister** as Regional Sales Manager. Based in Ohio, Mr. McAllister will oversee the sales efforts of a network of agents and distributors in the Midwest, Southwest, Southeast, and parts of the Mid-Atlantic region. Mr. McAllister is a member of the CDIC Society. He will report to **Warren Pushaw**, Vice President and General Manager.



J. McAllister

Gissoo Kazemi has been appointed Marketing Manager within the Rubber Chemicals and Pigments Division of Degussa Corp., Ridgefield Park, NJ. Ms. Kazemi will be responsible for market development of the company's line of carbon blacks, silicas, and silanes to the mechanical rubber goods market. As Marketing Manager, she will also be charged with product management responsibilities for carbon black.

John Keegan has been appointed Manager of International Business Development for Convenience Products, Fenton, MO. Mr. Keegan's responsibilities will include the continued development of the company's polyurethane foam insulation products internationally for both the consumer and industrial industries, as well as locating distributors and sales representatives overseas.

C. Blanton

Crissy Blanton has accepted a promotion as Sales Representative for Radcure's southeast region for UCB Chemicals Corp., Smyrna, GA. The position's territory includes Georgia, Florida, Alabama, East Tennessee, and Mississippi. Ms. Blanton will report to **Bill Cox**, Sales Manager of the eastern region.

Jack Hartnagel has accepted the position of Regional Sales Manager in the Nemo® Progressing Cavity Pump Division of Netzsch Inc., Exton, PA. Based in Manchester, MO, Mr. Hartnagel will be responsible for the north central portion of the U.S.

The newly appointed Director of Marketing for Industrial Chemicals of Albright & Wilson Americas, Richmond, VA, is **Mike Hamlin**. Mr. Hamlin will be responsible for industrial products in North America.

Steven J. Demetriou has been named Vice President and General Manager of Global Coating and Resin Products business at Cytec Industries Inc., West Paterson, NJ. He will report to **David Lilley**, President and Chief Operating Officer. Mr. Demetriou was formerly Vice President of Global Adhesive Polymers business at Exxon Chemical Co.

David K. Denner has been promoted to Executive Vice President of Manufacturing Operations for ANGUS Chemical Co., Buffalo Grove, IL. Mr. Denner will be responsible for overseeing all aspects of operating the company's plants in Sterlington, Louisiana and Ibbenburen, Germany. In addition, he will also be responsible for the implementation of a new company-wide information system.

In other news, ANGUS has promoted **Janet E. Mann** to Executive Vice President of Commercial Operations. Ms. Mann will have worldwide responsibility for sales, marketing, research, and development in efforts to increase growth through geographic expansion, market development, and the introduction of new products.

U.S. Filter, Palm Desert, CA, has promoted six senior executives to head product groups. **Nicholas C. Memmo** has been named President/Chief Operating Officer of the Domestic Process Water/Consumer Water Group. **Andrew D. Seidel** will serve as President/Chief Operating Officer of the Domestic Wastewater Group. **Harry K. Hornish, Jr.** will become President/Chief Operating Officer of the WaterWorks Distribution Group. **Thierry Reyners** will serve as President/Chief Operating Officer of the European Water and Wastewater Group. **Andrew Denver** has been named President/Chief Operating Officer of the newly formed Filtration/Separation Group, and **David J. Shimmon** will become President/Chief Operating Officer of the Industrial Products and Services Group. These six will report to **Richard J. Heckmann**, Chairman, President and CEO of U.S. Filter.

International Specialty Products, Wayne, NJ, has promoted **Peggy Dorrance Bennett** to Director of Sales, Industrial Performance Chemicals, for the Americas region. This region includes North, Central, and South America.

Books/ Publications

Title 29 Regulation Guide

Labelmaster is offering an edition of the 1997 CFR Title 29. All of the new regulations are in OSHA's new Performance Oriented Language. The two volume set is spiral bound, and covers OSHA's general industry safety.

Circle No. 30 on Reader Service Card

Oligomer Technology Resource

Marcel Dekker, Inc. has published *Oligomer Technology and Applications*. This resource details laboratory and industrial synthesis and applications of oligomers. This 536-page book offers solutions to on-the-job problems and contains over 1,450 references, tables, and equations.

Circle No. 31 on Reader Service Card

Corrosion Catalog

NACE International has released its 1998 Products Guide. This publication features 23 new corrosion reference books, seven new technical standards, and 14 new software programs among more than 1,000 related products for corrosion control and prevention.

Circle No. 32 on Reader Service Card

ANGUS Product Guide

ANGUS Chemical Co. has published the "Guide to Product Literature" which compiles the company's technical references into one source. The guide contains a summary of 47 technical bulletins and monographs describing physical properties of, and applications for, ANGUS' products in the paint and coatings industry.

Circle No. 33 on Reader Service Card

Filtration Textbook

Filtration Technology 2nd Edition, a 250-page, 12 chapter, illustrated textbook is available from Parker Hannifin. This publication highlights components encountered in a typical filtration system. It is designed to serve as an introduction and reference guide to both beginners and experienced filtration students.

Circle No. 34 on Reader Service Card

Vacuum Processing

Charles Ross & Son Co. has released a new issue of the "Ross Technology Report," in which hands-on articles discuss applications and techniques in vacuum mixing, blending, and drying. In this issue vacuum design considerations are examined in two case histories.

Circle No. 35 on Reader Service Card

Ceramics

Nine new books on ceramics are being offered. The books contain topics such as sol-gel processing, innovative processing, and synthesis of ceramics, glasses and composites, environmental issues and waste management technologies, and recent advances in the processing of ceramic superconductors. Contact the American Ceramic Society to obtain a catalog.

Circle No. 36 on Reader Service Card

Packaging Guide

The *Rauch Guide to the U.S. Packaging Industry* provides market facts and figures

on the packaging industry in an organized format and serves as a ready-reference for top executives as well as the industry newcomer. Published by Impact Marketing Consultants, Inc., this guide is 324 pages and focuses on market size, industry forecasts, historical data, market share, and competitive information.

Circle No. 37 on Reader Service Card

Plastics Reference

Metallized Plastics Fundamentals and Applications is a comprehensive reference includes developments such as metallization techniques for plastic substrates, and theoretical studies of metal/polymer interfaces. The guide is 392 pages, illustrated, and available through Marcel Dekker, Inc.

Circle No. 38 on Reader Service Card

EGBE

The Ethylene Glycol Ethers Panel of the Chemical Manufacturers Association is offering a four-color, nine-page publication, *EGBE-A World of Solutions*. The publication describes EGBE's (ethylene glycol butyl ether) cleaning capabilities and summarizes ongoing voluntary scientific research.

Circle No. 39 on Reader Service Card

Paint Industry Report

Information Research Limited has published a report entitled *A Profile of the Paint Industry of the Americas, 2nd Edition*. The report reviews the structure of each of the national paint markets with discussions of long-term trends and predictions for each region. A directory of 300 paint producers covering 31 countries is included within its 203 pages, 83 tables, and nine figures.

Circle No. 40 on Reader Service Card

Laboratory Apparatus

Reflectance Accessory

The Thunderdome is a single reflection accessory for FT-IR spectrometers that utilizes a spherical ATR crystal that provides "point-to-point" contact for analyzing hard, rigid, difficult to analyze samples by reportedly producing a 2X reduction in the beam diameter. It is available through Spectra-Tech Inc.

Circle No. 41 on Reader Service Card

Slip/Peel Tester

The SP-2000 slip/peel tester is a microprocessor-based instrument for measuring peel strength of pressure sensitive adhesives. Manufactured by IMASS, the instrument is available in a choice of units: grams, ounces, pounds, or Newtons; and a choice of speeds: inches per minute, millimeters per second, and centimeters per minute. The tester can also be linked to a PC through Windolink software.

Circle No. 42 on Reader Service Card

Diameter Gage

The Benchmike 283, available through Beta LaserMike, measures the diameter of a variety of round products including medical tubing, glass rods, hose, wire, cable, and plastic pipe. The Benchmike features touch screen interface with Windows™-style menus. Three kinds of V-blocks, a universal slide, and rotating chuck fixtures are also available.

Circle No. 43 on Reader Service Card

Opacity Meter

The Rhopoint Instrumentation Ltd. Novo-Pac measures how effectively a paint or coating will cover, or hide, the surface to which it is applied. Its design allows the user to place a sample of a material on a test substrate while a 45/0 reflectometer makes reflectance measurements which calculate the hiding power.

Circle No. 44 on Reader Service Card

Coating Thickness Gage

The PosiTector 6000-FA coating thickness gage for measuring non-magnetic coatings is now available through DeFelsko Corp. The gage has a 0-10 mil measuring range with 0.01 mil increments in the 0-4 mil range. The PosiTector 6000-FA is available in either standard or memory versions, and fits in one hand.

Circle No. 45 on Reader Service Card

Storage Boxes

Thomas Scientific is offering TrippNT's storage boxes for pipets, thermometers, glass capillary viscometers, and HPLC columns. They are available in two sizes with or without a hinged, clear acrylic lid. The boxes can also be used as drawer liners.

Circle No. 46 on Reader Service Card

Viscosity Sensor

Norcross Corp. announces the introduction of its new Model M-50 In-line Viscosity Sensor. The sensor utilizes a piston and cylinder structure for low flow, viscosity, and pressure in-line applications. It can also be mounted directly in the pipe line.

Circle No. 47 on Reader Service Card

Raw Materials

UV-Curable Lacquer

Sony Chemicals Corporation of America is offering a transparent UV-curable, acrylic-based lacquer of optical media applications. The SK3200 lacquer reportedly provides resistance to high heat and humidity to insure lifetime preservation of the information layer.

Circle No. 48 on Reader Service Card

Silicone Treatment

Wacker Silicones' water and oil repellent BS 29A is a VOC-compliant emulsion of silane, siloxane, and fluoroploymer used to repel water and oil. This repellent emulsion can be used on mineral substrates, concrete, natural stone, and unglazed ceramic tile to reduce cracking, spalling, freeze/thaw damage, chemical degradation, biological growth, efflorescence, and dirt pickup.

Circle No. 49 on Reader Service Card

Flatting Agent

Syloid® C series of silica gel flatting agents for wood, metal, and leather coatings has been introduced by Grace Davison. The series includes nine products which are designed to offer increased pore volume, tighter particle size distribution, improved gel strength, and enhanced purity levels.

Circle No. 50 on Reader Service Card

Flow and Leveling Additive

The Lubrizol Corp. introduces a new flow and leveling additive. Lanco™-Flow P10 is a flow modifier absorbed onto a silica carrier that provides the powder coatings manufacturer with an easy to handle dry additive. It reportedly improves flow and leveling of the coating during the curing process, and minimizes cratering, fisheyes and orange peel in thermoset powder coatings.

Circle No. 51 on Reader Service Card

Photoinitiator

The Additives Division of Ciba Specialty Chemicals has developed a photo-initiator based on bisacyl phosphine oxide (BAPO) technology. Irgacure®819 offers radiation curing properties with a photobleaching effect that prevents yellowing in substrates.

Circle No. 52 on Reader Service Card

Bonding Primer

Sherwin-Williams Chemical Coatings Group has introduced the Kem Aqua®

Bonding Primer for plastic. The single component, low VOC (1.5 lb/gal) acrylic primer is designed to form a strong bond to a variety of structural foam plastics. It is reportedly lead and chromate free, has a low odor, has no flash point, is fast drying, and may be air- or force-dry cured.

Circle No. 53 on Reader Service Card

Chemical Resistant Emulsion

A chemical-resistant waterborne acrylic emulsion for wood, plastic, and concrete surfaces is now available from SC Johnson Polymer. SCX-1970™ is a one-pack, non-formaldehyde system that offers resistance to a variety of common household chemicals used in schools, offices, and homes.

Circle No. 54 on Reader Service Card

Polyester Polyol

Stepan Co. has announced their new polyester polyol, Stepanpol® PN-110. This ortho phthalate/neopentyl glycol based polyol offers hydrolytic stability for urethane-based coatings, adhesives, sealants, and elastomers. It can also be used in the synthesis of waterborne polyurethane dispersions, urethane acrylate oligomers, and urethane hot melt adhesives.

Circle No. 55 on Reader Service Card

Misc. Miscellaneous

Blackening Process

A new patented part finishing process is available from Birchwood Casey. The Color Safe® process reportedly produces a deep black finish for use on all non-stainless steel ferrous alloys including cast iron and tool steels. It can also serve as direct replacement for the conventional hot oxide finish.

Circle No. 56 on Reader Service Card

Packaging Press

The Rotopak 3000-3R gravure press from Valmet Rotomec packages webs from 20 to 47 in., roll to 33 in. in diameter, and light films to 11-point board at speeds to 800 ft/min. The compact machine is available with integrated electric, pneumatic, and water components.

Circle No. 57 on Reader Service Card

Leak Detector

Veeco Instruments Inc. introduces the MS-50 Argon console leak detector for applications that are too permeable for helium. The detector has automatic calibration check, 50 programmable test recipes, and an internal temperature compensated Argon calibrated leak standard traceable to NIST.

Circle No. 58 on Reader Service Card

Finishing System

The Aviator™ Electrostatic spray gun system is available from ITW Ransburg for finishing large vehicles such as buses, tractor trailers, fleet trucks, and aircraft. It is reportedly lightweight and maneuverable with no moving parts. This product's features include a control unit, low voltage cable, and a Ransburg hand-held electrostatic spray gun.

Circle No. 59 on Reader Service Card

Rust Removal Agent

BetzDearborn's Ferroquest® is a noncorrosive rust removal agent designed to clean systems on-line. This non-acid product removes deposits while protecting system metallurgy.

Circle No. 60 on Reader Service Card

Calendar of Events

Federation Meetings

For information on FSCT meetings, contact Federation of Societies for Coatings Technology, 492 Norristown Rd., Blue Bell, PA 19422 (610) 940-0777, FAX: (610) 940-0292. Web site: http://www.coatingstech.org

1998

(Apr. 15-17)—ICE Latinoamerica '98. Miami Beach Convention Center, Miami, FL.

(April 25-26)—FSCT Spring Board of Directors Meeting. April 25—Executive Committee Meeting; April 26—Board Meeting. Renaissance Cleveland Hotel, Cleveland, OH.

(May 14-15)—FSCT Incoming Society Officers Meeting. May 14—FSCT Headquarters Visit; May 15—Meeting, Park Ridge Hotel and Conference Center, King of Prussia, PA.

(July 23-24)—Pan-American Coatings Expo. World Trade Center, Mexico City, Mexico.

(Oct. 14-16)—ICE '98—FSCT Annual Meeting and International Coatings Expo and Technology Conference. Ernest N. Morial Convention Center, New Orleans, LA.

1999

(Oct. 20-22)—ICE '99—FSCT Annual Meeting and International Coatings Expo and Technology Conference. Dallas Convention Center, Dallas, TX.

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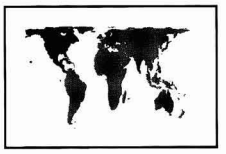
1999

(Feb. 16-18)—24th Biennial Western Coatings Societies' Symposium and Show. Sponsored by the Golden Gate, Los Angeles, Pacific Northwest, and Rocky Mountain Societies. John Ascuaga's Nugget, Sparks, NV.

(April 13-16)—Southern Society Annual Meeting. Hyatt Regency Hotel, Savannah, GA. (Dale Kenknight, Akzo Nobel Coatings, Inc., 6369 Old Peachtree Rd., Norcross, GA 30071-1780).

Other Organizations



1998—North America

(Mar. 16-17)—"Understanding Microbial and Chemical Contaminants in Buildings." Seminar sponsored by Air Quality Sciences, Inc. Atlanta, GA. (Pam Lackey, Air Quality Sciences, Inc., 1337 Capital Circle, Atlanta, GA 30067).

(Mar. 17)—Kansas City Society's Technical Symposium. Harrah's Hotel and Conference Center, North Kansas City, MO. (Yasmin Sayed-Sweet, CCP, P.O. Box 419389, Kansas City, MO 64141-6389; (816) 391-6190; or Dave Hazlett, Tnemec Co., Inc., 123 W. 23rd Ave., North Kansas City, MO 64116; (816) 474-3400.

(Mar. 22-25)—Spring Convention. Sponsored by The Adhesive and Sealant Council, Inc. Buena Vista Palace, Orlando, FL. (The Adhesive and Sealant Council, Inc., 1627 K St., N.W., Ste. 1000, Washington, D.C. 20006).

(Mar. 22-26)—NPCA Spring Meeting and Architectural and Industrial Coatings Committee Meeting. Sponsored by the National Paint and Coatings Association (NPCA). Boca Raton Resort & Club, Boca Raton, FL. (Dorothy Brawner, NPCA, 1500 Rhode Island Ave., Washington, D.C. 20005-5597).

(Mar. 22-27)—"Corrosion/98." Sponsored by NACE International. San Diego Convention Center, San Diego, CA. (NACE International, P.O. Box 218340, Houston, TX 77218-8340).

(Mar. 23-27)—"Basic Composition of Coatings." Short course sponsored by University of Missouri-Rolla (UMR), Rolla, MO. (UMR Coatings Institute, 236 Schrenk Hall, 1870 Miner Circle, Rolla, MO 65409).

(Mar. 23-27)—19th Annual Equipment Exhibition. Sponsored by the Northern California Chapter of the American Vacuum Society. San Jose, CA. (Margaret Stringer, AVS, 120 Wall St., 32nd Floor, New York, NY 10005).

(Mar. 24-26)—"Silicones in Coatings II." Sponsored by The Paint Research Association. Disney World Village, Orlando, FL. (Dip Dasgupta, Paint Research Association, 8 Waldegrave Rd., Teddington, Middlesex TW11 8LD United Kingdom).

(Mar. 25-27)—"New Nuts and Bolts to Keep Your Brushes Rolling." 55th Southwestern Paint Convention. Del Lago Resort and Convention Center, Conroe, TX. (Eric Stoeber, c/o Ribelin Sales Inc., 7786 Blankenship Dr., Houston, TX 77055; (713) 688-7722).

(Mar. 30-Apr. 1)—Southern Society Annual Meeting. Marriott Grand Hotel, Point Clear, AL.

(Mar. 31-Apr. 1)—Hazardous Materials Training Seminar. Sponsored by the National Paint and Coatings Association (NPCA). Chicago, IL. (Dorothy Brawner, NPCA, 1500 Rhode Island Ave., N.W., Washington, D.C. 20005-5597).

(Apr. 14-17)—"Introduction to Coatings Technology." Short course sponsored by Kent State University. Kent, OH. (Carl J. Knauss, Director, Professional Development Institute, P.O. Box 1792, Kent, OH 44240).

(April 15)—"Spectrum of Coatings." Symposium sponsored by the Louisville Society. Executive West Hotel, Louisville, KY. (Ilona Nemes-Duvall, Red Spot Paint and Varnish, 1107 E. Louisiana St., 47711; (812) 467-2337).

(Apr. 18-19)—"Water Problems in Building Exterior Walls: Evaluation, Prevention, and Repair." Symposium sponsored by the American Society for Testing and Materials (ASTM) Committee E-6. Atlanta

Hilton and Towers, Atlanta, GA. (ASTM, 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959).

(Apr. 18-23)—"Vacuum Coating Manufacturing and Technology Issues." 41st Technical Conference. Sponsored by the Society of Vacuum Coaters. The Westin Hotel, Copley Place, Boston, MA. (Society of Vacuum Coaters, 440 Live Oak Loop, Albuquerque, NM 87122).

(Apr. 19-22)—RadTech '98 North America Conference. Sponsored by RadTech International North America. Hyatt Regency, Chicago, IL. (RadTech International North America, 60 Revere Dr., Ste. 500, Northbrook, IL 60062).

(Apr. 20-22)—ASTM Committee B-8 on Metallic and Inorganic Coatings. Sponsored by the American Society for Testing and Materials. West Conshohocken, PA. (ASTM, 100 Barr Harbor Dr., West Conshohocken, PA 19428.

(Apr. 20-24)—"Applied Rheology for Industrial Chemists." Short course sponsored by Kent State University. Kent, OH. (Carl J. Knauss, Director, Professional Development Institute, P.O. Box 1792, Kent, OH 44240).

(Apr. 20-24)—"Introduction to Paint Formulation." Short course sponsored by University of Missouri-Rolla (UMR), Rolla, MO. (UMR Coatings Institute, 1870 Miner Circle, Rolla, MO 65409).

(April 21)—"Innovative Coatings: Practical Solutions for Global Demands." 23rd Annual FOCUS Conference sponsored by the Detroit Society. Michigan State University Management Education Center, Troy, MI. (Rosemary Brady, Akzo Nobel Coatings Inc., P.O. Box 7062, Troy, MI 48007-7062).

(Apr. 21-24)—"Coverings." Exhibition organized by TSI, Inc. Orange County Convention Center, Orlando, FL. (TSI, Inc., 900 E. Indiantown Rd., Ste. 207, Jupiter, FL 33477).

(Apr. 22)—"Manufacturing Symposium." Co-sponsored by the Cleveland Society for Coatings Technology and the Pittsburgh Society for Coatings Technology. (James Currie, Jamestown Paint Co., 108 Main St., P.O. Box 157, Jamestown, PA 16134; 412-932-3101).

(Apr. 23-24)—"Waterborne Coatings: Sink or Swim II." 41st Annual Technical Symposium. Co-sponsored by the Cleveland Society for Coatings Technology and the Pittsburgh Society for Coatings Technology. (Vicki Fisher, Jamestown Paint Co., 108 Main St., P.O. Box 157, Jamestown, PA 16134; 412-932-3101).

(Apr. 27-29)—"Making Life Easier for the Epoxy Formulator—Technical Solutions." Conference sponsored The Society of the Plastics Industry Inc.'s Epoxy Resin Formulators Division. The Ritz-Carlton Kempinski, Montreal, Canada. (Tina Kierzek, SPI Epoxy Resin Formulators Div., Ste. 600K, 1801 K St., N.W., Washington, D.C. 20006-1301).

(Apr. 28-29)—44th Annual Technical Meeting of the Institute of Environmental Sciences and Technology. Phoenix Civic Plaza, Phoenix, AZ. (Institute of Environmental Sciences and Technology, 940 East Northwest Hwy., Mount Prospect, IL 60056-3422).

(Apr. 28-29)—Hazardous Materials Training Seminar. Sponsored by the National Paint and Coatings Association (NPCA). Baltimore, MD. (Dorothy Brawner, NPCA, 1500 Rhode Island Ave., Washington, D.C. 20005-5597).

(May 1-2)—51st Annual Technical Symposium. Sponsored by the Pacific Northwest Society for Coatings Technology. Doubletree Inn at the Quay, Vancouver, WA. (Debra Severson, Miller Paint Co., 12730 NE Whitaker Way, Portland, OR 97230; 503-255-0190).

(May 4-6)—"Adhesion and Coatings Adhesion: Theory , Applications, and Durability." Conference sponsored by The Institute of Materials Science. Orlando, FL. (Angelos V. Patsis, The Institute of Materials Science, State University of New York, New Paltz, NY 12561).

(May 4-8)—"Adhesion Principles and Practice for Coatings and Polymer Scientists." Short course sponsored by Kent State University. Kent, OH. (Carl J. Knauss, Director, Professional Development Institute, P.O. Box 1792, Kent, OH 44240).

(May 5-6)—"Effects of Surface Finish on Corrosion Testing." Symposium sponsored by the American Society for Testing and Materials (ASTM). Atlanta Hilton, Atlanta, GA. (Bob Held, ASTM, 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959).

(May 6-8)—ASTM Committee G-1 on Corrosion of Metals. Sponsored by the American Society for Testing and Materials (ASTM). Atlanta Hilton, Atlanta, GA. (Bob Held, ASTM, 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959).

(May 11-14)—Eastern Training Conference II and Show. Sponsored by the Philadelphia Society. Valley Forge Convention Center, King of Prussia, PA. (Wayne Kraus, Hercules Incorporated, Research Center, 500 Hercules Rd., Wilmington, DE 19808; (302) 995-3435).

(May 11-14)—"Introduction to Powder Coatings Technology." Short course sponsored by The University of Southern Mississippi. Hattiesburg, MS. (Shelby F. Thames or Debbie Ballard, The University of Southern Mississippi, Box 10037, Hattiesburg, MS 39406-0037).

(May 11-15)—"Interpretation of IR and Raman Spectroscopy." Short course sponsored by The Fisk Infrared Institute. Vanderbilt University, Nashville, Tennessee. (Clara Craver, The Fisk Infrared Institute, 1000 17th Ave., N., Nashville, TN 37208).

(May 11-15)—"Dispersion of Pigments and Resins in Fluid Media." Short course sponsored by Kent State University. Kent, OH. (Carl J. Knauss, Director, Professional Development Institute, P.O. Box 1792, Kent, OH 44240).

(May 13-15)—"Spray Finishing Technology Workshop." Sponsored by Bowling Green State University and ITW DeVilbiss. Toledo, OH. (Richard A. Kruppa, Bowling Green State University, Bowling Green, OH 43403).

(May 17-20)—1998 Fluid Controls Institute Annual Meeting. The Cloister, Sea Island, GA. (Fluid Controls Institute, Inc., 1300 Summer Ave., Cleveland, OH 44115-2851).

(May 18-21)—"Coatings Science for Coatings Technicians." Short course sponsored by The University of Southern Mississippi. Hattiesburg, MS. (Shelby F. Thames or Debbie Ballard, The University of Southern Mississippi, Box 10037, Hattiesburg, MS 39406-0037).

(May 18-22)—"Physical Testing of Paints and Coatings." Short course sponsored by University of Missouri-Rolla (UMR), Rolla, MO. (UMR Coatings Institute, 236 Schrenk Hall, 1870 Miner Circle, Rolla, MO 65409).

(June 1-3)—"Colorimetry and Color Measurement." Short course sponsored by Rochester Institute of Technology's Munsell Color Science Laboratory. Rochester, NY. (Colleen M. Desimone, RIT Munsell Color Science Laboratory, 54 Lomb Memorial Dr., Rochester, NY 14623-5604).

(June 1-5)—"Advances in Emulsion Polymerization and Latex Technology." Short course sponsored by Lehigh University. Emulsion Polymers Institute, Bethlehem, PA. (Mohamed S. El-Aasser, Emulsion Polymers Institute, Lehigh University, 111 Research Dr., Bethlehem, PA 18015).

(June 4)—"Instrumental Color Matching." Short course sponsored by Rochester Institute of Technology's Munsell Color Science Laboratory. Rochester, NY. (Colleen M. Desimone, RIT Munsell Color Science Laboratory, 54 Lomb Memorial Dr., Rochester, NY 14623-5604).

(June 5-6)—Joint Meeting of the St. Louis and Kansas City Societies. Lake of the Ozarks, MO.

(June 8-12)—"Introduction to Paint Formulation." Short course sponsored by University of Missouri-Rolla (UMR), Rolla, MO. (UMR Coatings Institute, 1870 Miner Circle, Rolla, MO 65409).

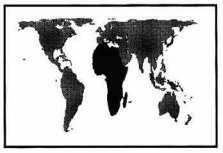
(June 8-12)—"Foundations of Color Management Systems." Short course sponsored by Rochester Institute of Technology's Munsell Color Science Laboratory. Rochester, NY. (Colleen M. Desimone, RIT Munsell Color Science Laboratory, 54 Lomb Memorial Dr., Rochester, NY 14623-5604).

(June 9)—ASTM D01.51 on Powder Coatings. Sponsored by the American Society for Testing and Materials (ASTM). Omni Inner Harbor Hotel, Baltimore, MD. (Jeffrey Hagerlin, O'Brien Powder Products, 9800 Genard Rd., Houston, TX 77041-7624).

(June 9-11)—1998 Department of Defense-Industry Aerospace Coatings Conference. Renaissance Waverly Hotel, Atlanta, GA. (Omar Deel or Rick Wolterman, Battelle, 505 King Ave., Columbus, OH 43201-2693).

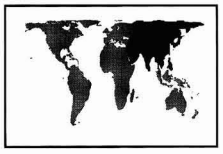
(June 9-11)—Automotive Finishing '98. Conference and Exposition sponsored by the Society of Manufacturing Engineers. Cobo Conference and Exhibition Center, Detroit, MI. (SME, One SME Dr., P.O. Box 930, Dearborn, MI 48121-0930).

1998—Africa



(Mar. 6-8)—"Coatings for Africa '98." Sponsored by The Oil & Colour Chemists' Association's (OCCA) South African Division, the Natal Section, and Surfex Ltd. International Convention Centre, Durban, South Africa. (Christopher Pacey-Day, OCCA, 967 Harrow Rd., Wembley, Middlesex, England HA0 2SF).

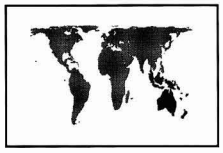
1998—Asia



(May 12-14)—Techno Trade '98. Sponsored by Singapore Confederation of Industries, Taiwan Association of Machinery Industry, and Taiwan Industrial Fasteners Institute. World Trade Center, Singapore. (Interfama Brooks Exhibitions Pte. Ltd., Forum Place, Hatfield, Hertfordshire AL1O ORN, United Kingdom).

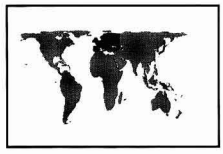
(June 10-13)—China Coatex '98 and China Surtex '98. Exhibition sponsored by Vincentz Verlag. Shanghai Centre, Shanghai, China. (Vincentz Verlag, Schiffgraben 43, D-30175, Hannover, Germany).

1998—Australia



(July 29-Aug. 1)—"Coatings for the Future." Second Trans Tasman Surface Coatings Conference. Co-sponsored by Surface Coatings Association, New Zealand, Inc., and Surface Coatings Association, Australia, Inc. The Carlton Hotel, Auckland, New Zealand. (98 Transtas Conference, P.O. Box 5192, Wellesley St., Auckland, New Zealand).

1998—Europe



(Apr. 1-3)—PCE '98. Conference and exhibition sponsored by the Journal Protective Coatings Europe (PCE). The Netherlands Congress Centre, The Hague, The Netherlands. (PCE '98, 2100 Wharton St., Ste. 310, Pittsburgh, PA 15203-1951).

(Apr. 20-25)—Hannover Fair '98: World Center for Industrial Technology. Hannover Fairgrounds, Hannover, Germany. (Andrea Anderson, Hannover Fairs USA, Inc., 103 Carnegie Center, Princeton, NJ 08540).

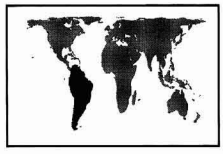
(Apr. 23)—"What is Paint?" Training course sponsored by the Paint Research Association. Teddington, Middlesex, United Kingdom. (Heena Mehta, PRA, 8 Waldegrave Rd., Teddington, Middlesex TW11 8LD United Kingdom).

(Apr. 27-29)—"Colour Measurement and Colour Control." Training course sponsored by the Paint Research Association. Teddington, Middlesex, United Kingdom. (Heena Mehta, PRA, 8 Waldegrave Rd., Teddington, Middlesex TW11 8LD United Kingdom).

(May 25-27)—11th International Symposium on Polymer Analysis and Characterization (ISPAC-11). Santa Margherita Ligure, Genoa, Italy. (Oscar Chiantore, Dept. of Chemistry IPM, University of Torino, Via Giuria 7-101025 Torino, Italy; Fax: +39 11 670 7855).

(June 22-24)—"SURFEX '98." Sponsored by The Oil & Colour Chemists' Association (OCCA). Harrogate, England. (Christopher Pacey-Day, OCCA, 967 Harrow Rd., Wembley, Middlesex, England HA0 2SF).

1998—South America



(Apr. 15-17)—ICE Latinoamerica '98. Miami Beach Convention Center, Miami, FL. (Lisa McGlashen, FSCT, 492 Norristown Rd., Blue Bell, PA 19422; (610) 940-0777, FAX: (610) 940-0292. http://www.coatingstech.org).

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EEO/AA/M/F/D/V

Humbug from Hillman

I have learned to depend on Bob Athey for his regular contributions to Humbug. What follows he found in the fall issue of *Color Full News*, written by Gwen Davis.

The Monkey's Disgrace

Three monkeys sat in a coconut tree
Discussing things that are said to - be
Said one to the others, "Now listen - you two
"There's a rumor around that can't - be true
"that man descended from our noble - race
"The very idea is a great disgrace.
"No monkey has ever deserted his - wife
"Starved her babies and ruined her - life
"And you've never known a mother - monk
"To leave her babies with others to - bunk
"Or pass one onto another
"Till they scarcely knew who is their - mother.
"Here's another thing a monkey won't do
"Go out at night and get on a stew
"Or use a gun or club or knife
"To take some other monkey's life.
"Yes, man descended, the ornery cuss,
"But brother, he didn't descend from us."

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And, from equally reliable Dick Kiefer, we have the following. If you don't think they are funny, it's your turn to be insulted.

Computer Illiterates (Excerpts from Jim Carlton in the *Wall Street Journal*)

•Compaq is considering changing the command "Press any Key" because of the flood of calls asking where the "Any" key is.

•AST technical support had a caller complaining that her mouse was hard to control with the dust cover on. The cover turned out to be the plastic bag the mouse was packaged in.

•A Dell customer called to say he couldn't get his computer to fax anything. After 40 minutes of troubleshooting, the technician discovered the man was trying to fax a piece of paper by holding it in front of the monitor screen and hitting the "send" key.

•Another customer called Compaq tech support to say her brand new computer wouldn't work. She said she unpacked the unit, plugged it in, and sat there for 20 minutes waiting for something to happen. When asked what happened when she pressed the power switch, she asked, "What power switch?"

•A Dell technician advised his customer to put his troubled floppy disk back in the drive and close the door. The customer asked the tech to hold on, and was heard putting the phone down, getting up and crossing the room to close the door to his room.

•Another Compaq technician received a call from a man complaining that the system wouldn't read the word processing files from his old diskettes. After troubleshooting for magnets and heat failed to diagnose the problem, it was found that the customer stuck labels on the diskettes and then rolled them into the typewriter to type the labels.

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Frank Borrelle was sent a list of "certified" classified ads via E-mail. Here they are, as space will allow, with Humbug's old stuff deleted:

—Illiterate? Write today for free help.
—Our experienced Mom will care for your child. Fenced yard, meals, and smacks included.
—Man wanted to work in dynamite factory. Must be willing to travel.
—Three-year old teacher needed for preschool. Experience preferred.
—Girl wanted to assist magician in cutting off head illusion. Blue cross and salary.
—Now is your chance to have your ears pierced and get an extra pair to take home too.
—Great Dames for sale.
—For rent: six-room hated apartment.
—Christmas tag-sale. Handmade gifts for the hard-to-find person.
—Wanted: Hair cutter. Excellent growth potential.
—We will oil your sewing machine and adjust tension in your home for $1.
—Man honest. Will take anything.

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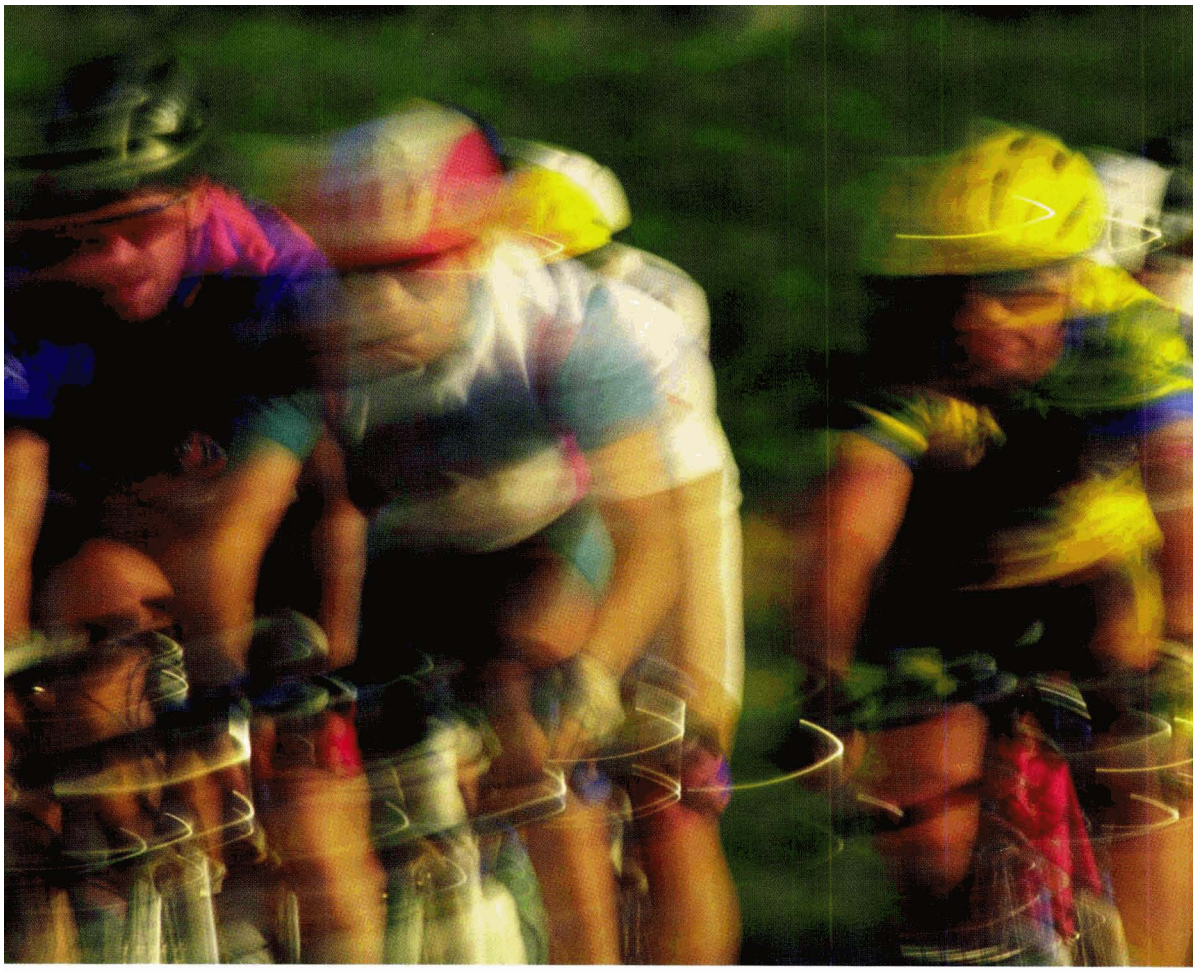
Rudolph Deanin, of the University of Massachusetts Engineering Department, takes responsibility for the following inventions and generously offers the ideas to any of our readers. Here are most of them.

Great Ideas—We Can Find a Market Later

Fluorescent Black Ink—Glows in the Dark
Molding Powder that Reverts to Monomer in the Mold
Rubber with TG 150°C for Use in Fires
Heavy Gas as Blowing Agent for High Density Foams
Foamed Lead—Low Density Lead
Foamed Hydrogen Gas for Ultra-Low-Density Foams
Dehydrochlorinated PVC—No Toxic Chlorine Left
Fluorine Gas—Higher Oxygen Index than Teflon
PolyBucky Balls—Synthetic Pearl Necklace
Copolymer of Silica and Silicone—Unbreakable Glass
Crosslinked Polyanything—Transparent Fiber for Polyanything
Trinitrotoluene—Ink for Secret Documents
Author of this Study—Candidate for Graduate Study at Solomon Institute—No GRE Required

—Herb Hillman, Humbug's Nest, P.O. Box 135, Whitingham, VT 05361.



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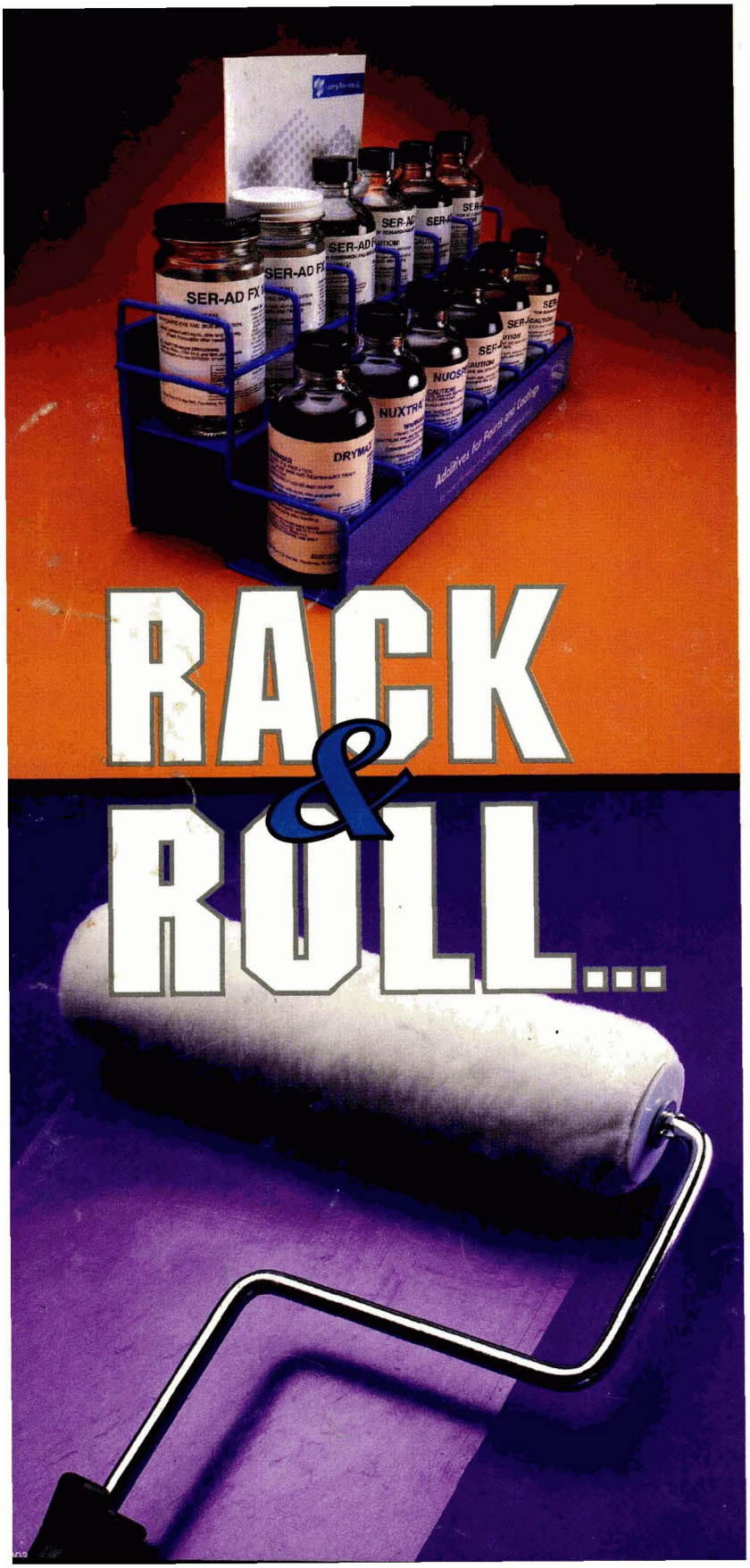

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