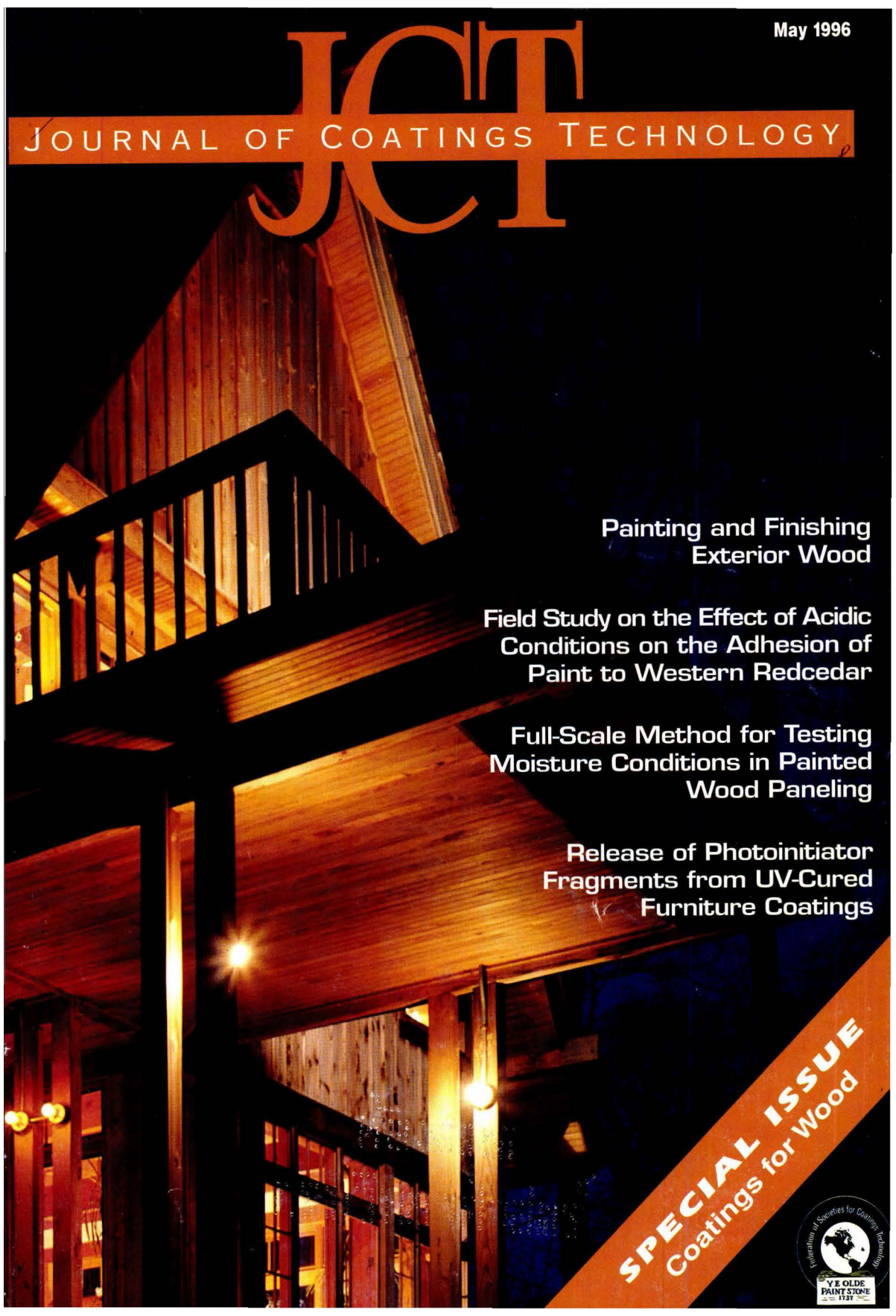
May 1996

JCT

JOURNAL OF COATINGS TECHNOLOGY



Painting and Finishing Exterior Wood

Field Study on the Effect of Acidic Conditions on the Adhesion of Paint to Western Redcedar

Full-Scale Method for Testing Moisture Conditions in Painted Wood Paneling

Release of Photoinitiator Fragments from UV-Cured Furniture Coatings

SPECIAL ISSUE
Coatings for Wood

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MAY 1996 VOL. 68, NO. 856

Feature Article

Technical Articles

Federation News

Departments

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Technical Abstracts

Spanish translations provided by Jesús Camacho, of Instituto Mexicano de Tecnicos en Pinturas y Tintas.

Field Study on the Effect of Acidic Conditions on the Adhesion of Paint to Western Redcedar—M.T. Knaebe, R.S. Williams, and J.W. Spence

JCT, Vol. 68, No. 856, 27 (May 1996)

Previous research results involving sulfur accumulation on cross sections of wood coated with latex paint led us to investigate whether acidic conditions could affect the bonding strength of paint and be a factor in catastrophic paint peeling. Through simulation of acidic dew under outdoor conditions, the study reported herein determined the effect of acid rain and/or dew on painted wood siding. Painted wood was soaked before dawn in various acid solutions for two hours each day, then exposed outdoors for the remainder of the day and night during the summer near Madison, WI. From October to May, the specimens were exposed but not soaked. After four years of exposure to weather and acid, only the painted wood interface for specimens soaked in sulfurous acid at pH 2 indicated deterioration as measured by fracture toughness testing.

Estudio de Campo Sobre el Efecto de las Condiciones de Acidez en la Adhesion de Pintura en Redcedar Del Oeste—M.T. Knaebe, R.S. Williams, y J.W. Spence

Resultados de investigaciones previas que involucran la acumulación de azufre en secciones superficiales de madera recubierta con pintura latex permitio investigar si las condiciones de acidaz podrían afectar la fuerza de enlace de pintura y ser un factor en el catastrófico descascaramiento de la misma. Por medio de la simulación del rocío ácido en condiciones externas, el estudio aquí reportado determino el efecto de la lluvía ácida y/o roció en el canal la madera pintada. La madera pintada fué humedecida diariamente durante dos horas antes del amanecer en varias soluciones acidas y se expuso por la parte exterior por el resto del día y de la noche durante el verano cerca de Madison, Wisconsin. De octubre a mayo, las muestras fueron expuestas pero no humedecidas. Después de cuatro años de exposición a la intemperie y al ácido, solamente la interfase de madera pintada por muestras humedecias en ácido sulfúrico con pH 2 indico deterioro en base a la prueba de fractura-dureza.

A Full-Scale Method for Testing Moisture Conditions in Painted Wood Paneling—S. Hjort

JCT, Vol. 68, No. 856, 31 (May 1996)

Recognition of the critical problems of wood rot in exterior panel structures has led to the initiation of several research projects in the Nordic countries, in order to prevent damage of this kind. The moisture conditions in a panel are crucial to determining the risk of wood rot, unless the wood has been treated with a preservative.

Presented here is a laboratory computer-based method for monitoring the moisture conditions in a test panel during a specific climate cycle. The test paneling consists of five boards with nails, joints, and overlaps. To measure the moisture content distribution, an electrical resistance method with 14 measuring points is used. All of the probes are connected to a computer, which monitors the moisture conditions at hourly intervals. The climate cycle consists of a rainfall phase and a drying phase. The method makes it possible to determine the capacity of a paint or a paint system to keep a panel in good condition.

More than 40 paneled structures painted according to different paint systems have been studied by this method. Panels from old structures, painted in a way found to be inadequate, were used as references. System painting, by which a coating is built up in several layers, each with its own purpose, has given the best results. It has also been shown that treatment of the end grain with the priming system is crucial.

Un Metodo de Dimensiones Normales para Probar las Condiciones de Humedad en Entrepaños de Madera Pintada—S. Hjort

La identificación de los problemas críticos de la descomposición de la madera en la estructura de los paneles exteriores ha originado la iniciación de varios proyectos de investigación en los paises nordicos, con el fin de prevenir este tipo de daños. Las condiciones de humedad en un panel son cruciales para determinar el riesgo de la descomposición de la madera, a menos que la madera haya sido tratada con un preservativo.

El presente es un método de laboratorio con base en la computadora para monitorear las condiciones de humedad en un panel de prueba durante un ciclo de clima específicio. La prueba de entrepaño consiste de cinco tablas con clavos, juntas y solapas. Se usa un método de resistencia electrica con catorce puntos de medición para medir la distribución del contenido de humedad. Todas la varillas de pruebas están conectadas a una computadora, la cual monitorea las condiciones de humedad a intervalos de una hora. El ciclo de clima consiste de una fase de lluvia y una fase de secado. El método hace posible determinar la capacidad de una pintura o un sistema de pintura para mantener un panel en buenas condiciones.

Se han estudiados por este método más de cuarenta estructuras de paneles pintados acorde a los diferentes sistemas de pintura. Se usaron como referencia paneles provenientes de viejas estructuras pintadas de un modo considerado inadecuado. El sistema de pintado, por el cual un recubrimiento es colocado en varias capas, cada una con una función especifica, ha proporcionado los mejores resultados. Esto también ha mostrado que el tratamiento de el grano final con el sistema de primera mano de pintura es crucial.

Release of Photoinitiator Fragments from UV-Cured Furniture Coatings—T. Salthammer

JCT, Vol. 68, No. 856, 41 (May 1996)

Radiation cured furniture coatings for indoor use have often been criticized for strong odor. For a better understanding of the emission characteristics, the release of volatile organic compounds from some specially manufactured furniture was studied in 1 m^3 climate chambers. Special attention was given to the detection of photoinitiator fragments, which can significantly contribute to the pollution of indoor air. It was shown that the fragmentation products contributed 20-60% to the total emission, which was typically found in a range of 100 $\mu g/m^3$ to 250 $\mu g/m^3$ within the testing period of about 600 hr. One main compound was the strongly odorous benzaldehyde that is generated by many applied photoinitiators via a-cleavage. It was also observed that the curing time has a strong effect on the emission potential.

Liberacion de Fragmentos de Fotoiniciador de Recubrimientos Curados uv Para Muebles—T. Salthammer

Los recubrimientos curados por radiación para muebles de uso interno han sido criticados debido a su fuerte olor. Para una mejor comprensión de las características de emisión, fué estudiada en cambiadores de clima de 1m^3 la liberación de compuestos orgánicos volátiles de algunos muebles especialmente manufacturados. Se puso especial atención en la detección de los fragmentos de fotoiniciador, el cual puede contribuir significativamente en la contaminación de el aire interno. Esto mostro que los productos de la fragmentación contribuyeron del 20 al 60% de la emisión total, la cual fué encontrada en un rango de 100 $\mu g/m^3$ a 250 $\mu g/m^3$ dentro del período de prueba de aproximadamente 600 h. Uno de los principales componentes fué el fuertemente oloroso benzaldehido, que es generado por muchos fotoiniciadores aplicados viá a-hendidura. Esto también mostro que el tiempo de cura tiene un fuerte efecto en el potencial de emisión.

Viscosity Reduction via Monomer Selection in Solvent-Borne High-Solids Styrene/Acrylic Coating Resins—C.A. Zezza and K.D. Talmo

JCT, Vol. 68, No. 856, 49 (May 1996)

The ability to prepare solvent-borne, high-solids, coating resins has been hampered by the need to use resins which have lower than desired T_gs or use more solvent than would be preferred to reach application viscosity. Recent work has indicated that cyclic, higher T_g, methacrylate monomers that are incorporated into a styrene/acrylic copolymer may be effective in reducing solution viscosity. This work will discuss the effect of incorporating different cyclic methacrylate monomers on solution viscosities of several styrene/acrylic polymers. The high T_g cyclic monomers studied were: isobornyl methacrylate, cyclohexyl methacrylate, t-Butylcyclohexyl methacrylate, and 3,5,5-Trimethylcyclohexyl methacrylate.

The monomers were incorporated into two polymers of different T_gs (30°C and 60°C) at between 60-65% solids level. Viscosities were measured and distinct differences in solution viscosities were noted. The polymers were characterized by various measurements. This paper will discuss these observations and the impact that this data provides.

Reduccion de la Viscosidad via Seleccion de Monomeros en Resinas de Recubrimientos de Estireno/Acrílico de Altos Solidos Base Solvente—C.A. Zezza y K.D. Talmo

La habilidad para preparar resinas de recubrimientos de altos sólidos base solvente ha sido enmarañada por la necesidad de usar resinas las cuales tienen menor T_g que el que se desea o usan más solvente que requerido para alcanzar la viscosidad de la aplicación. Un trabajo reciente ha indicado que los monomeros ciclicos de metacrilato de mas alto T_g que son incorporados dentro de un copolimero estireno/acrílico puede ser efectivo para reducir la viscosidad de la solución. Este trabajo discutira el efecto de incorporar diferentes monomeros ciclicos de metacrilato en viscosidades de soluciones de varios polímeros estireno/acrílico. Los monomeros ciclicos de alto T_g estudiados fueron: isobornil metacrilato, ciclohexil metacrilato, t-butilciclohexil metacrilato y 3,5,5-trimetilciclohexil metacrilato.

Los monomeros fueron incorporados dentro de dos polímeros de diferentes T_g's (30°C y 60°C) en un nivel de sólidos de entre 60-65%. Se midieron las viscosidades y se anotaron las diferencias de la viscosidades en solución. Se caracterizaron los polímeros por varias mediciones. El presente documento discutirá estas observaciones y el impacto que estos datos proporcionan.

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FSCT Board of Directors—1995-96

COMMENT

From the Members

Mailed to all members and published in the March issue of the JCT was a summary of the Federation's strategic planning proposals. These proposals, as noted, will be discussed at the May meeting of the FSCT Board of Directors, which will evaluate not only the recommendations, but also will consider the Societies' views.

Also published in the March *Paint Stone* was a response form to be used by concerned members to communicate directly with the FSCT leadership. While the number of responses was not exactly overwhelming (18 in all), the replies were thoughtfully expressed and projected a sincere interest in the future of this organization. We thank all who took the time and effort to send on their comments. Your responses were forwarded to your Societies.

The fact remains, however, that of the 7,000-plus members of the FSCT, only 18 thought enough about its future to take pen (or computer) in hand. Consensus thinking states that only the nay-sayers will respond to these types of questions. (How many *positive* letters does Ann Landers receive?) Here, that certainly wasn't the case: of the 18 replies only two were negative. The remaining 16 were overwhelmingly positive!

So, is this a sign of apathy? We hope not. We would rather believe, based on the percentage of positive replies, that the general feeling of the members is one of *trust*. Trust in the Federation's leaders, both past and present, the Board of Directors, and many others who have been involved in defining the FSCT strategic plan.

Regardless of the outcome of the Board's discussion in Seattle (reported in the May *Paint Stone*), it is thoroughly understood that the Federation must move forward, it's just a question of when and to what degree.

Robert F. Ziegler
Executive Vice President

Coatings from start to finish

Surface Coatings Association Australia Inc

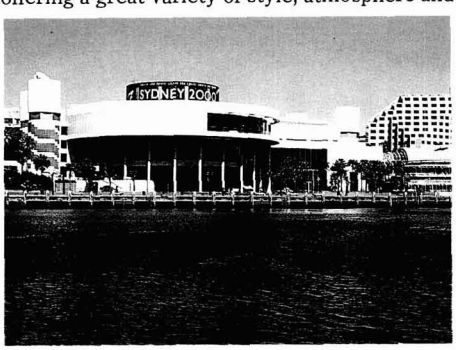
CONFERENCE IN THE GOLDEN JUBILEE YEAR
14-17 AUGUST 1996, SYDNEY
SYDNEY

The Surface Coatings Association Australia Inc (SCAA) invites attendance at the 1996 Annual Conference to be held at the Sydney Convention Centre, Darling Harbour, Sydney.

August is a fabulous time in Sydney with a variety of art galleries, museums, theatres and opera as well as parks, gardens and the harbourside Taronga Zoo. Sydney's excellent variety of restaurants take advantage of the fine local agricultural produce, seafood and wines, while the nightlife is exciting and plentiful.

Sydney Convention Centre is the Conference venue, a large purpose-built facility set in 50 hectares of parks, gardens, museums, shopping malls and amusement areas. It overlooks Darling Harbour with spectacular views of the city. The city centre is only a five minute monorail ride away and within walking distance of several hotels.

Sydney has a wide range of accommodation offering a great variety of style, atmosphere and location. A selection of hotels will be available to suit the budgets of all delegates.




Sydney

The theme for SCAA 96 is **"Coatings from start to finish"** and over 60 local and overseas expert speakers will cover the entire area of coatings — paint, ink, polymers, equipment, etc and from raw materials right through formulation, specification, application to performance **from start to finish.** The technical programme consists of three streams (lectures, seminars and workshops) and will run over the course of 3 full days.

SCAA 96 Keynote Speaker will be Professor Philip Cox, Australia's internationally renowned architect. His works include the Sydney Convention & Exhibition Centre and the Australian National Maritime Museum. Plenary Speaker for the Conference is Dr. John L. Gerlock, staff research scientist with Ford Motor Company, U.S.A.

For further information regarding the conference contact:

SCAA '96 SECRETARIAT
GPO BOX 128
SYDNEY NSW 2001
AUSTRALIA
Ph: +61 2 262 2277
Fax: +61 2 262 3135

The Paint Stone

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Route to:

FSCT Board Meets to Continue Strategic Plan; Discusses Proposals for Future of Organization

At the Spring Board Meeting of the Federation of Societies for Coatings Technology, FSCT leadership took another step towards implementation of the plan which will direct the future of the organization. Held on May 5 in Seattle, WA, the Board focused on the strategic planning proposals which were developed at the special Board Meeting in February and distributed to each Society for review and response prior to the Spring Meeting. *(A complete summary of the proposals and background on the strategic planning meetings was published in the Paint Stone insert of the March JCT.)*

As part of this Spring meeting, each proposal was reviewed. To determine if there was consensus in moving forward with these proposals, Board members were polled and a straw vote was taken to determine attitudes and opinions. Board members were encouraged to provide feedback from the Society discussions in which they participated prior to this meeting.

A brief summary of the discussions and the results of the polling follow. Comments are the views of individual Societies and may not necessarily be representative of the entire Board.

Membership

To stimulate increases in membership, it was determined that a more accommodating procedure for membership recruitment is needed. Discussed were several proposals which involve the acceptance of membership at both the national and local levels, with Societies having the option to have their annual collection of dues and roster maintenance performed by the FSCT national headquarters. To accomplish this, a common membership year for all Societies and the FSCT would be necessary. The proposal also calls for the development of a coordinated, targeted

(Continued on page 2.)

FSCT's Coatings Technology Conference Features Focused, Interactive Programs

On October 22-24, the International Coatings Technology Conference will debut in Chicago, IL. The conference, a "stand-alone" program, will be held in conjunction with the FSCT's Annual Meeting and International Coatings Expo (formerly the Paint Industries' Show). This new conference program format has been designed to take a focused look at subjects critical to achieving success in the coatings industry today.

To create a program of this magnitude, the FSCT Program Committee began meeting in the Fall of 1995. According to Program Committee Chair Steve Hodges, Technical Director for Halox Pigments, "We did a lot of brainstorming and reviewing member and attendee surveys. Then we decided on the structure of our conference." Audience

(Continued on page 3.)

Inside This Issue

FSCT Board of Directors Meets . . .

Continued from Page 1

promotional program to define the benefits of membership.

(1) A COMMON MEMBERSHIP YEAR WILL BE ADOPTED BY ALL SOCIETIES.

Currently, individual Societies have a variety of membership years ranging from May - April to September - August.

- *Board Response: All 36 were in favor.*

(2) CURRENT MEMBERSHIP CLASSIFICATIONS (ACTIVE, ASSOCIATE, RETIRED, EDUCATOR/STUDENT) WILL BE RETAINED BUT MEMBERSHIP CRITERIA WILL BE KEPT TO A MINIMUM.

This is a controversial point and there is no consensus on the question of a single classification.

- *Board response: 32 in favor; 4 opposed.*

(3) NEW MEMBERS MAY BE ACCEPTED AT BOTH NATIONAL AND LOCAL LEVELS.

Those accepted at national level will be assigned to a local Society according to the geographical boundaries. Members falling outside these geographic boundaries will be accepted as Affiliate members of the FSCT, consistent with current policy.

- *Board response: 34 in favor; 2 opposed.*

(4) TO ALLOW FEDERATION HEADQUARTERS TO INVOICE AND COLLECT INDIVIDUAL ANNUAL MEMBERSHIP DUES AND TO MAINTAIN SOCIETY MEMBERSHIP ROSTERS.

This will be done on an optional basis determined by each Society.

- *Board response: All 36 in favor.*

The members voiced no opposition to consideration of this *as an option.*

Five Societies indicated that they would take advantage of the option of having the FSCT handle rosters and dues collection. One Society pointed out that there is currently a duplication of effort in this area, since both the national and local levels maintain membership listings. They felt that their Society's volunteer efforts would be put to better use if these tasks could be "outsourced" to the FSCT headquarters and accomplished at no financial cost to the Society. The local Societies would receive an accounting of new members and their dues on a monthly basis.

Some voiced concern that the Societies' control regarding membership would be diminished. There were some questions regarding the Headquarter's ability to track members who change employers. In addition, some Societies feel that contacting members for membership renewal could best be accomplished on the local level.

(5) TO INCREASE AND IMPROVE PROGRAMS AND SERVICES AND DEVELOP TARGETED MEMBERSHIP PROMOTIONAL PROGRAMS.

- *Board response: All 36 in favor.*

Organizational Restructure

A critical issue in the strategic plan focuses on the manner in which the Federation is governed. It is felt that the current structure of the governing bodies and the system to revise Bylaws and Standing Rules do not allow for timely response to opportunities and threats that affect the future of the organization.

(1) TO REDUCE SIZE OF BOARD OF DIRECTORS TO 12-15 INDIVIDUALS. The restructured Board would include the three Officers, an FSCT Past-President, and 8-11 Society Representatives.

- *Board Response: 31 in favor; 5 opposed.*

Although the Board recognized the need for change in this area, they had many questions regarding the implementation of this proposal, and will consider this issue more directly when defined proposals are submitted. Most focused on the need for Societies to maintain adequate representation. There were concerns expressed regarding the frequency with which any Society would have direct representation on the Board; the need for continuity; and international representation (as expressed by the Canadian-based Societies). A full definition of Board duties is seen to be critical, especially regarding Bylaws approval.

(2) The Board would meet at least four times annually.

- *Board response: 34 in favor; 2 opposed.*

(3) TO ELIMINATE, AS EXTRANEOUS, THE EXECUTIVE COMMITTEE.

- *Board response: 33 in favor; 3 opposed.*

(4) TO CREATE A COUNCIL OF SOCIETY REPRESENTATIVES THAT WOULD MEET ANNUALLY TO ELECT FEDERATION OFFICERS AND REGIONAL SOCIETY REPRESENTATION ON THE BOARD, AND TO DISCUSS ITEMS OF IMPORTANCE FOR BOARD CONSIDERATION.

- *Board response: 34 in favor; 2 opposed.*

Discussion on this proposal restated many of the concerns expressed in proposal (1).

(5) TO REDUCE THE NUMBER OF FEDERATION COMMITTEES.

- *Board response: 35 in favor; 1 opposed.*

This agreement was based on the review and examination of all current Committees.

(6) TO STREAMLINE THE PROCESS FOR REVISION OF BYLAWS AND STANDING RULES.

- *Board response: All 36 in favor.*

Common Interest Groups

It has been proposed that the Federation create opportunities for individuals who are interested in specific segments or areas of the industry.

(1) TO FURTHER EXPLORE THE CONCEPT OF CREATING COMMON INTEREST GROUPS, ORGANIZED AS SELF-SUSTAINING GROUPS OF INDIVIDUALS PURSUING A COMMON INTEREST AND CONFORMING TO A MINIMUM SET OF STANDARDS AS ESTABLISHED BY THE FSCT BOARD OF DIRECTORS.

- *Board response: 35 in favor; 1 opposed.*

(2) THAT CIGS BE FEDERATION LEVEL ACTIVITIES THAT ARE NOT GEOGRAPHICALLY BASED.

It was agreed that further discussion is required.

(3) THAT A CIG HAVE A THREE-YEAR PROVISIONAL STATUS PRIOR TO ELIGIBILITY FOR "ACTIVE" STATUS BY THE FSCT BOARD.

- *Board response: All 36 in favor.*

(4) THAT MEMBERS OF ACTIVE CIGS MUST BE MEMBERS OF FSCT AND SOCIETIES.

- *Board response: All 36 in favor.*

(5) That when they have achieved specific growth goals, the CIG would have representation on Society Representatives Council

- *Board response: 20 in favor; 16 opposed.*

Although not specifically detailed at the February Board meeting, the possibility of CIG representation has been the subject of discussion. On the negative side, some Societies saw this as a potential threat, that CIGs could become more powerful than Societies. On the positive

(Continued on next page.)

FSCT's Coatings Technology Conference

Continued from Page 1

appeal also played a key role in restructuring the technical programs offered at the Annual Meeting.

Once the structure was decided upon, the committee selected the theme "Insights and Innovations." Mr. Hodges says, "The theme expresses the concept of change and the variety that is available in this new program in 1996." The Program Committee chose topics that would appeal to a large variety of the membership in terms of experience. Mr. Hodges states, "The committee wanted to have something to attract the person who is new to the industry as well as those who are further along in their coatings career." He describes the program as a "cross-section" of topics, while being very focused. "We wanted to have additional study topics available to attract peripheral industries such as inks, adhesives, concrete, plastics, etc."

Examples of the new program include a training seminar on "Spray Applications," which features a trip to Binks Manufacturing. Here the attendee will gain experience in spray techniques using actual equipment. Another example is "Executive Forum: Technology Assessment." The committee was looking at the people who are truly decision makers in their companies when the topic was developed. This interactive, executive level workshop introduces the participants to the management tools and techniques required to fully link the R&D function with the strategic objective of the business.

Two kinds of programs have been planned: (1) One-day training seminars, such as "Surfactant Chemistry," "Winning Technical Presentations," "Effective Technical and Scientific Writing Workshop," and "Design of Experiments"; and (2) Two-day conference courses which will focus on "Substrates and Coatings," "Coatings Characterization," "Polymer Chemistry," and "Back to Basics in Coatings Chemistry."

The new Technology Conference has many added features for broad appeal. Firstly, says Mr. Hodges, "it's not just a selection of papers. We've set up interactive training sessions with hands-on activity. In addition, course materials, in the form of hand-outs or proceedings, will be available for the attendees—an option not available in the past." The opportunity to share knowledge is unlimited in this teacher-student atmosphere.

Fees for Tuesday's one-day training seminars are $195 member, $295 nonmember. The two-day conference courses will cost $395 member, $495 nonmember. In addition, a special "package fee" for the full conference is available for $495 member, $595 nonmember. Attendees will be able to choose one training seminar, one conference course and still participate in ICE and the FSCT Annual Meeting Technical Presentations on Friday.

At first glance these fees seem to be much more significant than in the past, however, Mr. Hodges notes "Everybody wants to know what they are getting for their money. The focus of these interactive sessions combined with the fact that conference participants have access to the International Coatings Expo are nice features. What we have done is to give companies another viable option to spend their allocated technical training money on."

Mr. Hodges gives a lot of credit to the members of the committee. He describes their work as a team effort. "This has been a culmination of a lot of ideas, time, and effort from the entire committee and Mike Bell, FSCT's Director of Educational Services." In addition to Mr. Hodges, members of the committee include Andrew Gilicinski, of Air Products and Chemicals; Thomas L. Johnson, of ANGUS Chemical Co.; Gail Pollano, of Zeneca Resins; Latoska Price, of Akzo Nobel Coatings Inc.; Suzanne M. Rodgers, of BYK-Chemie USA; and Beverly Spears, of Tarr, Inc.

Despite the committee's efforts, Mr. Hodges is quick to add, "This change is actually coming from the voice of the people. We are following the word of our membership."

You won't want to miss out on the new 1996 International Coatings Technology Conference. Begin making your plans now—registration for many of the offerings is limited. See JCT pages 13-19 for additional information.

"Computer Uses in the Coatings Industry"

presented by

The Professional Development Committee of the Federation of Societies for Coatings Technology

Tuesday-Wednesday
August 20-21, 1996

Hyatt Regency O'Hare
Chicago, Illinois

For details, contact
FSCT, 492 Norristown Rd., Blue Bell, PA 19422
(610) 940-0777; Fax: (610) 940-0292

Board of Directors *(continued from page 2)*

side, representation is seen as enhancement rather than as a threat. Council representation would serve as an incentive for a growing, successful CIG to remain within the FSCT and not splinter off as separate group.

(6) THAT A CIG BE SUBJECT TO PERIODIC REVIEW.

- *Board response: All 36 in favor.*

(7) THAT CIGS MUST BE SELF-SUSTAINING.

- *Board response: All 36 in favor.*

* * *

To proceed with the strategic plan, members of the Board were directed to serve as a member of one of three subcommittees (membership, organizational restructuring, or common interest groups). These subcommittees are charged with developing the formal wording and details on implementing the above issues. The guidelines they develop will be distributed to all Societies in advance of the Fall Board Meeting (to be held October 22, 1996 in Chicago, IL.

At that time, all proposals will be discussed by the full Board.

The complete report of the Spring Board of Directors Meeting will be published in the July 1996 issue of the JOURNAL OF COATINGS TECHNOLOGY.

Society Incoming Officers Meet in Seattle For FSCT Annual Orientation Meeting

Incoming Society officers displayed true commitment when they braved an earthquake to attend the FSCT "Incoming Officers Meeting" on May 5 in Seattle.

Held annually by the Federation, this orientation meeting provides Society officers with the opportunity to interact with members from other Societies and to exchange ideas, concerns, and "success stories." In addition, FSCT Officers and Staff help the Society officers to become more aware of the programs and products that the FSCT can provide to assist them as they move through the leadership chairs of the local Societies.

Participants at the meeting formed small groups, and each participated in discussions focusing on areas such as Administration and Committees, Budgeting and Finance, Membership Recruitment and Retention, Education and Programming, and Publications and Marketing.

In the Administration groups, FSCT President Darlene Brezinski and Executive Vice President Bob Ziegler led some lively discussions on the current FSCT strategic planning initiatives. At the table on Budgeting and Finance, Secretary-Treasurer Tom Hill and Controller Joe Pontoski discussed financial matters that affect the Federation and the local Societies.

Improving Society meeting programming, common interest groups and committees were among the topics discussed by Education groups, led by FSCT President-Elect Jay Austin and Director of Educational Services Mike Bell.

Membership recruitment and retention are major concerns at both the national and local levels of the FSCT, and some suggestions were generated by the discussions involving the FSCT Director of Membership Services, Tori Graves.

With the Publications group, led by Director of Marketing Lyn Pollock and Director of Publications Pat Viola, the topics ranged from suggestions for more effective marketing of Society events to reactions on the JCT's "Spotlights."

Comments on the meeting were very positive. "Lots of helpful hints and useful references . . ." "Invigorating! . . ." "I learned a lot and I will do my best to put this into practice " . . . "Excellent format."

The FSCT extends special appreciation to the following Society officers:

Baltimore—Jane Takesian, Henkel Corp.

Birmingham—Brian A. Fowler, Resiblend Services Ltd.

CDIC—John Imes, DuPont

Chicago—William Bellman, Valspar, and Susan Simpson, Chemcept Services

Cleveland—James Currie, Jamestown Paint Co.

Dallas—Michael Templin, Zeneca Resins

Detroit—Ray Stewart, Akzo Nobel Coatings, Inc.

Golden Gate—Don Mazzone, Dowd & Guild, Inc.

Houston—Vic Santamaria, Champion Coatings

Kansas City—Debbie Koss, Davis Paint

Los Angeles—Joe Evans, Trail Chemical Corp.

Louisville—Paul Baukema, Akzo Nobel Coatings, Inc.

New York—Robert Schroeder, Daniel Products Co., Inc.

Northwestern—Glen Vetter, Valspar

Pacific Northwest—Deborah Severson, Miller Paint Co.

Philadelphia—Susan Neilsen, Best Brothers Paint Mfg. Co.

Piedmont—Dutch Hoffman, Kohl Marketing Inc.

Pittsburgh—Joseph E. Hunt, Palmer Supplies Co.

Rocky Mountain—Paul Delmonico, Old Western Paint Co.

Southern—Gary Scharfetter, Thompson Minwax

Toronto—Natalie Janowsky, Degussa Canada Ltd.

◆ ◆ ◆ ◆ ◆

We sincerely thank the members of the Pacific Northwest Society for their generous hospitality and support of the FSCT Board of Directors Meeting and the Incoming Society Officers Meeting.

Congratulations are extended to Beverly Spears, of Tarr, Inc., and the Committee Members who made the PNW Spring Symposium such a success.

Calendar of Events

June

- **14-15** Joint Meeting of the St. Louis and Kansas City Societies. Holiday Inn, Lake of the Ozarks, MO. (Randall Ehmer, Walsh & Associates, Inc., 500 Railroad Ave., N. Kansas City, MO 64116 [(816) 842-3014]).

August

- **15-17** Pan American Coatings Expo. Co-sponsored by FSCT, ANAFAPYT, and Instituto Mexicano de Tecnicos en Pinturas y Tintas. Sheraton Maria Isabel Hotel, Mexico City, Mexico. (FSCT, 492 Norristown Rd., Blue Bell, PA 19422. [(610) 940-0777]).

October

- **23-25** International Coatings Expo and International Coatings Technology Conference. McCormick Place North, Chicago, IL. (FSCT, 492 Norristown Rd., Blue Bell, PA 19422. [(610) 940-0777]).

FSCT Unveils New International Coatings Expo and Coatings Technology Conference

Insights and Innovations

New to the 1996 FSCT Annual Meeting is the International Coatings Technology Conference. The conference provides a forum for learning at all levels of the coatings industry, from the newly hired technician to top level management. Each course has been designed for specific areas of your organization, including lab personnel, sales and marketing staff, manufacturing, quality assurance and research and development.

Highlights of the Conference Include:

Five Pre-Convention Training Seminars, scheduled for Tuesday, October 22, 1996 at the Chicago Hilton & Towers (FSCT Headquarters), including an on-site program on Spray Applications at Binks Manufacturing.

An Executive Forum, covering Technology Assessment, also scheduled for Tuesday.

Four two-day Coatings Technology Conference Courses, scheduled for Wednesday and Thursday, October 23-24, 1996 at McCormick Place, allowing the attendees time to visit the International Coatings Exposition (ICE).

Complimentary Attendance to the International Coatings Expo and FSCT Annual Meeting Technical Presentations is included as a part of the registration fee for all one- and two-day and full conference registrations.

Set of Course Materials is provided to the attendees of each individual program.

Both you and your company benefit from attendance at this event. Your personal knowledge increases, which in turn improves your value within your organization, while the company stands to benefit from the new ideas and solutions you've learned during the conference. The conference also provides an opportunity for all coatings personnel to participate in the industry's premier event and learn the latest *"Insights and Innovations"* taking place in coatings technology.

An Invitation from the President

The FSCT is very excited about the events being planned this year for the annual gathering of our membership and the industry in Chicago. In a departure from past years, the Federation embarks in a new direction, prepared to offer an expanded show and an expanded technical program. Both are geared to bring new information, new technology, and the training experience needed by both the novice and experienced chemist, as well as your management, customers, and suppliers.

The new International Coatings Expo, or "ICE," will easily be the largest coatings manufacturing exposition ever held, with over 300 exhibitors in almost 100,000 sq. ft. of booth space, featuring exhibits covering all aspects of the industry.

Even more impressive will be the newly formed program of seminars and training sessions at the Coatings Technology Conference. Beginning on Tuesday, and running through Thursday, these conference sessions are specifically designed to bring you up to date on the new technologies and processes needed for today's industry professional.

Rounding out the convention is, of course, the FSCT's Annual Meeting, including the technical programming highlighted by the Mattiello Lecture by Dr. David Bauer, of Ford Motor Company.

I invite you to be part of the new FSCT and to come share the wealth of information available in Chicago!

Dr. Darlene Brezinski
FSCT President, 1995-96

International Coatings Technology Conference
"Insights and Innovations"

Executive Forum

Managing Technology for Strategic Success in the Coatings Industry

Monday Evening (Dinner) & Tuesday (Workshop)
October 21-22, 1996
Chicago Hilton and Towers

COURSE DESCRIPTION

This interactive, executive level workshop introduces the participants to the management tools and techniques required to fully link the R&D function with the strategic objective of the business. Based on the principles of "Third Generation R&D," the program uses presentations, group exercises and case studies. The course is designed for R & D group leaders; technical directors; senior chemists; marketing directors or managers; sales directors or managers; small business owners; and anyone with strategic leadership responsibility in their organization.

Registration limited to 30.

COURSE INSTRUCTORS

John Martin (Arthur D. Little)
Eric Carlson (Arthur D. Little)
Stephen Rudolph (Arthur D. Little)

PROGRAM FEES*

Member (FSCT & NPCA)—$395
Non-Member —$495
Includes dinner on Monday evening.

Training Seminar

Faster to Market with Better Products Through Design of Experiments

Tuesday, October 22, 1996
Chicago Hilton and Towers

SEMINAR DESCRIPTION

Design of Experiments (DOE) will give the coatings technologist five important benefits: cutting the time from inception to market; increasing product quality; lower raw material costs; research and development productivity; and manufacturable products. The understanding of DOE will allow the attendee to make a greater contribution to his or her company. The course is targeted at laboratory and R&D personnel and project managers and technicians interested in becoming more effective in the R&D function.

INSTRUCTOR

Charles Rooney (Orr & Boss)

PROGRAM FEES*

Member —$195
Non-Member—$295

Training Seminar Workshop

Effective Technical & Scientific Writing

Tuesday, October 22, 1996
Chicago Hilton and Towers

SEMINAR DESCRIPTION

For 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 session includes in-class writing exercises designed for practical application, and allows time for individual attention. Participants are invited to submit writing samples in advance for a confidential review by the instructor.

Registration limited to 25.

INSTRUCTOR

Sal Iacone (Consultant)

PROGRAM FEES*

Member —$195
Non-Member—$295

Training Seminar

Surfactant Chemistry

Tuesday, October 22, 1996
Chicago Hilton and Towers

SEMINAR DESCRIPTION

For R&D personnel, synthesizers, formulators and applicators in the coatings and ink industries, this course will provide attendees with a better understanding of surfactants and polymers; current information on new technologies and uses in this area; a working knowledge of surfactant synergy in waterborne technology; details on coatings and flows, and information on defoamers.

INSTRUCTORS

Steve Snow (Dow Corning)
Bob Stevens (Air Products)
Ed Orr (BYK Chemie)
Skip Scriven (Univ. of Minnesota)
Joel Schwartz (Air Products)

PROGRAM FEES*

Member—$195
Non-Member—$295

Training Seminar

Winning Technical Presentations

Tuesday, October 22, 1996
Chicago Hilton and Towers

SEMINAR DESCRIPTION

For laboratory and R&D personnel at all levels, in addition to marketing and sales staff and anyone else responsible for delivering technical presentations. Attendees will learn 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.

INSTRUCTOR

Carter Johnson (Buying Time Seminars)

PROGRAM FEES*

Member —$195
Non-Member—$295

Training Seminar

Coatings Spray Applications

Tuesday, October 22, 1996
Binks Manufacturing Co., Franklin Park, IL
(Transportation Provided)

SEMINAR DESCRIPTION

Provides both experienced and novice applicators, field service personnel,

specifiers and formulators with information on current and upcoming technologies as they apply to the application of coatings and finishes. Considered as a Learning Exchange Seminar, attendees will learn how to properly select, maintain and operate spray finishing equipment and to answer a variety of questions related to spray finishing.

Registration limited to 40.

INSTRUCTOR

Jerry Hund (Binks Manufacturing)

PROGRAM FEES*

Member— $195
Non-Member—$295
(Includes transportation to Binks Manufacturing Co.)

Conference Course

Polymer Chemistry for the Coatings Formulator

Wednesday–Thursday
October 23-24, 1996
McCormick Place

COURSE DESCRIPTION

Provides current information on polymer chemistry for coatings formulators, R&D chemists, and sales and marketing personnel with strong technical backgrounds or interests. Attendees will gain a greater understanding of the important basic concepts of polymer science and also will have an improved understanding of the fundamental principles that determine coating performance. The course will allow the attendees to develop coatings based on fundamental understanding as opposed to trial and error. The course is also relevant for ink, sealant and adhesive industry personnel.

INSTRUCTORS

Frank Jones (Eastern Michigan University)
Fritz Walker (Air Products and Chemicals)
David Nordstrom (DuPont Automotive)
Alvin C. Lavoie (Rohm & Haas)
Jennifer Cogar (McWhorter, Inc.)
Patricia Lesko (Rohm & Haas)
Paul R. Baukema (Akzo Nobel Coatings, Inc.)
Dr. Terry Potter (Bayer Corp.)
Bill Simonsick (DuPont Marshall Labs)
David A. Dubowik (Air Products and Chemicals)
Nicholas Albrecht (Cytec Industries, Inc.)
Manoj Gupta (BASF Corp.)

PROGRAM FEES

Member —$395
Non-Member —$495

Conference Course

Advances in Coatings Characterization

Wednesday–Thursday
October 23-24, 1996
McCormick Place

COURSE DESCRIPTION

Provides a quick review of key analytical techniques in the coatings industry, along with an update on recent methods. Attendees will also see examples of successful application of these techniques to solve practical paint and coatings problems. This course is targeted towards laboratory directors, QC managers, customers/specifiers, graphic arts industry personnel and analytical personnel.

INSTRUCTORS

Marek Urban (North Dakota State)
Mike Claybourn (ICI Paints)
Andy Gilicinski (Air Products)
Rich Granata (Lehigh University)
Peter Kamarchik (PPG Industries)
Paula Clark (Air Products)
Mike Reading (ICI Paints)

PROGRAM FEES*

Member—$395
Non-Member—$495

Conference Course

Substrates and Coatings

Wednesday–Thursday
October 23-24, 1996
McCormick Place

COURSE DESCRIPTION

Provides attendees with a better understanding of the effects substrates have on coatings performance. Attendees will learn of the various considerations which must be examined in order to develop the right coating for the right substrate. "Substrates and Coatings" is aimed at formulators, laboratory and R&D chemists, technical service and sales personnel, along with coatings specifiers. Individuals from the ink industry, and those who develop substrates will also benefit by attending this event.

FEDERATION OF SOCIETIES FOR COATINGS TECHNOLOGY

ICE INTERNATIONAL COATINGS EXPO AND TECHNOLOGY CONFERENCE

INSTRUCTORS

Sam Williams (USDA Forest Products Lab)
Eric Kline (KTA Tator)
Simon Boocock (SSPC)
Doug Grossman (Q Panel)
Jim McGuiness (Red Spot)
Bruce Thill (Dow Chemical)

PROGRAM FEES*

Member —$395
Non-Member—$495

Conference Course— "Back to Basics"

General Overview of Coatings Technology

Wednesday–Thursday
October 23-24, 1996
McCormick Place

COURSE DESCRIPTION

For chemists new to the industry or with minimal experience, lab technicians, and sales, marketing and field support personnel. The program will provide attendees with an overview of coatings types; a review of basic coatings composition; and cost savings ideas for formulation. Participants will gain a better understanding of the physical properties associated with coatings and be given tips on troubleshooting techniques.

PROGRAM FEES*

Member —$395
Non-Member —$495

**Fees are $50 more on-site.*

General Information on Expo and Conference

Registration Information

Registration fees include full admission to the International Coatings Expo as well as the FSCT Annual Meeting and its Technical Presentations and other events as outlined in the registration table below.

Registration Fees

No advance registrations will be accepted after 12:00 Midnight on September 11. After that date, all registrations must be made on-site in Chicago. All credit card transactions are processed in U.S. Dollars and are subject to current exchange rates. International checks must be submitted in U.S. Dollars, paid in U.S. Banks. Badges will be mailed in advance to pre-registered ICE and Conference attendees and their pre-registered Social Guests.

Badge holders will be distributed at the ICE registration verification areas located at McCormick Place North and at the Chicago Hilton and Towers.

Conference attendees registration credentials including badges will be distributed in Chicago at the ICE Conference Registration area located in the Chicago Hilton Hotel.

Training taken to maintain or improve your professional skills is usually tax deductible as an ordinary and necessary business expense. Consult with your tax advisor for applicability.

FSCT's Refund Policy

Cancellations received on or before October 9 will be charged $15. Cancellations received after that date will be charged $50. No refunds will be issued for cancellations received after October 16. All refunds will be processed after November 1.

Registration Hours

McCormick Place North
Tues., Oct. 22 ..... 7:30 am - 5:00 pm
Wed., Oct. 23 ..... 7:30 am - 5:00 pm
Thurs., Oct. 24 ..... 7:30 am - 5:00 pm
Fri., Oct. 25 ..... 7:30 am - 12 Noon

Chicago Hilton and Towers
Mon., Oct. 21 ..... 5:00 pm - 7:00 pm
Tues., Oct. 22 ..... 7:30 am - 5:00 pm
Wed., Oct. 23 ..... 7:30 am - 10:00 am

FSCT Convention Hotels

There are eight official ICE hotels in Chicago. Serving as the headquarters property will be the Chicago Hilton and Towers. Other hotels are: Palmer House (NPCA Headquarters); Hyatt Regency; Fairmont; Essex Inn; Executive Place; Renaissance Chicago; and Hyatt on Printers Row.

Special Airfare Discounts

Special arrangements have been made with United and Delta Airlines for reduced airfares for ICE attendees. To participate, call the FSCT Travel Desk or the airlines directly.

Contact the FSCT Travel Desk and mention **"ICE96"**
Phone 800-448-FSCT
Int'l callers 215-628-2549
Fax 215-628-0310

Contact the airlines directly by calling
United 800-521-4041
mention code: **563UA**
Delta 800-241-6760
mention code: **I 3623**

Social Guest Program

Activities for Social Guest registrants begin on Wednesday afternoon with a Welcome Social at the Chicago Hilton and Towers hotel.

On Thursday, Social Guests enjoy a continental breakfast and afterwards depart on motorcoaches for a tour of Chicago's downtown area. A visit to the Art Institute of Chicago will be included in the tour. Participants will view the traveling exhibition of the works of Edgar Degas. Organized by the National Gallery in London and the Art Institute of Chicago, the ex-

International Coatings Expo and Technology Conference Registration Fees

	Member		Non-Member	
Program Fee Schedule	**Advance**	**On-Site**	**Advance**	**On-Site**
Expo and FSCT Annual Meeting Presentations	$75	$90	$100	$125
Full Technology Conference & Expo	$495	$545	$595	$645
Coatings Technology Conference Two-Day Course	$395	$445	$495	$545
Executive Forum	$395	$445	$495	$545
Pre-Convention Training Seminar	$195	$245	$295	$345
Social Guest Program	$60	$70	$60	$70
Retired FSCT Member and Spouse (each)	$30	—	—	—
Student (Valid Student ID Required)	$15	$25	$15	$25

Available Programs

	International Coatings Expo	FSCT Annual Meeting & Technical Presentations	Opening Session	Mattiello Lecture	One Pre-Convention Training Seminar	Executive Forum Dinner	One Conference Course	Technology Assessment Seminar	Welcome Social	Continental Breakfast
International Coatings Expo (ICE)	✔	✔	✔	✔			✔			
Full Coatings Technology Conference & Expo	✔	✔		✔	✔		✔			
Coatings Technology Conference Course	✔	✔		✔			✔			
Executive Forum	✔	✔	✔	✔		✔		✔		
Pre-Convention Training Seminar	✔	✔	✔	✔	✔					
Social Guest Program	✔		✔						✔	✔

hibit features his later works between 1886 when he participated in the last impressionists exhibit and 1917, the year of his death.

An exclusive luncheon for Social Guests will be included in the tour.

The fee for Social Guests of $60 in advance and $70 on-site includes the Social Guests activities, 3-days admittance to the Expo, and attendance to the Opening Session. Space is limited and pre-registration is strongly suggested.

(The category Social Guest is not to be used by co-workers or associates in the industry. It applies to the Spouse or Significant Other of the industry attendee.)

Shuttle Service

Shuttle service between the official ICE hotels and the McCormick Place North will be offered according to the following schedule:

Tues., Oct. 22	7:30 am - 6:00 pm
Wed., Oct. 23	7:30 am - 6:00 pm
Thurs., Oct. 24	7:30 am - 6:00 pm
Fri., Oct. 25	7:30 am - 3:00 pm

Ground Transportation

From O'Hare International Airport: Shuttle bus service is available via Continental's Airport Express; fare is $14.75 one way. Taxi fares run upwards of $25 to the downtown hotels. The Chicago Transit Authority (CTA) operates rail service from O'Hare to downtown Chicago for $1.25 one way.

From Midway Airport: Shuttle bus service is available via Continental's Airport Express; fare is $10.75 one way. Taxi fares run upwards of $18 to the downtown hotels.

Registration Packages

Expo & FSCT Annual Meeting
- International Coatings Expo (ICE)
- FSCT Annual Meeting and Technical Presentations
- Opening Session
- Mattiello Lecture

Full Coatings Technology Conference and Expo
- One Pre-convention Training Seminar (Tues., Oct. 22)
- One Conference Course (two-day program, Oct. 23-24)
- International Coatings Expo (ICE)
- FSCT Annual Meeting and Technical Presentations
- Mattiello Lecture

Coatings Technology Conference
- One Conference Course (two-day program, Oct. 23-24)
- International Coatings Expo (ICE)
- FSCT Annual Meeting and Technical Presentations
- Mattiello Lecture

Executive Forum
- Executive Forum Dinner (Mon., Oct. 21)
- Technology Assessment Seminar (Tues., Oct. 22)
- International Coatings Expo (ICE)
- FSCT Annual Meeting and Technical Presentations
- Opening Session
- Mattiello Lecture

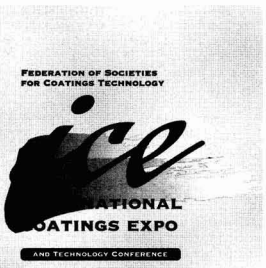
Pre-Convention Training Seminar
- One Pre-Convention Training Seminar (Tues., Oct. 22)
- International Coatings Expo (ICE)
- FSCT Annual Meeting and Technical Presentations
- Opening Session
- Mattiello Lecture

Social Guest Program
- Welcome Social (Oct. 23)
- Continental Breakfast and Tour (Oct. 24)
- International Coatings Expo (ICE)
- Opening Session

1996 International Coatings Expo

List of Exhibitors

(As of May 1, 1996)



A.P. Dataweigh Systems
Aceto Corp.
ACT Laboratories, Inc.
Adhesive Age
Advanced Software Designs
Air Products & Chemicals, Inc.
Akzo Nobel Chemicals & Akzo Nobel Resins
Alcan Toyo America, Inc
Alnor Oil Co.
American Chemical Society, Information & Services
American Colors
Amoco Chemical Co.
ANGUS Chemical Co.
Anker Labelers USA Inc.
Aqualon Co.
ARCO Chemical Co.
Arizona Instrument Corp.
Ashland Chemical Co.
Atlas Electric Devices
Atotech USA Inc.
Aztec Peroxides Inc.
B.A.G. Corp.
BASF Corp.
BatchMaster Software, Inc.
Bayer Corp.
Blacoh Fluid Control, Inc.
Brookfield Engineering Labs.
Buckman Laboratories, Inc.
Buhler, Inc.
Burgess Pigment Co.
BYK-Chemie USA
BYK-Gardner, Inc.
CB Mills
CCP
C.I.P Products/Sellers Cleaning Systems
Cabot Corp., CAB-O-SIL & Special Blacks Div.
Calgon Corp.
Cardolite Corp.
Center for Applied Engineering
Chemical & Engineering News
Chemical Week
Chemir/Polytech Laboratories
Ciba (Additives, Pigments, Plastics Divs.)
Cimbar Performance Minerals
Civacon
Clariant Corp.
Clawson Container Corp.
Coatings Magazine
Color Corp.
Columbian Chemicals Co.
Consolidated Research, Inc.
Cortec Corp.
CR Minerals Corp.
Crosfield Co.
Cytec Industries Inc.
D/L Laboratories
Daniel Products Co., Inc.
Datacolor International
Degussa Corp.
Dominion Colour Corp.
The Dow Chemical Co.
Dow Corning Corp.
Draiswerke, Inc.
Draiswerke GmbH
Drew Industrial Div. of Ashland
Dry Branch Kaolin Co.
DSM Resins US, Inc.
DuPont Nylon Intermediates & Specialties
E.C.C. International
Eagle Zinc Co.
Eastern Michigan University
Eastman Chemical Co.
Ebonex Corp.
Eiger Machinery, Inc.
Elf Atochem North America Inc.
EMCO Chemical Distributors
Engelhard Corp.
Engineered Polymer Solutions
Epworth Manufacturing Co., Inc.
Erie Chemical Sales
Etna Products Inc.
European Coatings Journal
Exxon Chemical Co.
Federation of Societies for Coatings Technology
The Feldspar Corp.
Fillite
Filter Specialists, Inc.
Fischer Technology Inc.
Fluid Management
FMJ International Publications
Fuji Silysia Chemical, Ltd.
H.B. Fuller Co.
Gamry Instruments, Inc.
Paul N. Gardner Co., Inc.
Garrison Industries, Inc.
Georgia Pacific Resins, Inc.
BFGoodrich Co. Specialty Chemicals
The Goodyear Tire & Rubber Co., Chemical Division
Grace Davison
Haake, Inc.
Halox Pigments
J.W. Hanson Co., Inc.
Harcros Pigments Inc.
Henkel Corp.
HERO Industries Ltd.
Heucotech Ltd.
Hickson Specialties, Inc.
Hilton Davis Co.
Hockmeyer Equipment Corp.
Hoechst Celanese Corp.
Horiba Instruments Inc.
J.M. Huber Corp./Engineered Minerals Div.
Huls America Inc.
Hunterlab
Huntsman Corp.
Ideal Manufacturing & Sales
IGT Reprotest Inc.
INDCO
Industrial Oil Products
Ink World Magazine
Inmark, Inc.
International Compliance Center
International Resources, Inc.
Int'l Specialty Products (ISP)
ITT Marlow/ITT A-C Pump
S.C. Johnson Polymers
Journal of Coatings Technology
Kady International
Kemira Pigments Inc.
Kenrich Petrochemicals, Inc.
King Industries, Inc.
Kline Co.
K-T Feldspar Corp.
KTA-Tator, Inc.
LaQue Corrosion Services
Lawter International
The Leneta Co.
Liquid Controls Corp.
Littleford Day Inc.
Longview Fibre
The Lubrizol Corp.
Lucas Meyer, Inc.
Luzenac America, Inc.
3M/Zeelan Industries
Macbeth, Div. of Kollmorgen
McWhorter Technologies
Malvern Minerals Co.
Mapico Inc.
The Mearl Corp.
Microfluidics International Corp.
Micro Powders, Inc.
Micromeritics
Millipore Corp.
Milwhite, Inc.
Ming-Zu Chemical Industries
MiniFibers, Inc.
Minolta Corp.
Mississippi Lime Co.
UMR Coatings Institute
Modern Paint & Coatings
Monsanto Co.
Morton International
Muetek Analytic, Inc.
Myers Engineering
Nacan Products Ltd.
Namatre Co.
National Paint & Coatings Assoc.
Netszch Inc.
Neupak Inc.
Neville Chemical Co.
New Way Packaging Machinery
North Dakota State University
NYCO Minerals, Inc.
Ohio Polychemical Co.
Olin Corp.
Omnimark Instrument Corp.
OSi Specialties Group/Witco
OxyChem
Paint & Coatings Industry
Paint Research Association
Parasol Systems, Inc.
Parker Hannifin Corp.
Particle Sizing Systems
Peninsula Polymers, Inc.
Phenoxy Associates
Pico Chemical Corp.
Pioneer Packaging Machinery
Polar Minerals
Poly-Resyn, Inc.
Reichhold Chemicals, Inc.
PPG Specialty Chemicals
PQ Corp./Potters Industries
Premier Mill Corp.
Q-Panel Lab. Products Corp.
Q-Sales and Leasing
K.J. Quinn & Co., Inc.
Raabe Corp.
Radtech Int'l North America
Ranbar Technology Inc.
Reichhold Chemicals, Inc.
Rheometrics Scientific
Rheox, Inc.
Rhone-Poulenc Inc.
Rohm and Haas Co.
Ronningen-Petter
Charles Ross and Son Co.
Royce Associates
Russell Finex Inc.
Sartomer Co., Inc.
Schenectady International, Inc.
Schlumberger Measurement Div.
Schold Machine Co.
SEPR
Shamrock Technologies
Shell Chemical Co.
Sherwin Williams Chemicals
Silberline Mfg. Co., Inc.
Software 2000, Inc.
Southern Clay Products, Inc.
University of Southern Miss.
Specialty Minerals Inc.
Spraymation, Inc.
Startex Chemical
Sub-Tropical Testing Service
Sud-Chemie Rheologicals
Summit Precision Polymers Corp.
Sun Chemical Corp.
Taotek North America, Inc./ Corob North America Div.
TAYCA Corp.
Teemark Corp.
Tego Chemie Service USA
Thiele Engineering
Thomas Scientific
Troy Corp.
UCB Chemicals
U.S. Aluminum, Inc.
U.S. Borax
U.S. Silica Co.
Unimin Corp.
Union Carbide Corp.
Union Process Inc.
United Mineral & Chemical Corp.
VanDeMark Group
R.T. Vanderbilt Co., Inc.
Van Waters & Rogers Inc.
Versa-Matic Pump Co.
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X-Rite Inc.
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Carl Zeiss Inc., Microscope Div.
Zeneca Biocides
Zeneca Resins

1996 PRE-REGISTRATION FORM

FSCT International Coatings Expo & Technology Conference

• Chicago, IL •
October 22 • 23 • 24 • 25, 1996

- **Fax** completed form to **(805) 654-1676**
- **Mail** completed form with payment to: ICE Registration, c/o RCS, 2368 Eastman Ave., Ste. 11, Ventura, CA 93003-7797
- *Registration Helpline:* (610) 940-0777, 8:30 - 4:30 ET

Deadline: September 11, 1996. Register Today!

To pre-register, this form must be postmarked no later than September 11, 1996. Forms received after then will be returned with a notice advising you to register on-site. Form must be filled out completely for processing. A confirmation of your registration will be sent to you. Badges will be sent in advance to U.S. registrants. International registrants may obtain their badges at the international registration desk in Chicago. ICE badges must be worn for admission to the convention programs and Expo.

1. Industry Attendee Badge Information:

CP ☐

FIRST NAME (Nickname)

FIRST NAME LAST NAME

COMPANY

MAILING ADDRESS (or P.O. Box)

CITY STATE/PROV.

COUNTRY (other than U.S.) POSTAL CODE

TELEPHONE NO. FAX NO.

2. Social Guest Badge Information:

CP ☐

FIRST NAME (Nickname)

FIRST NAME LAST NAME

CITY STATE/PROV.

COUNTRY (other than U.S.) POSTAL CODE

3. Registrant Profile:

FSCT Member? 1 ❒ Yes 2 ❒ No

Society Affiliation _____

Information below must be completed for registration to be processed

Your Company (Check one only)

31 ❒ Manufacturers of Paints, Varnishes, Lacquers
32 ❒ Manufacturers of Printing Inks
33 ❒ Manufacturers of Sealants, Caulks, Adhesives
34 ❒ Manufacturers of Powder Coatings
35 ❒ Manufacturers of Raw Materials
36 ❒ Manufacturers of Equipment and Containers
37 ❒ Sales Agents for Raw Materials and Equipment
38 ❒ Government Agency
39 ❒ Research/Testing/Consulting
40 ❒ Educational Institution
41 ❒ Paint Consumer
42 ❒ Environmental Services
43 ❒ Other_____

Your Position (Check one only)

51 ❒ Management/Administration
52 ❒ Mfg. & Engineering
53 ❒ Quality Control
54 ❒ Research & Development
55 ❒ Technical Sales Service
56 ❒ Sales & Marketing
57 ❒ Consultant
58 ❒ Educator/Student
59 ❒ Other _____

4. Registration Information:

Enter your selected options below. ***NOTE: Seminar and course attendance is limited.*** *If checking a conference seminar or course, provide second choice.*

	Member	Nonmember	AMOUNT
❒ **Expo & Annual Meeting Papers Only** ***(Oct. 23-25)***	$ 75 (A)	$100 (B)	$_____
❒ **Retired Member** (Expo & Annual Meeting Only)	$ 30 (C)	—	$_____
❒ **Social Guest of Retired Member**	$ 30 (D)	—	$_____
❒ **Student** (Expo & Annual Meeting Only)	$ 15 (E)	$15 (E)	$_____
❒ **Full Conference & Expo** ***(Oct. 22-25)***	**$495** (I)	**$595** (J)	$_____
Check one training seminar and one conference course below			
❒ **Conference Two-Day Course** ***(Oct. 23-24)*** *Check below*	$395 (K)	$ 495 (L)	$_____
❒ **Executive Forum** ***(Oct. 22)***	$395 (G)	$ 495 (H)	$_____
❒ **Pre-Convention Training Seminar** ***(Oct. 22)*** *Check below*	$195 (M)	$ 295 (N)	$_____
❒ **Social Guest Program** ***(Oct. 23-25)***	$ 60 (F)	—	$_____
❒ **FSCT Industry Luncheon Ticket** ***(Oct. 24)*** *No. of tickets* ___	$ 30 (X)	$ 30 (X)	$_____

Oct. 22 Training Seminars

T1 ❒ Surfactant Chemistry
T2 ❒ Technical Presentations
T3 ❒ Technical & Scientific Writing
T4 ❒ Design of Experiments
T5 ❒ Spray Application
_____ (second choice)

Oct. 23-24 Conference Courses

C1 ❒ Substrates & Coatings
C2 ❒ Coatings Characterization
C3 ❒ Polymer Chemistry
C4 ❒ Back to Basics
_____ (second choice)

TOTAL DUE $_____

JCT 5/96

5. Method of Payment:

Total Amount Due $_____

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VS Visa AE American Express

Card # _____

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Cardholder's Name (please print):

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Cardholder's Signature:

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Make checks payable in U.S. Funds to ***FSCT***

Cancellation Policy:

Cancellations received on or before October 9 will be charged a $15 cancellation fee. Conference cancellations received after that date will be charged a fee of $50. NO REFUNDS FOR CANCELLATIONS RECEIVED AFTER OCTOBER 16.

FATIPEC Congress to Be Held in Conjunction with European Coatings Show in Brussels, Belgium

On June 11-13, Brussels Exhibition Center, Brussels, Belgium, will host the European Coatings Show '96. Over 140 companies from more than 14 countries are expected to participate in this annual event.

Exhibits will include raw materials, process and production engineering, measuring and testing, coatings materials, waste disposal, environmental protection and services.

A new feature at this year's exhibition is The FairTimer. This service will provide visitors with the opportunity to plan their schedule in advance. The FairTimer, a free service, suggests possible appointments at exhibitor's stands and optimizes the route through the exhibition.

In conjunction with the exhibition, the XXIII FATIPEC Congress will be held on June 10-14. The Congress will focus on "Performance, Environment, and Legislation: Challenges and Sources of Innovation in the Coatings Industry."

For additional information, contact Destrée Organization, Rue des Drapiers 46, B-1050 Brussels, Belgium.

NDSU Intensive Coatings Course to Explore The Foundation of Coatings Technology

A course designed to provide an understanding of the principles that form the foundation of coatings technology will be conducted by North Dakota State University (NDSU), Fargo, ND, on June 3-14, 1996.

Although there is a one-week option available, the course is designed as a two-week event, and attending the entire two weeks is strongly recommended. The first week will focus primarily on synthetic aspects of coatings, whereas the second week will be designated to topics dealing with other physico-chemical processes, applications, and measurements.

The following topics will be discussed:

- ✓ Chain-Growth and Step-Growth Polymerization Resins
- ✓ Film Formation
- ✓ Acrylic, Polyester, Alkyds
- ✓ Amine-Formaldehyde Resins; Crosslinking
- ✓ Epoxy Resins
- ✓ Urethane Coatings
- ✓ Pigments & Pigment Dispersions
- ✓ Solvents
- ✓ Coatings Formulation
- ✓ Rheology
- ✓ Appearance of Coatings
- ✓ Coatings Performance
- ✓ Powder Coatings
- ✓ High Solids
- ✓ Radiation Curing
- ✓ Corrosion
- ✓ Structure-Property Relationships

The Coatings Science course is designed for chemists relatively new to the field, and for more experienced chemists who seek broader perspective, understanding, and fundamentals of coatings science. Participants should have some college chemistry background.

The fee for the two-week course is $2,500. The cost for the one-week option is $1,400. For more information, contact Debbie Shasky, Program Coordinator, NDSU, Dept. of Polymers and Coatings, 54 Dunbar Hall, Fargo, ND 58105; (701) 231-7633.

ICALEO '96 Slated for Oct. 14-17, in Michigan

The 15th International Congress on Applications of Lasers and Electro-Optics (ICALEO '96) will be held at the Radisson Plaza Hotel at Town Center, Southfield, MI, on October 14-17. This four-day conference will highlight state-of-the-art in lasers and laser applications, including materials processing and automaking. The meeting includes two separate conferences and a series of short courses on the safe uses of lasers, including the following:

Laser Materials Processing Conference—Areas of emphasis include: surface modifications; cutting and drilling; process modeling and control; rapid prototyping; microprocessing; welding; electronics applications; laser safety; and new developments in laser equipment and laser technology;

Lasers and Electro-Optics for Automotive Manufacturing Conference—Areas of emphasis include: welding applications for car bodies; cutting auto body components; welding/processing of automotive subassemblies (fuel injectors, air bags); processing drivetrain components; heat treating/cladding; and laser safety; and

Laser Solutions '96—A multi-day program providing manufacturing professionals a choice of laser-related short courses.

For more details, contact Daryl Flynn, Laser Institute of America, 12424 Research Pkwy., Ste. 125, Orlando, FL 32826.

BYK-Gardner Releases Upcoming Seminar Schedule

The schedule for upcoming Color & Appearance Seminars has been announced by BYK-Gardner, Silver Spring, MD.

The seminars will cover color and appearance measurement and provide hands-on testing of participant's samples.

Dates and locations for the half-day seminars are: June 4, Richmond, VA; Sept. 12, Minneapolis, MN; Sept. 24, Pittsburgh, PA; Oct. 1, Toronto, Ontario; Oct. 2, Indianapolis, IN; and Oct. 8, Atlanta, GA.

In addition, BYK-Gardner, in conjunction with BYK-Chemie, Wallingford, CT, will offer one-day seminars on additives and instruments. The dates and locations for these seminars are the following: June 18, Boston, MA; June 20, Philadelphia, PA; June 21, Baltimore, MD; Sept. 24, St. Louis, MO; Sept. 25, Chicago, IL; Nov. 12, Orlando, FL; Nov. 13, Atlanta, GA; and Nov. 15, Dallas, TX.

Contact BYK-Gardner USA, 2435 Linden Lane, Silver Spring, MD 20910; (800) 343-7721, for additional information.

Jack Kemp to Deliver NPCA's Keynote Address; NPCA Highlights New Program & EPA Regulation

The National Paint & Coatings Association (NPCA), Washington, D.C., will open its 109th Annual Meeting "Leading with Vision" with former Congressman Jack Kemp delivering the Keynote Address. Mr. Kemp will be featured during the opening session of the annual meeting, scheduled for October 23-25 at the Palmer House (Hilton), in Chicago, IL.

In his speech titled, "America on the Eve of the 21st Century," Mr. Kemp will discuss his economic and political vision that is based on pro-growth and pro-family, global competition for American business and labor, and urban strategies for combating poverty and despair.

Mr. Kemp, who represented Buffalo and the Western New York area in the U.S. House of Representatives from 1971-1989, is currently co-director of Empower America. Prior to founding Empower America, he served four years as Secretary of Housing and Urban Development. In March 1995, Mr. Kemp was named Chairman of the National Commission on Economic Growth and Tax Reform. Prior to entering the political arena, he was a professional football quarterback for 13 years.

Also on the agenda for NPCA's Annual Meeting is a modified version of the past two year's talk-show format, which includes live interviews, panel discussions, taped presentations, and interactive discussions.

This year's meeting will run concurrently with the FSCT's International Coatings Expo and Technology Conference. NPCA registrants will be admitted to the FSCT International Coatings Expo at no charge as part of attending the NPCA Annual Meeting.

For additional information on NPCA's Annual Meeting, contact Cheryl Matthews, NPCA, 1500 Rhode Island Ave., N.W., Washington, D.C. 20005-5597; (202) 462-6272.

Coatings Care™ Program Approved

NPCA's Board of Directors unanimously approved the association's new Coatings Care™ program. This program offers participating member companies the opportunity to pursue a common, effective, management approach for their health, safety, and environmental programs.

According to the Coatings Care policy statement, the program is outlined to:

- promote efforts to protect employees, customers, the public, and the environment;
- provide relevant information on the safe use and disposal of industry products to customers, and make such information available to the public on request;
- make protection of health, safety, and the environment an early and integral part of the organizational planning process;
- comply with all legal requirements which affect operations and products;
- be responsive to community concerns; and
- assist governments in the development of equitable and attainable standards.

Coatings Care will establish codes of management practices in four areas of health, safety, and environmental responsibility—manufacturing, transportation and distribution, product stewardship, and community responsibility.

NPCA has a tentative schedule for member implementation that would introduce the transportation and distribution code in 1997; manufacturing code in 1998; product stewardship in 1999; and community responsibility in 2000. Companies would be asked to achieve full code implementation within three years from the introduction of a code. According to this plan, Coatings Care should be fully implemented by 2003.

In addition to approving the Coatings Care program, NPCA's Board of Directors also approved the Mitretek Corporation's proposal for developing a computerized resource guide for Coatings Care, defining key program elements associated with regulatory requirements, and integrating NPCA publications and international standards on environmental management.

The resource guide, which will focus on activities that members should take part in while developing and implementing their Coatings Care programs, will eventually be linked to the Internet.

(Continued on next page.)

ACS Seeks Nominations for 1997 Tess Award

The American Chemical Society's Division of Polymeric Materials: Science and Engineering (PMSE) is seeking nominations for the 1997 Roy W. Tess Award in Coatings. This award will be presented at the 214th meeting of ACS, on September 7-11, 1997, in Las Vegas, NV.

The Tess Award recognizes outstanding individual achievements and noteworthy contributions to coatings science, technology, and engineering.

The Nominating Committee is chaired by Robert F. Brady Jr., of Naval Research Laboratory. Other members of the committee include: Donald W. Boyd, of PPG Industries; Frank N. Jones, of Coatings Research Institute, Eastern Michigan University; Jonathan W. Martin, of National Institute of Standards and Technology; and Rose A. Ryntz, of Ford Motor Co.

Nominations from all sections of industry, academia, and government are welcome. All nominations should be sent to Dr. Brady at Naval Research Laboratory, Code 6123, Washington, D.C. 20375-5342. Upon receipt of names, Dr. Brady will provide a documentation form requesting information on the nominee relevant to patents, publications, and overall qualifications. All finalized nominations for the 1997 Tess Award should be submitted prior to September 1, 1996.

Construction Underway at Kemira Pigments' Wastewater Treatment Facility in Pori, Finland

Kemira Pigments, Pori, Finland, has begun construction of a new wastewater treatment plant. The installation of the main equipment has started and the plant will be completed by the end of 1996. The total cost of the new facility is 165 million FIM ($36 million USD).

The new treatment plant will neutralize all wastewater produced at the sulphate-based Pori plant. The process of the treatment plant has been developed by Kemira Pigments and it has been studied for years. The process uses limestone powder which reacts with dilute acids, producing gypsum, which is filtered from the water with pressure filters. Specially treated gypsum finds use in a variety of technical applications.

The new wastewater treatment plant is a substantial part of the $116 million USD investment program of Kemira Pigments, in which the annual production capacity of the Pori plant will be raised from 90,000 tons to 120,000 tons and the combined production capacity of the whole Kemira Pigments Group to 321,000 tons. The program is also aimed at enhancing the quality of Kemira pigments and improving the environmental protection standards. Kemira Pigments has three titanium dioxide plants—in Finland, the Netherlands, and the U.S.

Hüls America Completes Expansion of IPDI Facility

Following the completion of a $40 million expansion, Hüls America Inc. has begun full-scale commercial production of Vestanat® isophorone diisocyanate (IPDI) at its Mobile, AL, facility. The manufacturing unit will have a capacity of more than 20 million pounds per year.

Hüls will be using the IPDI as feedstock for all its isophorone derivatives employed in coating applications. Major derivatives include Vestanat T-1890 solution grades for liquid coatings as well as Vestagon® blocked isocyanates for powder coatings.

Hercules' Plant Attains ISO 9002 Certification

Hercules Incorporated, Wilmington, DE, has announced that its Jefferson, PA, plant has achieved ISO 9002 certification.

Last year, Hercules Resins Division obtained certification for pure monomer and hydrogenated resins, two product lines manufactured at the Jefferson facility. Currently, the plant is pursuing certification in the dispersion manufacturing process and is expected to be certified by August 1996.

Production Begins At Rohm & Haas' Biocide Plant

Rohm & Haas Co., Philadelphia, PA, has started production at its new biocide manufacturing facility in Bayport, Texas, with its Sea-Nine® marine antifoulant products. Production of Kathon® biocides will follow shortly.

Construction of the biocides facility began in 1994 and cost about $45 million to complete.

Kemp to Keynote NPCA's Annual Meeting in October

(Continued from previous page.)

Another important feature of the Coatings Care program is that it is supportive and complementary to the chemical industry's Responsible Care® program. Companies who already fulfill a commitment to Responsible Care are acknowledged by NPCA as having met all of the requirements of Coatings Care.

EPA Allows States to Claim Credit for AIM Regulation

NPCA reports that EPA has issued a memorandum that will allow states to claim a 20% volatile organic compound emissions reduction credit towards a requirement that they reduce VOC emissions by 15% under the Clean Air Amendments of 1990.

The credit is significant to states with ozone nonattainment areas because they are required to reduce VOC emissions by 15% in those areas by November 1996. According to Jim Sell, NPCA's Senior Counsel, many states had relied on EPA to issue a national AIM coatings VOC rule before that date and had based their reduction plans on this expectation. The national regulation, however, will not be effective until 1997.

"If EPA had not issued the memorandum, many states, including those with high populations and significant markets for AIM coatings, would have felt compelled to issue their own individual AIM coatings regulations to ensure the integrity of their state implementation plans for meeting the 15% rate of progress requirement," explained Mr. Sell.

Failure to meet this requirement could result in significant sanctions being imposed on a state, including the cutoff of federal highway funds, as well as the imposition of additionally stringent requirements for further reductions in VOC emissions from newly constructed plants. Notably, a federal district court recently rejected the state of Missouri's efforts to challenge EPA's authority to impose such sanctions.

Prior to an earlier EPA decision in 1994 to grant a VOC reduction credit to the states on the basis of the forthcoming national AIM rule, several states were considering the stringent VOC limits found in California's South Coast Air Quality Management District.

Specialty Chemical Sales Expands Operations

Specialty Chemical Sales, Inc., Cleveland, OH, has expanded its operations into the chemical distribution market. The new offices and warehouses are located at 4050 W. 150th St., Cleveland, OH 44135; telephone: (216) 476-9600.

Painting and Finishing Exterior Wood

William C. Feist*

Introduction

This article is abstracted from an upcoming FSCT monograph, "Finishing Exterior Wood," from the FSCT *Series on Coatings Technology*. The article describes wood characteristics, exterior wood finishes, and their proper applications to solid and reconstituted wood products. It describes how manufacturing affects the surfaces of wood products, how various types of finishes interact with the surfaces, and how weathering affects the finished surfaces. More detailed information on wood properties and finishes, as well as additional information on methods for selecting and applying various exterior wood finishes, and information on the cause and cure of finish failures are covered in the soon-to-be published monograph. The new monograph will also contain a glossary of terms, information on acidic deposition, and more detailed information on the mechanisms of wood weathering. Other topics covered include finishing preservative treated wood and finishes for wood in special applications such as decks, fences, marine environments, and roofs.

Wood Properties and Finish Durability

Wood is a natural biological material and, as such, its properties vary not only from one species to another but within the same species. Some differences can even be expected in boards cut from the same tree. The natural and manufacturing characteristics of wood are important influences on finishing characteristics and durability.

The properties of wood that vary greatly from species to species are density, grain characteristics (presence of earlywood and latewood), texture (hardwood or softwood), presence and amount of heartwood or sapwood, and the presence of extractives, resins, and oils. The density of wood, or its "weight," is one of the most important factors that affects finishing characteristics. Excessive dimensional change in wood constantly stresses a film-forming finish such as paint and may result in early failure of the finish. Density varies tremendously from species to species and it is important because "heavy" woods shrink and swell more than do "light" woods. The paintability of various softwoods and hardwoods is related to natural wood characteristics of density, presence of latewood and texture, and of manufacturing characteristics such as ring orientation.

"Wood is a natural biological material and, as such, its properties vary not only from one species to another but within the same species."

The amount of warping and checking that occurs as wood changes dimensions and during the natural weathering process is directly related to wood density. Warping is generally caused by uneven shrinking or swelling within the board. Boards may twist from one end to the other, deviating from a straight line along the length of the piece; a form of warp called crook. High density (heavy) woods such as southern yellow pine tend to warp and check more than do the low density (light) woods such as redwood. Finally, low density woods are generally easier to nail, machine, and handle than are high density woods.

The presence and amount of latewood in softwood (conifer) lumber affect paint durability and are closely related to wood density. Latewood is denser, harder, smoother, and darker than earlywood, and its cells have thicker walls and smaller cavities. The wider the latewood band, the denser the wood. These distinct bands in woods like the southern pines often lead to early paint failure. New paint adheres firmly to both earlywood and latewood. However, old paint that has become brittle with age and weathering loses its adhesion and peels from the smooth, hard surface of the latewood.

As trees mature, most species naturally develop a darker central column of wood called heartwood. To the outside of the heartwood is a lighter cylinder of wood called sapwood. The sapwood serves to transport water and nutrients from the roots to the leaves and to provide mechanical support for the tree. The heartwood serves only as support. Heartwood is formed as the individual cells die and are impregnated with extractives, pitch, oil, and other extraneous materials. The old-growth timber from some species, such as redwood, redcedar, and cypress, is notable for its natural resistance to decay and insects.

Water-soluble extractives are extraneous materials that are naturally deposited in the lumens, or cavities, of cells in the heartwood of both softwoods and hardwoods. They are particularly abundant in those woods commonly used for exterior applications, such as western redcedar, redwood, and cypress, and are also found in lesser amounts in Douglas-fir and southern yellow pine heartwood. The attractive color, good dimensional stability, and natural decay resistance of many species are due to the presence of extractives. However, these same extractives can cause serious finishing defects both at the time of finish application as well as later. Because the extractives are water-soluble, they can be dissolved when free water is present and subsequently transported to the wood surface. When this solution of extractives reaches the painted surface, the water evaporates, and the extractives remain as a reddish-brown mark.

Pitch in most pines and Douglas-fir can be exuded from either the sapwood or heartwood. Pitch is usually a mixture of rosin and turpentine; this mixture is called resin. Rosin is brittle and remains solid at most normal temperatures. Turpentine, on the other hand, is volatile even at relatively low tem-

*6809 Forest Glade Ct., Middleton, WI 53562-1711.

"The presence of knots and other irregularities (such as bark, splits, pitch pockets, and insect damage) affects the paintability of lumber and is generally a function of lumber grade."

peratures. By use of the proper kiln-drying techniques, turpentine can generally be driven from the wood, leaving behind only the solid rosin. However, for green (wet) lumber or even dried lumber marketed for general construction, different kiln schedules may be used, and the turpentine remains in the wood, mixed with the rosin. The resultant resin melts at a much lower temperature than does pure rosin, and consequently the mixture can move to the surface. If the surface is finished, the resin may exude through the coating or cause it to discolor or blister.

Some characteristics of wood, such as how the board was sawn from the log (which determines growth ring orientation), the presence of knots and similar irregularities (lumber grade), and moisture content, are determined primarily during the manufacturing, grading, and distributing processes. These processes can affect the finishing characteristics and durability of solid wood products.

The manner in which a board is cut from a log affects the orientation of the annual rings in the piece and thus its paintability. Softwood lumber is referred to as either flat grained or edge-grained (plainsawed or quartersawed in hardwoods) or a combination of the two. Most standard lumber grades contain a high percentage of flat-grain. Lumber used for board-and-batten siding and shiplap is frequently flat-grained. Bevel siding of redwood or cedar is generally produced in a flat-grained standard grade and an edge-grained premium grade. Flat-grained lumber shrinks and swells more than does edge-grained lumber and also has wider, darker bands of latewood. Therefore, edge-grained lumber for siding will usually hold paint better than does flat-grained material.

Lumber may be left in its roughsawn condition or surfaced smooth after drying. Paint is easier to apply on smooth, edge-grained surfaces and will last longer than on smooth, flat-grained ones. However, paint on roughsawn, (or rough sanded with 60-grit sandpaper) flat-grained surfaces will last longer than on smooth, flat-grained ones. Natural finishes such as penetrating stains or preservative treatments are preferred for roughsawn and flat-grained lumber. The natural finishes often accentuate the rustic look of roughsawn lumber and allow the wood grain and surface texture to show through the finish. On plywood, paint will last longer on new, rough-textured surfaces than on smooth surfaces because more paint can be applied to the rough surface.

The presence of knots and other irregularities (such as bark, splits, pitch pockets, and insect damage) affects the paintability of lumber and is generally a function of lumber grade. Knots are mostly exposed end-grain. End-grained wood absorbs more finish than does flat- and edge-grained lumber, and this affects the appearance of the paint coating. In pine, knots often contain a high percentage of resin, which may cause the paint over the knot to discolor. Furthermore, large knots usually check and crack to the extent that a noticeable split or defect can result. Therefore, the higher grades of lumber intended for finishing are generally preferable for achieving maximum serviceability of a paint coat.

Finally, the moisture content of the wood is a critical factor in determining the service life of paint. The best time to paint wood is when its average moisture content is about that expected to prevail during service. Wood above 20% moisture should never be painted as paint peeling and delamination may occur. Lumber that is marketed for construction purposes in the kiln-dried condition but is obviously wet and sometimes discolored should be rejected. If the material is used, it will dry in service, but shrinkage and accompanying warping, twisting, and checking will likely occur.

Finishing Characteristics

Of the softwoods, edge-grained redwood and western redcedar are rated the easiest to finish and maintain, whereas flat-grained southern yellow pine and Douglas-fir are rated difficult to finish and maintain. Redwood and cedar are low density woods and have narrow bands of latewood, whereas southern yellow pine and Douglas-fir are higher in density and have wide bands of latewood. The best hardwoods for painting are fine, uniform-textured (small-pored) woods with medium to low density such as yellow-poplar. On hardwoods, paint tends to scale off in rather large flakes, apparently regardless of the grain of the wood beneath the paint. The pores of some hardwoods are so large that they are not filled and leveled off properly by ordinary house paint. The pores consequently become the foci for early paint failure. Therefore, the pores must be filled with wood-filler paste prior to painting.

"Three general categories of wood products are commonly used in construction: lumber, plywood, and reconstituted wood products."

When high density hardwoods are exposed to the weather without paint or with inadequate paint protection, or when water enters behind the wood, the wood has a marked tendency to warp or cup and pull away from fastenings. These hardwoods need to be nailed firmly, although such nailing may cause the boards to split. Thinner boards are more likely to cup or warp from surface wetting and drying than thicker boards. For these reasons, 1/2 in. siding of heavy hardwoods is impractical. Boards for exterior exposure should be no thinner than 3/4 in. at any point and preferably less than 6 in. wide.

Wood Products Used Outdoors

Three general categories of wood products are commonly used in construction: lumber, plywood, and reconstituted wood products. Each product has unique characteristics that will affect the durability of any finish applied to it. In addition, any of these products may be treated with wood preservatives or fire-retardant chemicals, some of which also affect the finishing characteristics of the product.

Lumber continues to be favored for exterior application. Although this use had declined for several decades, there is currently an increase in the use of solid wood siding, particularly in multi-family units and high value homes. Bevel siding is perhaps the most popular type of siding for houses. Vertical siding is increasingly popular.

Exterior plywood manufactured from southern yellow pine, Douglas-fir, and western redcedar with smooth and roughsawn surfaces is commonly available. Roughsawn plywood with vertical grooving to simulate board-and-batten and other patterns is specified for exterior use (called texture 1-11 or T 1-11). Smooth-sanded plywood is **not** recommended for siding, but it is often used in soffits. Both smooth and roughsawn plywood will develop surface checks (face checks), especially when exposed to moisture and sunlight. These surface checks can lead to early paint failure especially with oil or alkyd paint systems. However, this problem can be avoided by using quality acrylic latex stain-blocking primer and topcoat paint sys-

tems. The flat-grained pattern present in nearly all plywood contributes to early paint failure even more than does face checking. Therefore, if smooth or roughsawn plywood is to be painted, special precautions should be exercised. Penetrating stains are often appropriate for roughsawn exterior plywood surfaces, but the stains must be renewed regularly.

Reconstituted wood products are made by forming small pieces or particles of wood into large sheets, usually 4 x 8 ft, or as required for a specialized use such as beveled drop siding. These products may be classified as either fiberboard or particleboard, depending upon whether the basic component is a wood pulp or wood chips. Along with plywood, these products account for more than half the total surface area of all materials used as exterior siding for newly constructed dwellings and other structures in the United States.

Hardboard is a relatively heavy type of fiberboard. Its tempered or treated form, designed for outdoor exposure, is used extensively as siding. Hardboard is often sold factory primed in 4 x 8 ft. sheets and as a substitute for beveled drop siding, which has traditionally been made from solid wood.

Particleboard is manufactured from whole wood in the form of splinters, chips, flakes, strands, or shavings. Waferboard and flakeboard are two types of particleboard made from relatively large flakes or shavings. Oriented strandboard (OSB) is a relatively new type of particleboard. To improve the strength properties of this board, the individual particles are aligned to form several layers throughout the board thickness, much like plywood. The surface layers are oriented along the length of the board.

Only reconstituted wood products manufactured specifically for exterior use should be used. Some reconstituted wood products may be factory primed with paint, with or without a topcoat. Others may be overlaid with a resin-treated cellulose fiber sheet (similar to MDO plywood) or with wood veneers. The objective is usually to improve the surface appearance and finishing characteristics.

The edges and ends of all panel products tend to absorb water more readily than the rest of the piece. As a result, they will often swell in thickness. The swelled edges in particleboard, OSB, waferboard, and hardboard will not completely return to their original thickness even when dried out. Therefore, the edges of these products must be treated with a water-repellent preservative and painted to reduce the uptake of moisture.

Weathering of Wood

Natural weathering of wood can be considered the first method of wood finishing. During the first century of American colonization, exterior surfaces were left to weather naturally. Only later were painted surfaces used by the general populace.

The esthetic appeal and life expectancy of wood and the compatibility of the wood with potential finishes are greatly affected by the weathering process. This process, which modifies the molecular structure of wood, results from a complex combination of chemical, mechanical, biological, and light-induced changes, all of which occur simultaneously and affect one another. In general, with two months of exposure to sunlight, all woods will turn yellowish or brownish, then gray. However, dark woods eventually become lighter and light woods become darker. Subsequently, surface checks then cracks may develop. The grain raises and loosens; the boards cup and warp, pulling fasteners loose; and the wood surface becomes friable, with fragments separating from the surface. After the weathered gray surface has developed, usually in a year or two, further changes are very slow to develop.

"A variety of finishes can be applied to outdoor wood. These include clear finishes, which reveal and accentuate the natural beauty of wood; stains, which impart a rustic appearance; and paint, which can be obtained in a multitude of colors."

Once weathered wood turns gray, additional changes in the wood occur very slowly because the process affects only the surface of the wood. However, the wood surface slowly wears away in a process called erosion. In general, for softwoods like pines, firs, white cedar, redwood, and spruce, about 1/4 in. of wood thickness weathers away every 100 years. The maximum weathering rate reported is 65/100 in. per 100 years for slow-grown (24 annual rings per inch) western redcedar exposed vertically facing south. For dense hardwoods like the oaks, the weathering rate is only about 13/100 in. per 100 years. The weathering rate is affected by climatic conditions, the amount of exposure, wood density, amount of earlywood and latewood, and ring orientation as well as growth rate and, probably, lignin and extractives content.

Types of Exterior Wood Finishes

A variety of finishes can be applied to outdoor wood. These include clear finishes, which reveal and accentuate the natural beauty of wood; stains, which impart a rustic appearance; and paint, which can be obtained in a multitude of colors. Finishes or coatings are applied to exterior wood surfaces for a variety of reasons. The particular reason will determine the type of finish selected and subsequently the amount of protection provided to the wood surface as well as the life expectancy for the finish. Finishes can be divided into two general categories: (1) opaque film-forming coatings, such as paints and solid-color stains, and (2) natural finishes, such as water repellents, water-repellent preservatives, varnishes, oils, and semitransparent penetrating stains.

Paints are common coatings used on wood that provide the most protection against surface erosion by weathering and against wetting by water. They are also used for esthetic purposes and to conceal certain defects. Paints contain substantial quantities of pigments, which account for the wide range of colors available. Some pigments will essentially eliminate ultraviolet radiation degradation of the wood surface.

Oil-based paint films usually provide the best shield from liquid water and water vapor. However, they are not necessarily the most durable because they become brittle over time. No matter how well sealed, wood still moves with seasonal humidity, thus stressing and eventually cracking the brittle paint. On the other hand, latex paints, particularly the acrylic paints, remain more flexible with age. Even though latex paints allow more water vapor to pass through, they hold up better by stretching and shrinking with the wood.

Paints perform best on edge-grained lumber of light-density species such as redwood and cedar. Paints are applied to the wood surface and do not penetrate the wood deeply. Rather, the wood grain is completely obscured and a surface film is formed. This film can blister or peel if the wood is wetted or if inside water vapor moves through the house wall and wood siding because of the absence of a vapor barrier. Original and maintenance costs are often higher for a paint finish than for a water-repellent preservative or penetrating stain finish.

Solid-color stains (also called hiding, heavy-bodied, or opaque stains) are opaque, film-forming finishes that come in a wide range of colors and are essentially thin paints.

Solid-color stains are made with a much higher concentration of pigment than are the semitransparent penetrating stains, but a somewhat lower concentration of pigment than that of standard paints. As a result, solid-color stains obscure the natural wood color and grain, and they can also be applied over old paints or solid-color stains. However, surface texture is retained and a flat-finish appearance normally results. Like paints, solid-color stains protect wood against ultraviolet radiation degradation. Solid-color stains form a thin film much like paint and consequently can also peel loose from the substrate. They are often used on textured surfaces and panel products such as hardboard and plywood. These stains are most effective when applied in two or three coats.

A water-repellent preservative may be used as a natural wood finish. The treatment reduces warping and checking, prevents water staining at the edges and ends of wood siding, and helps control mildew growth. Paintable water-repellent preservatives may be used as a treatment for bare wood before priming and painting or in areas where old paint has peeled, exposing bare wood, particularly around butt joints or in corners. This treatment keeps rain or dew from penetrating the wood, especially at joints and on end grain, thus decreasing the shrinking and swelling of the wood. As a result, less stress is placed on the paint film, and its service life is extended.

Many oil or oil-based natural wood finish formulations are available for finishing exterior wood. The most common oils are linseed and tung. However, these oils may serve as a food source for mildew if applied to wood in the absence of a mildewcide. The oils will also perform better if a water repellent is included in the formulation. All these oil systems will protect wood, but their average lifetime may be only as long as that described for the water-repellent preservatives.

Semitransparent penetrating stains have grown in popularity and are available in nearly all paint supply stores. These stains are moderately pigmented water repellents or water-repellent preservatives. They penetrate the wood surface to a degree, are porous, and do not form a surface film like paint. Thus, they do not totally hide the wood grain and will not trap moisture that may encourage decay. As a result, the stains will not blister or peel even if moisture penetrates the wood. Penetrating stains are oil-based (or alkyd-based), and some may contain a fungicide (preservative or mildewcide), ultraviolet radiation stabilizer, or water repellent. Latex-based (waterborne) stains are also available, but they do not penetrate the wood surface as do their oil-based counterparts. Newer latex formulations are being developed that may provide some penetrating characteristics.

Clearcoatings of conventional spar, urethane, or marine varnish, which are film-forming finishes, are not generally recommended for exterior use on wood. Ultraviolet radiation from the sun penetrates the transparent film and degrades the wood under it. Regardless of the number of coats applied, the finish will eventually become brittle as a result of exposure to sunlight, develop severe cracks, and peel, often in less than two years.

A finish that forms a thin, erodable film has been developed in Europe. This finish is commonly called a varnish stain. The film of varnish stain is thicker than that provided by a semitransparent stain, but thinner than that provided by a varnish. Varnish stains contain a water repellent, special transparent iron oxide pigments, and mildewcides. The surface coating is designed to slowly erode and can be refinished easier than that provided by a conventional varnish. Varnish stains are usually applied initially as two- or three-coat systems.

There are two other types of film-forming transparent coatings, but neither works well in exterior applications. Two-part polyurethanes are tougher and perhaps more ultraviolet radiation resistant than other transparent film-forming coatings, but they are expensive, difficult to use, and usually have as short a life as conventional varnishes. The second type, lacquers and shellac, is NOT suitable for exterior application, even as sealers or primers, because these coatings have little resistance to moisture. These finishes are also normally brittle and thus crack and check easily. However, specialty pigmented knot sealer primers based on shellac are available for specific exterior applications.

Summary

Wood continues to play an important role as a structural material in today's high-tech society. As lumber and in reconstituted products, wood is commonly used for house siding, trim, decks, fences, and countless other exterior and interior applications. When wood is exposed to the elements, particularly sunlight and moisture, special precautions must be taken in structural design as well as in the selection and application of the finish.

This report briefly describes the characteristics of wood finishes and their proper application to solid and reconstituted wood products. It describes how manufacturing and construction practices affect the surfaces of wood products, how various types of finishes interact with the surface, and how weathering affects the finished surfaces. Methods for selecting various exterior wood finishes are presented.

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Field Study on the Effect of Acidic Conditions on the Adhesion of Paint to Western Redcedar

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Previous research results involving sulfur accumulation on cross sections of wood coated with latex paint led us to investigate whether acidic conditions could affect the bonding strength of paint and be a factor in catastrophic paint peeling. Through simulation of acidic dew under outdoor conditions, the study reported herein determined the effect of acid rain and/or dew on painted wood siding. Painted wood was soaked before dawn in various acid solutions for two hours each day, then exposed outdoors for the remainder of the day and night during the summer near Madison, WI. From October to May, the specimens were exposed but not soaked. After four years of exposure to weather and acid, only the painted wood interface for specimens soaked in sulfurous acid at pH 2 indicated deterioration as measured by fracture toughness testing.

INTRODUCTION

Sulfur is produced primarily from coal-fired power plants and nitrogen from the internal combustion engine. When oxidized in the presence of moisture, sulfur and nitrogen form acids. The most common acids are nitric (HNO_3) and sulfuric (H_2SO_4). Sulfur dioxide (SO_2) dissolved in water is called sulfurous acid (H_2SO_3). With the addition of oxygen, sulfuric acid (H_2SO_4) is formed.

Acid rain begins primarily as oxides of nitrogen and sulfur that are generally denoted as NO_x and SO_x. Through a series of complicated chemical reactions, acids are formed. Attempts to duplicate acid rain chemistry have been successful to some extent using a smog chamber. Edney et al. showed that ultraviolet (UV) radiation and heat, in the presence of moisture, promoted the sequential reactions to various compounds, many of which were acidic.[1] The chamber chemistry can be controlled to achieve a wide range of conditions, and Spence et al. found that sulfur dioxide concentration and relative humidity strongly influence paint degradation.[2]

The effects of acid dew were achieved by cooling from the back of the specimens.[2-3] This cooling caused rapid paint erosion of the painted steel specimens, particularly paint formulated with calcium carbonate. However, dew formation on painted wood could not be achieved because of the insulating properties of wood. This research by Edney et al. and Spence et al. focused on acid catalyzed erosion of the paint surface.[1-3] They did not attempt to investigate interfacial failure in their initial work.

The follow-up research at the USDA Forest Service, Forest Products Laboratory (FPL), analysis of cross sections of wood coated with latex paint using energy dispersive X-ray analysis showed an accumulation of sulfur compounds at the paint-wood interface when soaked in sulfurous acid.[4] This sulfur accumulation led to investigations on whether acidic conditions could affect the bonding strength of paint and be a factor in catastrophic paint peeling.

Other work at the FPL showed that outdoor exposure of unpainted wood for four to eight weeks dramatically decreased the bond strength of the paint when the weathered wood was subsequently painted.[5-8] It was also shown that acidic conditions could accelerate the weathering of wood.[9] Others have also shown this effect.[10,11] Because it was shown that acidic conditions could accelerate wood weathering and sulfur compounds could accumulate at the paint-wood interface, several studies were initiated to determine the effects of acid on the paint-wood interface. This research included exposing specimens in the smog chamber at the Environmental Protection Agency (EPA), Raleigh, NC, in the wind chamber constructed at FPL, and in the field and laboratory. Acid exposure during a rain event is of relatively short duration because most of the acid is stripped out of the air during the initial rain; therefore, the research reported herein attempted to duplicate acidic dew formation. The formation of dew removes and concentrates acidic gases from the air. Dew is likely to be a major path for aerosol acid to reach a surface.

Initial experiments at EPA using the smog chamber, the wind chamber at FPL, and field and laboratory exposure using

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Table 1—Average (Avg) Fracture Toughness Values in J/m² with Standard Deviation (Std) and Coefficient of Variation (COV)

Acid Solution	Timber 1			Timber 2			Timber 3			Timber 4			Timber 5		
	Avg	Std	COV	Avg	Std	COV	Avg	Std	COV	Avg	Std	COV	Avg	Std	COV
pH 3 NO_3	176	22	13	191	18	9	248	39	16	222	30	13	173	20	12
pH 2 NO_3	182	19	10	197	36	18	234	37	16	231	22	9	180	28	18
pH 3 SO_3	173	18	11	211	32	15	231	22	9	228	34	15	202	52	26
pH 2 SO_3	128	16	12	145	15	10	112	18	16	172	12	7	102	33	32
pH 3 SO_4	181	26	14	231	65	28	227	34	15	239	16	7	177	34	19
pH 2 SO_4	179	21	12	207	42	20	220	22	10	215	37	17	181	26	14
Deionized	174	19	11	243	56	23	237	40	17	230	43	19	178	22	12
3 SO_4/NO_3	178	14	8	243	16	6	210	30	14	244	26	11	176	20	11
2 SO_4/NO_3	187	10	5	226	33	15	201	29	14	241	21	9	160	23	14
Control	204	22	11	223	44	20	254	44	17	241	27	11	255	58	23

acids of various concentrations showed no degradation of the paint-wood interface. The failure of these methods was probably caused by their inability to simulate acidic dew formation. Simulating dew was the method chosen most likely to show an acid effect on the paint-wood interface.

The objective of the research reported here was to show the effect of a two-hour acid dip, just before sunrise, on the wood-paint bond strength. This experiment was an attempt to simulate the effects of acidic dew under outdoor conditions.

EXPERIMENTAL PROCEDURE

Acid Solution

Nine 127-L (1.22m x 300mm x 410mm deep) acrylic dip tanks were constructed: one for deionized water control and the other tanks for pH 2 and 3 solutions of nitric, sulfuric, a mixture of nitric and sulfuric, and SO_2 dissolved in deionized water. Nitric acid completely dissociates at both pH values, so 0.01 M for pH 2 and 0.001 M for pH 3 solutions were made by adding 80 ml and 8 ml, respectively, of concentrated HNO_3 to 127 L of deionized water. Sulfuric acid completely dissociates at pH 3; therefore, 0.001 M was made using 3.5 ml of concentrated H_2SO_4. The second pK for H_2SO_4 is 1.92, which results in the second proton being half dissociated at pH 1.92, corresponding to 47 ml of concentrated H_2SO_4. For pH 2, 42 ml was required. For the mixtures, one-half of the amounts of each acid was used. A pH meter confirmed the pH values and was used to control the addition of SO_2 to the tanks. All tanks were vacuumed weekly to remove sediment, refilled with deionized water, and adjusted to the correct pH.

To decrease dissolved oxygen, the SO_2 tanks were allowed to warm prior to adding the sulfur dioxide. While mixing, sulfur dioxide was bubbled through a glass frit into the tank until the desired pH was reached. Glycerine (0.1%) was added to the SO_2 tank to quench oxidation to sulfuric acid. Samples from the SO_2 tanks were acidified and titrated with potassium iodate (KIO_3) to determine the sulfite (sulfurous acid) concentration. This procedure was modified from the Sulfite (428 A.) Iodometric Method.[14] Initially, the analysis was done several times a week to determine the actual SO_2 concentration. Later, the analysis was only done after SO_2 addition, just before draining at one week, and periodically in between. Each dipper had 45 specimens that were soaked in the solutions from 4 to 6 a.m. and exposed perpendicular to the zenith for the remainder of the day. One set of panels was removed and tested after two years and another set removed and tested after four years.

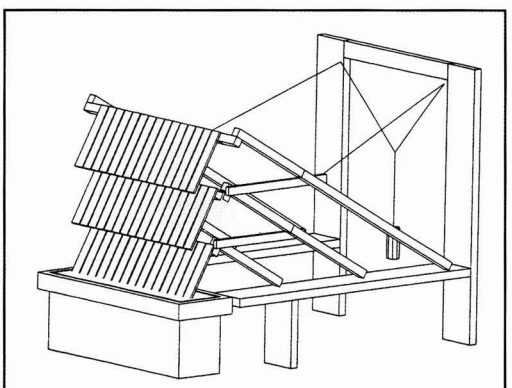

Figure 1—Dipper showing panels entering the tank.

Western Redcedar Panels

Five 150mm x 300mm x 3.66m western redcedar timbers were purchased, cut, and planed to 403mm x 70mm x 13mm panels. Five timbers, all from different trees, were used because of the natural variability of wood. Large timbers also made it possible to cut boards with a 5.7° (10:1 length:width) slope of grain, which was necessary for the sensitive fracture toughness test used.[12] The panels were completely encapsulated in a paint system consisting of an alkyd oil primer and acrylic latex flat topcoat. Nine panels from each timber (total of 45) were attached to each dipper in random order using silicone caulk. One of the nine dippers, indicating how the panels entered the dip tank, is shown in *Figure* 1. In addition to the deionized water control, a set of panels was kept dry and in the dark in a controlled environment.

Specimens for Mechanical Testing

At two and four years of exposure, 15 panels (three selected from the nine from each timber by a random number generator) were removed from each dipper for fracture tough-

ness testing along with the unexposed controls. The panels were epoxied to mates and each was cut into three specimens and tested. Specimens were tested in accordance with procedures previously reported,[12] and this involved propagating a crack along the paint-wood interface to determine the bonding strength of paint. Five fracture toughness values were obtained from each specimen. Details of the double cantilever beam test are given in Knaebe and Williams.[12] This test procedure was modified from ASTM D 3433-75.[13]

RESULTS

Results from specimens removed after two years of exposure were inconclusive. Results presented here are from the specimens removed after four years of exposure. The average fracture toughness values in J/m^2 with the standard deviation and coefficient of variation (COV) for each exposure were calculated for each timber and are listed in *Table* 1. Results from two timbers are presented in *Figures* 2 and 3. The results from each timber for each exposure are made up of 45 readings (3 panels x 3 specimens x 5 readings), except when problems occurred with the test machine and some data were lost. The fracture toughness values varied among the timbers because of the natural variability of wood, but the trends were the same. Timber 4 (*Figure* 2) provided the least definitive proof that SO_2 damages the wood-paint bond, and Timber 3 (*Figure* 3) most clearly demonstrated the effect of SO_2. Sulfurous acid at pH 2 decreased the adhesive strength of the paint, as the fracture toughness values indicate. The decrease was about 50% for pH 2 H_2SO_3 (*Figure* 3).

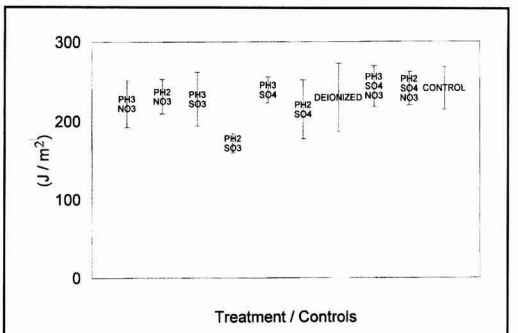

Figure 2—Fracture toughness values for timber number 4.

DISCUSSION

Because many factors, such as density, growth rate, grain orientation, and age of tree determine the characteristics of wood, five timbers were used. Comparing the results of each timber individually greatly decreased the COV. For all specimens, except those dipped in SO_2, the fracture toughness result essentially represented the cohesive strength of the wood, which was different for each timber. For example, fracture toughness values for specimens cut from timber 4 and dipped in SO_2 were the same as those for specimens cut from timber 1 and not dipped in SO_2, thus grouping data from all timbers served no purpose. The COV for timber 4 (*Figure* 2) ranged from 7 for pH 3 H_2SO_4 to 19 for deionized water.

Previous work that showed an accumulation of sulfur compounds at the paint-wood interface included only latex paint.[4] In our study, the fact that alkyl oil primers are less porous to water may have increased the time to degradation. It is unknown how a latex primer and topcoat paint system would have performed in our study.

The pH of the H_2SO_3 tanks slowly increased during the week because of loss of SO_2 into the atmosphere. The pK values for H_2SO_3 are 1.81 and 6.91, so the concentration of SO_2 required for pH 2 is greater than it would be for H_2SO4_3 because only one proton is dissociated. In other words, H_2SO_3, if permitted to oxidize to H_2SO_4, would nearly double the hydrogen ion concentration and lower the pH. The two processes are in competition and without glycerine, oxidation to sulfuric acid would predominate. The glycerine did not completely quench the oxidation. Sulfite analysis indicated that SO_2 left the system by either escaping or oxidizing at a half-life between one and two days. After one week, only 1 to 5% of the SO_2 remained. With the pH increasing about one-third of a pH unit, which is half the hydrogen ion concentration, one-fourth of the SO_2 oxidized to H_2SO_4 each week. For this reason, the SO_2 tanks were completely refilled each week. For the other acid solutions, the pH remained constant. Even one inch of rain did not appreciably change the concentrations of the 14-in. deep solutions. The solutions containing nitric acid grew some algae, which were removed each week when the tanks were vacuumed, refilled, and acidified.

CONCLUSIONS

Under fairly severe acidic dew conditions, degradation of the paint-wood interface was negligible in this study. Degradation can only occur if SO_2 is present. It is extremely unlikely that acidic dew can cause catastrophic paint peeling except in locations near an SO_2 source. In these locations, dew containing H_2SO_3 may be a factor in early catastrophic paint peeling. The increased weathering rate of the paint surface can still occur but is independent of the degradation shown in our research.

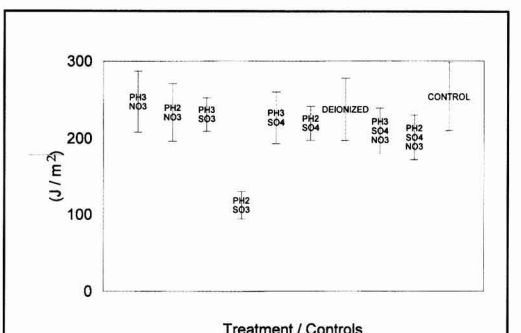

Figure 3—Fracture toughness values for timber number 3.

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Full-Scale Method for Testing Moisture Conditions in Painted Wood Paneling

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Recognition of the critical problems of wood rot in exterior panel structures has led to the initiation of several research projects in the Nordic countries, in order to prevent damage of this kind. The moisture conditions in a panel are crucial to determining the risk of wood rot, unless the wood has been treated with a preservative.

Presented here is a laboratory computer-based method for monitoring the moisture conditions in a test panel during a specific climate cycle. To measure the moisture content distribution, an electrical resistance method used. The probes are connected to a computer, which monitors the moisture conditions. The method makes it possible to determine the capacity of a paint or a paint system to keep a panel in good condition.

More than 40 paneled structures have been studied by this method. Panels from old structures, painted in a way found to be inadequate, were used as references. System painting has given the best results. It has also been shown that treatment of the end grain with the priming system is crucial.

INTRODUCTION

For centuries wood has been very popular as cladding material for buildings in the Nordic countries. The building and painting techniques used have provided good protection against moisture and problems due to rot in exterior paneling. However, during the past 10 years, a new type of problem has arisen. Thousands of houses in Sweden, Norway, and Denmark have been damaged by wood rot in the exterior paneling. Much of the wood rot problem can be explained by the changeover from traditional solvent-based oil-based paints to modern waterborne paints, as has been indicated in earlier studies of damaged houses, as well as measurements of moisture conditions in paneling.[1-7] Other possible explanations are the reduced use of effective biocides, such as pentachlorophenol and mercury, on the wood and/or in the paint and environmental changes.

Ever since this specific rot problem was identified, much research work has been directed toward understanding the causes of the rot and ways to avoid it.[3,8] There are two major methods for avoiding wood rot, assuming good architectural design:

- Using paints or paint systems that protect the wood from moisture, and
- Using effective biocides on the wood and/or in the paint.

It is unsafe to rely too much on biocides, since the ones still allowed in accordance with environmental considerations are less effective than the prohibited ones. Therefore, it is safer to build and paint the cladding in a way that prevents it from being exposed to excessive moisture conditions. Unfortunately, there has been a lack of effective and reliable methods for testing the moisture protection of painted wood. Most of the available methods are designed to measure the moisture protection in small pieces of panels, painted in different ways. From such small specimens it is, however, impossible to extrapolate the result to full-scale paneling structures consisting of overlapped boards, joints, and nails. A method has now been developed for monitoring moisture conditions in full-scale paneling structures.

MATERIALS AND METHOD

A laboratory test method is introduced here for monitoring the moisture conditions in wood paneling during a specific climate cycle. The setup for the measurements is shown in *Figure* 1. The moisture content (% by weight), the temperature, and the relative humidity are measured every hour by a computerized system. This method makes it possible to monitor the moisture conditions at specific points in the paneling, for instance, near butt joints and at the bottom edge. Another advantage is that the tests can be carried out under controlled and repeatable conditions.

The paneling used in the tests consists of five boards. The moisture content is obtained by measuring the electrical resistance between two probes fitted into the boards from the inside, see *Figure* 2. The temperature is measured in the panel

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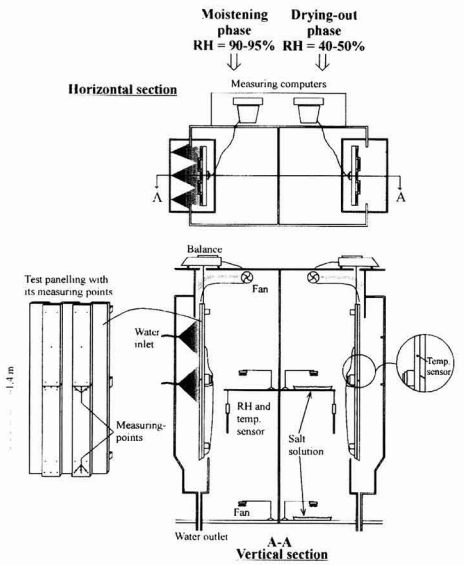

Figure 1—Setup for monitoring moisture conditions in a panel structure.

and taken into account in the subsequent calculation. Most of the probes are placed near the butt joints and at the bottom edge of the paneling because these parts have proved to be the most susceptible to moisture and rot.[1-6]

The test cycle consists of a moistening phase of two days and a drying phase that lasts until the moisture content is lower than 20%. This is the lower limit for wood rot.[12] However, a higher value of around 25-30%, i.e., the fiber saturation point, is a widely used value for wood decay of Norway spruce (*Picea abies*). A complete test cycle takes about 10 days, depending on the drying rate of the panel. Rainfall is simulated by using six one-hole nozzles placed at two levels. The drying climate is 40-50% relative humidity which is obtained by a saturated salt solution (potassium carbonate), while the temperature is approximately 20°C. Since the climate conditions that surround the paneling are important for moisture dynamics, the temperature and relative humidity are measured.

In order to obtain greater accuracy, a reference calibration has been carried out. The material tested was panels of Norway spruce, exposed to five different relative humidities (from 50 to 97% RH) and two levels of temperature (4 and 20°C). A regression analysis was carried out in order to adjust the measured values of moisture content (computed from gravimetric measurements) and the electrical resistance to a mathematical model.

RESULTS AND DISCUSSION

Reference Calibration

The reference calibration is shown in *Figure* 3 together with calibration results obtained by other researchers.

In order to measure levels of moisture content higher than those measured in the calibration, the curve was extrapolated. The influence of the circumference of the probes and the distance between the probes on the measured moisture content has also been studied. The result showed that the circumference of the probes has a much greater influence than the distance between them. Therefore, it is important to carry out a special reference calibration for each type of probe. The probes used are screws of stainless steel (6.5 × 2.9 mm).

The Paint Systems Tested

The test method presented here has been applied in a study of different paint systems, as well as different treatments of the end grain at the bottom edge of the paneling and at the butt joints. As references, paneling structures painted in a way found to be inadequate were used, e.g., P27 and P28. ("P" stands for paneling and the number is an identification number.) The paint systems tested are described in *Appendix* 1. Normally the pretreatment and the primer were painted on the single panel boards before assembly and the topcoating

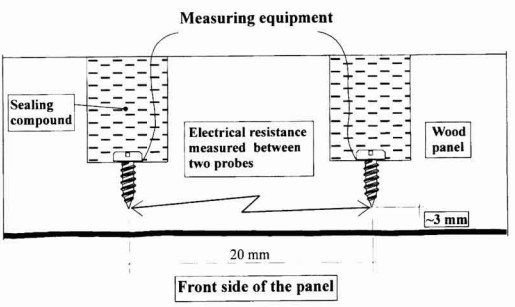

Figure 2—The measuring probes.

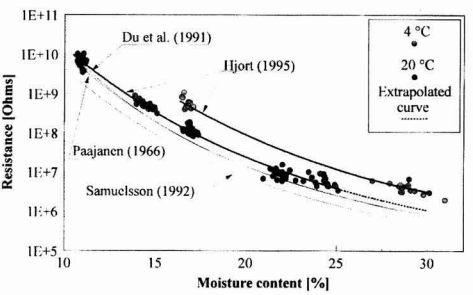

Figure 3—Calibration curves for Norway spruce.

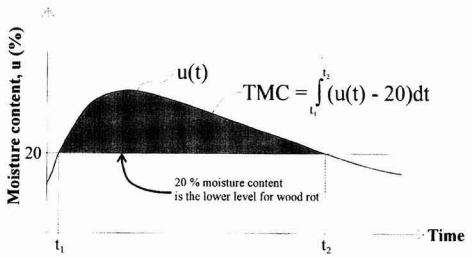

Figure 4—The definition of the TMC value. u(t) = moisture content as a function of time.

was applied after assembly. The end grain at the joints was treated only with pretreatment and primer. The end grain at the panel end was treated the same as the rest of the paneling. Divergence from this procedure is given in the column marked "Notes." Abbreviations used are SB (solvent-based) and WB (waterborne).

Comparing Results with the Time-Moisture-Content Value

A set of graphs showing the moisture conditions at the different measuring points of a selected paneling sample, as well as the climate conditions, is presented in *Appendix* 2. In order to make it easier to compare results from panel structures coated in different ways, a new term, time-moisture-content (TMC) value, has been introduced. The TMC value is defined as the area enclosed by the moisture content curve, u(t), and a line at 20% moisture content, see *Figure* 4. This area is calculated by using a spreadsheet program (Microsoft Excel). Only the values of the moisture content that are higher than 20% are taken into account, since this is the limit for wood rot.

In *Figure* 5, the TMC value is plotted for the paints and paint systems tested. Only the results from the measuring points placed at the butt joints, where the outer board overlaps the inner board, are presented in this paper because this is the most critical point for excessive moisture content and resulting wood rot. For each sample, the average value ± the standard deviation is presented, based on the results from two measuring points at each of two joints.

The Importance of Treating the End Grain

Wood is an anisotropic material and the transport of moisture is much faster parallel to the fibers than in the other directions. Consequently, treatment of the end grain is especially important in order to decrease the moisture flow. This study has shown a clear correlation between the end grain treatment and the moisture balance (moisture balance is the relation between moisture uptake and drying out). A low TMC value indicates a good moisture balance. The paneling structures with the worst moisture balance received either no treatment or were treated in a simplified way at the end grain (P55, P28, P47, P27, P48, P16, etc.). In contrast, the panel structures with the best moisture balance were end grain treated with both a penetrating oil and a primer.

The Moisture Balance of Waterborne Paints

Houses damaged by wood rot have almost all been painted with waterborne paints without any solvent-based alkyd primer. Some of these paints were included in this study, and they have shown a poor moisture balance, especially when the end grain was untreated. However, waterborne priming products have been improved in recent years and, when some of these newly developed paints were tested using the new method, the results were very promising (P34, P35, P45, P49, and P50).

System Painting Offers the Best Moisture Balance

System painting is a coating built up in several layers, each with its own purpose. An unpigmented penetrating oil and a primer are used as a priming system. The priming system gives the panel good moisture protection. The purpose of the topcoat is to give the panel an attractive appearance. Normally the priming products are solvent-based and the topcoat is waterborne or solvent-based but, as mentioned earlier, we have had good experience with some recently developed pure waterborne systems.

CONCLUSIONS

A new method has been developed for studying the capacity of paints to protect wood panel structures against moisture. More than 40 paneling structures painted with different paint systems have been studied using this method. System paint-

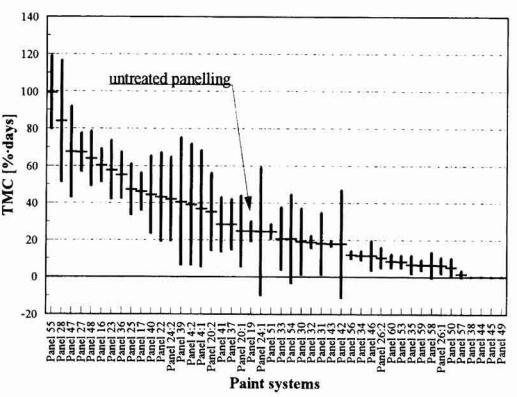

Figure 5—TMC values for measuring points near the butt joint and where the outer board overlaps the inner board. The colon on the horizontal axis means that the paneling has been tested twice. The products are presented in greater detail in Appendix 1. P28 and P27 are used as references because they were painted in a way found to be inadequate.

ing, in which the coating is built up in layers, usually three, each with its own purpose, has given the best results. It has also been shown that treatment of the end grain with a primer is necessary in an effective paint system.

ACKNOWLEDGMENTS

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Appendix 1—Paint Systems Tested and Details of Treatment

ID	Pretreatment with Unpigmented Product	Priming with Pigmented Product	Treatment with Topcoat	Notes
P4	SB priming oil Dry matter 12 vol-% Alcro-Beckers	SB alkyd primer Dry matter 54/72 vol-%/wt-% PVC 37	2 x WB acrylic paint Dry matter 40/53 vol-%/wt-% PVC 29	End grain at joints only treated with priming oil.
P16			1 + 1 WB acrylic paint Dry matter 40 vol-% PVC 30 Rohm and Haas	The first treatment with topcoat was done on single boards, which made it possible to treat the end grain at joints.
P17			1 + 1 SB alkyd paint Dry matter 32/40 vol-%/wt-% PVC 18 Alcro-Beckers	The first treatment with topcoat was done on single boards, which made it possible to treat the end grain at joints.
P19				Untreated paneling.
P20		SB alkyd primer Dry matter 54/72 vol-%/wt-% PVC 37 Alcro-Beckers	2 x WB acrylic paint Dry matter 40/53 vol-%/wt-% PVC 29 Alcro-Beckers	
P22		SB linseed oil paint Dry matter 98 vol-% Alcro-Beckers	2 x SB alkyd paint Dry matter 79 wt-% PVC 22 Alcro-Beckers	Treatment after the paneling was assembled. End grain at joints left untreated.
P23		SB linseed oil paint Dry matter 98 vol-% Alcro-Beckers	2 x WB acrylic paint Dry matter 40/53 vol-%/wt-% PVC 29 Alcro-Beckers	Treatment after the paneling was assembled. End grain at joints left untreated.
P24	SB priming oil Dry matter 12 vol-% Alcro-Beckers	SB alkyd primer Dry matter 54/72 vol-%/wt-% PVC 37 Alcro-Beckers	2 x SB alkyd paint Dry matter 79 wt-% PVC 22 Alcro-Beckers	Treatment after the paneling was assembled. End grain at joints left untreated.
P25	SB priming oil Dry matter 12 vol-% Alcro-Beckers	SB alkyd primer Dry matter 54/72 vol-%/wt-% PVC 37 Alcro-Beckers	2 x WB alkyd paint Dry matter 40/53 vol-%/wt-% PVC 29 Alcro-Beckers	Treatment after the paneling was assembled. End grain at joints left untreated.
P26	SB priming oil Dry matter 12 vol-% Alcro-Beckers	SB alkyd primer Dry matter 54/72 vol-%/wt-% PVC 37 Alcro-Beckers	2 x WB alkyd paint Dry matter 40/53 vol-%/wt-% PVC 29 Alcro-Beckers	Priming oil was used only at the end grain at joints and panel end.
P27			1 + 1 WB acrylic paint Dry matter 40 vol-% PVC 30 Rohm and Haas	The paneling was weathered for two years. End grain at joints was left untreated.
P28		SB alkyd primer Dry matter 54/72 vol-%/wt-% PVC 37 Alcro-Beckers	WB acrylic paint Dry matter 40/53 vol-%/wt-% PVC 29 Alcro-Beckers	The paneling was weathered for two years. End grain at joints was left untreated.

Appendix 1—Paint Systems Tested and Details of Treatment

ID	Pretreatment with Unpigmented Product	Priming with Pigmented Product	Treatment with Topcoat	Notes
P30	SB linseed oil Dry matter 110 vol-% Kulturhantverkarna	SB linseed oil primer Dry matter 98 vol-% PVC 20 Kulturhantverkarna	SB linseed oil paint Dry matter 98 vol-% PVC 26 Kulturhantverkarna	End grain at joints treated with linseed oil only.
P31			1+1 SB linseed oil paint 97/98 vol-%/wt-% PVC 29 Engwall & Claesson	The first treatment with topcoat was done on single boards, which made it possible to treat the end grain at joints.
P32			1 + 1 WB Swedish red paint 23/38 vol-%/wt- % PVC 28 Falu rödfärg	The first treatment with topcoat was done on single boards, which made it possible to treat the end grain at joints.
P33			1 + 1 WB alkyd paint Dry matter 40 vol-% PVC 20 YKI	The first treatment with topcoat was done on single boards, which made it possible to treat the end grain at joints.
P34	WB alkyd Dry matter 15/16 vol-%/wt-% DSM Resins		(1 + 2) x WB alkyd paint Dry matter 48 vol-% PVC 18 DSM Resins	The first treatment with topcoat was done on single boards, which made it possible to treat the end grain at joints.
P35	WB linseed oil Dry matter 30/31 vol-%/wt-% DSM Resins	WB alkyd primer Dry matter 41/54 vol-%/wt-% PVC 32 DSM Resins	2 x WB alkyd paint Dry matter 50/61 vol-%/wt-% PVC 20 DSM Resins	
P36			1 + 1 WB acrylic paint Dry matter 40/53 vol-%/wt-% PVC 29 Alcro-Beckers	The first treatment with topcoat was done on single boards, which made it possible to treat the end grain at joints.
P37	SB priming oil Dry matter 12 vol-% Alcro-Beckers		1 + 1 WB acrylic paint Dry matter 40/53 vol-%/wt-% PVC 29 Alcro-Beckers	The first treatment with topcoat was done on single boards, which made it possible to treat the end grain at joints.
P38	SB priming oil Dry matter 16 wt-% Dickursby	SB alkyd primer Dry matter 80 wt-% PVC 35 Dickursby	2 x WB acrylic paint Dry matter 51 wt-% PVC 25 Dickursby	Priming oil was used only at the end grain at joints and panel end.
P39	SB priming oil Dry matter 16 wt-% Dickursby		2 x WB acrylic paint Dry matter 51 wt-% PVC 25 Dickursby	
P40	SB priming oil Dry matter 16 wt-% Dickursby	WB alkyd primer Dry matter 37 wt-% PVC 46 Dickursby	2 x WB acrylic paint Dry matter 51 wt-% PVC 25 Dickursby	Priming oil was used only at the end grain at joints and panel end.

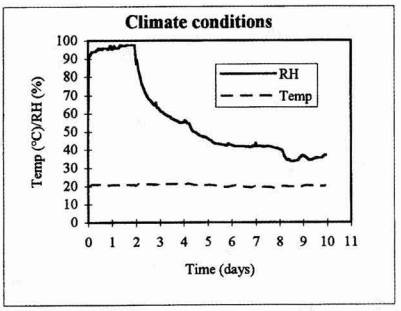
Appendix 1—Paint Systems Tested and Details of Treatment (cont'd)

ID	Pretreatment with Unpigmented Product	Priming with Pigmented Product	Treatment with Topcoat	Notes
P41	WB fatty acid mod urethane Dry matter 21 wt-% Zeneca Resins		2 x WB acrylic paint Dry matter 52 wt-% PVC 16 Zeneca Resins	
P42	WB acrylic/alkyd Dry matter 21 wt-% Zeneca Resins		2 x WB acrylic paint Dry matter 52 wt-% PVC 16 Zeneca Resins	
P43	SB priming oil Dry matter 12 vol-% Alcro-Beckers	WB alkyd paint Dry matter 50 vol-% PVC 22 Alcro-Beckers	WB acrylic paint Dry matter 40/53 vol-%/wt-% PVC 29 Alcro-Beckers	
P44	SB priming oil Dry matter 12 vol-% Alcro-Beckers	SB alkyd primer Dry matter 54/72 vol-%/wt-% PVC 37 Alcro-Beckers	WB acrylic paint Dry matter 40/53 vol-%/wt-% PVC 29 Alcro-Beckers	
P45	WB acrylic oil Dry matter 52 wt-% Nordsjö/Rohm and Haas	WB acrylic primer Dry matter 41/49 vol-%/wt-% PVC 25 Nordsjö/Rohm and Haas	2 x WB acrylic paint Dry matter 39/48 vol-%/wt-% PVC 26 Nordsjö/Rohm and Haas	
P46	SB alkyd Dry matter 5/6 vol-%/wt-% Nordsjö/Rohm and Haas	WB acrylic primer Dry matter 41/49 vol-%/wt-% PVC 25 Nordsjö/Rohm and Haas	2 x WB acrylic paint Dry matter 39/48 vol-%/wt-% PVC 26 Nordsjö/Rohm and Haas	
P47	WB mod linseed oil Dry matter 30 vol-% Alcro-Beckers/DSM		(1 + 2) x WB alkyd paint Dry matter 45 vol-% PVC 29 Alcro-Beckers/DSM	Treatment after the paneling was assembled. End grain at joints left untreated.
P48	WB mod linseed oil Dry matter 30 vol-% Alcro-Beckers/DSM		(1 + 2) x WB alkyd paint Dry matter 46 vol-% PVC 21 Alcro-Beckers/DSM	Treatment after the paneling was assembled. End grain at joints left untreated.
P49	WB acrylic Dry matter 21 wt-% Zeneca Resins	WB acrylic primer Dry matter 48 wt-% PVC 22 Zeneca Resins	2 x WB acrylic paint Dry matter 52 wt-% PVC 16 Zeneca Resins	
P50	WB fatty acid mod urethane Dry matter 20 wt-% Zeneca Resins	WB fatty acid mod urethane Dry matter 40 wt-% PVC 36 Zeneca Resins	2 x WB acrylic paint Dry matter 52 wt-% PVC 16 Zeneca Resins	
P51			(2 + 2) x WB acrylic paint Dry matter 40/53 vol-%/wt-% PVC 29 Alcro-Beckers	The first two treatments were done before assembly of the paneling.

Appendix 1—Paint Systems Tested and Details of Treatment (cont'd)

ID	Pretreatment with Unpigmented Product	Priming with Pigmented Product	Treatment with Topcoat	Notes
P53	WB mod linseed oil Dry matter 20/33 vol-%/wt-% Alcro-Beckers	WB alkyd primer Dry matter 52/64 vol-%/weight-% PVC 20 Alcro-Beckers	1 x WB acrylic paint Dry matter 40/53 vol-%/wt-% PVC 29 Alcro-Beckers	
P54	WB alkyd Dry matter 15 wt-% Alcro-Beckers/Dickursby		2 x WB acrylic paint Dry matter 51 wt-% PVC 25 Alcro-Beckers/Dickursby	
P55	WB alkyd Dry matter 15 wt-% Alcro-Beckers/Dickursby	SB alkyd primer Dry matter 54/72 vol-%/wt-% PVC 37 Alcro-Beckers/Dickursby	2 x WB acrylic paint Dry matter 40/53 vol-%/wt-% PVC 29 Alcro-Beckers/Dickursby	Treatment after the paneling was assembled. End grain at joints left untreated.
P56	SB alkyd Dry matter 5/6 vol-%/wt-% Nordsjö/Rohm and Haas	SB alkyd primer 50/67 vol-%/wt-% PVC 32 Nordsjö/Rohm and Haas	2 x WB acrylic paint 39/48 vol-%/wt-% PVC 27 Nordsjö/Rohm and Haas	
P57	SB alkyd Dry matter 5/6 vol-%/wt-% Nordsjö/Rohm and Haas	SB alkyd primer 50/67 vol-%/wt-% PVC 32 Nordsjö/Rohm and Haas	2 x WB acrylic paint 39/48 vol-%/wt-% PVC 26 Nordsjö/Rohm and Haas	
P58	SB alkyd Dry matter 5/6 vol-%/wt-% Nordsjö/Rohm and Haas	SB alkyd primer 68/80 vol-%/wt-% PVC 28 Nordsjö/Rohm and Haas	2 x WB acrylic paint 39/48 vol-%/wt-% PVC 26 Nordsjö/Rohm and Haas	
P59	WB alkyd Dry matter 11 wt-% Nordsjö/Rohm and Haas	WB alkyd primer 43/53 vol-%/wt-% PVC 23 Nordsjö/Rohm and Haas	2 x WB acrylic paint 39/48 vol-%/wt-% PVC 26 Nordsjö/Rohm and Haas	
P60	WB alkyd Dry matter 11 wt-% Nordsjö/Rohm and Haas	WB alkyd primer 43/53 vol-%/wt-% PVC 23 Nordsjö/Rohm and Haas	2 x WB alkyd 50 wt-% PVC 16 Nordsjö/Rohm and Haas	

Appendix 2

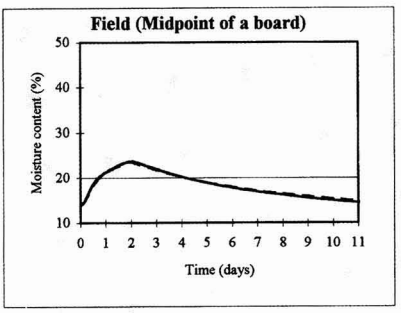


Panelling 36

Primer
WB acrylic

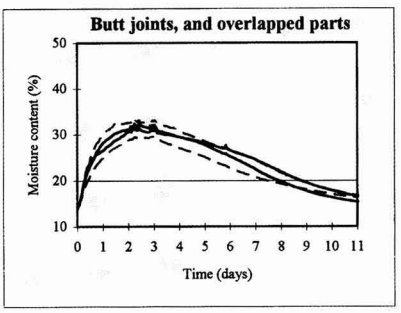
Assembly

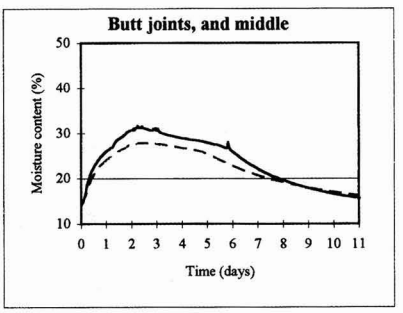
Top coat
1×WB acrylic

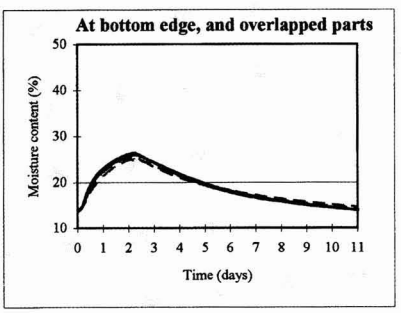


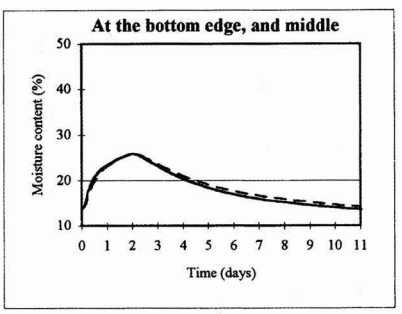
Tested October 1994

——— left top board
--------- right top board









Release of Photoinitiator Fragments from UV-Cured Furniture Coatings

T. Salthammer—Wilhelm-Klauditz-Institute (WKI)*

Radiation cured furniture coatings for indoor use have often been criticized for strong odor. For a better understanding of the emission characteristics, the release of volatile organic compounds from some specially manufactured furniture was studied in 1 m³ climate chambers. Special attention was given to the detection of photoinitiator fragments, which can significantly contribute to the pollution of indoor air. It was shown that the fragmentation products contributed 20-60% to the total emission, which was typically found in a range of 100 µg/m³ to 250 µg/m³ within the testing period of about 600 hr. One main compound was the strongly odorous benzaldehyde that is generated by many applied photoinitiators via α-cleavage. It was also observed that the curing time has a strong effect on the emission potential.

INTRODUCTION

The application of UV curing in coating technology for wood finishes has grown continuously over the past 25 years.[1-3] The reason for this increasing attraction is based on a number of benefits like rapid curing (saving of energy and costs), smooth and high quality surfaces, reduced solvent emissions, and a high content of solids, which involves reduced quantities of lacquer. Furthermore, oligomeric systems designed for UV curing like unsaturated polyesters (UPE), acrylic resins, and polyester-acrylic blends have steadily improved. Now it is possible to eliminate reactive thinning agents, for example, styrene.

The photoinitiator is an essential ingredient of UV-curable systems and has to fulfill the following requirements: sufficient absorption in the 250-400 nm range, high reactivity, high thermal stability, nonyellowing, and nonodorous. Common photoinitiators, which undergo different fragmentation processes (see Fragmentation Processes Section and *Figure* 1) are benzophenone (BP)/amine systems, 2-hydroxyacetophenones (HMEPP), benzyl ketals (DPAP), dialkoxyacetophenones (DAP), acylphosphine oxides (TBDPO), bezoin ethers, thiocyanate ketones, and others.[4-7] As a result of the high break off rate of the radical chain reaction on surfaces, which is mainly caused by cage reactions or oxygen inhibition,[10] the photoinitiator is generally added in hyperstoichiometric portions of about three-five percent. This may lead to problems in UV-curing technology, because uncontrolled reactions of remaining amounts may cause yellowing effects and emissions of odorous fragments like benzaldehyde.[8]

For several years, work has been carried out to determine the distribution and concentrations of volatile organic compounds (VOC) in indoor air. For a review see Brown et al.[9] and references therein. In supplementary chamber tests, emission factors of VOC from material surfaces have been determined under controlled conditions.[11,12] Such investigations have to date mainly focused on typical solvents (aliphatic and aromatic hydrocarbons, ketones, esters, alchols, ethers), monoterpenes, odorous aliphatic aldehydes, and the influence of inorganic pollutants.[13] In addition, surface quality tests have also been performed.[14] Much less attention has been paid to the detection of volatile odorous photoinitiator fragments.[15] In one recent study of different furniture coatings, Fischer and Böhm[16] have observed increased emissions of benzaldehyde, methylbenzoate, and cyclohexanone from UV-cured systems and have assigned these compounds as products from fragmentation processes.

The lack of knowledge may have several reasons. Firstly, UV-curable furniture coatings account for only 10-15% of the European market. Secondly, many fragmentation products cannot be identified easily and standard compounds are not always available. Nevertheless, it is well-known that UV-cured furniture coatings emit odorous compounds, which may cause irritation effects on occupants of dwellings. For a better understanding and to obtain more detailed information on the emission characteristics, the release of photoinitiator fragments and other VOC was monitored in 1 m³ test chambers under controlled conditions. The first and second tests were carried out in parallel with two coated chipboards applying the same lacquer. To observe the effect of VOC emissions on

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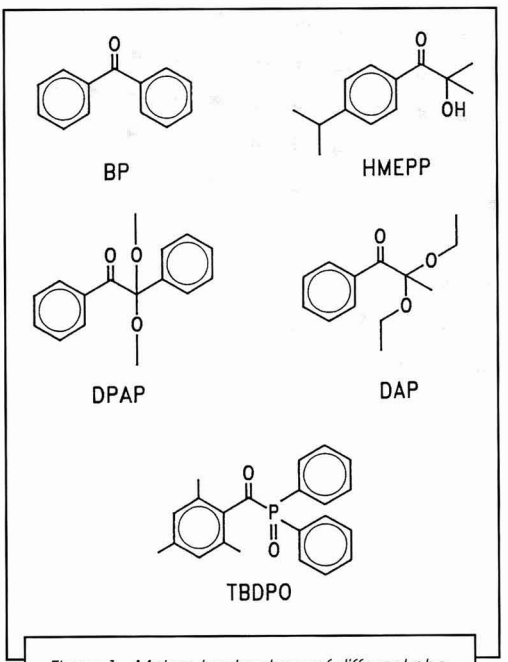

Figure 1—Molecular structures of different photoinitiators. See Table 1 for abbreviations.

the curing time, one sample was produced with a reduced radiation intensity per m^2 surface. For the third and fourth tests, small cubic furniture samples were self-manufactured from coated chipboards and put into the chamber for several weeks. All investigated lacquer systems represented the current state-of-the-art in coating technology and were supplied by different manufacturers.

FRAGMENTATION PROCESSES

The photochemistry of most common photoinitiators is primarily a chemistry of the carbonyl group. In the first step, absorption of UV light in the range of 250-350 nm (40000-33000 cm^{-1}) populates an excited singlet state with S_1 ($n\pi^*$) or $S_1(\pi\pi^*)$ configuration. $n\pi^*$–transitions are symmetry-forbidden, which means that only low molecular extinction coefficients ε_a (λ) and, therefore, low oscillator strengths $f = \int \varepsilon_a(\tilde{\nu})\, d\tilde{\nu}$ result. The UV spectra of BP and a commercially available photoinitiator solution containing DAP, both measured in ethanol, are shown in *Figure* 2. The measured molar extinction coefficients for BP of ε_a (330 nm) = 1561 cm^{-1} mol^{-1} ($n\pi^*$) and ε_a (255 nm) = 12200 l cm^{-1} mol^{-1} ($\pi\pi^*$) are typical for the types of carbonyl compounds shown in *Figure* 1. In most aromatic carbonyl compounds, the energy gap between singlet and the lowest excited triplet state is small. As a consequence, inter-system crossing to the T_1 ($n\pi^*$) proceeds efficiently. Depending on the individual electronic term energies, the generation of radicals may occur either from the singlet or the triplet state.[17]

There are three important fragmentation processes forming radical species (see *Figure* 3). Benzyl ketals (for example, DPAP), 2-hydroxy-acetophenones (HMEPP), and acylphosphine oxides like TBDPO generate benzoyl radicals via the Norrish I-reaction (α-cleavage) that initiate the polymerization process. Dialkoxy-acetophenones (DAP) undergo both Norrish I (≈ 67%) and Norrish II (≈ 33%) cleavage. On excitation of BP in the presence of tertiary amines, an electron transfer complex (exciplex) is formed, followed by proton transfer to form a ketyl radical and an aminoalkyl radical. It will be shown later that the knowledge of such basic photochemical processes is of special importance for the interpretation of compounds found in indoor air. More detailed information about fragmentation processes of photoinitiators can be obtained from references 4-6 and 17-19.

EXPERIMENTAL

Sample Preparation

Two commercially available UV-curable lacquer systems (acrylate and unsaturated polyester) were selected for the tests. The lacquers were applied on 19 mm urea-formaldehyde bonded chipboards (50 cm × 100 cm) coated with oak veneer, according to the requirements of the manufacturer. The light source was a 280-380 nm UV-radiator with 80 W/cm curve length. Four different samples were produced. A.1 and A.2 were made in parallel from the same lacquer, but A.2 was given only 50% of the required curing time. This was achieved by a faster transport through the irradiation zone. Both samples were wrapped in polyethylene film immediately after production and brought into the chamber within 24 hr. B and C were self-manufactured cubic boxes (40 cm × 40 cm × 40 cm ≙ 0.96 m^2 outer surface) with a front door. These samples were tested within 48 hr after production.

SAMPLE **A.1**: acrylate system; application technique: roller-coating; procedure: 15 g/m^2 (10 m/min) – 12 g/m^2 (5 m/min) – grinding – mordant (ethanol) – 5 g/m^2 (10 m/min) – 5 g/m^2 (5 m/min); photoinitiators: BP, DPAP, TBDPO.

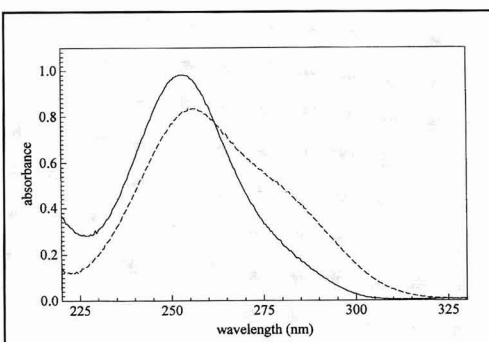

Figure 2—UV absorption spectra of benzophenone (BP) (—) and a commercially available photoinitiator (– –) solution containing DAP. Both spectra were measured in ethanol.

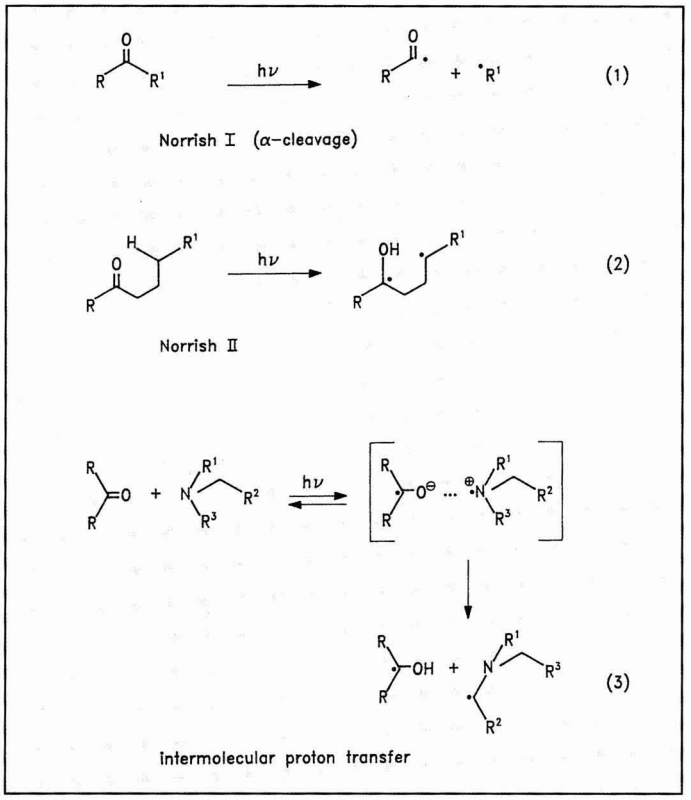

Figure 3—Formation of radicals for the initiation of polymerization processes via different fragmentation pathways.

air in the chamber is mixed by a rotating cylinder, which also contains the heating unit. The resulting air velocities are between 0.05 m/s and 0.4 m/s. The temperature is controlled by a Pt 100-thermocouple (Juchheim). To avoid temperature gradients, the chamber is covered with aluminum foil and insulating boards. After each test the chamber was cleaned with acetone and heated to 70°C for 48 hr to reduce memory effects. All results are given in chamber concentrations c ($\mu g/m^3$). Under the conditions mentioned previously, the emission rate ER ($\mu g/(h\ m^2)$), calculated by ER = c n/a, is also directly obtained.

Sampling and Analysis

Duplicate air samples were collected over a period of 20-26 days on Tenax TA (≈ 61 total volume at a flow rate of 60 ml/min) and on activated charcoal (NIOSH standard, SKC 226-01) (≈ 80l total volume at a flow rate of 0.5l/min). The analysis of the Tenax tubes was carried out using a GC/MS-system (Hewlett-Packard 5890A/5870) equipped with a thermal desorber-cold trap injector (Gerstel KAS 3). Identification of the compounds was based on a PBM library search.[21] Moreover, mass spectra and retention data were compared with those of reference compounds. The nonpolar VOCs were extracted from activated carbon with carbon disulphide or methanol under constant shaking for one hour and analyzed in a GC-FID system (Hewlett Packard 5890 A).

SAMPLE **A.2**: acrylate system; application technique: roller-coating; procedure: 15 g/m^2 (15 m/min) – 12 g/m^2 (10 m/min) – grinding – mordant (ethanol) – 5 g/m^2 (15 m/min) – 5 g/m^2 (10 m/min); photoinitiators: BP, DPAP, TBDPO.

SAMPLE **B**: acrylate system; application technique: roller-coating; procedure: 15 g/m^2 (10 m/min) – 12 g/m^2 (5 m/min) – grinding – mordant (ethanol) – 5 g/m^2 (10 m/min) – 5 g/m2 (5 m/min); photoinitiators: BP, DPAP, TBDPO.

SAMPLE **C**: unsaturated polyester (UPE); application technique; spray-coating; procedure: mordant – grinding – 90 g/m^2 (3 m/min) – grinding – 90 g/m^2 (3 m/min); photoinitiators: HMEPP, DAP.

The specification of photoinitiators follows the declaration of the manufacturers (see *Table* 1).

Chamber Tests

All experiments were carried out in a self-constructed 1 m^3 glass chamber[20] under the following conditions: temperature = 23°C, relative humidity = 45%, air exchange rate n = 1.0 h^{-1}, loading factor a = 1.0 m^2/m^3. The chamber is purged by compressed air, which is passed through an oil separator and activated charcoal for purification. The air exchange rate is steadily controlled by a mass-flow controller (MKS 147). The required humidity is regulated by mixing dry and wet air. The

RESULTS

All applied photoinitiators and their detected fragments are listed in *Table* 1 with CAS-numbers and characteristic mass peaks. The mass spectra were recorded with a quadrupole mass spectrometer (70eV electron beam) after tuning the system with perfluorotributylamine. TBDPO could not be found in the chamber air, a pure standard was not available. Therefore, no mass spectral data are presented for this compound.

Comparison of Different Curing Times: Acrylate Coating

The VOC emissions of both test samples (A.1 and A.2) were monitored for 26 days. The compounds to be quantified are shown in *Table* 2. The chamber concentrations after one day (24 hr) and after 20 days (480 hr) are also listed. For the

Table 1—Applied Photoinitiators and Identified Photofragments, Abbreviations Used in the Text, CAS-Numbers, and Characteristic Mass Peaks

Compound	Abbreviation	CAS-No.	Characteristic Mass Peaks (m/z)
Benzaldehyde	BA	100-52-7	50, 51, 77, 78, 105, 106
Benzophenone	BP	119-61-9	51, 77, 105, 112, 182
Benzenemethanol	BM	100-51-6	51, 65, 77, 79, 107, 108
Benzil	BZ	134-81-6	105, 77, 51, 210
Methylbenzoate	MB	93-58-3	50, 51, 77, 105, 136
Acetophenone	AP	98-86-2	50, 51, 77, 105, 120
4-(1-methyl-ethyl)-benzaldehyde	MEBA	122-03-2	51, 77, 105, 119, 133, 148
4-(1-methyl-ethyl)-acetophenone	MEAP	645-13-6	91, 103, 119, 132, 147, 162
2-hydroxy-acetophenone	HAP	582-24-1	51, 77, 105, 123, 136
1-phenyl-1,2-propane-dione	PPP	579-07-7	50, 51, 77, 105, 148
2,4,6-trimethyl-benzaldehyde	TBA	487-68-3	77, 91, 105, 119, 147, 148
2,2-dimethoxy-2-phenyl-acetophenone	DPAP	24650-42-8	51, 77, 105, 151, 225
2,2,-diethoxy-acetophenone	DAP	6175-45-7	47, 75, 77, 103, 105, 163
2-hydroxy-2-methyl-1-(4-(1-methyl-ethyl)-phenyl)-1-propanone	HMEPP	69673-85-4	59, 105, 119, 133, 147, 148
2,4,6-trimethyl-benzoyl-diphenyl-phosphine-oxide	TBDPO	127090-72-6	not detected

total volatile organic compounds (TVOC) only approximate values are given. Some gaschromatographic signals, which could not be definitely assigned and counted in sum for less than five percent of the total emission, were neglected.

The following photoinitiators and fragments were found in the chamber air: BP, BA, BZ, TBA, MB (A.1 and A.2) DPAP, AP, (A.2). The occurrence of all fragments can be explained by the mechanisms (1)-(3) presented in *Figure* 3. The reactive benzoyl- and trimethyl-benzoyl-radicals are directly produced via α-cleavage of DPAP and TBDPO.[22] A fast hydrogen abstraction follows to generate BA and TBA. BZ is formed by dimerization of benzoyl radicals. MB results as a secondary product from the thermal decomposition of the dimethoxy-benzyl radical, which is previously formed upon α-cleavage of DPAP. AP is a product of the rearrangement of the benzoyl-radical and an alkyl-radical.[23]

Only BA and BP could be quantified in the chamber air of a certain period. All other photocomponents were detected in concentrations below 10 μg/m³. AP and DPAP were obvious in the vapor-phase for the first 300 hr. BA and MB disappeared after 400 hr. The times versus concentration curves comparing samples A.1 and A.2 are shown in *Figure* 4 for BP and *Figure* 5 for BA. The differences between full curing and reduced curing are most evident from the decay curves of BP, where the concentration after 24 hr was 326 μg/m³ for A.2. The curve decreased slowly and after 600 hr testing time 108 μg/m³ were still found in the chamber air. The values for A.1 were always a factor of 3-5 lower. For BA, the curves lay much closer. A steep descent was observable for A.2 within the first 24 hr. After 400 hr, the concentrations of BA were below 1 μg/m³ in both chambers. It was also obvious that for A.1 the TVOC-portion of BA and BP was about 40% after 24 hr and decreased to 18% after 480 hr. For A.2 the contribution of both compounds was about 46-48% throughout.

Eight additional organic components were found in the vapor-phase (see *Table* 2). The TVOC-value was about 240 μg/m³ for A.1 after 24 hr and decreased to 102 μg/m³ after 480 hr. Besides n-butylacetate and three monoterpenes (α-pinene, limonene, Δ³-carene), the aromatic hydrocarbons toluene, ethylbenzene, and m,p-xylene (determined as sum of both isomers) were main compounds and accounted for 40% of the total emission. For A.2, a similar distribution of VOC was obtained. As expected, the TVOC-values were significantly higher with 820 μg/m³ (24 hr) and 211 μg/m³ (480 hr). Only

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Table 2—Chamber Concentrations of Volatile Organic Compounds (Samples A.1 and A.2), Measured 24 hr and 480 hr after Starting the Test

Compound	A.1		A.2	
	24 hr	480 hr	24 hr	480 hr
	μg/m³			
Toluene	42	35	114	75
Ethylbenzene	30	9	135	≤1
m,p-xylene	22	7	86	8
n-butylacetate	8	2	35	≤1
Δ³-carene	10	9	12	6
Limonene	3	3	4	4
α-pinene	30	19	56	16
Benzaldehyde	32	≤1	52	≤1
Benzophenone	63	18	326	102
TVOC	≈240	≈102	≈820	≈211

the five solvents were in accordance with the result of a static gaschromatographic headspace analysis of the raw material. The monoterpenes were probably emitted from the unsealed edges of the chipboard.

Test of Furniture: Acrylate Coating

The first investigated furniture sample (B) was coated with the same UV-curing system as used for A.1 and A.2 (declaration of the manufacturer). The detected photocomponents were BP, BA, BZ, DPAP, TBA, and HAP. Quite unclear was the occurrence of HAP, which could be identified by mass spectral data and the retention time of a reference compound. Nevertheless, as far as the starting products, BP, DPAP, and TBDPO are concerned, there is no simple photochemical pathway leading to the formation of HAP. There was also some evidence for PPP, which could be formed from DPAP as a recombination product of the benzoyl- and the dimethoxyphenyl-radical.

The time versus concentration curves for BA and BP are presented in *Figure* 6. BA shows a similar pattern as found for A.1. The chamber concentration decreased from 31 μg/m³ to 6 μg/m³ after 400 hr. For a more expanded period, the concentration fell below 1 μg/m³. A different behavior was observed for BP. Here, the concentration increased from 38 μg/m³ after 24 hr to 52 μg/m³ after 400 hr. Within the total testing time of ≈ 600 hr (not shown in *Figure* 6), a decay of the BP concentration was not obvious. This effect resulted in an increase of the relative contribution of BA and BP to the TVOC-value from about 33% with TVOC = 209 μg/m³ (24 hr) to 60% with TVOC = 97 μg/m³ (400 hr). When comparing the VOC emission characteristics of A.1 and B, the expected similarity is evident. Only the three monoterpenes could not be found in the chamber air of sample B. The reason for this may come from sealing the edges of the chipboards with a tight lamination.

The VOC concentrations in the interior of the boxes were also monitored. For sampling, a Teflon hose line was led through a 5 mm bore to the chamber exit. As expected, the measured concentrations of all components were distinctly higher, e.g., with 149 μg/m³ (24 hr) – 19 μg/m³ (400 hr) and 95 μg/m³ (24 hr) – 107 μg/m3 (400 hr) for BA and BP, respectively. The solvent concentrations in the interior were enhanced by a factor of 4-5 throughout.

Test of Furniture: UPE Coating

The second furniture sample (C) was coated with a water-based system (water vapor open) that contained an unsaturated polyester (UPE) resin and a polyester acrylate. Here, DAP and HMEPP were used as photoinitiators. The photocomponents found in the chamber air were BA, BM, MEBA, MEAP, and the initiators themselves. Again, BA and MEBA were directly generated via α-cleave of DAP and HMEPP, respectively. The occurrence of the acetophenone derivative MEAP has been explained in a previous work.[23] The structure of one fragmentation product could not be clarified sufficiently. However, there was strong evidence for 2-ethoxy-acetophenone. This compound would also be plausible, because it is generated from DAP via Norrish II-reaction, followed by a breaking of the β-bond and keto-enol-tautomerization.[24] It is well-known that DAP undergoes the Norrish II-pathway with a probability of 33%.[4,5]

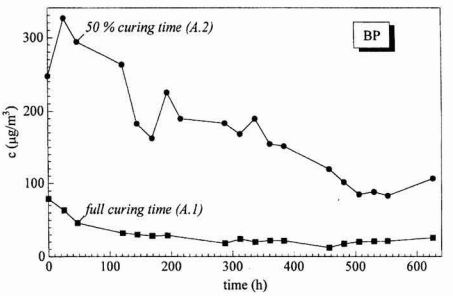

Figure 4—Concentration versus time profiles for the emission of BP and UV-cured acrylate systems with full curing time (A.1) (■) and 50% undercuring (A.2) (●).

The compounds that could be quantified in the chamber air over several weeks were BA and MEBA. The time versus concentration curves are presented in *Figure* 7. The highest values were found for MEBA with 78 μg/m³ after 24 hr (see *Table* 3). Then the curve steeply decreased within 150 hr. Afterwards, only a slight decay was observable. A similar curve shape resulted for BA, but with lower concentrations in a range from 25 μg/m³ to 4 μg/m³. The four solvent components, toluene, m,p-xylene, and butylglycol (2-butoxy-ethanol) were also detected in the chamber air. The aromatic hydrocarbons were not part of the formulation but were also found when analyzing the raw material with static headspace gas chromatography. The main component was butylglycol, which is added to water-based lacquer systems in amounts of 5-10% to improve the rheological parameters and the film formation. In comparison to sample B, the TVOC-value of 498 μg/m³ after 24 hr was significantly higher, where butylglycol contributed 66%. This should have several reasons. In contrast to B, the surface coating of C was water vapor open, which means that the diffusional resistance is strongly reduced. Furthermore, butylglycol has a high boiling-point of

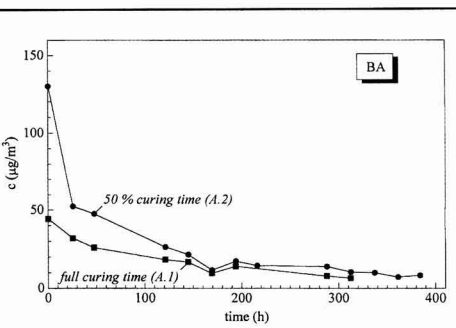

Figure 5—Concentration versus time profiles for the emission of BA from UV-cured acrylate systems with full curing time (A.1) (■) and 50% undercuring (A.2) (●).

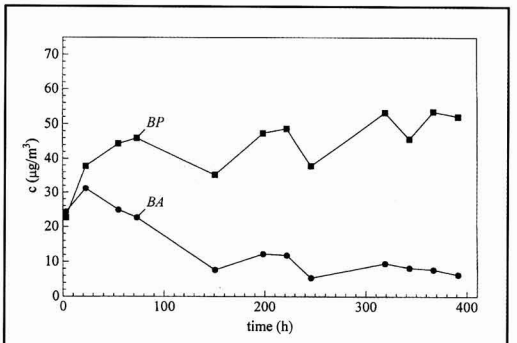

Figure 6—Concentration versus time profiles for the emission of BA (●) and BP (■) from a UV-cured acrylate system.

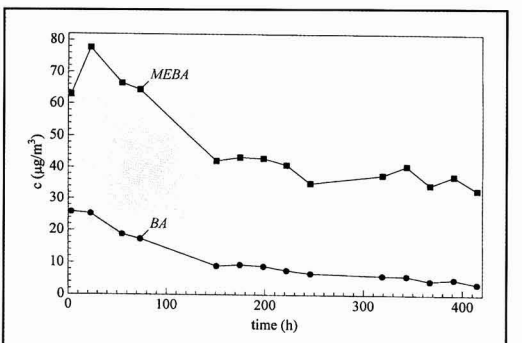

Figure 7—Concentration versus time profiles for the emission of BA (●) and MEBA (■) from a UV-cured UPE system.

172°C and a low vapor pressure of 0.89 mbar at 20°C. As a consequence, higher amounts will remain in the layer of the freshly produced furniture. After 400 hr testing time, the TVOC had decreased to 139 µg/m³, which can be regarded as usual for the freshly produced furniture. For this system, the photoinitiators BA and MEBA counted with 21-27% to the total emission.

Again, the VOC concentrations in the interior of the box were measured for comparison. For BA and MEBA values of 177 µg/m³ (24 hr), 31 µg/m³ (400 hr), and 392 µg/m³ (24 hr), 247 µg/m³ (400 hr) were found. Most remarkable was butylglycol, which reached a concentration of 2724 µg/m³ after 24 hr and then dropped to 358 µg/m³ after 400 hr.

DISCUSSION

The results have shown that UV-curable coating systems may release a number of volatile organic compounds, which can significantly contribute to indoor air pollution under normal living conditions. In comparison to other coatings for wood finishes, which are not part of this study,[16,25] fewer solvent components were detected and the concentrations decreased below 100 µg/m³ after 400 hr testing time. However, odor problems may be caused by emission of photoinitiators and photofragments into indoor air. Although the most initiators are known as nonodorous, their fragments may stimulate unpleasant smell. This is well-known for BA with reported high odor and low odor thresholds of 190 µg/m³ and 0.8 µg/m³, respectively.[8,26] For TBA and MEBA no data have been reported. On the premises that the conjugation of the carbonyl group and a double bond is responsible for the sensoric effect,[27] it can be assumed that the odor thresholds of BA, TBA, and MEBA are in the same range. As a consequence, odorous fragments will be emitted, as long as aromatic carbonyl compounds are used, whose primary photochemical pathway is α-cleavage. For all other compounds listed in *Table* 1, odor thresholds were available only for AP (835 µg/m³ to 2946 µg/m³)[8] and BM (450 µg/m³).[26]

Table 3—Chamber Concentrations of Volatile Organic Compounds (Samples B and C), Measured 24 hr and 400 hr after Starting the Test

Compound	B		C	
	24 hr	400 hr	24 hr	400 hr
	µg/m³			
Toluene	57	15	12	2
Ethylbenzene	23	5	n.d.	n.d.
m,p-xylene	39	19	52	33
n-butylacetate	21	4	n.d.	n.d.
Butylglycol	n.d.	n.d.	331	67
Benzaldehyde	31	6	25	4
Benzophenone	38	52	n.d.	n.d.
MEBA	n.d.	n.d.	78	33
TVOC	≈209	≈97	≈498	≈139

It should be emphasized that all chamber tests were carried out under identical conditions, which corresponded directly to the climatic parameters generally chosen for material testing. An air exchange rate of 1.0 h^{-1} is recommended by many national occupational health services due to hygienic reasons.[28] Nevertheless, this is rarely reached in reality and insufficient values below 0.4 h^{-1} have been measured in most cases.[28,29] In addition, the loading rate will also be higher in many dwellings (1.7 m^2/m^3 to 6.7 m^2/m^3 have been reported for wooden boards,)[16] and it can be assumed that increased VOC concentrations may result in living rooms under unfavorable conditions. The cited investigations by Fischer and Böhm[16] (see Introduction Section) were performed with a higher loading rate of 5 m^2/m^3. Here, chamber concentrations of 126 µg/m³, 156 µg/m³, and 522 µg/m³ were measured for BA, MB, and cyclohexanone* after 480 hr. Moreover, many types of boards, for example, wardrobes, have closed spaces or drawers and the problem of an inside accumulation of VOC arises. This effect was most evident from the increased concentrations measured in the interior of the chests. In contrast to the living area, nearly static conditions prevail, and in theory, the concentration of each VOC component is limited by the saturated vapor pressure. The accumulated compounds may diffuse into textiles or escape abruptly, when the door is opened.

*Cyclohexanone is not relevant for this study, because the compound is formed from the hydroxy-cyclohexyl radical upon α-cleave of 1-hydroxy-cyclohexyl-phenone, followed by hydrogen abstraction and keto-enol-tautomerization.

CONCLUSION

The release of photoinitiator fragments and other volatile organics from UV-cured furniture coatings has been studied in detail. It was demonstrated that the emission potential is extremely sensitive to the quality of the manufacturing conditions. Special attention must be paid to enable an optimized UV-curing process with sufficient time and radiation intensity. From the Lambert-Beer law it is apparent that the choice of an efficient curing technique must fit different parameters like light source characteristics, film thickness (optical density), absorption behavior, and concentration of the photoinitator.[4] Future work is required to find efficient and nonyellowing photoinitiators, which for example undergo β-cleavage instead of α-cleavage[7,30] to avoid odorous fragments. It is also necessary to reduce the portion of photoinitiators in formulations or to remove surplus amounts.

ACKNOWLEDGMENT

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Viscosity Reduction via Monomer Selection in Solvent-Borne High-Solids Styrene/Acrylic Coating Resins

Charles A. Zezza and Kimberly D. Talmo—Rhône-Poulenc, Inc.*

The ability to prepare solvent-borne, high-solids, coating resins has been hampered by the need to use resins which have lower than desired T_gs or use more solvent than would be preferred to reach application viscosity. Recent work has indicated that cyclic, higher T_g, methacrylate monomers that are incorporated into a styrene/acrylic copolymer may be effective in reducing solution viscosity. This work will discuss the effect of incorporating different cyclic methacrylate monomers on solution viscosities of several styrene/acrylic polymers. The high T_g cyclic monomers studied were: isobornyl methacrylate, cyclohexyl methacrylate, t-Butylcyclohexyl methacrylate, and 3,5,5-Trimethylcyclohexyl methacrylate.

The monomers were incorporated into two polymers of different T_gs (30°C and 60°C) at between 60-65% solids level. Viscosities were measured and distinct differences in solution viscosities were noted. The polymers were characterized by various measurements. This paper will discuss these observations and the impact that this data provides.

INTRODUCTION

Regulatory pressures from all corners of the globe have greatly impacted the coatings industry. Those pressures have forced coatings manufacturers and applicators to seek alternative methods of supplying customers with new products that have equivalent if not better performance than currently available. Prices of these new products must be competitive with existing materials while meeting more stringent regulatory requirements. In many cases the issue of VOC levels in coatings are of prime concern. Many legislative acts (e.g., Clean Air Act Amendments) seek to set limits on the amounts and types of permissible VOCs.

Suppliers of coatings have used many methods to reduce VOC content (increasing solids) while keeping viscosity as constant as possible. Viscosity can be controlled by reducing the molecular weight of the polymeric binder resin. In acrylics this is easily accomplished. Unfortunately, reductions in molecular weight can lead to poorer film properties (chemical attack, hardness, water sensitivity) due to diminished crosslink densities of the resulting films. Viscosity can also be held constant by the use of reactive diluents, which become an integral part of the film network.[1] These diluents have the effect of increasing solids content of a coating at a constant viscosity. Such coatings can also have film properties that are less than optimal (softer films, poorer chemical resistance). Modified acrylic resins have been prepared that have viscosity reduction properties and have some useful properties.[2]

The relationship of polymer molecular weights (M_w), amount of functionality, glass transition temperature (T_g), solvent type and content, and viscosity of solvent-borne coatings is complex. Manufacturers of solvent-borne coatings attempt to balance the VOC level of the coating against the coating's viscosity while using permitted solvents. The maintenance of the needed application viscosity of the coating is critical to the performance of the system.

High-solids acrylic coatings resins are becoming lower and lower in molecular weight in efforts to increase solids content while keeping the viscosity at a constant level. High-solids acrylics also are using lower T_g polymers, which have less solvent demand. This has the effect of increasing solids at constant viscosity. However, the lower T_g of such resins may not provide all the performance characteristics of a higher T_g resin with respect to scratch/mar resistance in the final cured film.

What would be most desired in an acrylic coating resin would be the ability to prepare polymers of higher T_g (>25°C), at higher-solids levels (>60%), with good levels of reactive functionality all while maintaining viscosity at a reasonable level. Previous work has demonstrated that polyacrylate polyols can be prepared that have calculated T_gs of between 23 and 40°C, which have viscosities of between 2,400 and 5,000 mPa·s at 70% solids.[3] VOC levels of coatings made from these resin solutions were suited to the newer California regulations (1995: 3.5 lbs/gal VOC) for automotive refinish applications.

It is widely believed that for a polymer of given T_g, the viscosity of the polymer will be somewhat consistent regardless of the monomer composition (at similar M_w, functionality

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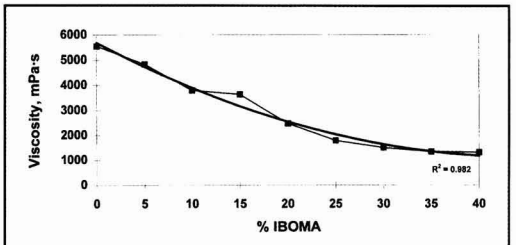

Figure 1—Plot of viscosity versus % cyclic monomer (IBOMA) at a T_g of 30°C.

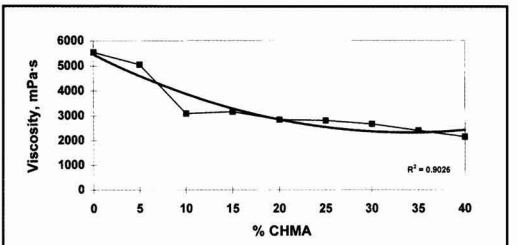

Figure 2—Plot of viscosity versus % cyclic monomer (CHMA) at a T_g of 30°C.

Table 1—Replacement of MMA with Various Cyclic Monomers at Constant T_g (30°C); Monomers are given in Weight %

	Monomers							
Polymer	MMA	BA	IBOMA	CHMA	t-BCHMA	TMCHMA	STY	HEA
1	39.9	20.1	0.0	—	—	—	20	20
2	34.9	20.1	5.0	—	—	—	20	20
3	29.8	20.2	10.0	—	—	—	20	20
4	24.7	20.3	15.0	—	—	—	20	20
5	19.6	20.4	20.0	—	—	—	20	20
6	14.5	20.5	25.0	—	—	—	20	20
7	9.4	20.6	30.0	—	—	—	20	20
8	4.4	20.6	35.0	—	—	—	20	20
9	0.0	20.7	39.3	—	—	—	20	20
10	35.5	19.6	—	5.0	—	—	20	20
11	30.8	19.2	—	10.0	—	—	20	20
12	26.2	18.8	—	15.0	—	—	20	20
13	21.6	18.4	—	20.0	—	—	20	20
14	17.1	17.9	—	25.0	—	—	20	20
15	12.5	17.5	—	30.0	—	—	20	20
16	7.9	17.1	—	35.0	—	—	20	20
17	3.3	16.7	—	40.0	—	—	20	20
18	35.1	19.9	—	—	5.0	—	20	20
19	30.2	19.8	—	—	10.0	—	20	20
20	25.3	19.7	—	—	15.0	—	20	20
21	20.4	19.6	—	—	20.0	—	20	20
22	15.6	19.4	—	—	25.0	—	20	20
23	10.7	19.3	—	—	30.0	—	20	20
24	5.8	19.2	—	—	35.0	—	20	20
25	1.0	19.0	—	—	40.0	—	20	20
26	35.1	19.9	—	—	—	5.0	20	20
27	30.2	19.8	—	—	—	10.0	20	20
28	25.3	19.7	—	—	—	15.0	20	20
29	20.4	19.6	—	—	—	20.0	20	20
30	15.6	19.4	—	—	—	25.0	20	20
31	10.7	19.3	—	—	—	30.0	20	20
32	5.8	19.2	—	—	—	35.0	20	20
33	1.0	19.0	—	—	—	40.0	20	20

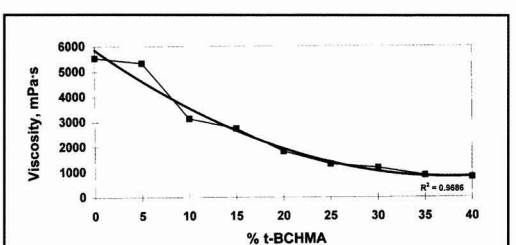

Figure 3—Plot of viscosity versus % cyclic monomer (t-BCHMA) at a T_g of 30°C.

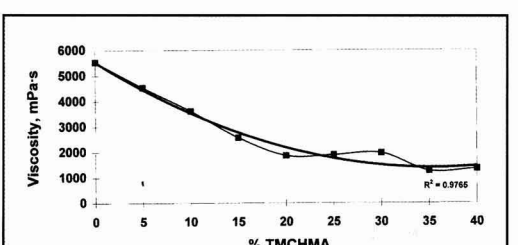

Figure 4—Plot of viscosity versus % cyclic monomer (TMCHMA) at a T_g of 30°C.

level, and solids content).[4] Other investigators have suggested that as a method of viscosity reduction in high-solids acrylic polymers, the incorporation of cyclic methacrylate monomers has the benefit of reducing viscosity of the polymer at constant T_g, M_w, functionality, and solids levels.[3] This effect is very interesting in coating resin application especially in light of stricter controls on volatile components in coatings. It is of benefit to find ways to reduce viscosity without decreasing solids levels or diminishing the performance of the coating. We have examined the suggested benefit of cyclic monomers in greater detail to better understand the effect that monomer selection has on the solution viscosity of styrene/acrylic copolymers. Several cyclic, high T_g, monomers were evaluated for their contributions to viscosity reduction in a series of polymers that were prepared.

EXPERIMENTAL

The basic polymer examined contains methyl methacrylate (MMA), styrene (STY), hydroxyethyl acrylate (HEA), and butyl acrylate (BA) and in most cases a cyclic monomer. The styrene and hydroxyethyl acrylate concentrations were each kept at a constant 20% level in every polymer. The polymers were prepared at a calculated T_g of 30 or 60°C by use of the Fox equation.[5] The amount of cyclic monomer was adjusted in five percent increments as a replacement for methyl methacrylate. The cyclic monomers chosen were: isobornyl methacrylate (IBOMA; T_g 110°C), cyclohexyl methacrylate (CHMA; T_g 83°C), t-Butylcyclohexyl methacrylate (TBCHMA; T_g 98°C), and 3,5,5-Trimethylcyclohexyl methacrylate (TMCHMA; T_g 98°C). The polymer T_gs were adjusted by changing the amounts of butyl acrylate and methyl methacrylate as shown in *Table* 1 (for polymers of calculated 30°C T_g) and *Table* 2 (for polymers of a calculated 60°C T_g).

The polymers used in this study were prepared via a simple thermal decomposition of benzoyl peroxide (BPO) in xylene under nitrogen atmosphere. The polymers were prepared at between 60-65% solids at a pot temperature of 140°C. The monomer feed was catalyzed with 4 g of BPO dissolved in 200 g of monomers and added over a three-hour period to the refluxing xylene. After the fourth hour of polymerization, an additional 0.25 g charge of BPO was added to help complete the polymerization. The polymerization was continued for an additional three hours (seven hours total polymerization time), whereupon it was cooled and bottled.

The resins were analyzed by GPC for M_w and dispersity using polystyrene as a standard. The hydroxyl and acid numbers were determined by titration. The solids levels were determined by ASTM Method D2369-81. The residual monomer was determined by capillary GC of monomers extracted

Table 2—Replacement of MMA with Various Cyclic Monomers at Constant T_g (60°C); Monomers are given in Weight %

	Monomers							
Polymer	MMA	BA	IBOMA	CHMA	t-BCHMA	TMCHMA	STY	HEA
41	55.5	4.5	0.0	—	—	—	20	20
42	50.4	4.6	5.0	—	—	—	20	20
43	45.3	4.7	10.0	—	—	—	20	20
44	40.2	4.8	15.0	—	—	—	20	20
45	35.1	4.9	20.0	—	—	—	20	20
46	30.0	5.0	25.0	—	—	—	20	20
47	24.9	5.1	30.0	—	—	—	20	20
48	19.9	5.1	35.0	—	—	—	20	20
49	14.8	5.2	40.0	—	—	—	20	20
50	9.7	5.3	45.0	—	—	—	20	20
51	50.9	4.1	—	5.0	—	—	20	20
52	46.3	3.7	—	10.0	—	—	20	20
53	41.8	3.2	—	15.0	—	—	20	20
54	37.2	2.6	—	20.0	—	—	20	20
55	32.6	2.4	—	25.0	—	—	20	20
56	28.0	2.0	—	30.0	—	—	20	20
57	23.5	1.5	—	35.0	—	—	20	20
58	18.9	1.1	—	40.0	—	—	20	20
59	14.3	0.7	—	45.0	—	—	20	20
60	50.6	4.4	—	—	5.0	—	20	20
61	45.7	4.3	—	—	10.0	—	20	20
62	40.9	4.1	—	—	15.0	—	20	20
63	36.0	4.0	—	—	20.0	—	20	20
64	31.1	3.9	—	—	25.0	—	20	20
65	26.3	3.7	—	—	30.0	—	20	20
66	21.4	3.6	—	—	35.0	—	20	20
67	16.5	3.5	—	—	40.0	—	20	20
68	11.7	3.3	—	—	45.0	—	20	20
69	50.6	4.4	—	—	—	5.0	20	20
70	45.7	4.3	—	—	—	10.0	20	20
71	40.9	4.1	—	—	—	15.0	20	20
72	36.0	4.0	—	—	—	20.0	20	20
73	31.1	3.9	—	—	—	25.0	20	20
74	26.3	3.7	—	—	—	30.0	20	20
75	21.4	3.6	—	—	—	35.0	20	20
76	16.5	3.5	—	—	—	40.0	20	20
77	11.7	3.3	—	—	—	45.0	20	20

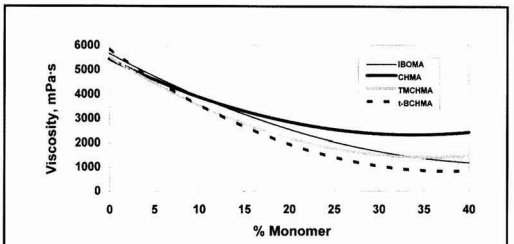

Figure 5—Plot of viscosity versus % cyclic monomer at a T_g of 30°C.

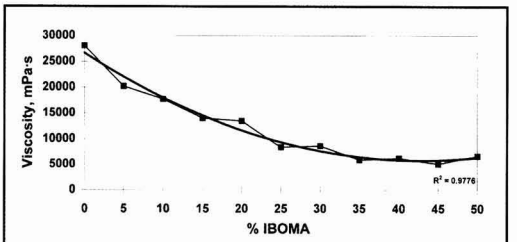

Figure 6—Plot of viscosity versus % cyclic monomer (IBOMA) at a T_g of 60°C.

Table 3—Characterization of Low T_g Polymers (30°C)

Polymer	% Cyclic Monomer	Viscosity (Xylene) mPa·s	% Solids	OH#	Acid #	M_w	Residual Monomer	D
1	0	5171	62.6	53	2.4	14.1k	<0.1	1.93
2	5	4835	62.2	54	2.2	14.8k	0.17	1.58
3	10	3791	62.2	52	2.2	13.9k	0.20	1.68
4	15	3635	62.8	53	2.4	14.0k	0.21	1.60
5	20	2471	62.3	55	2.3	13.6k	0.16	1.52
6	25	1788	61.8	52	2.5	14.1k	0.20	1.50
7	30	1500	62.0	53	2.4	13.7k	0.24	1.61
8	35	1344	62.4	56	2.4	14.1k	0.30	1.58
9	39	1308	62.3	56	2.6	14.1k	0.40	1.56
10	5	5051	61.2	57	2.1	15.4k	<0.10	1.57
11	10	3095	61.8	57	2.2	14.8k	<0.10	1.55
12	15	3167	62.3	56	2.0	14.4k	<0.10	1.58
13	20	2843	62.1	58	2.3	14.4k	<0.10	1.60
14	25	2807	62.3	59	2.2	16.3k	<0.10	1.66
15	30	2663	62.2	60	2.1	16.1k	<0.10	1.70
16	35	2399	62.1	59	2.1	16.2k	<0.10	1.68
17	40	2148	62.2	60	2.2	17.6k	<0.10	1.80
18	5	5339	62.7	61	1.8	12.7k	<0.10	1.61
19	10	3131	61.5	61	1.9	12.1k	0.15	1.59
20	15	2735	61.5	62	1.7	12.3k	0.19	1.60
21	20	1824	61.8	62	1.8	12.0k	0.35	1.60
22	25	1320	61.5	63	1.8	11.8k	0.42	1.59
23	30	1176	61.3	62	1.9	12.1k	0.56	1.61
24	35	876	59.5	62	1.9	11.4k	0.63	1.58
25	40	804	59.5	64	1.9	11.9k	0.73	1.60
26	5	3911	64.2	42	2.0	12.2k	<0.1	1.45
27	10	3119	64.0	56	1.9	12.2k	<0.1	1.45
28	15	2220	63.8	58	2.1	12.0k	<0.1	1.44
29	20	1608	64.3	69	1.9	12.0k	<0.1	1.44
30	25	1632	62.1	64	1.8	12.2k	<0.1	1.45
31	30	1692	63.0	65	1.8	12.2k	0.16	1.46
32	35	1092	62.2	65	1.8	11.8k	0.17	1.45
33	40	1164	62.9	64	1.7	12.0k	0.23	1.46

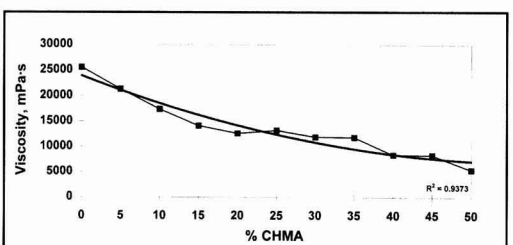

Figure 7—Plot of viscosity versus % cyclic monomer (CHMA) at a T_g of 60°C.

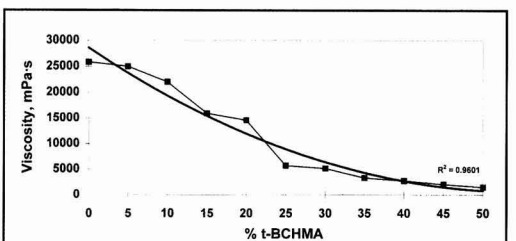

Figure 8—Plot of viscosity versus % cyclic monomer (t-BCHMA) at a T_g of 60°C.

Table 4—Characterization of Low T_g Polymers (30°C)

Polymer	% Cyclic Monomer	Viscosity (Xylene) mPa·s	% Solids	OH#	Acid #	M_w	Residual Monomer	D
41	0	28074	65.1	62	2.1	11.3k	<0.1	1.36
42	5	20240	66.0	64	1.9	12.8k	<0.1	1.45
43	10	17768	64.7	64	2.4	12.5k	<0.1	1.42
44	15	14037	65.4	65	1.9	12.3k	<0.1	1.44
45	20	13521	65.4	63	2.0	12.3k	<0.1	1.42
46	25	8386	65.0	67	2.0	11.9k	0.16	1.43
47	30	8626	65.0	66	2.6	11.3k	0.15	1.40
48	35	5903	64.9	64	1.9	11.5k	0.17	1.42
49	40	6215	64.7	63	1.9	11.8k	0.22	1.44
50	45	5123	65.4	64	2.1	11.3k	0.22	1.42
51	5	21307	64.3	58	1.8	16.0k	<0.1	1.71
52	10	17384	63.9	61	1.8	13.7k	<0.1	1.69
53	15	14133	63.5	61	1.8	13.8k	<0.1	1.59
54	20	12633	65.6	53	2.0	14.1k	<0.1	1.61
55	25	13233	64.3	63	1.8	14.4k	<0.1	1.63
56	30	11925	64.0	62	1.8	14.3k	<0.1	1.65
57	35	11859	65.1	43	2.2	14.0k	0.3	1.67
58	40	8452	64.4	46	2.3	13.7k	0.3	1.63
59	45	8374	64.5	46	2.3	13.4k	0.1	1.65
60	5	24979	64.3	65	2.5	13.2k	<0.1	1.62
61	10	22003	63.3	66	3.0	14.5k	<0.1	1.71
62	15	15921	63.5	65	3.7	16.3k	<0.1	1.85
63	20	14577	63.6	65	4.3	18.5k	<0.1	1.98
64	25	5699	62.5	63	1.9	12.5k	0.24	1.42
65	30	5135	62.7	63	1.9	12.1k	0.28	1.42
66	35	3287	61.7	64	2.0	12.1k	0.37	1.42
67	40	2747	61.4	66	1.9	12.4k	0.52	1.42
68	45	2064	61.4	67	1.9	12.2k	0.58	1.43
69	5	19544	64.8	62	2.1	12.7k	<0.1	1.43
70	10	18812	64.8	62	2.0	12.7k	<0.1	1.42
71	15	14781	64.7	63	2.0	12.4k	<0.1	1.43
72	20	12309	64.9	61	2.1	12.7k	<0.1	1.43
73	25	8542	64.8	62	2.1	12.2k	0.15	1.42
74	30	7234	64.4	62	2.1	11.7k	0.20	1.40
75	35	7690	62.5	65	1.9	12.9k	0.14	1.62
76	40	7474	63.8	64	1.8	12.5k	0.18	1.61
77	45	6659	63.3	63	1.3	11.8k	0.26	1.57

from the polymers. Viscosity of the resins were measured by a Brookfield viscometer at 5 rpm (LV spindle #4 at 25°C).

RESULTS

A total of eight sets of polymers were prepared. Four were prepared at a calculated T_g of 30°C, and the other four were prepared at a calculated T_g of 60°C. Within each set of polymers, there were eight or nine polymers prepared depending on the T_g desired. *Table* 1 indicates examples of the monomer compositions of polymers having the same calculated T_g for a series of polymers that contain cyclic monomers as the replacement monomer for MMA. In an identical manner, the composition of the high polymers (60°C T_g) can be calculated and are again shown in *Table* 2.

The physical characteristics of the polymers were measured and are shown in *Table* 3 (30°C T_g) and *Table* 4 (60°C T_g). The hydroxyl numbers of the polymers were all within expected limits of each other as shown. The acid numbers of the polymers are also within expected limits. The acid values indicate that statistically there is less than one acid group per polymer chain. No increase in acid values were noted at this high temperature of polymerization. Decomposition of the (meth) acrylate monomers into free (meth) acrylic acid is minimal under these conditions.

The residual monomer content was measured on all the polymers. The soluble portion of the polymer resins were extracted and analyzed by capillary GC. The residual monomers were all less than 7500 ppm. About 45% of the determinations were < 1000 ppm. Problems with incomplete polymerization (residual monomer > 1000 ppm) occurred when high levels (>25%) of cyclic monomers were incorporated into the 60°C T_g polymers. For example, when high levels of residual monomers were observed, the cyclic monomers were the only residual monomers detected. To compensate for this, (e.g., in IBOMA polymers) IBOMA can be more completely polymerized by using a staggered dual feed of IBOMA in one feed line and the remaining monomers in the other. When IBOMA was added to the pot at a faster rate than the remaining monomers, the residual monomer level was observed to be less than 1000 ppm. The polymers obtained from such a polymerization were similar to IBOMA polymers prepared in the usual fashion with respect to M_w, dispersity, viscosity, acid number, hydroxyl number, and solids content. The expectation is that this technique will be a valid method of incorporating high levels of other cyclic monomers.

The molecular weights of the materials ranged from 11,100 to 17,600 based on polystyrene standard and are shown in *Table* 3 and *Table* 4. The dispersity of the polymers prepared were all under 2.0. In some cases it was noted that M_w decreased with increasing amounts of cyclic monomer indicating chain transfer pathways or sluggish polymerization at high concentrations of cyclic monomer.

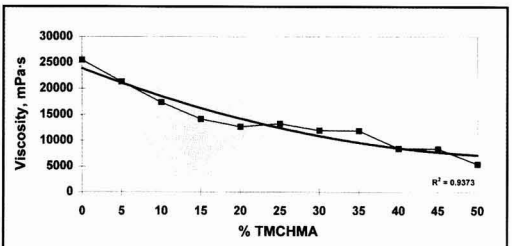

Figure 9—Plot of viscosity versus % cyclic monomer (TMCHMA) at a T_g of 60°C.

The data of viscosity versus % monomer were plotted for a given T_g and are shown individually on separate graphs. The viscosities of the 30°C T_g polymers are shown in *Figures* 1-4. The data is presented as a polynomial regression of the data points along with the original data obtained for each polymer prepared. Correlation coefficients are presented on the figure. There is a clear decrease in viscosity of the polymers as incremental amounts of cyclic monomers are added and methyl methacrylate is removed. The 0% level of cyclic monomer is a standard hydroxyl functional polymer (i.e., polymer 1 as in *Table* 1). All the cyclic monomers show this viscosity decrease.

When these data are combined onto one graph, a better comparison can be seen. *Figure* 5 shows that at low levels of cyclic monomer, all of the monomers appear to be fairly equivalent in their viscosity reduction behavior. At higher levels, CHMA is the least effective cyclic monomer, while IBOMA and t-BCHMA are the most effective.

The viscosity versus % cyclic monomer relationships of the 60°C T_g polymers are shown in *Figures* 6-9. Correlation coefficients of the polynomial regression are presented on the figure. Again, there is a clear decrease in viscosity of the polymers as incremental amounts of cyclic monomers are added and methyl methacrylate is removed. Again, the 0% level of cyclic monomer is a standard hydroxyl functional polymer (i.e., polymer 41 as shown in *Table* 2). The comparison of all the polymers having 60°C T_g is shown in *Figure* 10.

To reach the equivalent viscosity of a 60°C polymer, which contains 45% of a cyclic monomer, the solids level of the standard hydroxyl functional polymer needs to be reduced by at least 15%. All the cyclic monomers show this viscosity decrease. As was noted in the earlier comparison, at high levels, CHMA is the least effective cyclic monomer, while IBOMA and t-BCHMA are the most effective.

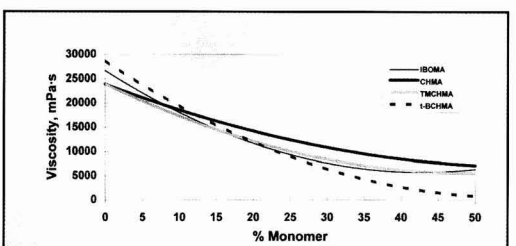

Figure 10—Plot of viscosity versus % cyclic monomer at a T_g of 60°C.

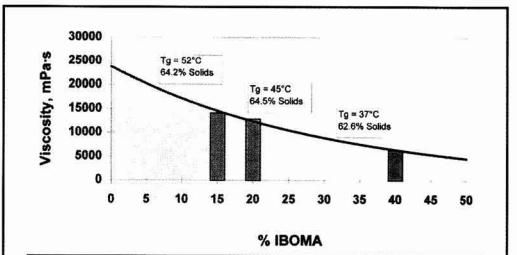

Figure 11—Plot of viscosity versus % cyclic monomer (IBOMA) at a T_g of 60°C. (Shaded boxes represent comparative polymers of different T_gs that have no cyclic monomer.)

When these polymers are compared to a standard acrylic resin (i.e., 0% added cyclic monomer), it is obvious that in order to reach the lowest viscosities, the standard acrylic must be reduced in either solids content or by decreasing the T_g of the polymer. *Figure* 11 demonstrates the extent of decrease in T_g that is needed to obtain the low viscosities that can be obtained for polymers that contain high amounts of IBOMA. The polymers represented by the bar graphs were prepared from methyl methacrylate, styrene, hydroxyethyl acrylate, and butyl acrylate at the calculated T_gs shown. This demonstrates that a polymer with 60°C T_g can have the same viscosity as a 37°C T_g polymer at similar solids, M_w, and functionality. This clearly shows the trade off that must be made in order to obtain low viscosities. The addition of cyclic monomers to acrylic polymers increases the options for acrylic/styrene polymer formulations, which can be used in high-solids coatings.

CONCLUSION

This work has demonstrated that it is possible to prepare polymers with high T_gs and application viscosities that can be lower than expected by incorporating increased amounts of cyclic monomers into the polymer. The reasons for this particular phenomenon are not fully understood. What can be stated is that at low levels of cyclic monomer, there is little difference among the monomers in their effectiveness of reducing solution viscosity. At high levels, IBOMA and t-BCHMA are more effective at decreasing solution viscosity for either a 30° or 60°C T_g polymer. The amounts of reactive functionality are high enough to permit sufficient crosslink density of coatings made from these polymers. Thus no drop in performance (degree of cure) should be expected. High-solids levels allow for lower VOC levels, which increases regulatory compliance. The ability to prepare high-solids coatings with as high a T_g as has been demonstrated is a marked advantage to the formulator looking to increase performance (cure speeds, dry time, solvent resistance, etc.) while maintaining compliance with the latest regulations.

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January 1996 Subcommittee Reports of ASTM Committee D-1

The January 1996 meeting of ASTM Committee D-1 on Paint and Related Coatings, Materials, and Applications was held January 21-24 at the Crown Sterling Suites, Ft. Lauderdale, FL. Approximately 200 D-1 members and guests met in about 190 scheduled working task group and subcommittee meetings. The current D-1 membership is about 593.

Highlights

The initial meeting of D01.09, Technical Advisory Group to ISO/TC 35/SC 9 on Paints and Varnishes was held. At the meeting, progress made on the compilation of ISO and ASTM methods to determine equivalency between methods was reported. A form for all cooperators to fill out in performing this work was developed. Copies of various ISO methods were distributed to specific task group members. D01.09 hopes to have this compilation completed for review before the June meeting. Reports from the various ASTM members serving as liaisons to the 10 working groups of SC 9 were made. It was announced at meetings of D01.21.14, D01.27.31, D01.34, and D01.51.08, that they would be working very closely with their ISO counterpart working groups.

VOC continues to be an important subject. D01.21 has ongoing developments on a variety of analytical methods related to VOCs, HAPs, metals, etc. D01.24 is updating D 1475 on density determination which is a key to an accurate VOC calculation.

D01.27 issued an IS0 liaison report stating ASTM D-1 is finally becoming a voting member of ISO/TC 35/SC 9 on general test methods for paint and varnishes. Until now, members of the U.S. paint industry had no way to participate in the formation of ISO paint standards that can dramatically affect their international business. M. McKnight was appointed liaison for TC 35/SC 9 working group 25 on Environmental Tests, such as salt fog and corrosion. D. Grossman was appointed liaison for TC 35/SC 9 Working Group 26 on Performance Tests, such as carbon arc, xenon, and fluorescent UV.

D01.31.13 reported justification for their task group is the mutual benefit to both ISO and ASTM. A concordance of the test methods between ISO SC 2 and ASTM was complied by B. Schiller and copies were distributed for comments from the attendees to be mailed to the task group chair.

D01.38 held their first meeting. The title of D01.38 was established as "Hydrocarbon Resins," where "resin" refers to certain thermoplastic polymeric hydrocarbons (and derived materials) used (for example) as tackifiers or in inks. A. Kravetz was elected Chair, and L. Graves Vice Chair, and J. Bryson was elected Secretary. R. Allen agreed to be membership chairman; he asked each supplier to provide two customer contacts as potential subcommittee members. A. Kravetz agreed to be publicity chairman.

D01.51, for the second consecutive year, held a joint meeting with the PCI (Powder Coatings Institute) Test Procedures Subcommittee. The first meeting was in January 1995. The combined participation benefits both groups. It will become a regular part of the January meetings. A liaison task group will be formed to accommodate this activity with E. Marx, of Shell, as the Chair.

D01.53 had two methods submitted and approved in a single year, something not done within over 15 years in D-1: D 5723-95, "Determination of Chromium Treatment Weight on Metal Substrates by X-Ray Fluorescence," and D 5796-95, "Measurement of Dry Film Thickness of Thin Film Coil-Coated Systems by Destructive Means Using a Boring Device." They announced OSHA has delayed implementation for five years of slip resistance requirements (proposed by SENRAC) for decking. AISI (American Iron and Steel Institute) has the responsibility to create a new standard which is agreeable to both the painted metal industry and the ironworkers. There is, however, a slip resistance standard for structural steel: painted structural steel can be no more slippery than bare, unpainted structural steel.

Dates and Locations of Future Meetings

June 23-26, 1996—San Francisco, CA
January 26-29, 1997—Ft. Lauderdale, FL
June 22-25, 1997—Toronto, Canada
January 11-14, 1998—San Diego, CA
June 6-10, 1998—Baltimore, MD
January 24-29, 1999—Memphis, TN
June 12-16, 1999—Cincinnati, OH
January 23-28, 2000—New Orleans, LA

DIVISION 1 ADMINISTRATION

Subcommittee D01.08 Environmental Concerns

E.A. Praschan, Chair

Chair Praschan expressed thanks to J.C. Berry for agreeing to serve as co-Chair of D01.08. The Chair summarized current environmental-related method developments and other activities of interest within D-1. D01.21 has ongoing developments on a variety of analytical methods related to VOCs, HAPs, metals, etc. D01.24 is updating D 1475 on density determination and D01.33 is working on a method for formaldehyde in emulsions.

M. McKnight reviewed activities of Committee E-50 on Environmental Assessment. Current projects include development of environmental audit standards, audit certification guides, and guides for identifying lead hazards.

H. Fujimoto said three VOC Training Workshops were conducted in 1995 for government and industry personnel. The next workshop is scheduled for May 1996. Participants learn valuable techniques for VOC analysis. Some HAP issues will be addressed as well. Increased publicity is needed to inform people using these methods.

The Chair will work with D01.21 officers on plans for updating ASTM manual MNL 4 on Determination of VOC in Paints. Open issues include confirmation of J. Brezinski as editor, providing support funding, and designation of associate editors.

W. Spangenberg announced that recently there has been increased regulatory activity concerned with lead in soil and workmen's clothing. Procedures for minimizing risk related to paint removal are being pursued. D01.21 is developing methods for lead analysis in paint. Cooperative actions have been increasing between industry and EPA.

J. Berry reviewed the spectrum of current EPA regulatory activity on clean air matters. The health-based ambient air quality standards (NAAQS) are being reviewed for updating. MACT standards for reducing HAP emissions are being developed for specific industry categories.

Method 311 has been issued by EPA for analysis of HAPs, but D01.21 members have expressed concern about its feasibility. EPA is issuing guidance documents intended to clarify and simplify the process of applying for operating permits by major emission sources. EPA has proposed an open market trading rule. A new rule is also under development which will require procedures for monitoring emissions-related equipment and processes to provide agencies with greater assurance of ongoing compliance. An article in the October 1995 *Standardization News* described open issues related to analysis of VOCs and HAPs. The group discussed ways to increase communication and cooperation between D-1 and EPA on test method development needs.

G. Nelson provided an overview of ISO 14000 International Environmental Standards development which will provide a procedure for establishing environmental management systems, with objectives, strategies, auditing, and review elements. Environmental standards are also being prepared pertaining to product development, labeling, and life cycle assessment. ASTM is the administrator for the U.S. Technical Advisory Group to ISO/TC 207.

B. Nelson reported on the varied environmental-related activities and publications provided by NPCA (National Paint and Coatings Association). NPCA maintains an information system on the Internet.

Additional information pertaining to environmental news, events, workshops, etc. was also discussed.

Subcommittee D01.09 Technical Advisory Group to ISO/TC 35/SC 9 on Paint and Varnishes

T.J. Sliva, Chair

D01.09—Technical Advisory Group to ISO/TC 35/SC 9 on Paints and Varnishes—T. Sliva, Chair, reported that progress has been made on the compilation of ISO and ASTM methods to determine equivalency between methods. P. Guevin had developed a form for all cooperators to fill out in performing this work. The Chair has distributed copies of the various ISO methods to the respective task group members. It is the hope of D01.09 to have this compilation completed and ready for review before the June meeting.

There were reports from the various ASTM members serving as liaisons to the 10 working groups of SC 9. Each liaison reported on activities in their respective working groups and any ballot actions that were taken during the past six months. Each of the members have also written to their respective working group conveyor informing them of work currently under progress in D-1 and offering their hospitality for the coming joint meetings.

S. Orthey, D-1 Staff Manager, reported on contacts with Ms. Josien Paap, of ISO, on coordinating the various schedules for the joint ASTM/ISO meetings to be held in conjunction with the D-1 meeting in June of 1996 in San Francisco. G. Pilcher has developed a letter to be sent to members soliciting funds for the joint meeting.

R. Schiller requested that D-1 submit an application to become a participating member in SC 2 on Pigments and Extenders. J. Weaver is soliciting for volunteers to serve as liaisons to SC 1 on Terminology and SC 10 on Test Methods for Binders for Paints and Varnishes.

The Chair distributed a copy of the proposed scope for the newly created D01.09. The scope was accepted by D01.09 and will be voted upon by D01.90 Executive Subcommittee.

M. McKnight has agreed to serve as the new Chair for D01.09 as of the June meeting. T. Sliva will serve as D01.09 secretary.

DIVISION 20 RESEARCH

Subcommittee D01.21 Chemical Analysis of Paints and Paint Materials

K.H. Fujimoto, Chair

D01.21.10—Lead Paint Policy—J.C. Weaver, Chair. The NIST-lead abatement standards program instigated in 1991 by HUD has achieved about thirty standards encompassing collection and analysis of field samples, control and abatement, field assessments and quality assurance and safety. These are in various stages from drafting to full ASTM adoption and are reported in the appendix "ASTM E06.23 News," April 1996 (see pages 74-75). They will be published in the *ASTM Standards Volume 4.07* and may also be published as a separate compilation.

D01.21.13—Coordination of VOC Standards and Information—M. K. Harding and R. C. Matejka, Co-Chairs. R. Matejka announced some significant changes to Method 311, "Analysis of Hazardous Air Pollutant Compounds in Paints and Coatings by Direct Injection into a Gas Chromatograph," in the furniture coatings reg neg. These changes involved the applicability statement, a method exclusion of cure volatiles, establishing a relationship between the enforcement analytical sample, the MSDS, and the coating supplier's certified product data sheet. The analytical conditions placed on the certified product data sheet by the coating manufacturer must be followed by EPA's enforcement contact analytical laboratory.

A presumptive MACT meeting for the Composition Board Manufacture was covered. Industry's plan is to exclude coatings from the presumptive MACT process and placed in its own MACT around 2002.

Co-Chair M. Harding stated the National AIM rule from the EPA will be published in March or April 1996, and promulgated four to six months after publication. A significant change in EPA philosophy can be expected. For example, one table of standards and a small package exemption may be proposed. Jefferson County, KY, will revise its current AIM regulation to be effective February 1, 1996. It may contain different effective dates pertaining to the activities of coating manufacture, distribution sales, and use. Oregon and five counties in Washington have an effective date of July 1, 1996 for their AIM rule.

A discussion on the most recent VOC round-robin study on high water/low VOC paints reveals measured results are generally excellent while the calculated values for VOC reproducibility are very poor. No one at the meeting could offer any approach to improve these reproducibility results.

M. Harding reported on the EPA's Marine Coating Rule. Emission limits on HAPs are to be expressed as grams/liter of solids. Emission limits are set at two application temperatures with the "cold weather" application set at a higher limit. Under "exempt" solvents, state published information was disseminated to D01.21.13. The two exempt solvents are acetone and parachlorobenzenetrifluoride (PCBTF).

Petitions are in process to delete butyl Cellosolve, and methanol from the HAPs list. There was a discussion on the activity of OSHA to re-designate methylene chloride as a noncarcinogen. According to M. Harding, the South Coast (Southern California) VOC RECLAIM proposal was placed on hold as of January 12, 1996. The steering committee, as well as others, felt the RECLAIM proposal was not satisfactory. Wisconsin's proposed regulation on traffic coatings, which is effective in several months, has a VOC limit of 92 grams/liter (-H_2O and exempt). There was a brief discussion on the European activity in which there is a proposal to reduce VOCs by 30% by 1999 using the 1988 baseline.

D01.21.14—New Publications & Paint VOC Measurement Workshops—K.H. Fujimoto Chair. W.C. Golton presided in lieu of K. H. Fujimoto who had laryngitis.

VOC WORKSHOPS: There were three VOC workshops in 1995. The next workshop is scheduled for May 1996 at Cleveland, OH. Suggestions were made to have the workshop in June in San Francisco to attract ISO attendees at the next D-1.

PUBLICATIONS: ASTM Manual MNL 4, Determination of Volatile Organic Compound (VOC) Content in Paints, Inks and Related Coating Products, Second Edition, continues to be the "bible" for the measurement of VOCs. For the 3rd edition, J. J. Brezinski, indicated he cannot continue due to the loss of office support. J. Benga offered secretarial help from PPG. It was suggested that ASTM underwrite J. J. Brezinski's expenses.

Everyone concerned with VOCs should read U.S. EPA's J. Berry's article in *Standardization News* on VOCs, October 1995. D01.21 will encourage its task group Chairmen to publish results of their round-robin testing on new and improved test methods in appropriate journals. It is important to keep the industry and regulatory bodies informed on their scientific endeavors.

D01.21.24—Revision of D 2369, Test Method for Volatile Content of Coatings—M. E. Sites Chair, reported the newest revision of D 2369-95 was published in August, 1995. It will appear in the 1996 *ASTM Book of Standards*, Vol. 6.01. This revision deleted reference to D 4713, Test Method for Nonvolatile Content of Heatset and Liquid Printing Ink System, since it has not been approved by the EPA and users of D 2369 might interpret its reference in the method as a license to use this method when determining the VOCs of inks. In addition, reference to 2-ethoxy-ethyl acetate in the method was deleted because of safety issues.

The latest round-robin in January 1995 was to answer criticism that D 2369 was not suited for today's new technology, i.e., low VOC/high water content coatings. In addition to running a round-robin on D 2369, all Method 24 test methods were run to determine VOC precision. The results showed, while precision data for each of the individual methods run was as good or better than existing precision data for each of the methods, precision of the calculated VOCs was poor. The results are not unexpected. J. Benga explained the reason for these poor VOC numbers. With low VOC/high water containing paints, even calculating the VOCs without subtracting out the water present in the denominator showed the precision was no better than those calculated using Method 24.

A discussion followed on what should be done with these round-robin results. The options include: (1) change the precision statement of D 2369 based on this round-robin. However, if this were done, the scope of the method would have to changed since the samples run were fewer and less varied than the samples used in the original round-robin on which the current precision is based. (2) Add this data into the method as an "addendum." (3) Run another round-robin using a wider variety of new paint technology samples. D01.21.24 was not in favor of this type of action at this time. (4) Put the round-robin data into an ASTM research report. (5) It was decided, at this time, to add an "addendum" to this method in the appendix and publish the scope of the round-robin and the results obtained for the D 2369 precision. These results will be filed, also, as a ASTM research report. The these results will be published in an appropriate journal. The newest revision of D 2369, in addition to the inclusion of the addendum, will contain a revision to Para. 7.2 for the purpose of clarification. Para 7.2.1 will be added to say "run duplicate specimens" and Para. 7.2.2 will state "The precision obtained is based on the mean of duplicate specimens."

D01.21.25A—VOCs Available For Abatement—L. E. Pattison, Chair. The meeting started with a full review by J. Benga on the purpose for the development of this method to measure VOCs emitted for abatement and VOC credits. L. Pattison reported on progress made since the last meeting at the American Automobile Manufacturing Association (AAMA) in Detroit, MI. The meeting reviewed some in-plant work at Ford Motor and Chrysler. The method under development differs from the original proposal in which water retained in the sprayed panels was determined. The new approach is to determine the VOC volatiles from foil sprayed samples by gas chromatography. A second meeting was held to review the in-plant method and the in-lab method developed at the Chrysler Highland Park location. G. Menovcik was to write up the two methods in ASTM format for the January 1996 meeting. Since the method was not ready, D01.21.25A has been placed on hold.

The test method should be completed by the middle of February 1996. When this is done, copies will be sent to all participants for comments and review. A tentative meeting is scheduled for March to review the test method and collected data.

D01.21.26—Review of D 2697, % VNV, Helium Gas Pycnometer—K. Leavell, Chair, said the goal of D01.21.26 is to replace the disk method, which is based on Archimedes's buoyancy effect, in D 2697 for the determination of the density of the dried or baked paint film with a helium gas pycnometer. The pycnometer takes less time and is more accurate especially with those paints with high PVC.

The proposed method was balloted and one negative was obtained from W. Zimmt which was found to be persuasive. The "Scope" and Significance and Use paragraphs of the method will be rewritten. The negative pointed out the "Significance and Use" statement states the method will be used to determine coverage and the helium gas pycnometer is recommended because it fills coating voids especially in high PVC paints. The problem is the voids are part of the film and contribute positively to aid in the coverage and should be included. By filling all voids, the helium gas pycnometer gives a maximum value for density, minimum value of coverage, and % VNV. This method cannot be used for coatings with substantial void volume. K. Leavell will rewrite the method to reflect these changes and he will reballot the method.

D01.21.51—Determination of Formaldehyde in Paints—D. McCunn, Chair. J. Benga acted as temporary Chair in the absence of D. McCunn. Minutes from the last meeting, the proposed method and the results from the last round-robin were reviewed. The results from the system blank, paint blank, and a formaldehyde standard were acceptable. However, Chair McCunn was concerned by the low recovery when the formaldehyde from a standard spike was collected. It appears the formaldehyde from the standard is being affected by the vapors from the paint sample. After a lengthy discussion, D01.21.51 agreed the purpose of the proposed test is to measure free formaldehyde. Poor formaldehyde recovery is not the problem, but the capability to measure the formaldehyde emitted is needed. When formaldehyde is added to paints, some of it reacts and is retained by the paint. What we are interested in is the amount of free formaldehyde which can be measured. D01.21.51 encouraged the Chair to run a round-robin with these provisions: (1) have the collaborators spike the test paint sample, mix, and run the test; (2) specify when the tests are to be run so that everyone runs the tests about the same time; and (3) specify how long after the spiking, the tests are to be run. It was pointed out the U.S. EPA uses FTIR for the quantitative analysis of formaldehyde in flue gas.

D01.21.52—Paint Solvent Analysis by Gas Chromatograph—J. Benga gave a brief explanation of the work and rationale beyond EPA Method 311. The final version of Method 311 was published in the *Federal Register* on December 7, 1995. Although, during the development of the method, the intent was to limit the use of Method 311 to furniture coatings, in the final version the scope appears to include the determination of most volatile HAPs in all types of coatings. Since Method 311 is more of a general guide to be used for the determination of volatile hazardous air pollutants, the need still exist for more specific methods that minimize lab to lab variations in data. By presenting a method that gives the analyst some latitude in the specifics of the analysis conditions, a criteria to be able to cover most of the volatile HAPs (VHAPs) found in coatings, some of the members present expressed a concern that this approach was not specific enough to qualify as a "method" the way we are used to dealing with methods within the framework

of D01.21. This approach to Method 311 underscores the need for D01.21.52 to develop a method or methods which can be used to ensure uniform practice of HAPs determination across the industry.

A brief discussion of a proposed HS/GC/MS procedure for the "Determination of Exempt and Prohibited Compounds in Consumer Products" proposed by the California Air Resources Board followed. The merits and potential pitfalls were briefly debated. A concern was expressed that the use of such an "expensive" analytical technique may have the potential to impede commerce, i.e., make it prohibitive for some laboratories to provide analytical data using these methods to comply with regulations. It was pointed out that, although expensive, in today's regulatory environment, and the more common use of compliant coatings, this was unavoidable, and D01.21 should continue investigating the standardization of these methods.

The capillary gas chromatograph procedure D01.21.52 is evaluating, for the determination of coating volatiles (solvents), shows variations due to equipment, and there may not be an easy answer to this predicament. Based on this fact, it was agreed we should organize a full interlaboratory study. Five laboratories volunteered to participate in this study. Other state laboratories will be contacted to see if they wish to participate. Since the goals of D01.21.52A are similar, they will use the same samples to evaluate the merits of the HS/GC/MS procedure. It is the hope of D01.21.52 that one or both of these approaches may lead to methods which could be used to verify "true" VOC values. The need still exists for collaborators to help us evaluate these methods. If you have an interest in solvent analysis of paints and coatings and willing to participate in any evaluation and/or round-robin, please contact J. Benga or K. H. Fujimoto.

D01.21.52A—Hazardous Air Pollutants (HAPs) in Paint by Headspace/Gas Chromatography/Mass Spectrometric Detector (HS/GC/MS)—S. Ramesh, Chair. In the absence of Chair S. Ramesh, J. Benga acted as temporary Chair. Copies of the proposed method were distributed to D01.21.52A for review. Some of the comments were: (1) Para 1.2 states the test is run at 110°C. The question was whether this locks in the method at 110°C only. Does it matter since in the GC method, the injection port is kept at 200°-250°C. J. Benga stated there is a temperature in both methods in which similar results can be obtained. (2) Tighten up Para. 3.2.3. Eliminate "or can be baked at the actual baking temperature..." and keep the test conditions at 110°C.

A discussion ensued on what the HS/GC/MS and the GC method measured. W. C. Golton stated since both D01.21.52's and D01.21.52A's purpose are to determine VOCs and HAPs and since both methods, alone, may not be satisfactory, let's run them using the same samples and compare results. We might conclude there is no one test method which measures all the VOCs and HAPs. R. Matejka objected to the use of HS/GC/MS which costs in the neighborhood of $70-$90 K and which would be an expensive item for a small paint company. D01.21.52A felt the determination of HAPs and VOCs require sophisticated techniques which, in turn, requires sophisticated equipment. In relation to the possible fines, if out of specification, the costs of a GC and/or HS/GC/MS is not out of line. At the present time, every state is developing its own VOC and HAP regulations and test methods. It was noted California's ARB is shifting toward the use of GC/MS. Chair Ramesh plans to run a round-robin as soon as he can obtain the test paint samples. Volunteers at this meeting were L. Mink, P. Ford, J.H. Phillips, and K.H. Fujimoto.

D01.21.54—Revision of D 4017 Water in Paints and Paint Materials by Karl Fischer Titration Method—W.C. Golton, Chair, reported revisions to D 4017 were in the D-1 (95-03) ballot. Three negative votes and a number of comments were received. One of the negatives was from R.D. Athey. He did not comment on the ballot item, but criticized the EPA and concept of VOCs. J. Benga moved, seconded by M.E. Sites, to find the negative not persuasive on grounds that there was no comment specific to the Karl Fischer method in the ballot. The other two negatives were cast by P. Ford and R. Montemayor. Both voters cited the lack of supporting data for the changes in the precision statement, and several typos in the ballot item, which gave incorrect paragraph numbers and a wrong value to be replaced (0.7 instead of 1.7, to be replaced by 0.9). Chair Golton sent the data and explained the mistakes to the negative voters. P. Ford agreed to withdraw his negative provided the supporting data be placed on record as a research report. Montemayor has not agreed to withdraw his negative, despite the action taken. Moved by J. Benga, seconded by K. H. Fujimoto, to find R. Montemayor's negative not persuasive on grounds that: (1) the objections were satisfied; (2) P. Ford withdrew his negative which had the same objections; and (3) provided ASTM editorial staff agrees the changes are editorial. R. C. Montemayor complained, also, about the use of "Hydranal" throughout the test of the proposed changes. The Chair agreed to substitute "non-pyridine reagents" as an editorial change. A round-robin study was initiated to gather precision data on two new methods; methanol extraction method and the use of the homogenizer in the Karl Fischer titration vessel. With considerable help from R. Osterman, six samples were sent to 14 collaborators. To date, six sets of data have been received for the homogenizer method and three sets for the methanol extraction method. J. Benga presented a statistical analysis of the data on hand which shows encouraging results. D01.21.54's consensus was to allow a reasonable time for the receipt of additional data, then submit both methods, with their precision data, as appendices to D 4017, in time for letter ballot D01 (96-01). J. Berry suggested the Chair write to the EPA to explain that all three methods are equivalent and recommend the labs be permitted to use whichever of the three options that gives the best precision for their products. California ARB's proposed new Karl Fischer method, Draft SOP MLD 302, was distributed and explained. In this method, a specimen is mixed with 1-methoxy-2-propanol (MPA) and an aliquot is heated to 180°C in a glass oven accessory to a Karl Fischer apparatus. The MPA-water azeotrope is swept into the Karl Fischer solvent with dry nitrogen and titrated. The data provided with the method were similar to the round-robin data just obtained, and the data already obtained for D 4017 using nonpyridine Karl Fischer reagent. The consensus was not to pursue this option, which has obvious drawbacks including being time consuming.

D01.21.55—Exempt Solvents in Paints—J. Benga, Chair, reviewed the scope of D01.21.55. Due to recent activities on federal and several state levels, which defines acetone as an exempt volatile for the purpose of VOC compliance and the potential for its wide use in coatings, the mission of D01.21.55 is to develop a method that allows the determination of acetone in a variety of coatings. Two methods were proposed for evaluation. One is a capillary GC method which uses external standard quantification is currently being evaluated by the California ARB. The second method uses a similar approach but uses an internal standard to achieve quantification. Based on current common practice within the industry and based on general consensus, an internal standard approach, in general, provides more precise values. D01.21.55 agreed to undertake an interlaboratory study on the internal standard method. S. Prince volunteered to rewrite the method into ASTM format. Since the delisting of acetone as a VOC is a fairly recent event, D01.21.55 is in need of representative coating or resin samples to conduct this study. If you are aware of coatings that may contain acetone, and/or willing to provide a sample, and/or willing to participate in this study, please contact J. Benga.

D01.21.56—Revision of D 3960, Standard Practice for Determining Volatile Organic Compound (VOC) Content for Paints and Related Coatings—M.E. Sites, Chair, said this standard practice provides a guide to appropriate ASTM test methods and the calculations needed to determine VOC results required by many government regulatory agencies. This practice is kept up-to-date to incorporate any new changes in VOC regulations or test methods. For this reason it has been updated numerous times since it was first issued in 1981. The latest revision, D 3960-96, will be published in March 1996 and will

be available from ASTM. It will appear in the 1997 *Book of ASTM Standards*. The latest revision was made to include D 5403, Test Method for Volatile Content of Radiation Curable Materials under the Reference Document section. D 5403 been approved for use by the U.S. EPA in determining the VOCs of these types of compounds.

A discussion on how to get new test methods for determining VOCs of certain classes of compounds approved by the U.S. EPA followed. Once a test method has been developed, round-robin tested, data collected and evaluated, and made into an ASTM method, the EPA can be approached. D 4503 is an example of this kind of effort. It was pointed out that D 3925, "Practice For Sampling Liquid Paints and Related Pigmented Coatings," is not referenced in D 3960. Accurate sampling is the most important step in VOC measurement; poor samples give poor results. If appropriate, this practice will be included in the next revision.

D01.21.80—Exploratory Analytical Chemistry—K.H. Fujimoto, Chair. W.C. Golton presided in lieu of K.H. Fujimoto. The purpose of D01.21.80 is to consider proposals for new ASTM standard analytical methods. Five items were considered at this meeting: (1) Infrared microscopy—this technique is used increasingly for problem solving and troubleshooting involving paint film impurities and defects. The question was asked whether a standard or guideline should be developed. Although there was some interest, the proposal was tabled due to a lack of a volunteer to spearhead the effort. (2) VOC liaison with the U.S. EPA; it was proposed to form a task group to meet with the U.S. EPA in Research Triangle Park, NC, annually, to share progress in VOC measurements, to discuss the updates in ASTM VOC test methods, to find out what is needed by the EPA in VOC related measurements, and to find out what their goals are in this field. The proposal received enthusiastic support. Volunteers for the group include: J. Berry, K. H. Fujimoto, W. C. Golton, J. Benga, E. Praschan, K. Leavell, D. Mahoney, J. deWit, M. E. Sites, J. Phillips, and M. Harding. The new D01.21.15 will develop its scope for approval at the next meeting. (3) Technique to Follow Degradation of Paint Films-FTIR and a hydroperoxide test have been used to follow and explain paint degradation in weathering studies. There is some talk of sophisticated paint users requiring this kind of information from paint suppliers. There is a need to develop a standard ASTM acceptable test method. L. Pattison volunteered to survey D01.21 members to find out what test methods are being used and report back at the next meeting. (4) Revised D 2369 method for the VOC of Fast Cure Multicomponent Paints—K.H. Fujimoto pointed out that current VOC methods for multicomponent paints are not fast enough to handle systems which are designed to cure in minutes such as traffic paints. He has developed a procedure that is applicable to such situations and will bring the method and data to the next meeting for consideration. (5) Publication of ASTM Test Development Work-In a general discussion, it was agreed to publish results of round-robin studies on new and improved methods in appropriate journals to gain wider recognition and acceptance of their validity.

Subcommittee D01.23 Physical Properties of Applied Paint Films

P.R. Guevin, Jr., Chair

D01.23.10—Adhesion—G. Nelson, Chair, reported on the results of D-1 (95-03) ballot, Items 11-15. Items 13-15 were received without negatives. The negatives received on Items 11 and 12 were found persuasive.

D 2197, "Test Method for Adhesion of Organic Coatings by Scrape Adhesion," was balloted for withdrawal. The purpose was to identify current users of the test method who may be interested in working on a revision of the test method. A number of individuals have come forward to the subcommittee Chair and the task group has withdrawn the item from ballot.

A new peel test was identified for potential future work.

D01.23.12—Dry Film Thickness—S. Boocock, Chair, reviewed the standards under its jurisdiction and suggested the following changes.

For both D 1186, "Method for Nondestructive Measurement of Dry Film Thickness of Nonmagnetic Coatings Applied to a Ferrous Base," and D 1400, "Test Method for Nondestructive Measurement of Dry Film Thickness of Nonconductive Coatings Applied to a Nonferrous Metal Base," the task group Chair will obtain the analysis of data for developing a revised Precision and Bias statements for both methods.

For D 1186, the group suggested rewording the prohibition on the use of plastic shims. A firm recommendation to avoid the use of plastic shims with pull-off gages will be added in section 7.2. The current wording on frequency of checking the calibration of a gage will change.

D01.23.14—Hardness, Abrasion and Mar Resistance—A. Rutkiewic, Chair, reported that the main committee ballot of the proposed "Test Method for Dry Abrasion Mar Resistance of High Gloss Coatings" resulted in three negative votes. All of the negatives were found persuasive.

A report was made by a representative of Taber Industries dealing with issues concerning the clearance of the vacuum head used with the Taber Abraser and the setting of the vacuum level. The clearance should be set at 1/4-in. from the test surface and a vacuum setting of 80% is recommended. A motion was made to revise all test methods that site the use of the Taber Abraser, to specify these recommendations. It was the opinion of the task group that a round-robin should be conducted to generate a new Precision an Bias statement on these methods. A motion was made to submit D 658, "Test Method for Abrasion Resistance of Organic Coatings by Air Blast Abrasive," for withdrawal. The apparatus required is no longer commercially available.

A discussion was held on the specifications for the radius of the rocker rings of the Sward-type hardness rocker used in D 2134, "Test Method for Determining the Hardness of Organic Coatings with a Sward-Type Hardness Rocker." Since no resolution could be obtained without the cooperation of the current manufacturers, both Modern Machinery and Tool Co. and Sheen Instruments agreed to develop a mutually acceptable recommendation and present it at the June 1996 meeting.

The main committee ballot for the withdrawal of D 2197, "Test Method for Adhesion of Organic Coatings by Scrape Adhesion," and D 5178, "Test Method for Mar Resistance of Organic Coatings by Scrape Adhesion," generated numerous negatives. The instrument suppliers will specify the appropriate stylus point and a new round-robin will be conducted.

D01.23.15—Slip Resistance—P. Guevin, Jr., Chair, reported that D 5858, "Test Method for Static Coefficient of Friction of Painted Walkway Surfaces as Measured by a Horizontal Pull Slip Tester," and D 5859, "Test Method for Determining the Slip Resistance of Painted Surfaces Using the Variable Incidence Tester," passed society letter ballot. However, letters from Committee F-13 on Safety and Traction of Footwear caused the Committee on Standards (COS) to stop any further progress of these standards until the standards are revised.

Draft #3, new "Test Method for Determining the Coefficient of Friction of Coated and Other Like Surfaces Using a Portable Inclined Articulated Strut Slip Tester," received a negative vote from J. Tracy whose negative was found persuasive.

P. Guevin summarized the 12 items contained in the letter from W. Marletta (Committee F-13 Chair) regarding Test Method D 5858. These comments were considered to be persuasive and will be used as the basis for a major revision of Test Method D 5858. The recommended change by Committee F-13 in the title of Test Method D 5859 was determined to be persuasive.

D01.23.19—Drying Time—T. Sliva, Chair, reported that both the revision to D 1640, "Test Methods for Drying, Curing, or Film Formation of Organic Coatings at Room Temperature," and the proposed "Test Method for Measuring Times of Drying or Curing During Film Formation of Organic

Coatings using Mechanical Recorders," had completed society ballot.

H. Ashton reported on his review of the Precision and Bias data from the completed round-robin using the straight line recorders. It was his suggestion that two additional cooperators be used to improve the reproducibility of the statement.

The results from the first round-robin using the circular drying time recorders were reviewed. It was the decision of the task group to run an additional round-robin using only the six-hour circular recorder.

D01.23.20—Exploratory Research—P. Guevin, Jr., Chair, reported that Draft #3, proposed "Test Method for Nondestructive Measurement of Dry Film Thickness of Organic Coatings Applied to a Base Using an Ultrasonic Gage," received two negative votes. It was the opinion of the task group that the items suggested by I. Sellars in his negative were included in the scope of the standard and are already present in other areas of the standard and in the position required by the *Form and Style of ASTM Standards*.

J. Peters explained the technical nature of his negative vote. He stated the standard should be made clearer regarding the use of a couplant. This negative was found persuasive at the subcommittee meeting.

D01.23.21—Contact Angle Measurement—V. Scarborough, Chair. Acting Chair, P. Guevin, distributed a two-page draft of the proposed method submitted by V. Scarborough in her absence. A. Leathers and C. Schoff stated that PPG has an internal contact angle measurement test method that they will compare with the ASTM draft and pass along their comments.

C. Schoff also stated that relative humidity is considered to be an interference and the test method should require that it be reported. P. Guevin discussed how to place the sessile water droplet on the coated surface. He reported that manufacturer's equipment will generate the sessile water droplet and then a platform is raised until the droplet touches the surface to be tested.

Subcommittee D01.24 Physical Properties of Liquid Paints

C.K. Schoff, Chair

D01.24.18—Dispersion Phenomena—R. K. Morrison, Chair, discussed the revision of D 1210, "Fineness of Dispersion of Pigment-Vehicle Systems," which was balloted recently and received several negatives and a number of comments. Many of the points in the negatives were considered persuasive so the method has been withdrawn from the ballot. The revision provides substantial changes in the method, including a stepped gauge for cleanliness. A revised revision will be submitted for ballot.

D01.24.19—Efflux Cups—The revision of D 5125, "Viscosity by ISO Flow Cups," which is ready to be submitted for a concurrent Subcommittee 24 and D-1 ballot. A revision of D 4212, "Viscosity by Dip Type Viscosity Cups," also was considered. The purpose of this revision is to indicate that dip cups can be used for inks and to include a precision statement for inks. The revised method will be submitted for Subcommittee 24 ballot and an informational ballot to Subcommittee 56 (Printing Inks). There also was a discussion carried over from the June 1995 meeting regarding whether the viscosity-efflux time equation in D 1200, "Viscosity by Ford Cup," fit the cups. It was decided that the equations may fit the average number of cups, but variations in manufacture, etc. may mean that individual cups are not fit by a given equation.

D01.24.20—Rotational Viscometers—D 2196, "Test Method for Rheological Properties of Non-Newtonian Materials by Rotational (Brookfield) Viscometer," the revision of which was balloted recently was discussed. The revision had received one negative and several comments. The negative was based on two things:

(1) That the method was written around an instrument from one manufacturer (Brookfield) and the other, similar viscometers now were available and should be included.

(2) That directions for doing the various measurements described in the method (Methods A, B, and C) should be removed and reference made to the manufacturer's directions instead.

After much discussion, it was decided that point (1) had merit, but number (2) did not. Manufacturers' literature cannot take the place of the steps in ASTM methods and, in this case, the measurements cited are not covered by information from the manufacturer. J. Peters will further revise the method incorporating material from the negative and the several comments. Since the method will only refer to Brookfield and Brookfield-type viscometers, it was thought that there might be a place for a Guide for Rotational Viscometers (not a method) that would deal with such instruments in a more general fashion.

D01.24.21—Viscosity by Stormer Viscometer—The major revision of D 561, "Test Method for Viscosity by StormerType Viscometer," was discussed. Additional changes were made in the draft and more will be made based on H. Ashton's negative and on comments from others stemming from an earlier D-1 ballot. However, the method will leave two separate, complete methods (A and B, Manual and Electronic Stormer) even though some sections are repeated. It was felt that this made the method easier for inexperienced operators.

D01.24.22—Density—The revision of D 1475, "Test Method for Density of Paint, Varnish, Lacquer and Related Products," which had drawn a negative on a 1995 ballot and several comments since then was covered. A modified revision was circulated and discussed. The title was changed to "Test Method for Density of Liquid Coatings, Inks, and Related Products." The specification of the volume range for the weight per gallon cup or pycnometer was removed. This was done because the current specification excludes the most commonly used weight per gallon cup (8.3 ml) and it was felt that we should not try to anticipate all equipment volumes. The new specification will state that the cup or pycnometer must be able to be filled readily with a viscous liquid, adjusted to an exact volume, and covered to exclude loss of volatile matter. It also was decided to change the wording to emphasize weight per gallon cups over pycnometers since the cups are much more commonly used. Several other changes will be made and the method resubmitted for ballot.

D01.24.33—Odor Evaluation—D. Darr, Chair, discussed the latest draft of the proposed "Guide to the Detection, Identification and Characterization of the Odors of Paints, Inks, and Related Materials." Since there is very little on characterization in the guide, that word will be removed from the title. There were several new people at the meeting and it is hoped that they will be able to help move the guide along.

D01.24—During the meeting of D01.24, the Chair indicated that he was resigning as of June 30, 1996. A possible new Chair has been approached and it is hoped that this person will be able to take over at the June 1996 meeting.

Subcommittee D01.25 Evaluation of Weathering Effects

M.J. Crewdson, Chair

Task Group—D01.25.03 on Imaging—Will prepare a questionnaire on imaging techniques to determine where standards are needed. This will be circulated to the members of D-1.

D01.25—Revision of D 4214, "Evaluating the Degree of Chalking of Exterior Paint Films," will be sent to ballot with major revisions, as suggested by R. Morrison. These changes include removing the method of rotating the felt cloth to pick up the chalk. The method is also being changed to satisfy a comment by G. Pilcher in order to remove any suggestion that certain methods are recommended for a particular substrate. The subcommittee also voted to petition ASTM editorial staff to permit the listing of two

sources for the tapes used in the Tape Chalk Method.

Two standards that were recently reapproved with the promise that revisions would be made, will now be sent out for ballot. Those standards are D 714, "Evaluating Degree of Blistering of Paints," and D 772, "Evaluating Degree of Flaking (Scaling) of Exterior Paints." Major revisions to these documents were well underway before being tabled to allow for reapproval.

A draft of a compilation of the visual evaluation standards will be prepared, hopefully in time for the next meeting. M. Crewdson, J. Martin, and A. Rutkiewic will coordinate on the draft to be presented to the subcommittee.

A mini round-robin to investigate the precision of D 4214 on chalking evaluations will be held at the next meeting. Chalked panels will be donated by R. Burns, G. Yakulis, R. Kumar, and R. Morrison. Members of D-1 with experience in chalk rating will be invited to participate in the round-robin.

Subcommittee D01.26 Optical Properties

R. Kumar, Chair

D01.26.06—Hiding Power—L. Schaefer, Chair, reported on progress of the hiding power method being developed under the auspices of D01.51. A D01.51 ballot is planned for that purpose. The latest revision of D 2805, to be D 2805-96, is now in the galley proof stage, with several editorial comments to be inserted before publication. Method D 344, "Visual Hiding Power of Brushouts," which is overdue for review and possible revision, will be submitted to D01.26/D-1 ballot prior to the June meeting.

D01.26.11—Gloss and Goniophotometry—A.F. Rutkiewic, Chair, reported D 5767, "Test Method for the Instrumental Measurement of Distinctness of Image Gloss of Coating Surfaces," will be published in the *1996 Book of ASTM Standards* Vol. 06.01. Any instrument manufacturer that wishes their instrument be included in this test method should submit a draft that conforms to *Form and Style of ASTM Standards* along with distinctness of image gloss data comparison with an instrument currently included in the method. The submission will be reviewed and balloted for inclusion as a revision if appropriate.

Representatives of Paul N. Gardner Co. and BASF expressed the desire to develop a standard for the Visual Evaluation of Distinctness of Image Gloss. It is desirable to improve the discrimination and reproducibility over what can be obtained using D 4449, "Test Method for Visual Evaluation of Gloss Differences between Surfaces of Similar Appearance," or with Model GBH-8GM, Distinctness of Image Meter offered by Paul N. Gardner Co.

A draft of the instrumental measurement of orange peel of high-gloss coatings will be submitted by BYK-Gardner USA at the June 1996 meeting.

Subcommittee D01.27 Accelerated Tests for Protective Coatings

D.M. Grossman, Chair

D01.27.04—Light and Water Exposure Apparatus—L.E. Thieben, Chair. W. Ketola stated that there were no negatives received on D 822, "Open Flame Carbon Arc," on a D01.27 ballot. This revision is now ready for publication. There was one negative ballot on the title of D 5031, "Enclosed Carbon Arc," from W. Spangenberg. The author of this negative offered to withdraw the negative if the majority of D01.27 voted the negative not persuasive. The vote was for not persuasive passed. W. Ketola asked for a vote to request ASTM for an exemption to allow listing two equipment suppliers in a footnote in both D 822 and D 6031. The vote was in favor of the footnote. Some editorial changes were suggested for D 5031. D 6031 and D 822 should be ready for publication.

D. Grossman will revise D 4587-91, "Fluorescent UV/Condensation," to include (1) irradiance level specifications and reporting; (2) recommendations for which bulbs to use, UVA or UVB; and (3) cycle for water spray option.

There was no report on the new standard for Xenon-Arc. K. Scott offered to look into the status of the latest draft and will give a report at the June meeting.

D01.27.17—Evaluation of Weathering Effects— M. Crewdson, Chair. This task group is now its own separate subcommittee: D01.25.

D01.27.29—Test Substrates—D. Grossman, Chair. A revision to D 3891, "Glass Test Panels," received one negative and several comments on a previous D0l.27 ballot. The draft will be revised for further ballot. The revision addresses the differences in adhesion and composition between the sides of glass that are in contact with molten tin or air curing manufacture.

D01.27.30—Corrosion Test Automotive—W. van der Linde, Chair. The new standard practice for Accelerated Outdoor Cosmetic Corrosion was discussed. A minor change will be included for D01.27 ballot.

The revision of the new Guide to Laboratory Cyclic Corrosion Testing will be taken over by W. Van der Linde for D01.27 ballot.

The SAE round-robin on the preferred cyclic corrosion test is not yet completed. The background leading to the selection of this test was reviewed. The interest of the automotive and steel companies in a reliable cosmetic corrosion test shows in their sponsors through AISI. A favorable conclusion of the round-robin may lead to the adoption of this cyclic corrosion test by the automotive manufacturers. When that occurs, this test should be considered as a standard test method by ASTM.

D01.27.31—Corrosion Tests-Non Automotive—G. Rommal, Chair. The new Standard Practice for Cyclic Corrosion/UV Exposure of Painted Metal (Alternating Exposures in a Fog/Dry Cabinet and a UV/Condensation Cabinet) passed all balloting levels and was assigned the designation D 5894. A few editorial clarifications will be made by D. Grossman, based on ballot comments, and the new standard will appear in the next standards volume. Much of the credit for development of this method should go to researchers at Sherwin-Williams, the Cleveland Society of Federation of Societies for Coatings Technology, and the SSPC.

Q-Panel has completed manufacture of a very large quantity of test panels of the eight coil coated materials for the round-robin. The number of panels for each outdoor exposure was clarified to be 120, rather than 40, since three removals with destructive ratings were planned for five replicates of the eight materials. G. Rommnal will supply Q-Panel with a list of panel sizes and numbers for each outdoor site, and panels will be sent immediately thereafter. S. Pikul, of LaQue, expressed interest in performing two additional exposure sets at the Kure Beach 25m lot to test the effects of angle and direction of mounting, and the group agreed to supply the extra material.

S. Boocock briefly discussed preliminary outdoor results from the industrial maintenance panels at Panama and Kure 25m. With the severity of these sites, sufficient data to permit ranking of materials should be available within the next year. More detail on the preliminary observations will be presented in Boocock's paper at the G-3 symposium on Wednesday.

G. Rommal received a proposed evaluation methodology for the coil panels adapted from the rating scheme recently developed by AISI GC-1841 Task Force on Accelerated Corrosion Testing, based on the NamZAC (North American Galvalume producers) building inspection protocol. Rommal will develop a form to be used by people rating the panels, and distribute it to the outdoor and lab testing sites. M. McKnight suggested that this methodology might be suitable for development into its own standard. This will be pursued within the newly formed Subcommittee D01.25.

Outdoor sites were reminded that the proper evaluation schedule is critical, and may be different for each site. We ask that each site periodically inspect the panels to ensure that failure does not proceed too far before evaluation.

S. Boocock noted that SSPC has a relatively large number of industrial maintenance specimens which did not meet their dry film thickness cutoffs. These could be used for practice runs in accelerated tests.

The first round of accelerated testing will be as follows: B 117 will be run by Atotech on both coil and a good set of industrial maintenance panels. D 5894 will be run by Atotech and Q-Lab using coil and practice maintenance specimens. D 5894, but with an alternate acid rain electrolyte, will be run by Q-Lab using a subset of coil and practice maintenance panels that can fit into one cabinet. G. Rommal will supply a test of panel requirements for outdoor and lab testing sites to SSPC: and Q-Panel to facilitate distribution of panels. It was noted that evaluation techniques must be identical between lab and outdoor panels. SSPC will supply a copy of their method with each panel shipment. Accelerated test sites should closely monitor specimens during testing so that test periods can be chosen to provide good discrimination between materials.

In the future, the task group will be jointly Chaired by S. Boocock and G. Rommal, which will coordinate the industrial maintenance and coil coated halves of the program, respectively.

ISO Liaison Report, ASTM D-1 is finally becoming a voting member of ISO/TC 35/SC 9 on general test methods for paint and varnishes. Up until now, members of the U.S. paint industry had no way of participating in the formation of ISO paint standards that can dramatically affect their international business. A joint meeting of D-1 and ISO/TC 35 is scheduled for our June 1996 meeting in San Francisco. M. McKnight was appointed D-1 liaison for TC 35/SC 9 Working Group 25 on Environmental Tests such as salt fog and corrosion, and D. Grossman was appointed D-1 liaison for TC 35/SC 9 Working Group 26 on Performance Tests, such as carbon arc, xenon, and fluorescent UV. D01.90 Executive Subcommittee is devising procedures to ensure that interested D-1 members have an open opportunity to participate in framing the U.S. position on these ISO standards (without getting drowned in the flood of ISO documentation). If you are interested in participating in ISO weathering/corrosion standards, please contact M. McKnight or D. Grossman.

Subcommittee D01.28 Biodeterioration

M.C. McLaurin, Chair

D01.28.01—Package Stability—M.C. McLaurin, Chair. It was agreed that our newly approved D 2574-96 is a vast improvement over the much older version. However, several small refinements are still being suggested. A general change of the incubation temperature to read 30 ± 2°C instead of 30°C throughout the document was proposed. In addition, section 5.4.1 will be revised to include a negative control (containing no biocide). The wording of having organisms "found" instead of "recovered" was also discussed. Finally, a new section 8.1.5.1 was proposed to include a warning that resistance against the test organisms is not a guarantee that the sample will be resistant to all possible contamination sources, and a recommendation for good plant housekeeping practices. The Chair will make the proposed change and submit them for D01.28 ballot prior to the next meeting.

D01.28.02—Rapid Determination of Enzymes—C.W. Vanderslice, Chair. The current Chair tendered his resignation due to increased responsibilities in D01.42, and we are now seeking a new Chair. The proposed test method for distinguishing between cellulase and chemical degradant contamination in latex paints and raw materials was summarized—differential degradation of a highly substituted hydroxyethylcellulose (HEC) and a moderately substituted sodium carboxymethylcellulose (CMC). As suggested at the June 1995 meeting, the round-robin test protocol will be revised to include an increased level of 500 ppm t-butyl hydroperoxide in the latex. The outgoing Chair will submit a revised copy of the draft and other information to M. McLaurin to hold until a new Chair is appointed.

D01.28.04—Resistance of Paint Films to Algae Attack—K. Roberts, Chair. Proposed changes to D 5589-94 include a new list of algal species more closely relating to organisms found on paint and coating films. Discussion about the Singapore (SISR) test method indicated there was a concern that it requires that the algicide leaches out of the sample in order to pass the test. This may be counter to the desired profile of activity. It was also suggested that the method specify cultures be grown and maintained in broth rather than agar since that is the standard practice. These changes will be incorporated by the Chair and circulated for D01.28 ballot prior to the next meeting.

D01.28.05—Correlation of Exterior versus Accelerated Fungal Tests—J. Hinkle, Chair. Discussion of the need for revising this method to include exterior exposure was again lively. Non-soil chamber methods and methods similar to the Zabel test with single species were discussed. It was agreed that some base information will be shared on the correlation of actual test fence (exterior exposure) results with the D 3273 results. This information will be forwarded to the Chair. A round-robin of 6-12 paints for testing by the various methods (D 3273 and D 5590) will be considered to support any findings. A name change of this task group to "Correlation of Exterior versus Accelerated Fungal Tests" was agreed upon.

D01.28.07—Revision of D 3274 (Defacement Ratings)—B. Matta, Chair. The current Chair resigned by letter and M. McLaurin served as the acting Chair. A Rutkiewic circulated some sample computer generated photographic descriptions of ratings that his company generated. It was agreed by the group that they would be of great value, but A. Rutkiewic indicated financial contributions of about $2,000 per set would be required to proceed further. M. McLaurin will contact ASTM to investigate possible funding for this work.

D01.28—Biodeterioration—M.C. McLaurin, Chair. The minutes from June's meeting were approved as written. It was noted that section 11 of D 5588-94 should be changed to agree with the new rating system as adopted in D 2574-96, section 7. M. McLaurin will include with this the other D01.28 ballot items. All attendees agreed that this was a very productive meeting and are looking forward to more discussions in June.

DIVISION 30 PAINT MATERIALS

Subcommittee D01.31 Pigment Specifications

D.E. Kesatie, Chair

D01.31.08—Titanium Dioxide—C. Tatman, Chair, reported that D 476-84, "Standard Specification for Titanium Dioxide Pigments," was balloted and re-approved in calendar 1995. Based on the task group input at the meeting, along with conversations and correspondence with task group members and users outside the meeting, the Chair will draft a proposed revision to the Standard Specification for Titanium Dioxide Pigments. This will be circulated to task group members and interested parties for comment prior to the June 1996 meeting. Discussion on the feedback will occur at the June meeting and a ballot-suitable form of the revision initiated.

D01.31.13—ISO Pigments Coordination—B. Schiller, Chair, reported that the obvious justification for D01.31.13 is the mutual benefit to both organizations, ISO and ASTM, and their relationship to ANSI as the U.S. Voting Member. A concordance of the test methods between ISO SC 2 and ASTM was complied by B. Schiller and copies were distributed for comments from the attendees to be mailed to the task group Chair. The attendees were also asked to submit in writing items to be placed on the agenda for discussion at the 1996 meeting in San Francisco, CA. B. Schiller asked that a one-hour meeting be held at the June meeting in San Francisco, CA.

D01.31.12—Zinc Pigments—D. Leggett, Chair, reported on a brief summary of the testing of zinc dust at a 0.06 % lead level. Results should be available by the June 1996 meetings. The purpose of the test program is to establish documentation that will support what lead levels should be when using zinc dust. Zinc Phosphate Pigments specification will be conducted by W. Spangenberg and M. Denesha for the June 1996 meeting. This specification will be updated and submitted at the June Meeting.

D01.31—Under old business, no old business was reported due to the loss of minutes from the spring 1995 meeting in Atlanta, GA. Under new business, 19 standards were reviewed. Eighteen standards were reviewed for key wording and bias. Standards: D 49, "Test Method for Chemical Analysis of Red Lead," D 83, "Specification for Red Lead Pigments," D 153, "Test Method for Specific Gravity of Pigments," D 209, "Specification for Lampblack Pigment," D 211, "Specification for Chrome Yellow and Chrome Orange Pigments," D 475, "Specification for Pure Para Red Toner Pigments," D 561, "Specification for Carbon Black Pigment for Paints," D 602, "Specification for Barium Sulfate Pigments," D 603, "Specification for Aluminum Silicate Pigments (Hydrous)," D 604, "Specification for Diatomaceous Silica Pigments," D 605, "Specification for Magnesium Silicate Pigment (TALC)," D 964, "Specification for Copper Powder for Use in Antifouling Paints," D 1208, "Test Method for Common Properties of Certain Pigments," D 2218, "Specification for Molybdate Orange Pigments," D 2448, "Test Method for Water Soluble Salts in Pigments by Measuring the Specific Resistance of the Leachate of the Pigments," D 3619, "Specification for Aluminum Silicates (Anhydrous)," D 3360, "Test Method for Particle Size Distribution by Hydrometer of the Common White Extender Pigments," requires a correction in the mathematical equations. All of these items will be sent out for main committee ballot. W. Spangenberg suggested that a letter be drafted and sent to all pigment manufacturers and end users asking for their involvement in ASTM. W. Spangenberg and M. Denesha will draft a letter by the June 1996 meeting. Thirty items are up for review in 1996. It was suggested that the items up for review that have interest be reviewed and all others be put up for withdrawal.

Subcommittee D01.33 Polymers and Resins

J.G. Lamberton, Chair

D01.33—P. Stievater Chaired in the absence of J. Lamberton. J. Alexander reported that the proposed new standard "Test Method for Determination of Free Formaldehyde in Emulsion Polymers by Liquid Chromatography," successfully completed D01.33/D-1 balloting.

M. McKnight reviewed methods that were due for reapproval or withdraw. Methods D 563, "Test Method for Phthalic Anhydride Content of Alkyd Resins and Resin Solutions," D 1306, "Test Method for Phthalic Anhydride Content of Alkyd Resins and Esters Containing Other Dibasic Acids (Gravimetric)," and D 3432, "Test Method for Unreacted Toluene Diisocyanates in Urethane Prepolymers and Coating Solutions by Gas Chromatography," will be submitted for reapproval. J. Weaver will submit revisions for D 154, "Guide for Testing Varnishes." Ten methods are going to be balloted for withdrawal because there was not enough interest from the members present to have them submitted for reapproval.

There was a discussion concerning the low turnout for the D01.33 meeting. Those present felt that there needed to be better representation from the companies associated with emulsion polymers at the D01.33 meetings to make them productive. J. Alexander and L. Mink will contact the companies that make up the emulsion polymer roundtable to solicit interest for future meetings. They are going to send out a list of the D01.33 methods and ask the companies what their interests are in the existing methods. They are also going to survey the same companies to see what new methods need to be developed.

Subcommittee DOl.34 Naval Stores

J. Russell, Chair

D01.34.01—Capillary Gas Chromatography of Rosin and Fatty Acids—W. Trainor, Chair, reviewed the results of the round-robin carried out on tall oil fatty acids, rosin, and distilled tall oil. Both the area percent method and the internal standard method were included in the study. It had been hoped that more laboratories would have participated in the study and so it was agreed to allow results to be accepted for another four weeks. W. Trainor will prepare the research report and precision statement. The method will then be submitted for the March D-1 ballot. Various ways of presenting the precision statement were discussed and it was agreed that tables listing the required statistical data for the various compounds reported and the three substances tested, would be the most appropriate. Such detail would result in a longer than normal precision and bias statement but should be acceptable to ASTM.

D01.34.03—Softening Point of Rosin and Rosin Derivatives by the Automatic Mettler Apparatus—P. Zawislak, Chair, had distributed the first draft of this method, prior to the D01.34 meeting, with the agenda. Comments had been received from M. Sherratt in the U.K. These were discussed and it was agreed that J. Russell would relay the conclusions of the subcommittee to Mr. Sherratt. In particular, M. Sherratt suggested that ASTM regulations would not allow the use of the company name, Mettler, in the standard. It was determined however that company names can be used if only one supplier exists and that supplier gives permission. It was also agreed that a provisional statement on the precision and bias of this method would be prepared for inclusion in the text and that no specific heating rate would be recommended. It is anticipated that the amended text of this method will be submitted for a subcommittee ballot in February or March.

D01.34.04—Iodine Value of Tall Oil Fatty Acids—J. Bowers, Chair, reported that this method, which uses isooctane rather than carbon tetrachloride as the solvent, had completed all balloting and would be published as 1995 Standard D 5768.

D01.34.05—Ring and Ball Softening Point of Rosin and Rosin Derivatives—P. Zawislak, Chair, had distributed the revised text of E 28 prior to the meeting. This revision included all the changes agreed to at the fall meeting in Charleston. Additional changes suggested by J. Bryson were discussed. Some were agreed to and some were withdrawn. The Chair will add the latest changes to the text and the method will be submitted for a joint D01.34/D-1 ballot in February 1996.

D01.34.06—Color Measurement by Instrumental Methods—W. Mark, Chair, again reminded D01.34 that the goal of D01.34.06 was to develop an instrumental method that would measure and report the Gardner color numbers more precisely than the current Gardner color disc method. He then reviewed the status of the planned round-robin. Final arrangements have made with Minolta, BYK-Gardner, and Tintometer to use "loaner" instruments in this study. Participating laboratories will have all three instruments simultaneously for a two-week period and they will measure the color of three liquid samples. A proposed reporting sheet was distributed and discussed. Some minor changes were suggested. These will be incorporated into the reporting sheet and the sheet will be distributed with the instructions. It is hoped that at least the preliminary results will be available for discussion at the June meeting in San Francisco. B. Allen has agreed to supply the samples for this round-robin. The samples are ready for shipment but require special labels in order to satisfy regulatory concerns. The samples will be shipped no later than mid February.

D01.34—J. Russell, Chair, reported that revisions of three standard methods had passed a D-1 ballot with no negative votes and should become 1996 standard methods. These three methods are for the determination of acid number, fatty acid content, and rosin content of naval stores products. It was agreed

to start revisions, with a view to reapproval, of seven 1992 standard methods which are the responsibility of D01.34. ASTM guidelines require ballot action in 1997. In the area of ISO activities, the Chair reported that he had voted negative on a proposed revision of an ISO specification covering tall oil fatty acids. This specification listed a minimum iodine value of 150, well above the normal iodine value of tall oil fatty acids produced in the United States. The negative vote is currently being studied by the appropriate ISO committee. It was agreed that the next three meetings of D01.34 would be in San Francisco (June 1996), Savannah (October 1996), and Fort Lauderdale (January 1997). All meetings would be scheduled to avoid conflicts with the newly formed Subcommittee D01.38-Hydrocarbon Resins.

Subcommittee D01.35 Solvents, Plasticizers, & Chemical Intermediates

R.G. Montemayor, Chair

J. Frugé, Vice Chair, presided over the meeting of the D01.35 in the absence of R.G. Montemayor. D01.35 is up to date and on schedule with the review/reapproval process of all the 94 standards under its jurisdiction.

D01.35.10—Hydrocarbon Solvents and Ketones—S. A. Yuhas and R. L. Hinrichs, Co-Chairs. This task group is up to date and on schedule with the review/reapproval of the 24 standards for which it is responsible. One standard, D 3257 "Aromatics in Mineral Spirits by Gas Chromatography," received a negative from J. Phillips. He suggested separate performance criteria for packed and capillary columns, and safeguards added to the capillary column method due to the tendency of the TCEP phase to "bleed." His negative was found persuasive and the item withdrawn from ballot. His suggestions will be incorporated in a subsequent revision of the method and balloted at the D01.35 level. J. Bryson, of Goodyear, voted affirmative with comments regarding the numerical values in the precision statement. R. Montemayor reviewed and responded to the comments stating that the numerical values in the balloted item are correct.

The status of method development on a capillary version of D 3893, "Test Method for Purity of Methyl Amyl Ketone and Methyl Isoamyl Ketone by GC," was not discussed since R. Bartram was unable to attend the meeting.

No progress was reported on the development of the new test method for Trace Benzene in Hydrocarbon Solvent by Capillary GC which was presented last June by R. Montemayor. The new method potentially shows excellent results over a range of 0.1 to 2400 vppm, and it was planned to draft the method in ASTM format. However, both R. Montemayor and R. Bartram were unable to attend this meeting. The new method is especially significant since the RCRA (Resource Conservation Recovery Act) requires analysis of benzene content down to a level of 0.5 vppm.

The General Services Administration has revised Federal Specification TT-T-291f, Thinner, Paint, Mineral Spirits, Regular and Odorless. The new designation is A-A-2904, and is effective December 1, 1995. Three types of mineral spirits are specified, all similar to the three types in D 235.

Mr. In-Sik Rhee, of the Fuels and Lubricants Division, Military Technology Center, has been working to revise Federal Specification P-D-680. A survey was made of over 50 Department of Defence (DOD) locations in the U.S. requesting inputs on their requirements for a multipurpose cleaning/degreasing solvent. A comprehensive laboratory evaluation was made on 82 alternative commercial solvents and cleaning products. Twenty-three candidate solvents were selected as a result of the laboratory evaluation. No aqueous products were found to be acceptable due to corrosivity effects.

D01.35.20—Reactive Monomers—J.E. Frugé, Chair. There are no standards under the responsibility of this task group that are overdue. Some comments were received regarding D 2086, "Acidity in Vinyl Acetate," from P. Barnard, of Quantum Chemical, to make modifications to the method. He suggested to add bromothymol blue as an indicator and use 0.02N NaOH to achieve better accuracy on low acidity samples. These suggestions will be incorporated in a revision to be presented at the June 1996 meeting.

D01.35.30—Chemical Intermediates—J. Morrison, Chair. All Standards under the responsibility of this task group are up to date and on schedule for review. F. Tate voted negative on D 1969, "Specification for 2-Ethylhexanol," at the D-1 ballot. He contended that section 5.1.5 of the standard specified that the carbonyl content of the ethylhexanol be calculated as 2-ethylhexanol instead of 2-ethylhexanal. This was clearly a typo and ASTM headquarters indicated that this can be corrected editorially. F. Tate agreed to withdraw his negative subject to the editorial change.

No progress on the GC method for determining the formic acid content of glacial acetic acid as submitted by J. Frugé last June as R. Bartram was unable to attend this meeting.

D01.35.40—Plasticizers and Ester Solvents—J.E. Lawniczak, Chair. All Standards are up to date and on schedule for review. Suggested changes to D 1209 "Test Method for Color of Clear Liquids (Platinum-Cobalt Scale)," were discussed. The standard will be balloted at the D-1.35 level. The revision will result in separate precision statements for samples with Pt-Co Color ≥25 and for samples with Pt-Co Color of <25.

D01.35.50—Coordination—L. Forrest, Chair. D-1: Two standards: D 1310, "Flash Point and Fire Points by TAG Open Cup Apparatus," was in the D-1 (95-03) ballot. D 3278, "Flash Point of Liquids by Setaflash Closed Cup Apparatus," was revised to replace "Setaflash" as "Small Scale" to comply with a COS directive. No information was received from D-2. On revisions to D 16, 10 standards appeared on the December 6, 1995 ballot with the addition of E 29 for significant digits.

D01.35.60—Method Development—R. Bartram, Chair. This task group did not meet at this meeting. The Chair was unable to attend the meeting. Information supposed to be given by R.G. Montemayor to D01.35 was also not made due to his last minute inability to make the meeting.

Subcommittee D01.36 Cellulose and Cellulose Derivatives

G.Y. Moore, Chair

At the D01.36 meeting, Chair G.Y. Moore reported 13 standards completed balloting action in 1995; three of these were balloted for withdrawal.

In 1996, the following eight standards require action: D 817, "Method of Testing Cellulose Acetate Propionate and Cellulose Acetate Butyrate," and D 871, "Method of Testing Cellulose Acetate," will be reviewed by J. de Wit. D 1695, "Terminology of Cellulose and Cellulose Derivatives," has been reviewed by J. Morton and will be sent for concurrent ballot early 1996. D 1915, "Method for Chromatographic Analysis of Chemically Refined Cellulose," has passed D-1 ballot and is now on December 1995 society ballot for withdrawal to be replaced by J. Morton's new method D 5896, "Test Method for Carbohydrate Distribution of Cellulosic Materials." This new method passed D-1 (95-04) ballot with one comment and is on the December 1995 society ballot. Method D 2364, "Method of Testing Hydroxyethylcellulose," received a negative which was later withdrawn and will also proceed to society ballot early 1996. Method D 3876, "Test Method for Methoxyl and Hydroxypropyl Substitution in Cellulose Ether Products by Gas Chromatography," received a late negative from D. Kiesel on the D01.36 (95-02) ballot (which according to the bylaws can be considered a comment) but passed the D01 (95-04) ballot, and has been placed on the December 1995 society ballot. A new method by J. de Wit entitled D 5897, "Determination of Percent Hydroxyl on Cellulose Esters by Potentiometric Titration—Alternative Method," passed D-1 (95-

04) ballot with one comment, and has been placed on the December 1995 society ballot. The comment concerned the precision and bias statement which has been developed from duplicates within one laboratory. Plans are to conduct a full round-robin as soon as enough qualifying laboratories can be found to participate.

A new standard entitled "Test Method for Cuprammonium Viscosity of Cellulose by the Ball-Drop Method" has been reviewed during the meeting and will be balloted early 1996.

Subcommittee D01.37 Ink Vehicles

A.N. Scarlatti, Chair

D01.37.01—Resin Solutions—A. Scarlatti, Chair. Results of the main committee ballot on new "Practice for the Preparation of Oil-Based Ink Resin Solutions" were reviewed. One negative vote was considered persuasive. One point in the negative vote related to the use of "solution" and "dispersion" terms interchangeably. This was discussed and resolved by adding the note: Industrial practice may use the term "solution loosely to describe what may actually be a clear "dispersion." For the sake of simplification the terms "solution" and "dispersion" have been used interchangeably in this practice.

The second point related to the recommendation that Note X be dropped because it introduced an unnecessary element of commercialism. Many members felt that since we had gone to extremes to get these materials accepted, they should be referenced in the standards. This runs counter to recently instituted ASTM policy that, if more than one supplier exists, there should be no mention of source. This was resolved by changing the note to read: For better interlaboratory reproducibility, standard oils are available from raw material suppliers. Standard ink oils are described in *American Inkmaker*, September 1995, p. 42. These revisions to the practice will be made and it will be submitted for reballot. Revised method was approved in a D01.37 ballot.

D01.37.06—Ink Vehicle Wettability—M. Fuchs, Chair. Original PMC guide was revised and put into ASTM format. First draft was reviewed. Questions arose on terminology, procedure (Sec. 7) and the suggestion was made to include a specific formula. M. Fuchs agreed to incorporate comments/suggestions into a revision and send copy to L. Gutman for editorial review prior to next meeting where a final review be done prior to submission for ballot.

D01.37.07—Resin/Solvent Compatibility—D. Frisch, Chair. A second round-robin was completed and analyzed by E 691 to develop precision statement. All the information was put together into a research report and submitted with a final draft of the "Standard Test Method for Determining the Compatibility of Resin/Solvent Mixtures by the Precipitation Method" for D01.37/D-1 balloting.

The specific bias statement was not acceptable and required revision. Scott Orthey said to use wording in *Blue Book*, Section A21.5.6. He also indicated that since this is a first time ballot. The method must be submitted for a D01.37 ballot first.

D01.37.08—New Membership—D. Frisch, Chair. Since our last meeting, a concerted effort was made to increase participation in D01.37. Eighteen letters were sent out to representatives of 15 companies. Response was received from 12 individuals and six new people attended the meeting. In particular, new participants came from Central Ink, Kustom Blending, Flint, INX, Radiant Color and Arizona Chemical.

D01.37.09—Alkyd Compatibility—J. Zerkel, Chair. In J. Zerkel's absence, J. Daust circulated his first draft of "Standard Method for the Determination of Alkyd Compatibility of Ink Resins." Group discussed the draft and recommended to expand title to include "by the Direct Cut Method." It was decided that other comments be forwarded to J. Zerkel by February 29 for incorporation into the second draft for review at the next meeting.

D01.37.10—Rheology of Ink Vehicles—D. Weisel, Chair. D. Weisel reviewed the need for additional test methods to evaluate the rheology of inks. D 4040, "Viscosity of Printing Inks and Vehicles by the Falling-Rod Viscometer," is considered adequate for what it was designed for, but due to changes in inks, it is limited. D. Grossman recommended that methods for both higher and lower viscosity be developed. W. Duke overviewed the capabilities of this new viscometer. The group felt that sufficient numbers of these units are in use to justify need for a standard. D. Grossman will work with W. Duke to write a standard around this new instrument which is capable of measuring viscosity in excess of 300 poise.

A test method for oscillatory measurement of ink vehicles is needed but the group agreed to progress the Duke viscometer method and then reconsider this.

D.01.37—Ink Vehicles—A. Scarlatti, Chair. Two subcommittee methods are up for review. D 566-91, "Practice for Laboratory Preparation of Gelled Vehicle Samples Using a Microwave Oven," was balloted and received one negative vote. Negative vote related to inclusion of note specifying commercial sources of materials. The negative was considered persuasive and modified as follows: For better interlabortory reproducibility, standard oils are available from raw material suppliers. Standard ink oils are described in *American Inkmaker*, September 1995, p. 42.

Revised method was approved in D01.37 ballot. Changes will be made and the method reballoted. D 5062-82, "Resin Solution Dilutability," was originally developed by task group D01.37.02 headed by J. Daugherty. Task group leadership was transferred to J. Daust who will shepherd the method through reballot. Suggestions to revise and rename the method with a more descriptive title will be incorporated and submitted for ballot. A. Scarlatti will check whether the revised method can be balloted in a D01.37/D-1 ballot or require an initial D01.37 only ballot.

Subcommittee D01.38 Hydrocarbon Resins

R. Allen, Chair

R. Allen, the acting Chair of D01.38, welcomed the attendees to the initial meeting of this new subcommittee.

Title and Scope—It was moved and passed that the title of D01.38 be "Hydrocarbon Resins," where "resin" refers to certain thermoplastic polymeric hydrocarbons (and derived materials) used (for example) as tackifiers or in inks. It was moved and passed that the scope of D01.38 is "to develop standards for defining and characterizing hydrocarbon resins," to provide the users of such resins with means for comparing products.

Planned areas of activity of D01.38 include terminology (including feedstock descriptors) and the determination of: low color levels, softening points, compatibilities (cloud points), thermal and storage stabilities, viscosities, additive analyses, VOCs, determination of residual levels of certain monomers, and properties of resin dispersions. Use tests will be left to other ASTM subcommittees or organizations.

Election of Officers (Subject to the approval of the D-1 secretary)—A. Kravetz was elected D01.38 Chair and L. Graves Vice-Chair. J. Bryson was elected Secretary. R. Allen agreed to be Membership Chair; he asked each supplier to provide two customer contacts as potential subcommittee members. A. Kravetz agreed to be Publicity Chair. It was recommended that announcements of the formation of D01.38 be sent to *Adhesive Age*, "Adhesives and Sealants Industry," TAPPI, Adhesive and Sealants Council, the Adhesive Manufacturers' Association, etc. (please send any additional suggestions). Publicity releases are to be cleared by Scott Orthey.

Task Group Formation (Chairs)—

(1)Terminology (J. Silcox)

(2)Softening Point (P. Zawislak): A method (an adaptation of E 28) will be developed to reflect the softening-point behavior of hydrocarbon resins and the requirements of hydrocarbon resin customers. Two procedures (sample preparation by the powder method, and softening point determination

for samples having a softening point up to 35°C) will be transferred from E 28 to this method, since they are not used for rosin derivatives or terpene resins.

(3) Color (R. Allen)

(4) Compatibilities (L. Graves): It was felt that the best industry-wide comparison of compatibilities would be based on cloud points in solvents such as diacetone alcohol. Instrumental detection of the endpoint would be preferred.

(5) Viscosity (P. Lawislak) The task group Chairmen are to solicit applicable methods from others, for consideration.

Funding—It needs to be determined whether donations to D01.38 will be needed, and what the rules for subcommittee fund accounting are.

DIVISION 40 PAINT PRODUCTS APPLIED ON SITE

Subcommittee D01.42 Architectural Finishes

C.W. Vanderslice, Chair

D01.42.03—Porosity of Paint Films—C.C. Tatman, Chair, reviewed the second draft of the Standard Test Method for Porosity of White and Tinted Paints. The following task group suggestions will be incorporated into a third draft and submitted to Subcommittee 42 ballot: eliminate reference to mineral-oil insolubility; specify test method applicability to measurement of stain, soil, or topcoat penetration; clarify differences between the test method under development and existing D 3258 Standard Test Method for Porosity of Paint Films; address issues dealing with type of film application and type of mineral oil effects; and revise method for calculation of porosity to eliminate the need to limit comparative testing to paints of similar density.

D01.42.04—Wet Adhesion of Latex Paints—C.W. Vanderslice, Chair, reviewed the progress of defining a test method using a Gardner washability machine to measure both early and mature wet adhesion. Repeat test data comparing two semigloss paints from Rohm and Haas showed the expected difference when evaluated by a procedure similar to one used by Union Carbide. The preferred substrate was an industrial gloss alkyd paint which produced widely different values at failure. A 20 mil thick developmental plastic panel from The Leneta Co. coated with a UV-cured nonoxidizing coating designed to mimic an alkyd, showed promise, but needs additional refinement to become a standard substrate for the proposed method. The latest draft of the proposed method will be revised as previously agreed upon. A round-robin will be initiated by the new D01.42.04 Chair, L. Mullen, using two eggshell and three semigloss test paints along with the specified gloss alkyd paint as a substrate. Eight cooperators have volunteered to participate in the round-robin.

D01.42.05—Adhesion of Latex Paints to Chalky Surfaces—A. Leman, Chair, distributed an outline of the proposed round-robin evaluation and the test method was distributed to task group members. Eight cooperators volunteered to participate in the round-robin evaluation. D01.42.05 agreed to use a naturally weathered latex paint panel to represent a standard chalky surface for testing. It was also agreed that the formulation of this latex paint be included in the standard and provisions should be made for its availability to all users of the test method. The task group reviewed three different adhesion test methods that were proposed to evaluate the adhesion of latex paints to chalky surfaces. It was agreed that all three methods, which include procedures for evaluating wet and dry adhesion and early blister resistance, be included in the round-robin testing. The task group Chairperson will be distributing test paints, materials, apparatus for adhesion testing, and chalky substrate panels to the cooperators for round-robin testing.

D01.42.22—Guides for Testing Architectural Coatings—H. E. Ashton, Chair, reviewed the status of the revision of D 1546, "Performance Tests of Clear Floor Sealers." The D01.42 letter ballot of March 29, 1995 was supposed to have two items: a complete practice revised on the basis of the consensus reached at the January meeting that, if approved, could be sent to committee voting in time for an improved version of the 1962 standard to appear in the 1996 *ASTM Book of Standards*; a detailed ballot to address points previously raised but not yet resolved. Unfortunately, the letter did not appear as a separate item and was overlooked by many voters. The Chair had prepared draft #4, based on the comments on and discussion of the third draft, for review at the June meeting, which he had not attended. Verbal changes had been made but a marked copy was received only prior to this meeting. These changes were reviewed and the Chair explained, where possible, the reasons for the previous wording. Consequently, the changes were revised in some cases, modified in others, or sustained. Where the change involved something that applied to item 2, it was suggested that the original wording be kept until an ad hoc group could review unsolved points from the previous ballot. It was agreed to add a diagram to clarify the system on each of the five test panels. The Chair agreed to prepare draft #5 for concurrent D01.42/D-1 ballot. Several names of members who would be familiar with this type of product were suggested for the ad hoc group. D-1 LB 95-03, reapproval of D 1641, Exposure Testing of Exterior Varnishes, had received two negative votes. This item had been added to the roster of Group 22 without the knowledge of the Chair. In view of the limited time, the staff editor suggested submitting D 1641 for straight reapproval to maintain its place in the *ASTM Book of Standards* and, if possible, to resolve the negative votes and prepare a complete revision of D 1641. The Chair will attempt to resolve the status of D 3730 that was voted on in January 1995.

D01.42.25—Scrub Resistance of Latex Paints—T. Sliva, Chair, reported that the revision of D 2486 had completed society ballot and would be published in the 1996 volume of 06.02. The Chair then proposed the following amendments for the next revision of D 2486: change in title to delete "Interior Latex Flat," as the method is used with interior and exterior, latex and solvent, flat and gloss paints; delete sections in Significance and Use that make qualitative judgements on D 2486 versus D 4213; revise Apparatus and Materials section to make wording conform with D 3450, D 4213 and D 4828; and add section outlining the recommended storage and breaking in of brushes before use.

The Chair reported on the results of the recently completed round-robin on D 2486, in which paints where applied perpendicular to the length of the black plastic panel and two shims were used. The data showed that there were no significant differences in scrub values when applied in the manner versus the method spelled out in D 2486. It was the consensus that D 2486 be revised to include two methods, namely; Method A in which cycles to break is reported (current form), and a Method B in which the materials are applied perpendicular to the length of the chart and a wet control or standard paint is used. In this method the reported cycles would be "relative" scrub resistance based upon values obtained with the control paint. Five cooperators have agreed to participate in a round-robin on the revision to the method. The Chair will report on the results of this round-robin at the June meeting.

D01.42.26—Burnish Resistance of Latex Paints—C.W. Vanderslice, Chair, summarized progress in his own lab at rating the dry and wet burnish resistance of various types of latex paints using a test method furnished by Rohm and Haas. The method utilizes a cheesecloth-wrapped "sand-paper" attachment with the Gardner washability machine to abrade the paint surface for 200 cycles after which the change in 85° gloss is determined. An earlier study after 5, 10, 15, 20, 25, and 50 cycles showed an apparent maximum in burnish resistance after only 20 cycles. It was suggested that the data be statistically evaluated first before finalizing the number of cycles for a round-robin. Several paint producers stated that they rate this property at multiple cycle points, such as 5 and 25 cycles. Lower numbers are probably more typical of what the average consumer would use. The

current draft of the test method will be revised to fix the number of cycles in accordance with the statistical results. Prior suggestions made on the number of positions on a panel for rating as well as a means of ranking or indexing burnishing will also be incorporated. A suggestion was made that the effect of substrate porosity also be investigated by comparing the current Leneta black plastic chart versus wallboard. An initial round-robin will be conducted using three paints of widely varying burnish resistance and four cooperators.

D01.42.28—Paint and Coating Removers—T. Sliva, Acting Chair, proposed that the "Standard Test Method for Evaluating the Efficiency of Chemical Coatings Removers for Clear or Pigmented Coatings" had completed D01.42 letter ballot. Comments from L. Schaeffer, J. Brezinski, and G. Gohs were reviewed and will be incorporated into a revision of the method. Comments from B. Appleman will be reviewed later with the votes. H. Ashton reported on his evaluation of the recently completed round-robin. It was his suggestion that the rating system be changed to a 0-5 scale from the current 0-10 scale and that two additional cooperators be used to develop a more comprehensive precision and bias statement. These two cooperators, along with the previous three cooperators will also work at evaluating the method using a more resistant coating, such as a two-component urethane coating to develop more data. The Chair, V. Scarborough, will report on the results of this round-robin at the June meeting. The method will be revised and submitted to concurrent D01.42/D-1 letter ballot before the June meeting.

D01.42.29—Guide to Testing Exterior Wood Stains—A.Z. Leathers, Chair, reported that the information on the D 16 ballot of definitions was not available. The first draft of the guide was distributed to all present. Section 2.4, unreferenced but needing documents and test methods, was reviewed. Members and visitors were requested to submit to the Chair any test methods practiced for tannin stain resistance or lap sheen uniformity. It was suggested that a new task group be formed to write a method for tannin stain resistance. There were no volunteers to Chair the task group. Additional methods are needed from the wood industry and suppliers. The Chair will seek input from these sources before our next meeting. Method D 4587 on artificial weathering was reviewed and will be incorporated into section 2.1. Group D01.27.04 as well as D01.52 will be able to contribute to this accelerated weathering test. Comments on the guide were solicited by the Chair, requesting written revisions prior to the next meeting. Additionally, an ad hoc group was formed to review and further expand the guide. This group consists of the Chair and representatives from PPG, Sherwin-Williams, Thompson's, Rohm and Haas, and McWhorter Technologies. If input is received on a timely basis, a second draft will be distributed at the June meeting.

D01.42.30—Wet-Edge Time of Latex Paints—J. Cogar, Chair, reviewed the test methods which had been previously submitted and members were asked to send any additional methods. Copies of the five previously collected test methods will be sent to each attendee for comments. Comments and test methods will be used to prepare a common test method for an eventual round-robin.

D01.42.32—Whole Paint Specifications—T. Sliva, Chair, reported that the questionnaire on interest in D-1 in developing a whole paint specification showed a majority of those returning their forms were in favor of proceeding. The Chair introduced Tim Race, of the Army Corp of Engineers. T. Race has agreed to Chair the task group starting with the June 1996 meeting. He made a presentation outlining the government decree canceling Military Specifications and specifying that industry specifications be used in place of Federal Specifications, if such exist. T. Race presented to the group for their review draft proposals for setting up specifications for latex flat, semigloss, and gloss paints based upon various classifications. As no consensus could be reached at the meeting, the new Chair will send the drafts out to various interested parties for comments and criticisms and report their responses to the task group at the June meeting.

D01.42.33—Scrub Resistance by Abrasion Weight Loss—L. Schaeffer, Chair, reported that the recent D01.42 ballot on revision of D 4213 received 23 affirmatives and 6 abstentions. There were no negatives. Comments were received from M.E. McKnight pointing to an equation typographical error and recommending clarification of the displacement volume concept. Several editorial comments were received from T. Sliva. The method, with appropriate editorial revisions, now goes to D-1 ballot. The members discussed the role of D 4213 in relation to the widely used D 2486 Scrub-to-Failure method. It was generally felt that D 2486, modified for improved reproducibility, would remain primary because of custom and familiarity, and that D 4213 would be a fall-back method for special circumstances.

D01.42—Architectural Finishes—C.W. Vanderslice, Chair. The minutes of the last meeting were approved as written. Chair Vanderslice announced the addition of three new members, bringing D01.42 membership to 77. The Chair announced that the standards D 1849, D 2243, and D 2486 had passed society ballot. A negative on D-1 (95-04) ballot for "Efficiency of Chemical Coatings Removers," cast by H. Ashton, was found to be persuasive by D01.42.28. The negative dealt with the inability of the method's precision to accommodate a 0-10 scale. A 0-5 scale was suggested. The method will be revised with this change and be resubmitted for concurrent D01.42/D-1 letter ballot. The following standards and their status were discussed: D 1641-87—under revision; D 1736-89—balloted for withdrawal; and D 5146-90—under revision. The Chair also announced that the submission deadline for D-1 (96-01) ballot is February 22, 1996, and March 22, 1996, for D-1 (96-02) ballot. Standards up for review were itemized. In answer to a question on a standard's review year, Chair Vanderslice explained that review should begin in the fourth year following approval. A. Leathers asked if task group titles can be changed to be similar to the standard title, citing D 4213 as an example. The Chair agreed to change the title of D01.42.33 to "Scrub Resistance by Erosion Weight Loss." The task group minutes were read. W. Vanderslice read a letter he received from Donald Mays, of DuPont, who described a method he has developed which measures the degree of soilant removal from flat paint surfaces using reflectance. D. Mays will attend the June meeting to describe the method in detail. It was agreed that a new task group be formed using this method. H. Ashton requested that this method, if pursued, be kept separate from other cleanability methods. W. Vanderslice suggested that the task group Chairs begin meeting during semi-annual meetings to review officer roles and subcommittee rules. Those in attendance agreed. It was also suggested that D01.42.32, "Whole Paint Specifications," be allotted at least an hour for the June meeting in San Francisco.

Subcommittee D01.44 Traffic Coatings

A.R. Barrow, Chair

Report submitted by D. Schall on round-robin testing done on D 3627, "Test Method for Determination of Drying Speed of Waterborne Traffic Marking Paints." Ten labs responded to request for data. Data will be submitted, analyzed, and results returned for re-submission of method with appropriate precision and bias statement.

Report submitted by C. Fisher regarding development of a visual rounds test procedure for glass beads larger than 30 mesh: Three manufacturers were contacted as well as three state DOTs. Potters Industries Inc. submitted three methods for discussion. Kansas, Mississippi, and Iowa submitted their methods and comments were taken. By June, a consensus method will be submitted for discussion and balloting.

A. Barrow has resolved the issue of AASHTO's unauthorized printing of ASTM procedures.

A. Barrow reported on work being done on D 2205, "Guide for Selection of Tests for Traffic Paints." This guide is being looked at as to updating with the advent of waterborne

traffic paints. A request has gone out to the states requesting information on current users and any deviations from the practice. So far there have been 27 responses. Forty responses were hoped for, so more time will be given. Results will be submitted at the summer meeting.

With the recent submission and approval of D 713, "Practice for Conducting Road Service Tests on Fluid Traffic Marking Materials," D01.44 is up to date on all existing standards under its jurisdiction. The Chair congratulated D01.44 on the achievement of this status.

Subcommittee D01.45 Marine Coatings

R. Gangi, Chair

The subcommittee voted to reapprove the following methods: D 4938-89, D 4939-89, and D 5108-90. Based on this approval, a D01.45 ballot, a D-1 ballot and a society ballot will be conducted. Method D 5063-90, "Guide for Used Certification of Coating Conformance Form," has come up for review and reapproval. J. Hickey will contact the author W. Allenach to determine whether the federal government still requires this certification form and, if so, whether the current format meets government requirements. Action is planned at the next D01.45 meeting depending on W. Allenach's recommendation. EPA requirements for acceptable limits on sensitivity for a copper bleach rate from anti-oiling paints were discussed in detail. D01.45 members appointed by the Chair will contact appropriate EPA staff to clarify their "acceptable limits." Following EPA/ASTM D01.45 meetings, written summaries on ASTM stationery will be sent to EPA. These summaries will provide both a record of the required sensitivity limits and a basis for future D01.45 actions. D01.45 has decided to investigate biofouling adhesion test procedures. This subject is growing in the marine industry worldwide.

Subcommittee D01.46 Industrial Protective Coatings

G.W. Gardner, Chair

D01.46.02 Surface Preparation—G.W. Gardner reported that both D 2200-95, "Pictorial Surface Preparation Standards for Painting Steel Surfaces," and D 2092-95, "Guide for Preparation of Zinc Coated (Galvanized) Steel Surfaces for Painting," were published in June 1995.

D 4417, "Test Method for Field Measurement of Surface Profile of Blast Cleaned Steel," was discussed in comparison to International Standard ISO 8503-2: 1988(E) "Preparation of Steel Substrates before Application of Paints and Related Products—Surface Roughness Characteristics of Blast Cleaned Steel Substrates—Part 2: Method for the Grading of Surface Profile of Abrasive Blast-Cleaned Steel-Comparator Procedure." ISO 8503-2 describes a visual method similar to Method A of D 4417. D 4417 contains Method B that details procedures for using a dial gauge micrometer and Method C that details a procedure for using composite plastic tape. ISO 8503-2 does not cover Methods B and C. The task group does not believe that Method B is used much but Method C is used frequently and in fact is the preferred method in the U.S. The International Standards Organization will be encouraged to adopt D 4417 Method C.

The round-robin on D 4940, "Test Method for Conductimetric Analysis of Water-Soluble Ionic Contamination of Blasting Abrasives," using portable meters is nearing completion. Five collaborators have turned in their results. W. Johnson is coordinating this effort and will provide round-robin results at the June 1996 meeting.

T. Langill has reviewed D 2092, "Guide for Preparation of Zinc Coated (Galvanized) Steel Surfaces for Painting," and recommends two or three separate guides for the general galvanizing parts, sheet galvanizing parts, and annealed galvanizing parts. Langill will formulate these guides for discussion at the June 1996 meeting.

D01.46.03—Repainting—G.W. Gardner, Chair, reported that D 5064-95, "Practice for Conducting a Patch Test to Assess Coating Compatibility," passed D-1/D01.46 (95-03) ballot and October society ballot and will be published in January 1996. D 610-95, "Test Method for Evaluating Degree of Rusting on Painted Steel Surfaces," passed August society ballot and was published in November 1995. A new expanded version of D 610 is in process. K. Trimber and R. Weaver selected panels representing various rust grades and sent them to A. Rutkiewic to produce computer enhanced images to represent the many different types of rusting dispersities. A. Rutkiewic and S. Boocock will work together to produce computer enhanced representative pictorial images for discussion at the June 1996 meeting.

Round-robins on D 4752, "Test Method for Measuring MEK Resistance of Ethyl Silicate (Inorganic) Zinc-Rich Primers by Solvent Rub," and D 5402, "Practice for Assessing the Solvent Resistance of Organic Coatings using Solvent Rubs," were discussed. D01.46.03 was not able to determine a good procedure to determine precision and bias. Consideration will be given to at least three possibilities: (1) sending liquid paint samples to various laboratories to run both methods; (2) one laboratory running both methods; and (3) running tests at a single site during an ASTM, SSPC, or NACE meeting.

D01.46.07—Inspection—L. Smith, Chair, reported that D 3276, "Guide for Painting Inspectors (Metal Substrates)," passed D01.46 (95-02) ballot. Comments from A.R. Barrow, D.H. Kuniega, T.J. Langill, L.C. Stevens, Jr., and H.R. Stoner were reviewed. D 3276 with editorial changes will be sent out for D-1 ballot.

The new "Guide for Painting Inspectors (Concrete and Masonry Substrates)" received a negative from H. R. Stoner on D01.46 (95-02) ballot. The task group unanimously found Stoner's negative persuasive. Chair Smith will incorporate Stoner's changes. Comments from J.A. Lanning, M. Winkeler, J.S. Baker, P.A. Walker, A.C. MacDonald, and J.C. Zarzecki were reviewed. A revised guide will be submitted for D01.46/D-1 ballot.

D01.46.10—Condition Assessment—G.W. Gardner reported that D 5065, "Standard Practice for Assessing the Condition of Aged Coatings on Steel Surfaces," passed D-1 (95-03) ballot and society ballot. D 5043, "Standard Test Methods for Field Identification of Coatings," is obsolete and will be balloted for withdrawal.

D01.46.12—Sampling—G.W. Gardner reported that D 5702-95, "Standard Practice for Field Sampling of Coating Films for Analysis for Heavy Metals," was published in June 1995. D01.46.12 agreed to write a new practice for sampling coating films for analysis. L. Smith will provide a draft standard to the task group prior to the June 1996 meeting.

D01.46.13—Guide for Testing—J. Cheng, Chair, reviewed draft #3 of the new "Standard Guide for Testing Industrial Protective Coatings." Many changes were made and several task group members will provide suggestions to Cheng on changes for the next draft. Cheng will incorporate those changes and provide a draft #4 to the task group for review prior to the June 1996 meeting.

D01.46.14—Chemical Immersion—G.W. Gardner reviewed draft #2 of "Standard Test Method for Immersion Resistance of Industrial Protective Linings" prepared by C. Ray. Several changes were made. The task group agreed to separate this test method into two test methods: Method A Immersion and Method B Immersion with a Temperature Gradient. D. Griffin will provide a revised draft #3 for task group review prior to the June 1996 meeting.

D01.46—G.W. Gardner welcomed four new members to D01.46: Gary A. Barrett, Painting and Decorating Contractors of America, Fairfax, VA; Thomas J. Langill, American Galvanizers Association, Auroa, CO; Dallas E. Lehman, Alumax Coatings Products, West Helena, AR; Saadat M. Ullah, Randolph Products, Carlstadt, NJ. Gardner encouraged formation of a new task group on membership within D01.46. This task group would use word-of-mouth with industry peers to provide new thoughts, enthusiasm, and challenges into D01.46.

Subcommittee D.01.47 Masonry Treatments

E. McGettigan, Chair

D01.47 05—Water Vapor Transmission of Treated Masonry Substrate—E. McGettigan, Temporary Chair, conducted a review of the past work of the task group. The past methods included using a modification of the National Bureau of Standards method and a modification of C 67. Round-robin testing was conducted using these past methods with inconsistent results being the norm. It was decided to modify E 96 using D 1734 panels as a test substrate.

A draft method will be sent to four cooperators to run the method using the identical product with three different concentrations. The cooperators will send their results and comments to the task group Chairperson to be presented at the June meeting.

D01.47 06—Freeze-Thaw Resistance of Treated Masonry—L. Stark-Kasley, Chair, presented the results of the last D-1 and society ballots since the June meeting. This method is now standard D 5860. A copy of the method was distributed. Two comments were received from B. Edwards with his affirmative ballot. The first comment suggested that specimens produced via different methods might give different results. However, the method states that the cubes should be from the same lot of material for the companion study. His second comment was based on precision and bias. In the ASTM Form and Style Standard, the proper statement for this method should be "No information is presented about precision or bias since the test result is non-quantitative and relative to internal controls." (Blue Book A21.5 1) During the first revision of this method, this precision and bias will be added.

D01.47 07—Alkali Resistance of Masonry Treatments—B. Berglund, Chair, described the reason for developing the method, and the work performed up to the last meeting. Results of testing using three sealers and specimens made using three cement mixes with varying alkalinity were described. However, the surface pH was not measured. These three cement mixes might result in a similarly high pH. Possibly, neutral and high pH specimens should be used to observe the performance differences based on alkalinity. Concrete can be carbonated to produce specimens with lower surface pH. Ethyl and propyl functional sealers could also be tested to try to obtain materials that perform well initially, but lose performance with time. Also, the performance versus time effect might be observable in the current test data, so the data will be re-examined more closely. It was suggested that other factors such as UV exposure could affect sealer performance. Since multiple factors might be interdependent, testing could be done to evaluate sealer performance under the influence of multiple factors. This idea could become the scope of future test method development.

D01.47.10—Evaluation of Field Applied Treatments—E. McGettigan, Chair, discussed the status of the round-robin testing. The testing has been delayed due to a problem with the test substrates. New specimens were cast and will be sent to the four cooperators. The main change in the method from the last draft is lowering the drying temperature to 75°C from 110°C. Also, a control specimen will be completely sealed and tested to insure the effectiveness of the sealing media. Round-robin results will be presented at the next meeting.

D01.47 11—Research and Planning—E. McGettigan, Chair, introduced J. Linert, of 3M, who will lead a new task group, D01.47.01, "Stain Resistance of Masonry Treatments." The task group will develop methods to determine how well masonry treatments reduce or eliminate staining and/or penetration of oil based materials. The task group Chairperson will review current ASTM and trade group methods. A draft method will be presented at the next meeting

The subcommittee members were told that D01.15 will sponsor one mini-symposium per year. The members were polled for their ideas on future symposiums. Ideas that were generated included symposiums on silicone coating additives, stain resistance additives, concrete corrosion reduction treatments, and specialty surfactants.

Subcommittee D01.48 Pipeline Coatings

R.W. Geary, Chair

Chair R. Geary and the subcommittee reviewed Test Methods G 10, G 11, G 13, G 14, G 19, and G 20. These were submitted to D-1 for reapproval without any change. A review of Test Method G 8 and Test Method G 42 was made with minor changes and additions being recommended for both. These were submitted to D-1 for balloting.

A. Kehr was contacted regarding continuing the development of a new ASTM method for the determination of the Porosity of Fusion Bonded Epoxy Coatings. He stated that he intends to attend the June 23-26, 1996 meeting to pursue this.

J. Kellner presented the latest draft for a proposed ASTM Standard Method for Measurement of Shear Resistance of Pipeline Coatings. Kellner will make the subcommittee suggested changes, submit a copy of the final method for subcommittee ballot approv al. He will also select the laboratories for participation in a round-robin evaluation of precision.

J. Kellner accepted the position of First Vice Chair of D01.48. Geary said that if you are using the pipeline coating evaluation methods or if you have new input as to improved or new methods, you are invited to attend the San Francisco meeting. Good attendance assures that our methods are properly reviewed and that our subcommittee remains intact.

DIVISION 50 PAINT FOR FACTORY APPLICATION

Subcommittee D01.51 Powder Coatings

J.R. Hagerlin, Chair

D01.51.02—Hiding Power of Powder Coatings—M. Sharma, Chair. The proposed Test Method for Measuring the Hiding Power of Powder Coatings was written by L. Schaeffer and balloted in D01.51. The result was 12 affirmative, 5 abstentions, 2 negatives and 8 no returns. The negatives were reviewed in the meeting. One was considered editorial and the change was made. R. Boni submitted a lengthy negative, which was fully addressed in the meeting.

L. Schaeffer and J. Hagerlin will revise the draft and copy subcommittee members for review. D01.51 members are to review the draft and re-submit to J. Hagerlin quickly, so that he can have the revision balloted before the June 1996 meeting.

D01.51.03—Spray Characteristics of Powder—C. Merritt, Chair, Absent. The new guillotine for the transfer efficiency round-robin required further modifications, but should be ready for a round-robin in the next month. Proposed collaborators, and order of testing, are C. Merritt, J. Hadden, R. Boni, R. Burns, D. Pont, J. Hagerlin, R. Jabon, E. Waddles, and B. Smith.

M. Thies will be replacing C. Merritt as the ASTM representative beginning in June. He will probably assume the Chair of this task group.

J. Hagerlin handed out a cross reference of ISO/ASTM/PCI methods for powder coating that was not meant to be all inclu sive. It does include the ISO #8130-10 for Deposition Efficiency.

D01.51.05—Specific Gravity of Powder—D. Schneider, Chair, issued the revisions to the proposed Standard Test Methods for Specific Gravity of Coating Powders. The task group reviewed the document and proposed several changes that were deemed editorial by L. Gutman. R. Boni will send the proposed changes to D. Schneider by February 9, so that she can submit the document for main committee ballot this spring.

D01.51.07—New Subjects—J. Hagerlin, Chair. A gauge for determining the film thickness of powder coatings before cure was reviewed. The previously submitted "plow

gage" from Gardner Labs had been a disappointment. Gary Landon, of Gardner, reviewed work on a cylindrical "quarter gage" that may work better for powder coatings. J. Hagerlin will prepare details on another potential gage that may be developed by E. Waddles as a prototype only.

A round-robin was set up for the Gardner "quarter gage" with the following people, in order of testing: L. Waelde, D. Montenaro, J. Hadden, R. Boni, and J. Hagerlin. R. Boni will send the address list to Gary Landon.

R. Boni volunteered to review the ISO method for compatibility of powder coatings (8130-12) to determine how it would fit with ASTM and PCI. A meeting will be scheduled for June to discuss the creation of the ASTM document. If it is agreed to establish the method or practice, R. Boni will Chair a new task group.

Methods for determining tint strength of pigments and T-bend flexibility were discussed, but no action taken. J. Hagerlin will review information on lower explosive limits of coating powders for the next meeting. L. Waelde will conduct a survey of powder coating suppliers to determine the current test methods for dry powder fluidization and powder sampling techniques. He will present his findings at the June meeting.

J. Hagerlin asked that members bring test methods or references that are used for powder coatings to the next meeting. There may be enough information to create a reference document. Creation of a task group for generating interest in ASTM, specifically D01.51, was discussed. Although no action was taken, it was suggested that members work with sales personnel to get the word into the field.

D01.51—D3451 was last updated in 1992, so we must begin the re-evaluation of the document. E. Waddles will continue as the task group Chair.

Jeff Hagerlin informed the group that the June meeting in San Francisco will be a joint meeting with ISO.

The PCI (Powder Coatings Institute) Test Procedures Subcommittee held a meeting in conjunction with ASTM, as they did in January 1995. The combined participation is beneficial to both groups and will become a regular part of the January meetings. A Liaison task group will be formed to accommodate this activity with E. Marx, of Shell, as the Chair.

Subcommittee D01.52 Factory Coated Wood Building Products

S.B. Schroeder, Chair

D01.52b—Hardboard—S.B. Schroeder, Chair, reported that D2065-91, "Test Method for Determination of Edge Performance of Composite Wood Products under Surfactant Accelerated Moisture Stress," will need a round-robin to develop improved precision statistics. Test specimens from a recent AHA, (American Hardboard Association) series will be used, and an alternate, less "biotoxic" surfactant will be employed. Also, D2336-87 will be updated and reballoted with its title changed to "Standard Guide for specifying Factory Applied Wood Coatings." In a similar manner, D 2830-91 will be reballoted as "Standard Test Method for Exterior Durability of Factory Primed/Field Finished Wood Products."

D01.52.18—Accelerated Exposure—T. Rieth, Chair, reported that D5722-95, "Standard Practice for Performing Accelerated Outdoor Weathering of Factory Coated Embossed Hardboard using Concentrated Natural Sunlight and a Soak-Freeze-Thaw Procedure," will be extended to primed hardboards. Unexposed primed panels from recently completed AHA test fence exposures will be evaluated as pass-fail references in D 5722 and several proposed methods which add freeze-thaw cycles to QUV, Xenon Arc, etc. will be evaluated. Initial data are anticipated by June.

D01.52.19—Furniture—S.B. Schroeder, Acting Chair, reported on a negative ballot by J. Fetsko on D 2091—88, "Standard Test Method for Print Resistance of Lacquers." Her suggestion that the title should read "imprint" instead of "print" was found not persuasive.

D01.52.15—Film Thickness—S.B. Schroeder, Chair, reported that new test data using the ultrasonic instrument from DeFelsko Corp. appears to show promise of a non-destructive film thickness measurement for wood coatings. The key seems to be recalibration using metal shims coated with the same coating being measured on the wood. At the June meeting, D. Beamish from DeFelsko will provide a copy of the ASTM method for using the instrument on concrete coatings as a starting point for a wood method. Expansion of D 5235-92 to include video image microscopes as well as optical instruments was again discussed. A round-robin will be initiated this summer.

D01.52—The minutes of the last meeting and task group reports were approved and the action of the task group upheld, finding the negative on D 2091—88 not persuasive. The need for increased involvement by industry members was discussed.

Subcommittee D01.53 Coil Coated Metals

R.J. Tucker, Chair

D01.53.01—Pretreatment of Substrates—H.E.G. Rommal, Chair, discussed the progress made toward developing a round-robin to establish a precision and bias statement. Concern was expressed regarding the recommended calibration technique referenced in the new method, D 5723-95, "Determination of Chromium Treatment Weight on Metal Substrates by X-Ray Fluorescence." Tests will be performed with non-passivated coated steel products to determine the magnitude of the error in calibration which occurs as a result of abrading the calibration standard. Efforts will be made to obtain aluminum, galvalume, and galvanized steel materials, which will be coated with various levels of a chromecontaining pretreatment. This is being done to develop a precision and bias statement.

D01.53.03—Accelerated Weathering—D.A. Cocuzzi, Chair, requested additional volunteers for the accelerated portion part of this program. Real-time results are at a one-year level and test results will be available at the June meeting.

D01.53.04—Dry Film Thickness—G.R. Pilcher, Chair, distributed the new, approved method D 5796-95, "Measurement of Dry Film Thickness of Thin Film Coil-Coated Systems by Destructive Means Using a Boring Device." There was discussion about the development of a precision and bias statement regarding the use of this method. Three substrates, with two different dry film thicknesses, with various colors and coatings chemistries will be collected and submitted for testing. Details will be worked-out between now and the June meeting. At that time, there will be a final protocol, with a list of laboratories agreeing to participate, and a complete set of panels available for testing.

D01.53—Coil Coated Metals—R.J. Tucker, Chair, discussed the minutes from the last meeting. No additions or corrections were needed. Task group reports were made. Other items discussed were:

It was noted that D01.53 submitted, and had approved, two methods in a single year, something not done within over 15 years in D-1.

- The need for an ASTM solvent rub method was discussed. There are a few methods available to use: hand method (gauze wrapped around a finger), ball peen hammer method (gauze wrapped around a hammer), and automated equipment (DJH Device, Atlas Crockmeter). Members will gather historical information to review at the next meeting.
- D4145-90, "Test Method for Coating Flexibility of Prepaint Sheet," received one negative. Discussion with the individual casting the negative helped to clarify the issue, and the negative was withdrawn.
- D 4146-83, "Test Method for Formability of Zinc-Rich Primer/Chromate Complex Coatings," received one negative, indicating that one of the chemicals mentioned is no longer available. The negative has been resolved; this method will be reballoted with the footnote containing the out-of-date information deleted.

• We discussed the need to develop a test method for the RCA Abrader. R.J. Tucker will discuss the issue with N.D. Emily and report at the June meeting.

• D 3281, "Standard Test Method for Formability of Attached Organic Coatings with Impact-Wedge Bend Apparatus," was withdrawn.

• D 4214, "Standard Test Method for Evaluating the Degree of Chalk of Exterior Paint Films," is the only extant chalk method. It would be important to the coil coatings industry to modify D 4214, Method A (black felt method to determine the degree of chalking) to include metal substrates. (It currently allows only wood substrates, and, in the past, the felt method was the standard within the coil coating industry to test for degree of chalking.) R. J. Tucker will investigate this issue with D01.25.

OSHA has delayed implementation for five years of slip resistance requirements (proposed by SENRAC) for decking. AISI (American Iron and Steel Institute) has the responsibility to create a new standard which is agreeable to both the painted metal industry and the ironworkers. There is, however, a slip resistance standard for structural steel: painted structural steel can be no more slippery than bare, unpainted structural steel.

Subcommittee D01.55 Factory Applied Coatings on Preformed Products

R. Diem, Chair

D01.55.08—Coating on Plastics—The meeting was canceled. Task group Chair M. Lutterbach indicated that he will have a proposed revision to D 3002 for review at the June meeting.

D01.55.11—Mar Resistance of Automotive Clear Coatings—A. Rutkiewic, Chair, started by reviewing the subcommittee ballot of Z4875Z Standard Rub Test Method for Abrasion and Mar Resistance of High Gloss Coatings. No negatives were received. The task group agreed that the editorial revisions being made to the new standard Z3732Z "Standard Test Method for Dry Abrasion Resistance of High Gloss Coatings," on a D01.23 ballot, would be incorporated in a revised Z4875Z Standard Rub Test Method for Abrasion and Mar Resistance of High Gloss Coatings that will be submitted for concurrent D01.55/D-1 ballot

D01.55.12—Non-Conductive Coatings for Electrical Protective Equipment—L. Thieben, Chair, indicated that a first draft of a standard based on F 711, "Standard Specification for Fiberglass-Reinforced Plastic (FRP) Rod and Tube Used in Live Line Tools," has been prepared. This draft was sent to the Chair of F-18 for review. After discussion, the task group concluded that the proposed standard should cover only the testing of the non-conductive coating. The proposed standard will specify that F-711 be used to demonstrate that the integrity of the FRP has not been compromised by the coating. The objective is to have a ballot-ready draft for review at the June meeting.

D01.55—R. Diem indicated that there continues to be a major effort in the automotive industry in the area of etch resistant finishes. At present, each user has its own method for evaluating etch resistant finishes. The task group discussed the need for a guide to summarize the methods for measuring etch resistance. R. Diem agreed to pursue the issue to determine if there is interest in participating in the preparation of such a guide.

A.F. Rutkiewic indicated that there is a need to develop a practice for the exposure of automotive coatings to fleet service conditions. The intent of the standard would be to define the conditions that will provide statistically significant exposure data that can be correlated with laboratory bench test data. The task group agreed that there was such a need and R. Diem indicated that he will ask that a new task group be formed and that a 30-minute segment be scheduled at the June meeting.

Subcommittee D01.56 Printing Inks

J.M. Fetsko, Chair

D01.56.14—Setting of Heatset Inks—D. Ness, Chair, distributed a draft copy of the proposed test method for running comparative setting tests using the Sinvatrol on prints made with a dual constant film thickness gage. After suggested changes are made, the method will be submitted for D01.56 ballot.

D01.56.19—Printing Strength—J. Daugherty, Chair, reported that a pilot study based on ink film weight versus density exhibited poor repeatability and did not correlate with known strength levels of the inks used. Based on this information, it was decided to terminate the task force.

D01.56.22—Drying of Oxidizable Inks—B. Blom, Chair, reported that the D01.56 ballot of the proposed new test method for the drying of oxidizable inks by squalene resistance elicited one negative vote to do with reference to names of manufacturers in violation of a new ASTM policy. S. Orthey informed D01.56 that revisions made to comply would not require reballoting.

D01.56.25—Degree of Radiation Curing—E. Kobylarz, Chair, distributed the drafts of a proposed method using the Atlas Crockmeter. A round-robin is planned in which sets of prints cured to varying degrees will be circulated along with the same Crock Tester.

D01.56.26—Chemical Resistance—M. Fuchs, Chair, reported that he reviewed test methods utilized in the soap industry. He will conduct in-house tests by a number of approaches.

D01.56.28—Tinting Strength of Liquid Inks—D. Ness, Chair, reported that a round-robin on spectrophotometric determination of tinting strength was conducted with two blue aqueous-based liquid inks as a control. Since the number of samples is insufficient to develop a precision statement, two additional inks will be sent to round-robin participants.

D01.56.29—Membership—J. Daugherty, Chair, noted that, as a result of his solicitation, a number of new members were in attendance. The need for representation from printing houses was mentioned.

D01.56.31—Print Transparency—J. Fetsko, Chair, distributed copies of ISO 2846 (R) for transparency developed by a NPIRI Task Force. A pilot study will be conducted with inks diluted with varnish and an opaque white.

D01.56.32—Laboratory Printing—D. Ness, Chair, distributed a draft of the "Standard Practice for Preparing Prints of Printing Inks with the Little Joe Color Swatcher." The procedure was reviewed and a number of revisions suggested.

D01.56.33—Print Gloss—J. Daugherty, Chair, distributed copies of a proposed test method for print gloss. Suggested revisions included a measurement angle based on gloss level of the sample and use of a standardized backing, preferably black paper.

D01.56.34—Print Problem Terminology—J. Daugherty, Chair, reported that he received definitions for describing printing problems from a number of sources. The list must be put in a common format.

D01.56—Printing Inks—J. Fetsko, Chair, reported that three test methods were reapproved as a result of the five-year review: D 1316; "Degree of Dispersion by the NPIRI Grindometer" (J. Cichon, steward); D 4361, "Apparent Tack of Inks and Vehicles" (D. Ness, steward); and D 4942, "Water Pickup" (P. Ford, steward).

DIVISION 60 PAINT APPLICATION

Subcommittee D01.61 Paint Application Tools

F.B. Burns, Chair

D01.61.01—Paint Brushes—T. Sliva, Chair, reported that the proposed "Test Method for Evaluation of the Cleanability of Paint Brushes" had completed main committee letter ballot receiving (97) affirmatives,

(0) negatives, and (233) abstentions. The method will proceed to society ballot before the June meeting.

A negative was received from Z. Riders, a non-voting member. Z. Riders' reason for his negative included: (1) the method is not needed; and (2) the method should determine the ability of the brush to be cleaned and used again.

The task group voted to recommend to the subcommittee that it find the negative not persuasive. Various editorial comments received on the item will be balloted concurrently (D01.61/D-1), and the changes should be included in the method before its publication in 1997.

A round-robin of the proposed "Test Method for Leveling Efficiency of Paint Brushes" was conducted since the last meeting. Cooperators discussed suggestions for clarifying instructions on the application of the test paint as well as differences noted using sealed charts versus primed universal board as the test substrate. It was the decision of the task group to conduct a mini round-robin using a paint applicator to apply the test paint at a 400 sq. ft. per gallon. Five cooperators have agreed to participate. The results will be reported at the June 1996 meeting.

D01.61.02—Paint Rollers—F. Burns, Acting Chair, explained that J. Price, who had been task group Chair for many years, has retired from the post for health reasons.

Discussion was held on the potential merits of using D 5150-92, "Standard Test Method for Hiding Power of Paints Applied by Roller," as a model for a test method for Paint Rollers. Copies of Test Method D 5150 were distributed and will be further reviewed by the members for further discussion at the next meeting. Another standard project was proposed by the acting Chair that would be for "Characterization of Paint Roller Covers" and analogous to D 5301 on Paint Brushes. This concept will be reviewed at the next meeting.

D01.61.03—Woven Paint Applicator Fabrics—M. Murray, Chair, distributed draft #4 to the task group for review. The following changes will be made: (1) fiber composition will be added under significance and use, and procedure; (2) the figures, 1 & 2, will be added to the standard as outlined in the form and style handbook; (3) lot sample in 7.2.1 will be stated for better understanding and a case sample will be defined for 7.2.2; and (4) fabric samples and apparatus will be brought to the next meeting to demonstrate for different characteristics and testing procedures.

D01.61.05—Bulk Density of Filaments and Bristle—J. Feathers, Chair, reviewed comments on draft #11 during subcommittee balloting. The negative vote of C. Martin was discussed and judged to not pertain to the proposed procedure for level filaments. D01.61 recognized that the current draft yields valid results as demonstrated by round-robin testing. D01.61.05 voted to find the negative vote not persuasive.

Editorial changes suggested by T. Sliva will be included in Draft #12. This draft will be submitted for main committee balloting.

A first draft of a new procedure for measuring bulk density on tapered filaments and bristles will be developed for the June 1996 meeting by J. Feathers using a modified apparatus.

D01.61.07—Symposium Planning—T. Sliva, Chair, led discussion of a proposed agenda for this symposium scheduled for January 1997. Presenters will be: G. Harsch, Wooster—Paint Brushes; F. Burns, EZ Paintr—Paint Rollers and Applicator Attributes; and T. Sliva, D/L Laboratories—Moderator and ASTM Relationships. Participants agreed to develop abstracts of their presentations by May 1 for group approval at the June meeting. A special meeting for this task group will be scheduled on Sunday evening, June 23. All visual aids will be reviewed at that time.

D01.61—F. Burns, Chair, announced the opening for a new task group Chair for 61.02 "Paint Rollers" to replace J. Price, who has left for health reasons. He also acknowledged with appreciation, the many years of active participation by J. Price.

The Chair introduced two visitors from Purdy Corp., M. Dulak and B. Martin. B. Martin has applied for membership.

The subcommittee ballot reviewed in 61.05 was put in condition for submittal to main committee ballot, by finding the negative not persuasive and by accepting some of the editorial suggestions. F. Burns agreed to contact C. Martin to seek withdrawal of the negative. (This was accomplished January 23, 1996).

The negative vote on main committee letter ballot D-1 (95-03) Item 48 by Z. Riders found not persuasive by the task group was confirmed by the subcommittee and will be presented for main committee vote. This method will go on to society ballot.

J. Feathers suggested the group consider a new project on paint brush stiffness. This was discussed and will be further reviewed at the next meeting.

January 1996 Subcommittee Reports of ASTM Committee G-3

The Symposium on Durability Testing of Nonmetallic Materials, sponsored by Committee G-3 on Durability of Nonmetallic Materials, was held January 23-24, 1996 at the Crown Sterling Suites, Ft. Lauderdale, FL. Robert J. Herling was Symposium Chair. Fourteen papers were presented. The titles ranged from "Man Versus Machine: A Comparison of Visual Evaluation and Computerized Image Analysis for the Measurement of Weather-Induced Surface Cracking," given by L.F.E. Jacques and F.H. Lee, to "Report on Joint SSPC/ASTM Round-Robin" presented by S.K. Boocock.

Subcommittee G03.01 Joint Weathering Projects

W. Ketola, Chair

This subcommittee is now responsible for standards that relate to both natural and laboratory accelerated exposures. G03.01 was formerly named Editorial and Definitions. These tasks are now the responsibility of G-3 Subcommittees G03.91 and G03.92, respectively.

Negatives on the G-3 main committee ballot on draft #4 of the proposed standard practice for Conditioning and Handling of Nonmetallic Materials for Natural and Artificial Weathering Tests were found to be persuasive. A revised draft will submitted for simultaneous sub and main committee ballot. The subcommittee voted unanimously to request exception from the ASTM Editorial Board to allow mention of several suppliers of markers used for identification of panels. G03.01 members felt that only a limited number of markers have been shown to be durable enough for marking specimens for outdoor or laboratory accelerated exposure tests, and that it is important to provide users with information on the types that have been shown to be acceptable.

W. Ketola presented a draft of a new Standard Guide for Characterizing Weathering Reference Materials Used to Monitor Conditions in an Exposure Tests. Several changes to the initial draft were discussed and will be incorporated into a draft for subcommittee ballot. G03.01 is taking over the work of Subcommittee G03.05, which has been disbanded.

Several members provided liaison reports for other standards organizations working on durability testing standards. W. Ketola summarized work being conducted in ISO/TC 61/SC 6 on Aging, Chemical, and Environmental Resistance. D. Kockott reported that the ISO/TC 35 subcommittee responsible for weathering standards for paints and coatings has published an International Standard describing xenon arc exposures of paints and related coatings (ISO 11431) and is now balloting a method for fluorescent W exposures as a Draft International Standard (DIS 1 1507). K. Scott reported that the SAE is working on a new high-speed xenon arc exposure for automotive interior materials. J. Evans reported that the revision of SAE 1960, for xenon arc exposure of automotive exterior materials, is now at final ballot stage.

Subcommittee G03.02 Natural and Environmental Exposure Tests

J. Robbins, III, Chair

A negative on a subcommittee ballot of a revision to G 24, Standard Practice for Conducting Exposures to Daylight Filtered Through Glass, was found persuasive, and a revised draft will be submitted for subcommittee ballot. W. Ketola volunteered to prepare a draft revision for G 7, Standard Practice for Atmospheric Environmental Exposure Testing of Nonmetallic Materials, that will incorporate changes to accommodate negatives received on an early 1995 subcommittee ballot. The revised G 7 draft will also be submitted for subcommittee ballot.

Subcommittee G03.03 Simulated and Controlled Environmental Testing

R.M. Fischer, Chair

G03.03.01—Precision and Bias—R. Fischer, Chair. The main committee ballot for revision of G 23, G 26, and G 53 precision and bias statements passed with minor editorial comments. The subcommittee ballot on the draft Guide for Addressing Variability in Natural and Accelerated Testing of Nonmetallic Materials returned with one negative (R. Herling) and three comments. The negatives and comments were deemed persuasive. A major controversy involving ambient temperature effects on fluorescent lamp irradiance will have to be resolved before the ballot item will be redrafted and submitted for concurrent main and subcommittee ballot.

G03.03.02—Performance Standards—W. Ketola, Chair, discussed the main committee ballot results for the new Standard Practice for Exposing Nonmetallic Materials to Laboratory Light Sources. There were four negative votes along with several affirmative with comment submissions. Most aspects of the negatives were found persuasive. The document will be redrafted and submitted for concurrent main and subcommittee ballot.

Subcommittee G03.91 Editorial

M.J. Crewdson, Chair

This was the first meeting of G03.91. The new scope, which was passed by G-3 executive, was read to the visitors. The goal of G03.91 is to ensure that G-3 conforms to ASTM editorial policy. This will be done by reviewing all documents before ballot to check for compliance with The Blue Book regulations. G03.91 will also advise members on how to produce draft standards for balloting.

G03.91 will develop a checklist of editorial items to follow when drafting new documents or revising existing standards. A generic document template will also be drafted that can be used to write new standards. J. Evarts has volunteered to work on these projects.

G03.91 will recommend to the executive that ISO equivalency statements must be added to all G-3 standards. It is hoped that an Editorial Workshop can be presented to G-3 by G03.91 and this will be discussed further at the next meeting.

ASTM E06.23—Abatement of Lead Hazards in Buildings

Overview

Established—1991 request of HUD.

Goal—Develop consensus guidelines for abating and mitigating lead hazards in and around buildings.

March Meeting Report

Newly Approved Standards—Three encapsulation product standards and the wipe specification were approved as full consensus standards. The encapsulation standards are a specification for reinforced products, a specification for non-reinforced products, and a guide for their selection and use. The wipe specification provide performance requirements for materials used to collect settled-dust samples.

New Draft Standards—Several new draft standards were discussed in task group meetings. They include a method for ultrasonic extraction of lead from environmental samples, a method on portable electroanalysis for determination of lead in extracts, a guide for sampling waste streams for TCLP testing, and a guide for identification and management of lead hazards in buildings. Watch for these upcoming subcommittee ballots.

Revisions of Drafts—Revised drafts of the XRF paint inspection and risk assessment documents and performance evaluation of spot test kits were discussed. These documents, and the removal draft, will be revised and reballoted.

Approval of PS—Two provisional standards, a vacuum dust sampling method and a practice for evaluating quality systems of organizations engaged in conducting facility and hazard assessments, will be submitted for E06 and society ballot.

Joining E06.23

Call Steve Mawn, ASTM Headquarters, E06 Staff Manager, 610-832-9726 to obtain application form. Note all approved standards listed here will be in Vol. 4.07 of 1996 Annual Book of ASTM Standards.

E06.23 Approved Standards, March 1996

(Available as Singles from ASTM Headquarters—610-832-9500).

Collection and Analysis of Field Samples

	Topic	Standard
Collection	Paint Film	E 1729
	Soil	E 1727
	Dust (wipe)	E 1728
	Air Particulate	E 1553
	Dust (DVM)	PS 46
	Dust Wipe Specification	E 1792
	Waste Sampling	In ballot
Digestion	Paint Film	E 1645
	Soil	E 1726
	Dust (wipe)	E 1644
	Air Particulate	E 1741
	Ultrasonic-all media	In ballot
Analysis	Portable electro-analysis	In ballot
	FAA, ICP, GFAA	E 1613

Control and Abatement

Topic	Standard
Nonreinforced liquid encapsultant specification	E 1795
Reinforced liquid encapsulant specification	E 1797
Encapsulant selection and use	E 1796
Paint removal	In ballot
Iden. and management of lead in buildings	In ballot

Field Assessments

Topic	Standard
Spot test kit use for paint	E 1753
Evaluating performance of on-site	D 1775
Evaluation performance of spot test	To E06
XRF paint inspection	In ballot
XRF performance parameters	In ballot
Visual inspection of paint condition	In preparation
XRF soil measurement	In preparation
Risk assessment	In ballot
Sampling design	To E06.23 ballot

E 1533—Standard Practice for Collection of Airborne Particulate Lead During Abatement and Construction Activities.

E 1583—Standard Practice for Evaluating Laboratories Engaged in the Determination of Lead in Paint, Dust, Airborne Particulates, and Soil Taken from and Around Buildings and Related Structures.

E 1605—Standard Terminology Relating to Abatement of Hazards from Lead-Based Paint on Buildings and Related Structures.

E 1613—Standard Test Method for Analysis of Digested Samples for Lead by Inductively Coupled Plasma Atonic Emission Spectrometry (ICP-AES), Flame Atomic Absorption (FAAS), or Graphis Fumsca Atomic Absorption (GFAAS) Techniques.

E 1644—Standard Practice for Hot Plate Digestion of Dust Wipe Samples for the Determination of Lead by Atomic Spectrometry.

E 1645—Standard Practice for the Preparation of Dried Paint Samples for Subsequent Lead Analysis by Atomic Spectrometry.

E 1726—Standard Practice for Samples Digestion of Soils for the Determination of Lead by Atomic Spectrometry.

E 1727—Standard Practice for Field Collection of Soil Samples for Lead Determination by Atomic Spectrometry Techniques.

E 1728—Standard Practice for Field Collection of Settle Dust Samples Using Wipe Sampling Methods or Lead Determination by Atomic Spectrometry Techniques.

E 1729—Standard Practice for Field Collection of Dried Paint Samples for Lead Determination by Atomic Spectrometry Techniques.

E 1741—Standard Practice fore Preparation of Airborne Particulate Lead Samples Collected During Abatement and Construction Activities for Subsequent Analysis by Atomic Spectrometry.

E 1753—Standard Practice for the Use of Qualitative Chemical Spot Test Kits for Detection of Lead in Paint Films.

E 1755—Standard Guide for Evaluating Performance of On-Site Extraction and Field-Portable Electrochemical or Spectrophotometric Analysis for Lead.

E 1792—Standard Specification for Wipe Sampling Materials for Lead in Surface Dust.

E 1795—Standard Specification for Non-Reinforced Liquid Coating Encapsulation Products for Leaded Paint in Buildings.

E 1796—Standard Guide for Selection and Use of Liquid Coating Encapsulation Products for Leaded Paint in Buildings.

E 1797—Standard Specification for Reforced Liquid Coating Encapsulation Products in Leaded Paint in Buildings.

PS 45—Provisional Standard Practice for Evaluating Quality Systems of Organizations Engaged in Conducting Facility and Hazard Assessments to Determine the Presence and Extent of Lead in Paint, Dust, Airborne Particulates, and Soil in and Around Buildings and Related Structures.

PS 45—Provisional Standard Practice for the Collection of Surface Dust Air Sampling Pump Vacuum Technique for Subsequent Lead Determination.

Next Meeting Dates

July 30 and 31, 1996, NIST Gaithersburg, MD, November 13 and 14, NIOSH, Cincinnati, OH, March 17-19, 1997 with E-6 in St. Louis, MO.

Questions

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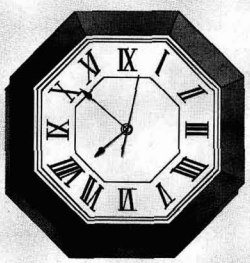
Quality Assurance and Safety

Topic	Standard
Worker safety	Under revision
Evaluating traditional laboratories	E 1583
Quality systems for organizations engaged	PS 45
Terminology	E 1603

Task Groups

Task Group	Chair
23.10 .... XRF Measurement of Lead Paint in Building	Gary Dewalt
23.11 .... Performance Evaluation of XRF Paint Analyzers	William Gutknecht
23.12 .... XRF Field Measurement of Lead in Soil	Mark Bernick
23.14 .... Visual Assessment of Paint condition	Albert Liabastre
23.16 .... Laboratory Test Methods/ Collection Methods	Kevin Ashley Gary Dewalt
23.20 .... Removal	Susan Drozdz
23.30 .... Encapsulants	Barbara Leczynski
23.40 .... Laboratory Accreditation and Field Quality Sys.	Walter Rossiter Albert Liabastro
23.41 .... Contractor Certification, Inactive	Jim Keck
23.50 .... Terminology	Gary Noonan Doris Adler
23.60 .... Worker Safety	Carl Ramsey Geoffrey Braybrooke
23.70 .... Quality Risk Assessment	Jim Keck Gary Dewalt
23.71 .... Testing Design	Bruce Buxton
23.72 .... Management of Lead in Buildings	Al Liabastre Warren Friedman

How Much  Do You Spend in Training?

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—Dr. Joseph V. Koleske, Editor
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TruTest Manufacturing

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—Dr. Thomas J. Miranda
Adjunct Professor, Chemistry
Indiana University, South Bend

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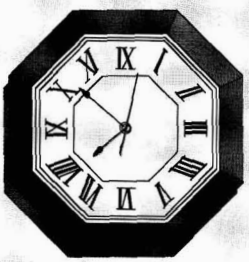
23.50 .... Terminology	Gary Noonan Doris Adler
23.60 .... Worker Safety	Carl Ramsey Geoffrey Braybrooke
23.70 .... Quality Risk Assessment	Jim Keck Gary Dewalt
23.71 .... Testing Design	Bruce Buxton
23.72 .... Management of Lead in Buildings	Al Liabastre Warren Friedman

How Much  Do You Spend in Training?

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Regulatory Update May 1996

This digest of current regulatory activity pertinent to the coatings industry is published to inform readers of actions which could affect them and their firms, and is designed to provide sufficient data to enable those interested to seek additional information. Material is supplied by National Paint and Coatings Association, Washington, D.C. The Regulatory Update is made available as a service to FSCT members, to assist them in making independent inquiries about matters of particular interest to them. Although all reasonable steps have been taken to ensure the reliability of the Regulatory Update, the FSCT cannot guarantee its completeness or accuracy.

Environmental Protection Agency
April 2, 1996 - 61 FR 14570
Integrated Risk Information System (IRIS); Announcement of Pilot Program; Request for Information
Action: Notice; Announcement of IRIS Pilot Program and request for technical information

The Integrated Risk Information System (IRIS) is a database containing EPA scientific consensus positions on potential human health effects from environmental contaminants. After analyzing the system, EPA is initiating a pilot program to improve the consensus health information process and strengthen peer review. Under the program, new or updated health assessments will be produced for 11 priority environmental chemical substances.

Therefore, the agency is requesting technical information from the general public on the following substances: arsenic, bentazon, beryllium, chlordane, hexavalent chromium, trivalent chromium, total chromium, cumene, methyl methacrylate, methylene diphenyl isocyanate, naphthalene, tributyltin oxide, and vinyl chloride.

Deadline for responses was May 2, 1996.

For additional information, contact Amy Mills, EPA, (202) 260-8930.

Research and Special Programs Administration
March 20, 1996 - 61 FR 11484
Hazardous Materials in Intrastate Transportation
Action: Supplemental notice of proposed rulemaking and notice of public meeting

Based on comments received in response to a notice of proposed rulemaking concerning applying the Hazardous Materials Regulations (HMR) to intrastate commerce by motor vehicle, the Research and Special Programs Administration (RSPA) has issued additional proposals on the subject.

The new proposals include exceptions from the HMR for certain small quantities of hazardous materials transported and used by carriers in the conduct of their businesses, and for the continued use of non-specification smaller cargo tank motor vehicles (i.e., less than 13,250 liters capacity) used exclusively in intrastate transportation of flammable liquid petroleum products. The rulemaking also provides an exemption from certain requirements dealing with registered inspections of these smaller cargo tank motor vehicles.

Comments on this supplemental notice of proposed rulemaking must be received by June 17, 1996. Send five copies to the Dockets Unit, RSPA, Department of Transportation, Washington, D.C. 20590-0001, identifying them as Docket (HM-200).

A public meeting on this proposal was held on May 14.

For additional information, contact Jackie Smith or Diane LaValle, RSPA, (202) 366-8553.

Environmental Protection Agency
March 26, 1996 - 61 FR 13125
Proposed Requirements for Control Technology Determinations for Major Sources in Accordance With Clean Air Act Section 112(g)
Action: Notice of reopening comment period; notice of availability of draft rule

The Environmental Protection Agency (EPA) has issued a revised draft of the proposed rule implementing section 112(g) of the Clean Air Act. This amended draft applies only to constructed or reconstructed major sources of hazardous air pollutants under section 112(g)(2)(B); at this point, EPA does not intend to issue a rule implementing the provisions in section 112(g) concerning modified sources. In addition, EPA extended the comment period on the proposed rule until April 25, 1996.

Electronic copies of the amended draft of the proposed rule are available through EPA's Technology Transfer Network bulletin board system, (919) 541-5742. The document is located under the Clean Air Act section, Title III, Recently Signed Rules.

For additional information, contact EPA's Gerri Pomerantz, (919) 541-2371, or Kathy Kaufman, (919) 541-0102.

Environmental Protection Agency
April 11, 1996 - 61 FR 16050
Control of Air Pollution; Removal and Modification of Obsolete, Superfluous or Burdensome Rules
Action: Direct final rule

In this notice, the EPA has announced the removal or modification of specific Clean Air Act regulations because they have been deemed "obsolete." This action is part of an ongoing effort by the Clinton administration to eliminate rules from the Code of Federal Regulations that are considered to be obsolete, unnecessary, or overly burdensome.

The regulations to be eliminated include sections on:

✓ state implementation plan requirements concerning the definition of reasonably available control technology;

✓ requirements for modifications of state implementation plans;

✓ state implementation plan requirements for primary and secondary air quality standards and for transportation control measures; and

✓ establishing requirements for submission extensions for state implementation plans.

This rule will go into effect on June 10, 1996, unless significant,

critical comments were submitted by May 13.

Comments should be sent to Maureen Delaney, EPA, 401 M Street, S.W., Washington D.C. 20460. For further information on the rule, contact Maureen Delaney at (202) 260-7431.

How To Obtain EPA Documents—RCRA, Superfund, EPCRA Hotline, (800) 424-9346, provides timely information about specific documents or responds to regulatory questions. The hotline is available weekdays from 9-6 EST.

Notice—On March 22, 1996, the Environmental Protection Agency issued a position paper on the use of credible evidence to enforce clean air laws. According to the paper, the agency proposes to allow state and federal agencies to use credible evidence to prove that a violation of the Clean Air Act has occurred. EPA would be authorized to use any evidence that the agency considers credible to determine whether a source has violated emission control requirements. In addition, sources of air emissions would be able to use credible evidence to defend themselves against charges of a clean air violation. State and federal rules of evidence would be used to specifically define credible evidence. Currently, EPA regulations allow only reference test methods to be used as evidence of a violation.

For further information contact Craig Haas (2242A), EPA, 401 M Street S.W., Washington, D.C. 20460; telephone (202) 564-8682. Electronic copies of the position paper are available on EPA's Technology Transfer Network bulletin board, (919) 541-5742.

Environmental Programs—Under the proposal, the EPA would receive $6.5 billion for fiscal year 1997, slightly more than the outlay for 1996. The budget priorities include funds to continue the superfund cleanup program and to encourage the development of brownfields. The plan also sets aside money to be used to restore the Florida Everglades. The Occupational Safety and Health Administration would also receive an increase in funding.

President Signs RCRA Reform Bill—President Clinton signed the Land Disposal Program Flexibility Act (H.R. 2036) on March 26, legislation that is designed to amend current hazardous waste disposal law. Under the bipartisan bill, decharacterized hazardous waste that will be disposed of in surface impoundments or injection wells is exempted from regulation under the Resource Conservation and Recovery Act (RCRA) Subtitle C. This bipartisan measure is the first environmental reform bill to be enacted in the 104th Congress.

Controversy Over Superfund Reform—Debate over superfund reform is continuing in Congress, with both Republicans and Democrats introducing their own draft proposals. The main issue of controversy still centers around the total extent of liability relief that will be offered to potentially responsible parties. At presstime, the Senate Environment and Public Works Committee was expected to hold hearings on the Senate version (S. 1285) on April 23 and 24. Following the hearings, the bill is scheduled for full committee mark up, skipping subcommittee consideration, indicating that committee chair John Chaffee (R-RI) is serious about clearing the bill for action on the Senate floor sometime in May.

House Republicans Form Environmental Task Force—House Speaker Gingrich (R-GA) has created a Republican Environmental Task Force, consisting of 78 House members and chaired by Representatives Sherwood Boehlert (R-NY) and Richard Pombo (R-CA). The task force is attempting to develop a long-range legislative agenda for environmental reform.

Under their leadership, the group has developed six basic principles for environmental reform, including (1) allowing industry to decide how to meet environmental standards; (2) encouraging the use of incentive- and market-based solutions; (3) organizing the enforcement of different environmental regulations; (4) granting state and local governments a greater role in establishing environmental standards; (5) basing environmental standards on sound scientific evidence; and (6) taking into consideration the rights of private property owners when creating environmental regulations.

States Proposed Legislation and Regulations

ARIZONA

Environmental Claims—AZ S. 1401 (Buster) imposes a five year statute of limitations on lawsuits claiming violations of state environmental laws. Provides numerous other changes. The bill passed the House on April 3 and was sent to the Senate for concurrence.

Graffiti—AZ H. 2196 (Marsh) expands a law revoking a youth's driver's license for a second graffiti conviction to revoke on first conviction in certain counties. The legislation passed the Senate with amendments on April 4 and was sent to the House for concurrence.

Hazardous Waste (Notices)—The Arizona Department of Environmental Quality (DEQ) has announced the availability of policy statements which (1) clarify their position regarding quantities of hazardous waste that may be accumulated in satellite accumulation areas; (2) address the establishment of guidelines for adequately preparing an underground storage tank facility meeting and developing a strategy to assist in shaping its outcome; and (3) outline the public notification process and public comment period once preliminary approval of an underground storage tank corrective action is achieved. Contact Waste Programs Division, DEQ, (602) 207-4103.

Hazardous Waste (Proposed Regulation)—The Arizona DEQ has proposed a rule which would revise financial and excise tax provisions for underground storage tanks and their owners and operators. Among other things, the proposal would revise technical requirements and establish additional requirements regarding installation, tank system upgrades, notification, maintenance, operation, and leak detection. Contact Martha Seaman, DEQ, (602) 207-2222.

CALIFORNIA

Air Quality (Proposed Regulation)—The California Air Resources Board (CARB) has proposed a rule which would fund part of the Board's Clean Air Act program for non-vehicular sources for the 1996-97 fiscal year. The regulation would require local air pollution control and air quality management districts to collect permit fees from major non-vehicular

sources of non-attainment pollutants and their precursors. Contact Cheryl Taylor, CARB, (916) 322-2884.

Environmental Audits—CA A. 2858 (Machado) enacts the Environmental Audit Privilege and Voluntary Noncompliance Disclosure Act of 1996. Makes information in an environmental audit report, privileged and not admissible in any civil action or administrative proceeding and not subject to any discovery. The bill is currently being considered by the Assembly Committee on Natural Resources.

COLORADO

Air Quality (Proposed Regulation)—The Colorado Department of Public Health and Environment (DPHE) has proposed a rule which would repeal the total suspended particulate standard, requiring the department to continue monitoring in identified special circumstances. A hearing is scheduled for May 16 and comments are due on May 15, 1996. Contact Air Quality Control Commission, DPHE, (303) 692-3100.

A proposed regulation of the Colorado DPHE would incorporate by reference federal EPA new source performance standards which would affect determination of density, volatile matter content, and water content of surface coatings. A hearing is scheduled for May 16 and comments are due on that same day. Contact Technical Secretary, DPHE, (303) 692-3520.

Lead—CO S. 131 (Alexander) concerns a comprehensive plan to reduce lead poisoning. On March 28, the bill passed the Senate and was referred to the House Committee on Health, Environment, Welfare, and Institutions.

Water Quality (Regulation)—The Colorado DPHE has adopted a final rule which clarifies that a Colorado Discharge Permit System (CDPS) permit is necessary for any non-stormwater discharge of pollutants from any industrial, commercial, or sanitary system into the stormwater. Stormwater discharges are not impacted by this regulation. The rule was effective March 30, 1996. Contact DPHE, (303) 692-3520.

CONNECTICUT

Hazardous Waste (Regulation)—A final regulation of the Connecticut Department of Environmental Protection (DEP) sets forth numeric standards for the remediation of environmental pollution at hazardous waste sites, providing for alternatives and variances to such provisions. The rule became effective January 30, 1996. Contact Michael Harder, DEP, (860) 424-3791.

FLORIDA

Air Quality (Regulations)—Final rules of the Florida Department of Environmental Protection (DEP) amend general provisions in reference to air pollution control, and consolidate and establish provisions governing operation permits for major sources of air pollution. Among other things, procedures are set forth for designation and redesignation of attainment and non-attainment areas and federal ambient air quality standards have been incorporated by reference. The rules were effective March 13, 1996. Contact Jeanne Carver, DEP, (904) 488-0114.

The Florida DEP has adopted final rules amending general provisions for stationary sources. The rules eliminate unnecessary or redundant provisions regarding emission estimates and air quality models, add procedures for emissions unit reclassification, and consolidate provisions for preconstruction review of stationary sources. The rules became effective March 13, 1996. Contact Jeanne Carver, DEP, (904) 488-0114.

A final regulation of the Florida DEP would revise general requirements for stationary sources by (1) clarifying permit effective dates and exemptions; (2) limiting VOC-containing coatings to six gallons per day; (3) indicating that annual reports are not required for facilities operating under a Title V general permit; (4) establishing reporting thresholds for hazardous air pollutants (HAPs); and (5) adopting by reference general permit notification forms for new sources. Contact Michael Hewett, DEP, (904) 488-0114.

The Florida DEP has adopted a rule which amends regulations in reference to operating permits for major sources of air pollution. Among other things, the regulation clarifies Title V application requirements and deletes provisions that make exemptions from permitting automatically available to units or activities within Title V sources. The rule became effective March 20, 1996. Contact Michael Hewett, DEP, (904) 488-0114.

Final regulations of the Florida DEP amend emissions standards to consolidate general pollutant and general particulate limiting standards, and compliance testing and sampling facility requirements. The rules also eliminate provisions governing best available control technology, certain applicable testing procedures, and definitions regarding stationary source monitoring. The rules were effective March 13, 1996. Contact Jeanne Carver, DEP, (904) 488-0114.

Water Quality—FL H. 749 (Tedder), identical to S. 1148 (McKay), removes the application of the tax for water quality to solvent mixtures. The bill was reported favorably out of the House Committee on Natural Resources on March 21. The Senate version of the bill was reported favorably out of the Senate Committee on Natural Resources on March 20 and referred to the Ways and Means Committee.

GEORGIA

Hazardous Waste (Proposed Regulation)—A proposed regulation of the Georgia Department of Natural Resources (DNR) would incorporate by reference 1995 federal underground storage tank requirements, update federal lender liability standards, and increase the environmental assurance fee to 0.5 cents per gallon for the state underground storage tank trust fund. Contact Underground Storage Tank Management Program, DNR, (404) 362-2687.

Lead—GA S. 554 (Henson and Madden) provides that implementation of certain lead paint abatement certification programs shall be contingent upon the promulgation of certain federal regulations. The bill was sent to the governor on March 18.

ILLINOIS

Air Quality—IL S. 1408 (Luechtefeld) creates the Interstate Ozone Act to provide for legislative review of any proposed memorandum of understanding which may require the state to undertake emission reductions in addition to those specified by the Clean Air Act Amendments of 1990. The bill also provides that the Director of the Illinois EPA shall submit any proposed memorandum of understanding plus any alternative emission reduction strategies to the House and Senate Committees. The legislation passed the Senate on March 26 and was referred to the House Committee on Rules.

Lead—IL H. 2800 (M. Davis) amends the Lead Poisoning Prevention Act so that physicians and health

care providers may screen children for lead poisoning in conjunction with the school health exam, if in the physician's judgment, the child is potentially at high risk of lead poisoning. The bill passed the House and was referred to the Senate on March 29.

INDIANA

Air Quality (Proposed Regulation)—The Indiana Air Pollution Control Board (APCB) has proposed a rule which would provide requirements for industrial or commercial surface coating operations to comply with a source specific agreement. Contact Larry Fedor, Office of Air Management, (317) 232-8223.

The Indiana APCB has proposed a rule which would prescribe an emissions limitation compliance method applicable to dip or flow operations at miscellaneous metal coating operations. Contact Patricia Troth, APCB, (317) 233-5681.

The Indiana Department of Environmental Management (DEM) has announced its intention to amend maximum achievable control technology (MACT) standards in order to minimize the environmental impact of new or modified sources of hazardous air pollutants. Contact Mike Brooks, DEM, (317) 233-5686.

The Indiana DEM has announced its intention to develop additional source-specific operating agreements which would provide degreasing and automotive refinishing operations with options to limit their potential emissions and eliminate the need for Title V permits. Hearings are scheduled for June 5, 1996. Contact Jon Bates, DEM, (317) 233-4226.

Graffiti—IN S. 60 (Dempsey) requires a court to order the suspension or denial of issuance of the operator's license or learner's permit of: (1) a child adjudicated a delinquent child because the child committed an act that would be the offense of criminal mischief or institutional criminal mischief if committed by an adult and the offense involved the use of graffiti; or (2) an adult convicted of criminal mischief or institutional criminal mischief that involved the use of graffiti. The bill was signed by the governor on March 21.

IOWA

Air Quality (Proposed Regulation)—The Iowa Environmental Protection Commission (EPC) has proposed a rule which would exempt non-major sources from the requirement of paying the Title V operating permit fees until these sources are required to apply for Title V permits. Contact Catherine Fitzsimmons, DNR, (515) 281-8941.

Toxics-in-Packaging—IA S. 2287 (Committee on Natural Resources) relates to the limitations on the use of toxic materials in packaging and provides for additional exemptions. The legislation passed the House on March 21 with amendments and was sent to the Senate for concurrence where it was passed on April 3.

KANSAS

Air Quality (Regulation)—A final regulation of the Kansas Department of Health and Environment (DHE) reduces the annual air emissions fee to $15 per ton of emissions that occur during 1995 and 1996 and $18 per ton of emissions thereafter. The date for submission of annual emission fee payments is changed to June 1, and the rule also eliminates certain provisions that provide for exemptions from air emissions fees. The rule became effective March 15, 1996. Contact Gary Miller, DHE, (913) 296-1547.

Hazardous Waste (Regulation)—The Kansas Department of Health and Environment (DHE) has adopted a final rule which excludes certain hazardous waste generators from specific reporting and recordkeeping requirements, and biennial and annual reporting fees. The rule does not affect large quantity hazardous waste generators regulated by the Environmental Protection Agency (EPA). Contact George McCaskill, DHE, (913) 296-1606.

KENTUCKY

Air Quality (Regulation)—A final rule of the Kentucky Department of Environmental Protection (DEP) sets forth criteria for determining if a source is major and if it must obtain a federally enforceable state operating permit or a Title V permit. The rule defines a minor source as any source with actual emissions of less than a specified percentage of the major sources threshold and implements monitoring, recordkeeping, reporting, and enforcement requirements. The rule was effective February 12, 1996. Contact John Hornback, DEP, (502) 573-3382.

A proposed regulation of the Kentucky DEP would add acetone to the list of exempted compounds from the definition of volatile organic compounds (VOCs). Contact John Hornback, DEP, (502) 573-3382.

Lead—KY S. 182 (Neal) defines "lead-hazard abatement." It also requires (1) all persons who perform or offer to perform lead-hazard detection or abatement services to be certified; (2) the Department for Health Services (DHS) to create and administer the certification program and promulgate administrative regulations to establish the training and testing requirements for certification; and (3) a permit for every lead-hazard abatement service performed. The legislation was signed by the governor on April 3.

MAINE

Lead—ME S. 528 (Berube and Daggett) limits the liability of landlords for lead poisoning to $250,000 unless the landlord has actual notice of conditions likely to cause lead poisoning and refuses to take corrective action. The legislation was signed by the governor on March 28.

MARYLAND

Hazardous Materials—MD S. 143 (Boozer) requires new home builders to disclose or make a certain disclaimer to the owner as to the presence of any hazardous or regulated materials, including asbestos, lead-based paint, radon, underground storage tanks, licensed landfills, and other environmental hazards present on the site of a new home. On March 11, the legislation was reported unfavorably out of the Senate Committee on Judicial Proceedings.

Lead—MD S. 549 (Derr) exempts affected property in which a child under 6 years old does not reside from provisions of law requiring the reduction of lead risk in housing by October 1, 1999. On March 18, the legislation was reported unfavorably out of the Senate Committee on Judicial Proceedings.

MD H. 237 (Hubbard) provides for the establishment of a lead poisoning screening program and a lead poisoning outreach and education program. The bill passed both Houses and was eligible for the governor's desk as of April 6.

Lead (Proposed Regulation)—The Maryland Department of the Environment (DOE) has proposed a rule which would establish standards and procedures for (1) the accreditation of persons who conduct inspections or risk assessments for lead paint; (2) those who serve as contractors or supervisors for activities

involving the abatement of lead paint hazards; and (3) accredited training courses for workers and project designers who engage in lead paint hazard abatement projects. Contact Deanna Miles-Brown, DOE, (410) 631-3173.

MASSACHUSETTS

Water Quality (Regulation)—The Massachusetts Department of Environmental Protection (DEP) has adopted a final rule which allows the issuance of national pollutant discharge elimination system (NPDES) permits which have interim compliance schedules for certain permittees that are unable to immediately meet stringent new metal limits contained in renewed permits, and the use of dissolved metal rather than total recoverable metal to comply with water quality standards. The rule became effective February 23, 1996. Contact Andrew Gottlieb, DEP, (617) 292-5653.

MINNESOTA

Transportation—MN S. 2104 (Stevens) delays prohibition on the use of lead in products until July 1, 1998 for substances used to mark road, highway, or bridge pavement. The bill passed the Senate on March 21 and was referred to the House. The legislature adjourned without giving final approval to the bill.

MISSISSIPPI

Graffiti—MS H. 753 (O. Scott) relates to prohibition of graffiti and provides penalties. The bill died in committee on March 5.

MISSOURI

Hazardous Waste (Regulation)—The Missouri Department of Natural Resources (DNR) has adopted a regulation which amends standards for hazardous waste generators. Among other things, the rule updates provisions for labeling and marking hazardous waste containers. The rule is effective 30 days after publication in the Code of State Regulations. Contact Hazardous Waste Program, DNR, (314) 751-3176.

The Missouri DNR has adopted final rules in reference to standards for owners and operators of treatment, storage, and disposal (TSD) facilities. The regulations revise the definition of "commercial facility," clarify loading and unloading of hazardous waste at TSD facilities, and modify financial assurance requirements. The rules are effective 30 days after publication in the Code of State Regulations. Contact Hazardous Waste Program, DNR, (314) 751-3176.

NEBRASKA

Hazardous Waste (Regulation)—A final rule of the Nebraska Department of Environmental Quality (DEQ) raises the reporting quantity to 100 pounds or the federal reporting quantities, whichever is less, for integrated solid waste management. The rule identifies the conditions under which releases are not reportable and allows the DEQ to investigate and require further actions of responsible parties even if the release or suspected release may not be reportable. The rule was effective December 17, 1995. Contact Dale Busch, DEQ, (402) 471-2186.

NEVADA

Air Quality (Proposed Regulation)—A proposed rule of the Nevada State Environmental Commission (SEC) would amend state hazardous air pollutants (HAPs) standards in order to maintain consistency with federal standards by repealing redundant provisions in reference to best and minimum available control technology requirements and the commission's authority to adopt emission standards. The rule would also simplify the threshold in permitting HAPs emissions. Contact David Cowperthwaite, SEC, (702) 687-4670.

The Nevada SEC has proposed rules which would amend the definition of "major source" by excluding particulate matter greater than 10 microns and "potential to emit" by removing the provision which requires air quality operating permits to be federally enforceable. The fee structure of the air quality stationary source permitting program would also be revised. Contact David Cowperthwaite, SEC, (702) 687-4670.

NEW HAMPSHIRE

Air Quality—NH S. 600 (Rodeschin) clarifies the authority of the Division of Air Resources (DAR) to issue a single permit to a facility that covers all regulated emissions emitted from, and individual devices located at, that facility; and issues facility-wide operating permits to non-major stationary sources covering all regulated emissions as provided in the current law for major sources subject to the Clean Air Act. The bill passed the Senate on March 20 and was sent to the House.

Environmental Audits—NH H. 275 (Teschner) encourages certain businesses to conduct self-audits, establishes a privilege extending to the environmental audit report, and sets forth a procedure detailing certain exceptions to the privilege. The legislation was signed by the governor on March 18.

NEW YORK

Graffiti—NY A. 9099 (Katz), identical to S. 6514 (Maltese), makes technical changes clarifying that a court has the power to require any individual placed on probation to participate in a graffiti removal program as a condition of such probation. Introduced on March 5, the bill was referred to the Assembly Committee on Codes.

NY S. 4578 (Tully) delays the issuance of a driver's license to any person under age 21 for one year for each conviction or adjudication as a youthful offender for making graffiti. The legislation passed the Senate and was referred to the Assembly Committee on Transportation.

Lead—NY A. 70 (Clark) relates to the penalty for failure to comply with a notice and demand for the discontinuance of a paint condition conducive to lead poisoning; increases such penalty from $2,500 to $5,000. The bill passed the Assembly on March 18 and was referred to the Senate Committee on Health.

NY A. 6163 (Eve) establishes a lead abatement licensing and certification program to reduce the health and safety hazards associated with lead abatement; imposes recordkeeping, training and education requirements; and authorizes the Commissioner of Health to promulgate standards for lead abatement projects. On March 18, the legislation passed the Assembly and was referred to the Senate Committee on Health.

Regulatory Reform—NY S. 3137 (Wright and Rath) requires that, where federal standards apply, state agencies shall not require higher state standards, except with specific, explicit legislative approval. On March 12, the bill passed the Senate and was sent to the Assembly Committee on Governmental Operations.

OHIO

Hazardous Waste—OH H. 435 (White) revises the requirements and

procedures governing modifications of hazardous waste facility installation and operation permits. The bill is currently being considered by the Senate Committee on Energy, Natural Resources, and Environment.

OREGON

Air Quality (Proposed Regulation)—A proposed rule of the Oregon Department of Environmental Quality (DEQ) would increase to $2569 the annual base charged for regulated major industrial sources and increase to $30.07 per ton the emission fee charged to such a source. Contact Susan Greco, DEQ, (503) 229-5213.

PENNSYLVANIA

Lead (Proposed Regulation)—The Pennsylvania Department of Labor and Industry (DLI) has proposed a regulation which would (1) set forth accreditation, certification, and contractor notification requirements; (2) establish procedures for training providers and lead-based paint occupations; and (3) specify fees and enforcement procedures and penalties. Contact Sharon Lawson, DLI, (717) 772-1912.

Water Quality—PA H. 23 (Michlovic) permits counties to form storm water management districts for the purpose of regulating stormwater within designated watershed boundaries, and provides for organization, function, enforcement, and financing. Introduced on March 12, the legislation was sent to the House Committee on Environmental Resources and Energy.

SOUTH DAKOTA

Environmental Audits—SD S. 24 (Committee on Agriculture) provides for certain voluntary environmental audits. The bill was signed by the governor on March 8.

TENNESSEE

Solid Waste—TN H. 2763 (Purcell) authorizes funds from the solid waste management fund to be used to enhance recycling efforts and to develop permanent collection sites for household hazardous wastes; and imposes tipping fees on municipal solid waste received at Class I landfills. The legislation passed the House on April 4 and was referred to the Senate.

TEXAS

Air Quality (Regulation)—The final regulation of the Texas Natural Resource Conservation Commission (TNRCC) modifies the definition of VOCs by exempting acetone, parachlorobenzotrifluoride, and volatile methyl siloxanes to maintain consistency with the federal EPA definition of VOC. The rule was effective March 7, 1996. Contact TNRCC, (512) 239-1970.

The Texas TNRCC has adopted a final rule which changes the basis for all surface coatings emissions limitations to pounds of VOCs per gallon of coating (minus water and exempt solvent); defines "high-bake and low-bake coatings" in order to clarify operations that include air or forced-air driers, and changes references to "automobile refinishing" to "vehicle refinishing (body shops)." The rule became effective March 7, 1996. Contact TNRCC, (512) 239-1970.

UTAH

Graffiti—UT H. 264 (Bigelow) creates a new section in the criminal code on graffiti, establishes liability for removal costs of graffiti, and provides for the voluntary removal of graffiti by the responsible person. The legislation was signed by the governor on March 12.

Hazardous Waste (Regulation)—Final regulations of the Utah Department of Environmental Quality (DEQ) would establish standards governing the collection and management of universal wastes and incorporates by reference federal EPA requirements. The rules went into effect on February 15, 1996. Contact Susan Toronto, DEQ, (801) 538-6776.

The Utah DEQ has adopted a final rule which amends accumulation time regulations by adding air emission control requirements for generators accumulating waste on-site in RCRA permit-exempt tanks and containers; and removing references which incorporate federal air emissions standards for tanks, surface impoundments, and containers until additional changes are made by the federal EPA. The rule was effective February 15, 1996. Contact Susan Toronto, DEQ, (801) 538-6776.

Final rules of the Utah DEQ amend standards for owners and operators of hazardous waste TSDs. The rules revise financial assurance requirements for owners and operators of hazardous waste facilities, change land disposal restrictions, and add organic air emission standards for tanks, surface impoundments, and containers. The rules became effective February 15, 1996. Contact Susan Toronto, DEQ, (801) 538-6776.

VERMONT

Lead—VT H. 778 (Committee on Health & Welfare) creates a program to prevent lead paint poisoning in children in rental housing and child care facilities. The legislation passed the House on March 22 and was referred to the Senate Committee on Health and Welfare.

VIRGINIA

Air Quality—VA H. 1512 (Stump) prohibits state agencies from entering into any agreement related to the transport of ozone if the proposed agreement contains stationary source emission requirements exceeding (1) the reasonable available control technology standard or (2) the nitrogen oxide standard contained in section 407 of the Clean Air Act. The bill was sent to the governor on March 26.

Water Quality—VA S. 480 (Gartlan) requires persons responsible for discharging prohibited wastes into or upon state waters, storm drain systems or lands to report such discharges to either the State Water Control Board (SWCB), the Director of the DEQ, or the local emergency services coordinator, and the appropriate federal authorities. On March 7, the bill became law without the governor's signature.

WASHINGTON

Air Quality (Proposed Regulation)—The Washington Puget Sound Air Pollution Control Agency (PSAPCA) has proposed a rule which would allow those operations consisting solely of manufacturing low vapor pressure coatings and inks to be exempt from regulation. Contact Dennis McLerran, PSAPCA, (206) 343-8800.

WISCONSIN

Graffiti—WI A. 134 (Krusick) relates to restitution for graffiti vandalism. The bill passed the Senate on March 19 and was sent to the Assembly for concurrence where it was passed on March 26.

CDIC—MARCH

"Industrial Melamine-Crosslinked Polyester Coatings"

The CDIC Executive Committee voted in favor of conducting elections earlier in the year. Earlier elections would enable the incoming officer to attend FSCT's orientation program. Paul Guevin will draft a recommended Bylaws change.

Society Representative Bill Hollifield, of Perry & Derrick Co., Inc., reported on the FSCT Strategic Planning Meeting in Chicago. The three areas that the Federation is focusing on are: membership, organizational restructuring, and common interest groups. Comments will be heard at the FSCT Board Meeting during Spring Week.

Hugh Lowrey, of Perry & Derrick Co., Inc., reported on the Ohio Paint Council activities.

Alan Machek, of Dow Corning Corp., announced that the Society is seeking candidates for Treasurer for 1996-97.

Philip Heidt, of Eastman Chemical Co., spoke on "General Industrial Melamine-Crosslinked Polyester Coatings-Structure/Property Characteristics of Dibasic Acids and Their Relationship to Weathering."

Mr. Heidt mentioned a study where a number of coating formulations employing different ratios of cycloaliphatic and (cyclo)aliphatic/aromatic structures were prepared and tested for weathering (gloss retention). Accelerated test methods incorporating UV absorption and photooxidation were used. Results of the study were summarized by Mr. Heidt:

- Cycloaliphatic structures afford a balance of properties normally achieved by combinations of traditional acids, isophthalic, and adipic.
- Isophthalic acid offers excellent protection against loss of gloss in clearcoats, however, pigmentation which absorbs UV light appears to reduce its effectiveness.
- Copolymers of (cyclo)aliphatics and isophthalic acid offers effective gloss protection of coatings containing them while providing an excellent balance of properties.
- Both the UV absorption and photooxidation test methods described offer an opportunity to accelerate QUV weathering on predicting the service life of coatings.

Teresa L. Case, *Secretary*

CLEVELAND—FEBRUARY

"Waterborne Epoxy"

A survey of members will be conducted. The Society is seeking input on topics of interest to the members.

Society Representative Brenda Carr, of Coatings Development Co., reported on "What Is Going On with the FSCT/NPCA."

The topic "Overview of Ambient-Cure Waterborne Epoxy Coating Technology," was presented by Ernest C. Galgoci, of Shell Chemical Co.

Dr. Galgoci gave an overview of waterborne epoxy, beginning with the first generation of waterborne systems. The speaker detailed the performance by using spider charts comparing performance characteristics like VOC, gloss, abrasion, adhesion, and recoat time.

The second generation of waterborne systems was then discussed. Dr. Galgoci stated that this system is faster drying and included two curing agents: (1) hydrophobic for corrosion and water resistance; and (2) hydrophilic for chemical resistance and hardness. Again, a spider chart comparison was made.

Dr. Galgoci then covered the third generation, by showing how the polyfunctional type dispersion resin gives higher crosslinking density. The two curing agents used were: (1) standard polyfunctional amine adduct and curing agent; and (2) higher reactivity amine adduct. He followed up with a spider chart showing the properties of corrosion resistant primers and rapid dry primers.

Q. What film thickness was used for comparisons?

A. For corrosion, a shot blast steel panel was used. Panel had a 2 mil profile and coating was 4 mil thick.

James J. Currie, *Secretary*

Cleveland Society February Meeting Photos

LOUISVILLE—NOVEMBER

Federation Officer Visit

FSCT Executive Vice President Robert Ziegler reviewed the Paint Industries' Show, in St. Louis, MO. He stated that 314 companies exhibited in the annual event, contracting over 90,000 square feet of exhibition space.

Mr. Ziegler also reported that the Federation is becoming more global and will offer two trade shows in 1996: the Pan American Coatings Expo and the International Coatings Expo (formerly the Paint Industries' Show).

Also visiting the Louisville Society was FSCT Secretary-Treasurer Tom Hill, of The Sherwin-Williams Co. He discussed the FSCT's Board of Directors desire to reengineer the Federation for the future.

The evening's technical presentation "DEFOAMERS: THEORY AND PRACTICE" was delivered by Philadelphia Society Member Ron Broadbent, of Henkel Corp.

Mr. Broadbent began by asking three questions: (1) Why do we need defoamers? (2) What is the theory of foaming and defoaming? and (3) How do we select defoamers?

The speaker stated that foam comes from the agitation during preparation of paint in manufacturing or application. Foam will hurt the application properties of the coating. According to Mr. Broadbent, the surface tension at the air-liquid interface will be stabilized by surfactants allowing foam to form. Two components are the Gibbs elasticity (a function of surface tension and area) and the Marangoni effect.

Defoamers are required to work in a large variety of coating systems, which is how Mr. Broadbent explained the many defoamers. Defoamers have three components: a primary liquid (insoluble in medium), emulsifiers and/or wetting agents, and tertiary compounds. To make the correct selection, the speaker recommended offsetting the lists of defoamers in specific vehicles. Different products have different needs (e.g. coatings, inks, and adhesives) and performance variables can dictate selection (flats versus higher gloss). The effect of dispersibility is low dispersibility which gives high persistance, while high dispersibility gives better gloss and compatibility. For latex manufacture, Mr. Broadbent stated that a three-day persistance is often sufficient, thus, one needs less defoamer. For long-term persistence (aging) use a less dispersible type.

Q. How do we evaluate dispersibility?

A. To qualify a material as dispersible or non-dispersible, one can add it to water and visually evaluate it. More sophisticated tests are required to further subdivide dispersibility.

CURRY SANDERS, *Secretary*

LOUISVILLE—JANUARY

"Lasers"

President-Elect Andy Traister, of Courtaulds Coatings, Inc., presented Mike Moilanen, of Süd Chemie Rheologicals, with the Past-President's Pin.

Roy Funkhouser, of Law Environmental, discussed the AIM regulations that went into effect.

Mark Lindsay, of the University of Louisville, discussed "YOU LIGHT UP MY LIFE: HOW LASERS WORK."

PAUL BAUKEMA, *Secretary*

LOUISVILLE—FEBRUARY

"Solvent-Free Architectural Coatings"

Roy Funkhouser, of Law Environmental, spoke on various environmental issues, including a hazardous waste facility. He stated that the Kentucky Department of Natural Resources is working to expedite underground storage tank permitting and information.

President William Leightner, of C.L. McGuire Co., reminded members of the Spring Symposium on April 17 and that nominations for a new Society Secretary would be requested from the floor.

Philadelphia Society member George Daisey, of Rohm and Haas Co., discussed "SOLVENT-FREE ARCHITECTURAL COATINGS."

Mr. Daisey described formulating with emulsion E-3122. This latex is designed for exterior use, from satin to flat gloss levels, "solvent-free" formulations. It achieves these properties by lowering the film formation temperature without a commensurate increase in dirt retention. The minimum film formation temperature is approximately 0°C (which is about 5° lower than a standard product for this end-use). Mr. Daisey noted that film formation at freezing (32°F) did require two to three percent Texanol®.

Mr. Daisey provided several formulating tips for thickeners, dispersants, and pigment wetting surfactants. In addition, a study of pigment volume concentration (PVC: 40-50%), volume non-volatiles (VNV: 30-40%), and Texanol (0-9%, 3% increments) under various temperatures (35 and 40°F) and relative humidities (30-70%) was presented.

Q. What is the importance of solvent-free coatings since the current regulations do not require them?

A. The major contribution may be to marketing. As a selling point, solvent-free coatings are extremely environmentally friendly, and they will also have reduced odor.

PAUL BAUKEMA, *Secretary*

NEW YORK—MARCH

Federation Staff Visit

Jay Austin, FSCT President-Elect, of Halox Pigments, discussed the Strategic Planning meeting that was held February 24-25 in Chicago. The three areas that the Federation is focusing on are: membership, organizational restructure, and common interest groups.

Pat Viola, FSCT Director of Publications, described FSCT as an association of professionals serving its Societies through the education and professional development of its members. In addition, Ms. Viola discussed the FSCT Spring Week, May 3-5; Pan American Coatings Expo, August 17-19; International Coatings Expo and Technology Conference, October 23-25.

Lyn Pollock, FSCT Director of Marketing, reported on the efforts of marketing the new International Coatings Technology Conference and advertising for the FSCT's publications.

Al Sarnotsky, of Spraylat Corp., commented on the ruling from the New Jersey fire code which required a dispensation of flammable liquids not by gravity. According to Mr. Sarnotsky, the New Jersey authorities notified the NYPCA that at this point they will not allow dispensation of flammable liquids by gravity. The fire department does not want free fall of flammable liquids.

Sid Rubin, of Empire State Varnish Co., announced that VOC regulatory requirements have been pushed back to the year 2000.

In addition, Mr. Rubin stated that he is organizing a joint symposium between the New York Society and Polytechnic University.

Abe Uhlman, of Polytechnic University, spoke to the membership about establishing a center for polymer science and technology. Dr. Uhlman said that it would be state as well as industry funded.

The speaker for the evening was Philadelphia Society member Jim Aloye, of Henkel Corp. He presented "TYPICAL PROPERTIES OF WATER-BASED EPOXIES."

According to Mr. Aloye, water-based epoxies have a surfactant attached to the epoxy resin as it goes through the advancement in molecular weight. The speaker attributed the differences in water-based epoxy resins between suppliers to the type of surfactant molecule used, and the amount used as it reacts into the backbone of the epoxy resin.

The notable differences between water-based epoxy systems is measured by oxygen and water vapor transmission rates; and how they perform as a barrier for corrosion and humidity resistance. Mr. Aloye noted that the water-based epoxies were significantly better than solvent two-component epoxies in water vapor transmission, leading to improved corrosion resistance.

Furthermore, Mr. Aloye stated that after catalyzing, there is a pot life of six hours; however, the paint does not increase in viscosity or change appearance. The problem is that after six hours the paint loses its good properties due to an excess of amines. According to the speaker, timing is important. The topcoat will lose gloss and the primer will lose performance if used improperly.

Other properties that showed an improvement over solvent systems are: direct impact; abrasion resistance; the surfactant suppresses the T_g for better film forming properties; the unique surfactant gives color compatibility with quality color dispersions, which have been a problem with other water-based epoxies.

QUV tests show slightly better gloss retention and much better nonyellowing properties. Solvent systems chalk after 400 hours—water-based epoxies go about 900 hours.

Q. How is salt spray performance improved with surfactants?

A. The surfactant molecule is reacted into the polymer backbone. The chemistry of the surfactant molecule gives it a crosslinked density barrier—reduces the T_g of the system giving it flexibility. This system does well without corrosion inhibitive pigments.

ROBERT W. SCHROEDER, *Secretary*

PACIFIC NORTHWEST (VANCOUVER SECTION)—MARCH

"Thermoplastic Waterborne Industrial Coatings"

Valerie Braund, of General Paint Ltd., reported on the FSCT/NPCA Manufacturing Management Committee Meeting, held in Charlotte, NC, on March 6.

In addition, Ms. Braund updated the members on recent changes with the FSCT. She noted that the Paint Industries' Show

Constituent Society Meetings and Secretaries

BALTIMORE (Third Thursday—Martin's West, Woodlawn, MD). JOSEPH SCHILARE, The Valspar Corp., 1401 Severn St., Baltimore, MD 21230 .

BIRMINGHAM (First Thursday—Strathallan Hotel, Birmingham, England). DAVID C. MORRIS, PPG Industries (UK) Ltd., P.O. Box 359, Rotton Park St., Birmingham, B16 0AD, England.

CDIC (Second Monday—Location alternates between Cincinnati, Columbus, Dayton, and Indianapolis). THERESA CASE, Fibreglass Evercoat Co., Inc., 6600 Cornell Rd., Cincinnati, OH 45242.

CHICAGO (First Monday—Sharko's Restaurant, Villa Park, IL). GERRY K. NOREN, DSM-Desotech, Inc., 1122 St. Charles St., Elgin, IL 60120.

CLEVELAND (Third Tuesday—Monthly meeting site TBA). JAMES CURRIE, Jamestown Paint Co., 108 Main St., Jamestown, PA 16134.

DALLAS (Second Thursday following first Wednesday—Dallas Medallion Hotel, Dallas, TX). MIKE TEMPLIN, Hilton-Davis Co., 1696 Dickerson Dr., Arlington, TX.

DETROIT (Second Tuesday—meeting sites vary). RAY STEWART, Akzo Nobel Coatings, Inc., 1845 Maxwell St., P.O. Box 7062, Troy, MI 48007-7062.

GOLDEN GATE (Monday before third Wednesday—alternates between Francesco's in Oakland, CA, and Holiday Inn in S. San Franscisco). DON MAZZONE, Dowd & Guild, Inc., 14 Crow Canyon Ct., #200, San Ramon, CA 94583.

HOUSTON (Second Wednesday—Medallion Hotel, Houston, TX). KEN MUNDY, Ribelin Sales, Inc., 7786 Blankenship Dr., Houston, TX 77055.

KANSAS CITY (Second Thursday—Cascone's Restaurant, Kansas City, MO). CURRY SANDERS, Tnemec Co., Inc., 123 N. 23rd Ave., N. Kansas City, MO 64116.

LOS ANGELES (Second Wednesday—Steven's Steakhouse, Commerce, CA). ARTHUR W. LORENZ, Sinclair-Ameritone Paint Corp., 6100 S. Garfield Ave., Los Angeles, CA 90040.

LOUISVILLE (Third Wednesday—Executive West Motor Hotel, Louisville, KY). PAUL BAUKEMA, Akzo Nobel Coatings, Inc., R&D Div., 4730 Crittenden Dr., P.O. Box 37230, Louisville, KY 40233.

MEXICO (Every fifteen days—Gabriel Mancera, Mexico City, Mexico). SERGIO ROJAS, Pinturas International, S.A. De C.V., Ganaderos 234, Col. Granjas Esmeralda, 09810 Mexico, D.F., 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). RICHARD TWOMEY, Kronos, Inc., 68 Fisher St., Medway, MA 02053-2004.

NEW YORK (Second Tuesday—Landmark II, East Rutherford, NJ). ROBERT W. SCHROEDER, Daniel Products Co., 400 Claremont Ave., Jersey City, NJ 07304.

NORTHWESTERN (Tuesday following first Monday—Jax Cafe, Minneapolis, MN). MICHAEL D. COAD, McWhorter Technologies, 1028 S. Third St., Minneapolis, MN 55415.

PACIFIC NORTHWEST (PORTLAND SECTION—Tuesday before third Wednesday—Tony Roma's, Mall 205, Portland, OR; SEATTLE SECTION—Third Wednesday—Wyndham Gardes Hotel, Sea-Tac, WA; VANCOUVER SECTION—Thursday after third Wednesday—Abercorn Inn, Richmond, B.C.). KENNETH WENZEL, Chemical Distributors, Inc., P.O. Box 10763, Portland, OR 97210.

PHILADELPHIA (Second Thursday—DoubleTree Guest Suites, Plymouth Meeting, PA). PATRICIA M. PETERSON, ARCO Chemical Co., 3801 West Chester Pike, Newtown Square, PA 19073-3230.

PIEDMONT (Third Wednesday—Ramada Inn Airport, Greensboro, NC). ALEX BLAHNIK, Chemcraft Sadolin, Inc., P.O. Box 669, Walkertown, NC 27051.

PITTSBURGH (Second Monday—Montemurro's Restaurant, Sharpsburg, PA). JAMES GIAMMARCO, Lockhart Chemical Co., 2873 W. Hardies Rd., Gibsonia, PA 15044.

ROCKY MOUNTAIN (Monday following first Wednesday—Monthly meeting site TBA). JOHN ELVERUM, Hauser Chemical Research, 5555 Airport Blvd., Boulder, CO 80301.

ST. LOUIS (Third Tuesday—The Salad Bowl Restaurant, St. Louis, MO). ROBERT PHELPS, P.D. George Co., P.O. Box 66756, St. Louis, MO 63166.

SOUTHERN (GULF COAST SECTION—third Thursday; CENTRAL FLORIDA SECTION—third Thursday after first Monday; ATLANTA SECTION—third Thursday; MEMPHIS SECTION—bi-monthly on second Tuesday; and MIAMI SECTION—Tuesday prior to Central Florida Section). EVE DE LA VEGA-IRVINE, J.M. Huber Corp., One Huber Rd., Macon, GA 31298.

TORONTO (Second Monday—Speranza Restaurant & Banquet Hall Convention Centre, Brampton, Ont., Canada). MIKE MOLNAR, CIBA Pigments, P.O. Box 2000, Mississauga, Ont., L5M 5N3 Canada.

WESTERN NEW YORK—MARKO MARKOFF, 182 Farmingdale Rd., Cheektowaga, NY 14225.

has been renamed the International Coatings Expo.

Separate from the Expo, the International Coatings Technology Conference will be held. These seminars are expected to attract people who do not normally attend the show.

The guest speaker was Ted P. Wursta, of Air Products and Chemicals. The title of his presentation was "An Additive's Approach to Defect Elimination in Thermoplastic Waterborne Industrial Coatings.

Kelvin J. Huget, *Secretary*

PHILADELPHIA—MARCH

"Do-It-Yourself Coatings Buyers"

Neil Shearer, of The 3E Group, reminded members that the Technical Seminar will be held on May 10.

Wayne Kraus, of Hercules Incorporated, stated that the Eastern Training Conference, slated for May 8-9, is sold out. Over 100 exhibitors have contracted space.

Allen Irish, of National Paint and Coatings Association, and Bill Cook, discussed "Do-It-Yourself Coatings Buyers, Who, Where, When and What's Happening."

The speakers reported on a survey by National Family Opinion, who polled approximately 40,000 people quarterly regarding their paint buying habits.

The survey revealed that 50% of paint purchased is "on sale." About half of those who raised prices still gained share. This depended on timing and also strong name with quality recognition. The channels for paint sale were 15% in discount stores, 6% in hardware stores, 17% in building supply outlets, and 62% in independent paint stores.

In addition, the survey noted that in 1990, 63% of paint sales were held by the top 10 brands. In 1995, the percentage was up to 75.6%. This indicates the continuation of consolidation in the paint industry. Brand equity was also very important.

Who is in the driver's seat in the paint industry? Eventually, the customer controls much of what happens in the industry. If they do not buy a product, the manufacturer must make adjustments or go out of business.

Q. What percent of paint sales is to the do-it-yourself person?

A. About 45%

Pat Petersen, *Secretary*

ROCKY MOUNTAIN—MARCH

"Thermoplastic Waterborne Industrial Maintenance Coatings"

President Christine LesCamela, of Kwal-Howells, reviewed the FSCT White Paper, "State of FSCT: A Case for Change." In addition, Ms. LesCamela reported on the FSCT Board of Directors Strategic Planning Meeting, February 24-25, in Chicago, IL.

Melinda Rutledge, of Rheox, Inc., asked whether the Arizona section of the Rocky Mountain Society is ready to separate to form their own Society. From discussion, it appeared that the Arizona section would not separate for another year.

In addition, Ms. Rutledge discussed the following new products available from FSCT: SciQuest CD-ROM and the *Coatings Encyclopedic Dictionary*.

The evening's technical speaker was Joel Schwartz, of Air Products and Chemicals, Inc. Mr. Schwartz discussed "An Additives Approach to Defect Elimination in Thermoplastic Waterborne Industrial Maintenance Coatings."

Mr. Schwartz began by reviewing a study that involved using three additives to minimize the formation of microfoam. He stated that the presence of internal and external microfoam in a coating applied by airless spray can increase the coating's water sensitivity, reduce its corrosion resistance, and contribute to a loss of gloss. The speaker reported that by using a concerted additives approach (defoamer, low foam dispersant, and wetting agent), the test results for the topcoat portion of the study indicated the following: a 75% reduction of microfoam, reduction of surface roughness of the dried coating, improved coverage and wetting, improved grind, and slight improvement in corrosion resistance.

The dynamics of air release from a drying coating involves a number of factors including entrained air/liquid interface, ambient air/liquid interface, rate of increase of bulk surface viscosity, entrained air size, variation in DFT, and the temperature and humidity when the coating is applied. He discussed his theory for the mechanism of foam (de)stabilization in relation to cohesive strength of the surfactant and surface viscosity. Conventional alkylphenol ethoxylated surfactants appear to form very stable symmetrical micelle structures, whereas Mr. Schwartz believes that the acetylenic diol type surfactants form micelle structures with lower cohesive strength (low surface tension). The speaker theorized that these micelles may be more oval in shape. This should allow the small microfoam bubbles to come in close contact with each other more readily, and coalesce into larger bubbles. The larger bubbles release more readily from the surface of the coating that the microfoam bubbles.

Mr. Schwartz briefly reviewed the results of a similar study involving four primer formulations. The test results indicated that there were a number of promising benefits by using the concerted additives approach to reduce microfoam in the coating formulation. These benefits included: superior early adhesion, higher loading capacity for anti-corrosion pigments, improved substrate wetting even on oily galvanized surfaces, elimination of orange peel, improved storage stability, and lower VOC content.

John Elverum, *Secretary*

TORONTO—NOVEMBER

"Solvent Selection"

Don A. Sullivan, of Shell Chemical Co., discussed "Solvent Selection in Today's

ENVIRONMENT—CHALLENGES AND OPPORTUNITIES."

Mr. Sullivan reviewed major regulations. He added Rule 66 covers smog and that there are three solvent classes. VOC reduction is aimed at reducing emissions and is application specific. HAPs reduction is aimed at all sources of air pollutants and addresses toxicity concerns. Most effective solvents have restrictions, MEK, MIBK, toluene, and xylene.

The speaker noted that the current regulatory status is aimed at tropospheric ozone reduction and stratospheric ozone protection. This puts most solvents into some level of restricted use. The latest regulatory development is acetone delisting. It is no longer a VOC compound. While this helps in a few paint applications, acetone is not useable in other paint applications. CMA is petitioning EPA for removing MEBK off the list.

According to Mr. Sullivan, the following characteristics are important to the formulator: solvency and viscosity reduction efficiency; evaporation rate; solvent balance; regulatory status; and cost effectiveness. However, the formulator now has a dilemma: lower emissions use most effective solvents; most efficient/best solvents are on HAPs list; and compliance solvents (non-VOC) cannot be used.

To address this dilemma, Mr. Sullivan stated that there are two potential solvents for modern coatings systems: methyl-n-amyl ketone and N-butyl propionate (both non-HAP). The properties of these solvents were discussed in different coatings systems, alkyds, polyesters, and epoxies. Similar results were obtained on film properties as compared to MEEK.

MIKE MOLNAR, *Secretary*

TORONTO—JANUARY

Society Mini-Symposium on "Coatings Plastics"

The first speaker of the symposium, Detroit Society member Rose Ryntz, of Ford Motor Co., covered "DECORATIVE COATINGS FOR AUTOMOTIVE PLASTICS."

According to Dr. Ryntz, 70% of the plastics used by the year 2000 will be thermoplastic olefins (TPO) for exterior coatings. The reason TPO is coated is to increase gloss, surface quality, chemical resistance, and durability. This coating consists of primer, basecoat, and clearcoat.

There are, however, problems with coating TPO such as with adhesion, flexibility, solvent attack, and the effect on mechanical properties.

Dr. Ryntz stated that a problem with adhesion in coating TPO is the variation in molding morphology. Adhesion is related to the physical and chemical forces of the coating and TPO surface. Then the speaker discussed various theories of adhesion including, electrostatic theory, diffusion theory—entanglement, mechanical interlocking theory, and adsorption theory. Since the PP migrates to the top in an alloy of rubber/PP (TPO), one needs to understand the top 25 mm and the level of permeation of the coating on bake. Also, molding stress conditions affect the surface, an effect known as birefringence.

According to Dr. Ryntz, different TPOs behave differently with haze development, absorption of UV absorbers, acceptance of adhesion promoters and solvents. Pretreatments help in plasticizing the surface and removing the WBL. Different TPOs have different levels of PP migration and crystallization near the surface. High surface crystallinity means poor adhesion. Low surface crystallinity means good adhesion. The adhesion can be predicted by measuring penetration in swelling tests using aromatic solvents with fluorescent dye and analyzing the surface roughness.

The speaker stated that scratch and mar resistance can be checked with new test

methods using scanning force microscopy. In addition, chip resistance can be checked with rock testers or a slag sand erosion tester. Gouge resistance is the main problem with TPO. This is a problem of total adhesion and stress in the molding.

Q. Does temperature have any effect on diffusion of the coating?

A. Yes, at or above 121°C is best.

The second speaker of the evening was Gary D. Kent, of Parker-Amchem. His topic was "ADVANCES IN SURFACE PREPARATION OF PLASTICS PRIOR TO PAINTING."

To assure that the painted article meets the performance requirements of the manufacturer, plastic surfaces undergo a cleaning pretreatment to remove various kinds of soils including: substrate components, processing aids, fabrication soils, and handling or storage soils.

Dr. Kent discussed three methods of pretreatment:

(1) Hand wiping is a labor intensive approach and uses a combination of chemicals and solvents. Few parts are cleaned this way.

(2) Solvent cleaning involves primarily vapor degreasing, but this technique is largely being replaced by aqueous procedures.

(3) Aqueous cleaning generally is a seven step process involving precleaning, cleaning, rinsing, conditioner or rinse aid, DI rinsing, air blow off, and oven drying. Current cleaning technology is based on phosphoric acid and new technologies based on nonphosphate based products are on the horizon to meet stricter environmental demands. The conditioner phase ensures that whatever cleaning chemicals are used, the surface is acidic when it is painted.

Dr. Kent noted that the evaluation of cleanliness is performed by measuring water drop contact angles before and after cleaning. Low contact angles indicate a clean surface.

Q. How much does DI water cost for bulk operations?

A. One to five cents per gallon.

The next speaker, Mary Jane Walzak, of Surface Science Western, discussed "ANALYSIS OF SURFACE DEFECTS IN COATINGS AND PLASTICS."

Ms. Walzak reviewed her company's lab capabilities and cited several case studies.

The symposium concluded with Paul Waller, of the Canadian Plastics Institute, who spoke on "THE FUTURE OF THE PLASTICS INDUSTRY IN CANADA."

Mr. Waller presented a macroeconomic analysis of the Canadian plastics industry.

MIKE MOLNAR, *Secretary*

TORONTO—FEBRUARY

"Paliochrome Pigments"

A moment of silence was observed for the passing of Joseph W. Tomecko, Past-President of the Toronto Society (1949-50) and Federation Past-President (1957-58).

The evening's technical speakers were Kenneth R. Mackinnon and Wendy Lorenzen, of BASF Corp. They discussed "PALIOCHROME PIGMENTS FOR INKS AND COATINGS."

Ms. Lorenzen discussed the paliochrome production techniques and relative shades produced by each technique. The effects and shade areas of each color were also mentioned. The advantages over mica effect pigments in each shade area were highlighted.

Mr. Mackinnon discussed fluorescent, interference, and infrared colorants used in the security printing industry. He showed different color copy effects which may prove useful in security printing.

MIKE MOLNAR, *Secretary*

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New FSCT Members

CDIC

Active

Griffith, Gregg A.—Colorscope Corp., Lexington, KY.

CLEVELAND

Active

Nicholson, Michael A.—Harrison Paint Corp., Canton, OH.

Associate

McKinney, Alfred H.—Ferro Corp., Cleveland, OH.
Roth, David A.—Deeks & Company, Cincinnati, OH.

Retired

Levy, Morton L.—Morton L. Levy PE, Shaker Heights, OH.

DETROIT

Associate

Hoopfer, John R.—Eastman Chemical Co., Kingsport, TN.

LOS ANGELES

Active

Barrie, Edward Jr.—Delta Technical Coatings Inc., Whittier, CA.
Celaya, Chris F.—Ameron PCD, Brea, CA.
Clarmont, Bert L.—Specialty Finishes, Fontana, CA.
Cohn, David S.—Catalina Industries, N. Hollywood, CA.
Crick, Denese R.—Ameron PCD, Brea.
Dalton, Randall S.—Ellis Paint Co., Los Angeles, CA.
Dotan, Pat—Frazee Industries, San Diego, CA.
Khan, Omar—Fine Line Paint Corp., Santa Fe Springs, CA.
Lopez, Eddie—Coatings Resource Corp., Huntington Beach, CA.
Lorenz, Arthur W.—Permalite Repromedia Corp., Gardena, CA.
Marquez, Benito—Ellis Paint Co., Los Angeles.
McKay, Thomas W.—Morton International, Colton, CA.
Nelson, Wayne D.—Spectra-Tone Paint Corp., San Bernardino, CA.

Associate

Gidwani, Bharato B.—Dura Chemicals Inc., Alameda, CA.
Lowney, Christopher B.—Chemcentral Corp., Santa Fe Springs, CA.
Morrow, Frank P.—Neville Chemical Co., Anaheim, CA.
Reiser, Stephen J.—Specialty Polymers, West Linn, OR.
Wells, Terry D.—Chemcentral Corp., Santa Fe Springs.

LOUISVILLE

Active

Magre, Dale M.—Devoe & Raynolds Co., Inc., Louisville, KY.
Weller, Lee E.—Devoe & Raynolds Co., Inc., Louisville.

Associate

Barbee, Bill D.—The Barbee Co., Inc., Louisville, KY.
Cross, Edwin—Willamette Ind., Louisville.

PIEDMONT

Associate

Hutchins, Worth G.—Marlowe Van Loan, High Point, NC.
Walker, Bill R.—Marlowe Van Loan, High Point.

Educator/Student

Chacko, Antony P.—Clemson University, Clemson, SC.

SOUTHERN

Active

Patterson, Margaret A.—Jones-Blair Co., Chattanooga, TN.
Sanders, Joseph E.—Allsteel Inc., Milan, TN.

Associate

Ritchie, Ed—Chemarco, Birmingham, AL.
Rube, James E.—Brady-Palmer Label, Carmel, NY.
Sierk, Karen L.—Arco Chemical Co., Tampa, FL.

* * * * * *

AFFILIATED MEMBERS

Edison, Michael P.—Edison Coatings Inc., Waterbury, CT.
Kim, Hyun-Joong—Virginia Polytechnic Institute & State University, Blacksburg, VA.
Law, Anthony G.—Chemiplas Australia, Epping, Australia.
Lee, KwanYoung—Dooyoung Chemical, Seoul, S. Korea.

R.L. Russell

Randall L. Russell has accepted the position of Director of Purchasing for Ranbar Technology Inc. and Ranbar Electrical Materials, Inc., Glenshaw, PA. A member of the Pittsburgh Society, Mr. Russell will be responsible for all raw materials, equipment, subcontract, and expense items for both facilities.

Daniel Products Co., Inc., Jersey City, NJ, has appointed **John O'Brien** to the position of Inside Technical Sales Manager. Mr. O'Brien will handle customers' requests for technical information on products, applications, and expeditious solutions to problems. He is a member of the New York Society.

In addition, **Paul Kloeblen** was named Manager of Management Information Systems. Mr. Kloeblen brings 14 years of experience in the development and management of information systems in the chemical process industry.

George Menendez, Vice President—Marketing for Buckman Laboratories, Memphis, TN, has assumed the leadership of the company's Strategic Planning Department. Mr. Menendez joined Buckman in 1976.

F.M. Armbrecht Jr. has been named Vice President and Chief Technology Officer of Witco Corp., Greenwich, CT. Mr. Armbrecht will oversee worldwide product, applications and technology development for all of Witco's business groups.

Daniel Klevisha has assumed the position of National Sales Manager for the QC/QA product lines of the newly formed business unit Bruker Optics, Billerica, MA.

In addition, **Richard Jackson** has joined the staff of Bruker Optics as an Applications Chemist.

Seth Silverman has joined NACE International, Houston, TX, as Editor of *Materials Performance*. Mr. Silverman will work with industry contacts and advisory groups. Prior to joining NACE, Mr. Silverman was the principal corrosion engineer and owner of Materials Testing Services, Inc.

The M.F. Cachat Co., Cleveland, OH, has appointed **Jack G. McGloin** to its sales team as a Sales Representative. Mr. McGloin will be based in Danbury, CT, where he will serve New England and the Mid-Atlantic States.

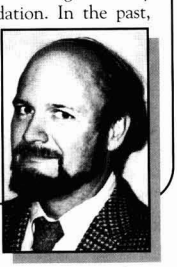
Robert L. Schweitzer has joined the staff of Sun Chemicals', Cincinnati, OH, Colors Group as Plastics Industry Manager. Mr. Schweitzer will be responsible for all plastics industry marketing programs. He is a member of the Louisville Society.

In other news, Sun Chemical Corp., Fort Lee, NJ, has promoted **Biagio N. Vignolo** to the position of Senior Vice President. Mr. Vignolo's recent responsibilities include all of the financial activities of the company's operating divisions and subsidiaries.

Malvern Instruments Inc., Southborough, MA, has announced new staff appointments due to the formation of the Malvern Science and Technology Group. **Peter Loguidice** will spearhead the organization.

Other members of the group include the following: **Mark Bumiller, Paul Dawson, David Pugh,** and **Rick Daley.**

PPG Industries, Inc., Pittsburgh, PA, has promoted **Donald W. Boyd** to the position of Senior Research Associate. A member of the Pittsburgh Society, Mr. Boyd is currently Vice President of the Coatings Industry Education Foundation. In the past, he served as Chair of the FSCT's Educational and Educational Coordinating Committees.



D.W. Boyd

The Steel Plate Fabricators Association (SPFA), Des Plaines, IL, has announced its new officers for 1996. Elected are: President—**R. Gary Kilkenny,** of Taylor Forge Engineered Systems, Inc.; Vice President—**Bernard S. Fineman,** of Caldwell Tanks, Inc.; Treasurer—**Jeffrey P. Hock,** of Enerfab, Inc.; and Secretary and Executive Director—**Wade D. Newman,** of SPFA.

The following were elected to three-year terms on the SPFA Board of Directors: **David M. Beinner,** of Bethlehem Steel Co.; **John A. Campo,** Tuscaloosa Steel Corp.; **Pat Fortier,** of Joseph T. Ryerson & Son, Inc., **Steve Fugatt,** of Berg Steel Pipe Corp.; and **Timothy G. Phillips,** of Thompson Pipe and Steel Co.

C. William Bauer, Jr., of CBI Na-Con, Inc., and **Robert H. Dillard,** of Offenhauser Co., were elected as at-large members of the SPFA Executive Committee.

Lomas International, Macon, GA, has announced the relocation of **Andy Deutscher** to Greenville, SC. He will be responsible for South Carolina, eastern Tennessee, and western North Carolina. Mr. Deutscher is a member of the Piedmont Society.

In addition, **Tom Buyalos** and **David Bynum** have joined the staff of Lomas International as Sales Representatives. Mr. Buyalos and Mr. Bynum will cover the North Carolina region.

Air Products and Chemicals, Inc., Allentown, PA, announced the following executive appointments: **William J. Cantwell** has been named Vice President and General Manager of the Polymer Chemicals Division.

Gerald G. Ermentrout was appointed Vice President and General Manager of the Gases and Equipment Group's Electronic Division.

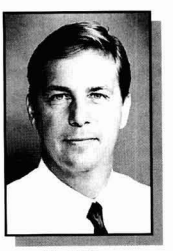
Also, **John E. McGlade** was named Vice President and General Manager, Chemical and Process Industries, within the company's Gases and Equipment Group.

David N. Verner has accepted the position of Group Vice President of OSi Specialties, Danbury, CT. Mr. Verner most recently served as Vice President, Urethane Additives. He will succeed **David I. Barton,** who has resigned.

Surface Protection Industries (SPI), Inc., North Billerica, MA, has announced the following appointments. **Robert C. Davidson Jr.** has assumed the title of Chairman and Chief Executive Officer of SPI. **Melvin Gagerman** was named President and Chief Operating Officer. In addition, **Harry Sheth** has been promoted to Vice President of Research and Development.

David Schwartz, Senior Manager, Petrochemicals, Chem Systems, Inc., was elected President of the Commercial Development Association (CDA). Mr. Schwartz will assume the Presidency on July 1, 1996.

Kurt Oldson has accepted the position of Account Manager for UniWest, Pasco, WA. In addition, Mr. Oldson will serve as Product Manager for the eddy current instrument. He will be responsible for implementing new eddy current and bond testing product lines including probes.



K. Oldson

J. Youngs

K. Moyer

John Youngs has joined the staff of LaserMike, Inc., Dayton, OH, as a Customer Service Manager. In this position, Mr. Youngs will manage the repair of equipment, direct field service activities, and develop service programs for maintenance and calibration.

In other news, **Kim Moyer** was named Quality Manager. Mr. Moyer will ensure compliance with ISO 9000 standards, evaluate and improve current manufacturing processes, and ensure customer satisfaction.

Ciba Additives, Tarrytown, NY, has promoted **Richard Brandon** to Director of Quality and Education at the company's McIntosh, AL, facility. Mr. Brandon joined the company in 1968.

Also, **Tom Conetta** was promoted to Director of Quality and Productivity. Mr. Conetta began his career at Ciba in 1973.

Decorating Retailer, the magazine published by the National Decorating Products Association, St. Louis, MO, has named **Paul Stoecklein** as Managing Editor. In his new capacity, Mr. Stoecklein will focus on news and trends in the paint and paint sundries segment of the decorating market. He previously served as Editor of *American Painting Contractor*.

Fitz Chem Corp., Elmhurst, IL, has announced the promotion of **Susan DiSantis** to Account Manager. Ms. DiSantis will service accounts in trade sales, resins, and the cosmetic industry located in the Chicago area and Southern Wisconsin.

Obituary

John F. "Jack" Shelton, founder of the J.F. Shelton Co., died on March 13, 1996. He was 73 years old.

In 1951, Mr. Shelton began his career in the paint industry at Great Western Chemical Co. Later, he managed the northwest operations of E.T. Horn Co. Eventually he founded the J.F. Shelton Co., where he served as President until he retired in 1984.

Mr. Shelton is survived by his wife; a sister; four daughters; and four grandchildren.

Kinney Vacuum, Canton, MA, has appointed **Lawrence Peter** to the position of Vice President, Sales and Marketing. Mr. Peter joined the staff of Kinney Vacuum in 1988.

Hercules Incorporated, Wilmington, DE, has named **Joseph P. Ziegler** as Plant Manager for their Jefferson, PA, facility. He most recently served as Nitrocellulose Manufacturing Manager.

Stephen M. Lustig has been named Commercial Director for Phenoxy Associates, Rock Hill, SC. Mr. Lustig will direct domestic and international sales and marketing activities for the company.

Nacan Products Ltd., Mississauga, Ont., has appointed **Alan Blackie** to the position of Marketing Manager, Resins & Specialty Chemicals. In this new position, Mr. Blackie is responsible for the marketing and market development activities of the division.

K.J. Herbert

Degussa Corp., Ridgefield Park, NJ, has named **Keith J. Herbert** Business Director, Stationary Emission Control Catalysts. Mr. Herbert will be responsible for the global business of Degussa SEC catalysts, including sales and marketing and the coordination of manufacturing, research, product development and technical services.

In addition, **John Turnure** accepted the position of Product Applications Manager within the company's Carbon Black Division. Working out of the company's Applied Technology Center in Akron, OH, Mr. Turnure will provide product application support to company's carbon black and iron blue product lines.

In other news, it was announced that **Kenneth C. Cwick**, Vice President and General Manager of its Silica Division, and **Reinhard W. Stober**, Vice President and General Manager of its Carbon Black Division, have exchanged responsibilities.

Elsewhere, **Dieter Kerner** was appointed Director of Manufacturing and Technology for the company's Silica Division. Dr. Kerner will plan, organize, and manage both short and long term manufacturing strategies in North America for Degussa.

Philip E. Grosse has joined the Air Quality Team at TolTest Inc., as an Air Quality Scientist. Assigned to the Permitting Services Section, Mr. Grosse brings seven years of experience in air quality permitting, engineering, compliance, industrial hygiene, and project management to the position.

ICI Surfactants, Wilmington, DE, has appointed **Martin N. Hochheiser** as Technology Planning Manager. Mr. Hochheiser will be responsible for identifying and progressing new strategic opportunities for the business in development and application of new surfactants technology, including production and investment.

Books/ Publications

UV/EB Applications

A new brochure illustrates a variety of commonplace applications to demonstrate the potential uses of UV and EB curing. The eight-page publication is presented in full-color throughout, and discusses the process as well as the results of UV and EB technology. RadTech International North America can be contacted for copies.

Circle No. 30 on Reader Service Card

Instrumentation

Varian Associates, Inc.'s recently updated instrument products brochure describes the company's line of instruments. Featured are instruments, accessories, and software for optical spectroscopy, chromatography, sample preparation, NMR, and leak detection. Options for updating, modifying, or creating systems are outlined.

Circle No. 31 on Reader Service Card

Steel Recycling

"Recycling Steel Shipping Containers" defines empty steel drums and pails, discusses recommendations for securing a reconditioner or scrap dealer relationship, and summarizes how to prepare empty steel drums and pails for recycling shipment. Three main steps are identified and discussed in steel container recycling. Copies of this brochure may be obtained from the Steel Recycling Institute.

Circle No. 32 on Reader Service Card

Water Jet Accessories

The latest NLB Corp. accessory catalog features more than 400 items to help clean, cut, or prepare surfaces with high-pressure and ultra-high pressure water jetting equipment. Cleaning lances, hoses, nozzles, tube lancers, tank cleaning heads, pressure controls, and floor and grate cleaners are included. The 56-page catalog includes photographs, specifications, model numbers, and ordering information.

Circle No. 33 on Reader Service Card

Manufacturer Directory

A revised third edition of *PAW 1—Paint Addresses Worldwide: W. Europe*, a commercial directory of Western European paint manufacturers, takes account of recent changes in the European coatings industry. Highlighted are 1300 companies and some 2800 tradenames in 22 European countries. The core of each entry in this Paint Research Association publication centers around company names and addresses which are often supplemented by product data, tradenames, and corporate affiliation.

Circle No. 34 on Reader Service Card

Titanium Dioxide

According to a new study, worldwide demand for titanium dioxide will advance four percent annually to 4.1 million metric tons in the year 2000. As the largest end-use market for this product, paints and coatings are expected to account for 59 percent of total consumption in the year 2000. These findings and more are presented and discussed in study #737, *World Titanium Dioxide*, published by The Freedonia Group, Inc.

Circle No. 35 on Reader Service Card

Marking Products

Diagraph Corp.'s "1996 Industrial Marking Products Catalog" is available. Traditional hand marking products, such as stencil cutters, stencil board, inks and applicators, industrial marking pens, and friction-driven roll coders, are highlighted. Also included are advanced systems such as bar code jet, on-line printer/applicators, and thermal label printers and labels.

Circle No. 36 on Reader Service Card

Equipment

Drum Mixer

The Drum-Mate®, high efficiency drum mixer uses four levels of bung-entry adjustable Swing-Wing™ turbine impellers to mix more drums of coatings. Available in three sizes, 5, 55, and 200-750 gallon containers, this mixer can be adapted to a variety of paint and surface coating mixing applications.

Circle No. 37 on Reader Service Card

Vacuum Belt Filter

Continuous lab, pilot, and production "RT" horizontal vacuum belt filters are available for a variety of applications. The filters are designed for a range of solid/liquid separation applications, including chemicals, dyestuffs/pigments, metals and metal salts, minerals and ores, plastics, and resins. Pannevis Inc. can provide further details on their horizontal vacuum belt filter lines and industries served.

Circle No. 38 on Reader Service Card

Drawer Oven

The Grieve No. 784, which is in use for stress relieving parts in fixtures to a maximum operating temperature of 500°F, is a five-tier, electrically heated drawer oven. The five drawers feature positive latching hardware, individual heat-sealing gaskets, and reportedly easy movement even when fully loaded. The oven has four-inch thick insulated walls and includes a digital indicating temperature controller.

Circle No. 39 on Reader Service Card

Small Dryers

A range of small size models of Wyssmont Co., Inc.'s rotary tray Turbo-Dryer® are available. Performance results can be scaled up to larger capacity units in these dryers, which are designed for small quantity production, pilot plants, testing, research, and laboratories. Reported attributes include drying of a variety of materials, solvent recovery, product quality, and unique features.

Circle No. 40 on Reader Service Card

Laboratory Apparatus

Filter Cartridges

Parker Hannifin Corp. has introduced the ProBond™ filter cartridge, a new easier handling line of resin bonded filter cartridges for viscous fluid filtration. ProBond filter cartridges provide two-stage filtration and are available in seven particle removal ratings from 2 to 125 µm.

Circle No. 41 on Reader Service Card

Particle Size

The Mastersizer S laser diffraction particle sizing instrument is a single-lens laser diffraction system capable of providing measurements of dry powders, emulsions, suspensions, aerosols, and transient sprays. This Malvern Instruments Inc. unit is recommended for research or QC of specialty chemicals, paints, and coatings. Included are a variety of characterization options, particle size ranges, sampling accessories, measurement control, and measurement principles.

Circle No. 42 on Reader Service Card

EDXRF Spectrometer

The Lab-X 3000, a benchtop energy dispersive X-ray fluorescence (EXDRF) spectrometer, features a separate autosampler. The Oxford Instruments Inc. apparatus does not use radioisotopes, hazardous chemicals, or complex dilutions. The autosampler allows for unattended operation for both routine analysis of samples and restandardization of a calibration line.

Circle No. 43 on Reader Service Card

Color QC

The CM-508d portable spectrophotometer is engineered to be lightweight and compact.

The miniature solid-state spectral sensor, featuring a single-chip silicon photodiode array, allows the instrument to simultaneously measure light from 400 to 700 nm. This unit, available from Minolta Corp.'s Instrument Systems Division, is switchable between specular component included and excluded.

Circle No. 44 on Reader Service Card

Injection Molder

A benchtop injection molder for plastics research is available for compounding and injection molding small polymer samples into miniature specimens for dynamic, tensile, and impact testing. The CS183 Mini-Max can mold cylindrical dumbbells from one gram of a thermoplastic. Available mold shapes in this Atlas Polymer Evaluation Products instrument include bar, coil, flat dumbbell, disc, and Izod impact.

Circle No. 45 on Reader Service Card

Coating Thickness

A modular system allows the use of nondestructive test methods, including electromagnetic, eddy current, and beta backscatter, for measuring different coating thicknesses in the PCB manufacturing process with a single desktop unit. The Fischerscope MMS, from Fischer Technology, can document, manage, and evaluate data according to customer and quality system requirements. The operator can handle all measurement, storage, evaluation, and documentation tasks through an interactive dialogue with the system.

Circle No. 46 on Reader Service Card

Polyols

CasChem, Inc. introduces a line of low molecular weight polyols for use as flexibilizers and crosslinkers in thermosetting polyurethane compounds. Recommended uses include process and performance modifiers in polyurethane formulations. The main backbone of the Caspol® D, M, and T series is hydrophobic in nature, reportedly producing a polyurethane with moisture resistance.

Circle No. 47 on Reader Service Card

Curing Agents

Three new phenalkamines for high performance anticorrosive epoxy coatings have been produced by Cardolite Corp. The first, Cardolite® NC-556 X 80, is designed for rapid cure with a workable pot life; the second, Cardolite® NC-559, is solvent-free with low viscosity for use in 100% solids coatings; and the third, Cardolite® NC-560, is designed for use in zinc-rich primers.

Circle No. 48 on Reader Service Card

Consumer Products Coating

Engelhard Corp. and Ferber Technologies, offer market flexible colored conductive inks, paints, and pastes. These products reportedly enhance the interactive capabilities of toys, books, games, and other consumer products. The technology features non-toxic colored conductive materials that are easy to apply, washable, flexible, and provide for customized electrical properties.

Circle No. 49 on Reader Service Card

Catalyzed Epoxy

The Sherwin-Williams Co. offers Hi-Solids Catalyzed Epoxy, certified to NSF Standard 61, for use in steel and concrete storage potable water tanks. This product was developed for immersion service in potable water, fresh water, and salt water. The low VOC coating reportedly provides corrosion and chemical resistance, and is designed to be compatible with cathodic protection systems.

Circle No. 50 on Reader Service Card

Product Selection

An interactive diskette-based product selection guide enables computer shopping for chemicals. The Windows™-based program is essentially a data handbook on diskette, covering Rohm Tech's line of emulation polymers. Data-Dex™ cross-references chemicals that best suit an identified application need, or offers specific technical information on compounds searched.

Circle No. 51 on Reader Service Card

Visual Programming

Data Translation announces two new versions of its DT VEE visual programming language, providing connectivity to a range of data acquisition instrumentation platforms and enhanced features. The software is designed to provide a productive environment for the development of test and measurement applications through the use of connected graphical objects. Included in the program's graphical user interface are more options for building custom instrument panels, data display, and controls.

Circle No. 52 on Reader Service Card

Performance Validation

An upgraded version of performance validation software has been developed to support the UV-2401 and UV-2501 PC spectrophotometers by Shimadzu Scientific Instruments, Inc. This tool is designed to assist a customer in verifying the quality of the instrumentation separate from the daily analysis. From a batch of 12 tests, the user can perform accuracy checks for wavelength and photometrics, resolution, stray light, and repeatability.

Circle No. 53 on Reader Service Card

Microscope Software

Omnic™ Atlμs microscope software is fully integrated and automated software for use with Spectra-Tech/Nicolet FTIR microscopes. The program fully integrates visual image capture, motorized stage control, and spectral acquisition of discrete points, lines, or areas of a sample. The new features of this software also allow the user to interact directly with a live video image of the sample.

Circle No. 54 on Reader Service Card

Dissolution System

Cary dissolution menu software, which fully automates the dissolution process, is designed to eliminate manual sampling and increase accuracy when combined with the VanKel dissolution bath and the Cary spectrometer. The Varian Associates, Inc. product can be used in pharmaceutical research and quality control. A flow-through method is offered which measures samples in real time as compared to HPLC techniques.

Circle No. 55 on Reader Service Card

Flexible Piping

Perma-Flexx® flexible piping is UL and ULC listed. Rated at 100 psi, this piping is compatible with petroleum products, alcohol, alcohol-gasoline blends, and chemicals. The Containment Technologies product can be used for pressurized pipe lines, suction systems, vapor recovery piping, and vent lines, as well as in various industrial and chemical piping applications.

Circle No. 56 on Reader Service Card

Reel System

A high pressure hose reel for airless paint sprayer applications reportedly attaches to most airless paint sprayers and operates under pressure up to 3600 psi. The Reel EZ™ attaches to paint sprayers via a heavy-duty universal mounting bracket. The Titan Tool Inc. unit includes a short flexible hose that connects to the port where the hose usually attaches to the sprayer; then the hose is attached to the unit and does not have to be disconnected again.

Circle No. 57 on Reader Service Card

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.

1996

(Aug. 15-17)—Pan American Coatings Expo. Co-sponsored by Federation of Societies for Coatings Technology, ANAFAPYT, and Instituto Mexicano de Téchnicos en Pinturas y Tintas. Sheraton Maria Isabel Hotel, Mexico City, Mexico.

(Oct. 22-24)—International Coatings Technology Conference. Chicago Hilton and Towers and McCormick Place North, Chicago, IL.

(Oct. 23-25)—International Coatings Expo (formerly Paint Industries' Show). McCormick Place North, Chicago, IL.

1997

(Nov. 3-5)—International Coatings Technology Conference and Expo (formerly Annual Meeting and Paint Industries' Show). Georgia World Congress Center, Atlanta, GA.

SPECIAL SOCIETY MEETINGS

1996

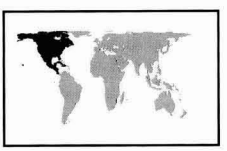
(June 14-15)—Joint Meeting of the St. Louis and Kansas City Societies. Holiday Inn, Lake of the Ozarks, MO. (Randall Ehmer, Walsh & Associates, Inc., 500 Railroad Ave., N. Kansas City, MO 64116; (816) 842-3014).

1997

(Feb. 18-20)—Western Coatings Societies' 23rd Biennial Symposium and Show. Sponsored by the Golden Gate, Los Angeles, Pacific Northwest, and Rocky Mountain Societies. Disneyland Hotel and Convention Center, Anaheim, CA. (Bruce Cotton, Pluess-Staufer (California), Inc., P.O. Box 825, Lucerne Valley, CA 92356; (619) 248-7306; or Ron Elliott, J.R. Elliott Enterprises, Inc., 300 Thor Pl., Brea, CA 92621; (714) 529-0711).

OTHER ORGANIZATIONS

1996—North America



(May 20-22)—"Advances in Flame Retardancy of Polymeric Materials: Applications, Materials, Industry Developments, Markets." Conference sponsored by Business Communications Co., Inc. Ramada Plaza, Stamford, CT. (Business Communications Co., Inc., 25 Van Zant St., Norwalk, CT 06855).

(May 20-24)—"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 20-24)—"Corrosion and Its Control by Protective Coatings." Short course sponsored by Lehigh University. Bethlehem, PA. (Richard D. Granata, Lehigh University, Sinclair Lab, 7 ASA Dr., Bethlehem, PA 18015).

(May 21-23)—Eastec Advanced Productivity Exposition. Sponsored by the Society of Manufacturing Engineers (SME). Eastern States Exposition Center, West Springfield, MA. (SME, One SME Drive, P.O. Box 930, Dearborn, MI 48121-0930).

(May 21-24)—"Coatings Science for Coatings Technicians." Short course sponsored by The University of Southern Mississippi (USM), Hattiesburg, MS. (Shelby F. Thames, Director, USM, Box 10037, Hattiesburg, MS 39406).

(June 3-5)—"Principles of Industrial Color Measurement." Sponsored by Rochester Institute of Technology (RIT). Munsell Color Science Laboratory, Rochester, NY. (Colleen M. Desimone, Munsell Color Science Laboratory, RIT, 54 Lomb Memorial Dr., Rochester, NY 14623-5604).

(June 3-6)—Applied Machine Vision Conference. Sponsored by the Society of Manufacturing Engineers (SME). Regal Cincinnati Hotel, Cincinnati, OH. (SME, One SME Drive, P.O. Box 930, Dearborn, MI 48121-0930).

(June 3-7)—"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).

(June 3-7)—"Advances in Emulsion Polymerization and Latex Technology." Short course sponsored by Lehigh University, Bethlehem, PA. (Mohamed S. El-Aasser. Emulsion Polymers Institute, Lehigh University, 111 Research Dr., Bethlehem, PA 18015).

(June 3-14)—"Intensive Coatings Science Course." Short course sponsored by North Dakota State University, Fargo, ND. (Debbie Shasky, Program Coordinator, NDSU, 54 Dunbar Hall, Fargo, ND 58105).

(June 6)—"Industrial Instrumental Color Matching." Sponsored by Rochester Institute of Technology (RIT). Munsell Color Science Laboratory, Rochester, NY. (Colleen M. Desimone, Munsell Color Science Laboratory, RIT, 54 Lomb Memorial Dr., Rochester, NY 14623-5604).

(June 10-13)—AESF SUR/FIN '96—"The Keys to Your Finishing Future." Sponsored by American Electroplaters and Surface Finishers Society (AESF). Cleveland Convention Center, Cleveland, OH. (Allen Shaw, AESF, Central Florida Research Park, 12644 Research Parkway, Orlando, FL 32826-3298).

(June 11)—Rheology Seminar. Sponsored by Brookfield Engineering Laboratories, Inc. Providence, RI/Boston, MA. (Brookfield Engineering Laboratories, Inc., Dept. NR-118, 240 Cushing St., Stoughton, MA 02072).

(June 11-14)—"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).

(June 13)—Rheology Seminar. Sponsored by Brookfield Engineering Laboratories, Inc. Detroit, MI. (Brookfield Engineering Laboratories, Inc., Dept. NR-118, 240 Cushing St., Stoughton, MA 02072).

(June 16-19)—CPMA 66th Annual Meeting. Sponsored by the Color Pigments Manufacturers Association, Inc. (CPMA). The Greenbrier, White Sulphur Springs, WV. (CPMA, P.O. Box 20839, Alexandria, VA 22320-1839).

(June 18-19)—BatchMaster Training. Laboratory/MSDS course sponsored by BatchMaster Software Corp. Chicago, IL. (Wendy Curfman, BatchMaster Software Corp., 1500 Pacific Coast Hwy., Ste. E, Seal Beach, CA 90740).

(June 18-21)—"Coatings Science for Coatings Chemists." Short course sponsored by The University of Southern Mississippi (USM), Hattiesburg, MS. (Shelby F. Thames, Director, USM, Box 10037, Hattiesburg, MS 39406).

(June 19-21)—"Coating Process Fundamentals." Short course sponsored by University of Minnesota. Minneapolis, MN. (Dept. of Chemical Engineering and Materials Science, University of Minnesota, 151 Amundson Hall, 421 Washington Ave, S.E., Minneapolis, MN 55455-0132).

(June 24-26)—"Additives for Metallocene-Catalyzed Polymers." Conference sponsored by Intertech Corp. Holiday Inn Mart Plaza, Chicago, IL. (Melanie Briggs, Intertech Conferences, U.S. 411 Route One, Portland, ME 04105).

(June 24-26)—"The Fundamentals of Corrosion and Its Control." Sponsored by LaQue Corrosion Services. Holiday Inn SunSpree Resort, Wrightsville Beach, NC. (S. Darden, LaQue Corrosion Services, P.O. Box 656, Wrightsville Beach, NC 28480).

(June 25-28)—"Coatings Science for Coatings Formulators." Short course sponsored by The University of Southern Mississippi (USM), Hattiesburg, MS. (Shelby F. Thames, Director, USM, Box 10037, Hattiesburg, MS 39406).

(July 10-11)—"The ABC's of Establishing Color Tolerances." Seminar sponsored by Chroma Corp. McHenry, IL. (Stephanie Schettig, Seminar Coordinator, Chroma Corp., 3900 Dayton St., McHenry, IL 60050).

(July 14-18)—Fifth World Congress of Chemical Engineering. Sponsored by American Institute of Chemical Engineers. Marriott Hotel, San Diego, CA. (AIChE*xpress* Service Center, 345 E. 47th St., New York, NY 10017-2395).

(July 15-17)—"Basic Coatings for Sales, Marketing, and General Personnel." Short Course sponsored by University of Missouri-Rolla (UMR), Rolla, MO. (UMR Coatings Institute, 1870 Miner Circle, Rolla, MO 65409).

(July 16-19)—"Introduction to Powder Coatings Technology." Short course sponsored by The University of Southern Mississippi (USM), Hattiesburg, MS. (Shelby F. Thames, Director, USM, Box 10037, Hattiesburg, MS 39406).

(July 23-26)—"Experiment Design Made Easy." Sponsored by Stat-Ease Inc. Cincinnati, OH. (Carol Summer, Stat-Ease Inc., Hennepin Square, Ste. 191, 2021 E. Hennepin Ave., Minneapolis, MN 55413-2723).

(Aug. 3-5)—31st National Heat Transfer Conference. Sponsored by American Institute of Chemical Engineers. Westin Galleria, Houston, TX. (AIChE*xpress* Service Center, 345 E. 47th St., New York, NY 10017-2395).

(Aug. 5-8)—50th Sea Horse Institute Conference. Sponsored by LaQue Corrosion Services. Blockade Runner Hotel, Wrightsville Beach, NC. (LaQue Corrosion Services, P.O. Box 656, Wrightsville Beach, NC 28480).

(Aug. 9-14)—31st Intersociety Energy Conversion Engineering Conference. Sponsored by the Institute of Electrical & Electronics Engineers, Inc. Omni Shoreham Hotel, Washington, D.C. (AIChE*xpress* Service Center, 345 E. 47th St., New York, NY 10017-2395).

(Aug. 14-16)—"Correctly Applying SPC Tools in Laboratory and Continuous Flow & Batch Manufacturing Processes." Short course sponsored by Oklahoma State University. Stillwater, OK. (George Collington, Oklahoma State University, Engineering Extension; (405) 744-5714).

(Aug. 19-22)—ARMA Fall Committee Meetings. Sponsored by Asphalt Roofing Manufacturers Association (ARMA). New Orleans, LA. (ARMA, 6000 Executive Blvd., Ste. 201, Rockville, MD 20852-3803).

(Sept. 8-12)—1996 EOS/ESD Symposium. Sponsored by the ESD Association. Lake Buena Vista, FL. (ESD Association, 7902 Turin Rd., Ste. 4, Rome, NY 13440).

(Sept. 9-12)—Safety in Ammonia Plants and Related Facilities. Sponsored by American Institute of Chemical Engineers. Westin at Copley Place, Boston, MA. (AIChE*xpress* Service Center, 345 E. 47th St., New York, NY 10017-2395).

(Sept. 9-13)—"The Basic Composition of Coatings." Short Course sponsored by University of Missouri-Rolla (UMR), Rolla, MO. (UMR Coatings Institute, 1870 Miner Circle, Rolla, MO 65409-0010).

(Sept. 4-11)—Manufacturing '96 Conference. Sponsored by the Society of Manufacturing Engineers (SME). McCormick Place, Chicago, IL. (SME, One SME Drive, P.O. Box 930, Dearborn, MI 48121-0930).

(Sept. 16-17)—Engineering & Construction Contracting Conference. Sponsored by American Institute of Chemical Engineers. Walt Disney World Swan Hotel, Orlando, FL. (AIChE*xpress* Service Center, 345 E. 47th St., New York, NY 10017-2395).

(Sept. 16-19)—Can Technology Conference & Exposition. Sponsored by the Society of Manufacturing Engineers (SME). Hyatt Rosemont, Rosemont, IL. (SME, One SME Drive, P.O. Box 930, Dearborn, MI 48121-0930).

(Sept. 22-25)—1996 Manufacturers and Suppliers Workshop and Exposition. Sponsored by The American Ceramic Society. Adam's Mark Hotel, Charlotte, NC. (The American Ceramic Society, 735 Ceramic Place, Westerville, OH 43081-8720).

(Sept. 23-27)—"Introduction to Paint Formulation." Short Course sponsored by University of Missouri-Rolla (UMR), Rolla, MO. (UMR Coatings Institute, 1870 Miner Circle, Rolla, MO 65409-0010).

(Oct. 2-3)—Fifth Annual Advanced Radiation (UV/EB) Curing Marketing/Technology Seminar. Sponsored by Armbruster Associates, Inc. Marriott Hotel, Newark Airport, Newark, NJ. (David C. Armbruster, Armbruster Associates, Inc., 43 Stockton Rd., Summit, NJ 07901).

(Oct. 8-11)—International Process Safety Managment Conference & Workshop. Sponsored by American Institute of Chemical Engineers. Airport Marriott Orlando, Orlando, FL. (AIChE*xpress* Service Center, 345 E. 47th St., New York, NY 10017-2395).

(Oct. 14-17)—15th International Congress on the Applications of Lasers and Electro-Optics. Sponsored by the Laser Institute of America. Radisson Plaza Hotel at Town Center, Southfield, MI. (Daryl Flynn, Laser Institute of America, 12424 Research Pkwy., Ste. 125, Orlando, FL 32826).

(Oct. 14-18)—43rd National Symposium of the American Vacuum Society. Pennsylvania Convention Center, Philadelphia, PA. (American Vacuum Society, 120 Wall St., 32nd Flr., New York, NY 10005).

(Oct. 16-19)—Joint Fall Meeting of the Basic Science, Nuclear, and Environmental Technology and Cements Division. Sponsored by The American Ceramic Society. San Antonio, TX. (The American Ceramic Society, 735 Ceramic Place, Westerville, OH 43081-8720).

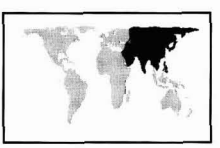
(Oct. 23-24)—"The ABC's of Establishing Color Tolerances." Seminar sponsored by Chroma Corp. McHenry, IL. (Stephanie Schettig, Seminar Coordinator, Chroma Corp., 3900 Dayton St., McHenry, IL 60050).

(Oct. 23-25)—109th Annual Meeting of the National Paint and Coatings Association (NPCA). Palmer House (Hilton), Chicago, IL. (Cheryl Matthews, NPCA, 1500 Rhode Island Ave., N.W., Washington, D.C. 20005-5597).

(Oct. 28-30)—"The Fundamentals of Corrosion and Its Control." Sponsored by LaQue Corrosion Services. Holiday Inn SunSpree Resort, Wrightsville Beach, NC. (S. Darden, LaQue Corrosion Services, P.O. Box 656, Wrightsville Beach, NC 28480).

(Oct. 29-31)—Fabtech West Conference & Exposition. Sponsored by the Society of Manufacturing Engineers (SME). San Jose Convention Center, San Jose, CA. (SME, One SME Drive, P.O. Box 930, Dearborn, MI 48121-0930).

1996—Asia



(May 28-31)—ChinaCoat. Exhibition sponsored by Sinostar International Ltd. Guangzhou, China. (Sinostar International Ltd., 1001 Siu Lam Bldg., 23 Luard Rd., Wanchai, Hong Kong).

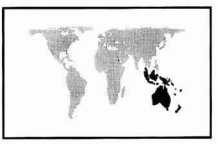
(June 5-6)—Asia-Pacific Coatings Show. Exhibition and Conference sponsored by FMJ International. Hong Kong Convention and Exhibition Centre, Hong Kong. (Mike Tarrant, FMJ International Publications Ltd., Queensway House, 2 Queensway, Redhill, Surrey RH1 1QS, England).

(June 5-8)—The International Exposition for Coatings & Paints. Sponsored by Chinese Chemical Society (CCS) and Chemical Industry and Engineering Society of China (CIESC). Shanghai Exhibition Center, Shanghai, P.R. China. (Worldwide Exhibitions Service Co., Ltd. (WES), 4/F, Bldg. 2, 1486 Nanjing Rd. (W), Shanghai 200040, P.R. China).

(June 12-13)—Korean Coatings Show '96. Exhibition and Conference sponsored by FMJ International. Hong Kong Convention and Exhibition Centre, Hong Kong. (Nicky Molloy, FMJ International Publications Ltd., Queensway House, 2 Queensway, Redhill, Surrey RH1 1QS, England).

(July 9-12)—Autofact Asia Conference. Sponsored by the Society of Manufacturing Engineers (SME). Singapore International Convention and Exhibition Center (Suntec City), Singapore. (SME, One SME Drive, P.O. Box 930, Dearborn, MI 48121-0930).

1996—Australia

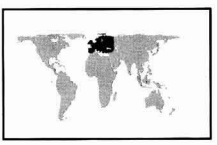


(Aug. 8-11)—"Cradle to Grave, The Life Cycle of Paint Products." Sponsored by the Surface Coatings Association New Zealand (SCANZ). Plaza International Hotel, Wellington, New Zealand. (SCANZ-CON.96 Secretariat, P.O. Box 38 546, Wellington, NZ; 64 4 568 8993).

(Aug. 11-16)—Third International Hydrocolloids Conference. Cosponsored by the CSIRO and the Cooperative Research Centre for Industrial Plant Biopolymers. Landmark Park Royal Hotel, Potts Point, Sydney, Australia. (Gail Hawke, Third International Hydrocolloids Conference, P.O. Box N399, Grosvenor Place, Sydney, NSW 2000, Australia).

(Aug. 14-17)—"Coatings from Start to Finish." Sponsored by the Surface Coatings Association Australia (SCAA). Sydney Convention and Exhibition Centre, Sydney, Australia. (SCAA '96 Secretariat, GPO Box 128, Sydney NSW 2001, Australia; 61 2 262 2277).

1996—Europe



(Apr. 11-12)—"Polymer Structure and Practical Properties." Seminar sponsored by Technomic Publishing AG. Hotel International, Basel, Switzerland. (Program Division, Technomic Publishing Co., Inc., 851 New Holland Ave., Box 3535, Lancaster, PA 17604).

(Apr. 15-17)—"Color Measurement and Color Control." Training course sponsored by Paint Research Association (PRA). Teddington, Middlesex, England. (Sue Benjamin, PRA, 8 Waldegrave Rd., Teddington, Middlesex TW11 8LD England).

(Apr. 18)—"Environmentally Friendly Wood Preservatives and Coatings." Sponsored by the Oil & Colour Chemist's Association (OCCA) Bristol Section. University of The West of England, Bristol. (Yvonne Waterman, OCCA, Priory House, 967 Harrow Rd., Wembley, HA0 2SF; 0181 908 1086).

(May 7-8)—"Hydrogels: Specialty Plastics for Biomedical and Pharmaceutical Applications." Seminar sponsored by Technomic Publishing AG. Basel Hilton Hotel, Basel, Switzerland. (Program Division, Technomic Publishing Co., Inc., 851 New Holland Ave., Box 3535, Lancaster, PA 17604).

(May 8-10)—"Medical Packaging Technology and Validation of the Packaging Process." Seminar sponsored by Technomic Publishing AG. Zurich Hilton Hotel, Zurich, Switzerland. (Program Division, Technomic Publishing Co., Inc., 851 New Holland Ave., Box 3535, Lancaster, PA 17604).

(May 13-17)—"Paint Technology Training Course." Sponsored by The Paint Research Association (PRA), Teddington, Middlesex, United Kingdom. (Sue Benjamin, PRA, 8 Waldegrave Rd., Teddington, Middlesex, TW11 8LD, United Kingdom).

(May 20-22)—"Protective Coatings for Structural Steel Training Course." Sponsored by The Paint Research Association (PRA), Teddington, Middlesex, United Kingdom. (Sue Benjamin, PRA, 8 Waldegrave Rd., Teddington, Middlesex, TW11 8LD, United Kingdom).

(May 21-22)—"Thermoforming: Process and Design." Seminar sponsored by Technomic Publishing AG. Hotel International, Basel, Switzerland. (Program Division, Technomic Publishing Co., Inc., 851 New Holland Ave., Box 3535, Lancaster, PA 17604).

(May 23-24)—"Thermoplastic Foams." Seminar sponsored by Technomic Publishing AG. Hotel International, Basel, Switzerland. (Program Division, Technomic Publishing Co., Inc., 851 New Holland Ave., Box 3535, Lancaster, PA 17604).

(May 30-31)—"Nanomaterials: Design, Preparation, Characterization, and Applications." Seminar sponsored by Technomic Publishing AG. Hotel International, Basel, Switzerland. (Program Division, Technomic Publishing Co., Inc., 851 New Holland Ave., Box 3535, Lancaster, PA 17604).

(June 3-5)—"Styrenics '96." Sponsored by Maack Business Services. Zürich, Switzerland. (Maack Business Services, Moosacherstrasse 14, CH-8804 AU/Zürich, Switzerland).

(June 3-5)—"Radiation Curing Technology Training Course." Sponsored by The Paint Research Association (PRA), Teddington, Middlesex, United Kingdom. (Sue Benjamin, PRA, 8 Waldegrave Rd., Teddington, Middlesex, TW11 8LD, United Kingdom).

(June 4-5)—"Sealing Technology: Materials, Design, and Applications." Seminar sponsored by Technomic Publishing AG. Hotel International, Basel, Switzerland. (Program Division, Technomic Publishing Co., Inc., 851 New Holland Ave., Box 3535, Lancaster, PA 17604).

(June 10-12)—"Printing Ink Technology Training Course." Sponsored by The Paint Research Association (PRA), Teddington, Middlesex, United Kingdom. (Sue Benjamin, PRA, 8 Waldegrave Rd., Teddington, Middlesex, TW11 8LD, United Kingdom).

(June 10-14)—23rd FATIPEC Congress. "Performance, Environment, and Legislation: Challenges and Sources of Innovation in the Coatings Industry." Conference sponsored by the Belgian Association of Coatings Technicians. Brussels, Belgium. (Michael Kuhn, Vincentz Verlag, Postfach 6247, 30062 Hannover, Germany).

(June 11-13)—European Coatings Show '96. Exhibition and conference sponsored by Vincentz Verlag. Brussels, Belgium. (Michael Kuhn, Vincentz Verlag, Postfach 6247, 30062 Hannover, Germany).

(June 10-13)—"Science and Technology of Pigment Dispersion." Vitznau (Luzern), Switzerland. (Angelos V. Patsis, Director, Institute for Materials Science, State University of New York, New Paltz, NY 12561).

(June 17-19)—18th International Conference in Stabilization and Controlled Degradation of Polymers. Luzern, Switzerland. (Angelos V. Patsis, Director, Institute for Materials Science, State University of New York, New Paltz, NY 12561).

(June 24-25)—"Radiation Coatings and Inks: Application and Performance." Sponsored by The Paint Research Association (PRA). Cairn Hotel, Harrogate, England. (Richard Kennedy, PRA, 8 Waldegrave Rd., Teddington, Middlesex, TW11 8LD, United Kingdom).

(June 25-26)—SURFEX '96. Sponsored by Oil & Colour Chemists' Association (OCCA). Harrogate, North Yorks, England. (Chris Pacey-Day, SURFEX Ltd., Priory House, 967 Harrow Rd., Wembley HA0 2SF, England).

(July 1-3)—Ninth International Symposium on Polymer Analysis and Characterization. Keble College, Oxford University, United Kingdom. (John Dawkins, Dept. of Chemistry, Loughborough University of Technology, Loughborough, Leicestershire, LE11 3TU, United Kingdom).

(July 1-5)—22nd International Conference in Organic Coatings—Waterborne, High-Solids, Powder Coatings. Vouliagmeni (Athens), Greece. (Angelos V. Patsis, Director, Institute for Materials Science, State University of New York, New Paltz, NY 12561).

1996—South America

(July 10-11)—Latin American Coatings Show '96. Sponsored by FMJ International. Sheraton Hotel, Buenos Aires, Argentina. (Mike Tarrant, FMJ International Publications Ltd., Queensway House, 2 Queensway, Redhill, Surrey RH1 1QS, England).

Advertisers' Index

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Humbug from Hillman

John A. Gordon, the popular coatings educator, writes:—

"For some unexplainable reason, I've been reading your philosophical page in the JCT for a number of years. Can't remember how many, but it often has given me hope that not all coatings science is dry and uninteresting." ("Humbug" is highly honored). Johnny goes on to correct the Burma Shave quote in the January issue:

In this vale of toil and sin
Your head grows bald
But not your chin
Burma Shave

Then, with aid of a consultant (his barber) he quotes:

To paint that cowshed
Barn or fence
That shaving brush
Is just immense.
Burma Shave

Does your husband misbehave
Growl and grumble
Rant and rave
Shoot the brute
Some Burma Shave.

Drinking drivers
Nothing worse
They put the quart
Before the hearse
Burma Shave

You can beat a mile a minute
But there ain't much future
In it - - - - - Burma Shave

Look. Look
A trip to Mars
For 1000
Empty jars
Burma Shave

Rumor has it that some guy collected 1,000 jars and the company sent him on a trip to Mars, Germany.

I imagine that Dick Stewart spends considerable time in the doghouse and believe me, he deserves it. Witness his latest confession:

"I was walking along the beach and came across a bottle that had washed up on the shore. I opened it and out popped a genie. He told me that he would grant me three wishes, but added that I should think very carefully first. Obviously, he was not one of your run-of-the-mill genies. He said that whatever I wished for, my wife would get 10 times as much.

I have always wanted to be independently wealthy, and figured that 10 million dollars ought to do it. 'Done.' said the genie. 'Remember now, your wife has 100 million.'

'What have I done?' I wondered. 'There'll be no living with her now.' I decided that I could always go out and play a round of golf, so I asked the genie to make me a scratch golfer.

'Done.' said the genie. 'But you had better not play with your wife. She is now minus 10.'

'This is stupid.' I thought. 'She will always get the best of me whatever I do.' I decided to think hard and long about the third wish.

'Come on, hurry up,' said the genie. 'I can't stand around here all day. I've got a lot more wishes to grant.'

'O.K. could you give me just a little heart attack.'

You may recall that some months ago, Saul Spindel generously donated to Humbug, Roger Axtell's very amusing and helpful book, *Do's and Taboos of Using English Around the World.* For those travelers headed to "Down Under," he includes a valuable glossary of "Australian English to American English." Here are some choice examples:—

Ankle-biter—A small child. See "rug rat."

Rug-rat—A small child. See "ankle-biter."

Bag of fruit—Ryming slang for a man's suit. As in "He was dressed to kill in his bag of fruit and didn't care who knew it."

Barbie—Barbecue. "Let's go down to the beach and have a barbie." Also, "He's a few snags (sausages) short of a barbie" is used to describe someone who is a little crazy.

Cuppa—A cup of tea. "What you need is a good cuppa." The Australian antidote to all problems.

Earbasher—Someone who talks endlessly. A bore.

Dummy, Split the—To lose one's temper.

Legless—Some one who is so drunk they can't walk.

Matilda—A swag or bedroll. To waltz Matilda is to carry a swag.

Mental, to chuck a—To lose one's temper. "Kylie really chucked a mental at the barbie last night."

Pollie—Politician. Australians, like many people, don't hold "bloody pollies in high regard."

Sheila—A young girl or woman. Less popular today in light of feminism.

As for Japan—If you've ever visited Italy or dined with Italians you may have heard the toast "Chin-chin." In Japan, however, that is the term for a boy's penis (literally, his "pee-pee"). One Japanese gentlemen told Axtell when he first heard that term used as an Italian toast, his thought was, "Well, we usually toast one's health but if you want to toast my penis, it's O.K. with me."

Bill Moyers, who was press secretary for President Lyndon Johnson, was also an ordained minister. At a White House dinner one evening, Moyers was asked to say grace. He said a few words and the president, sitting at the far end of the table, said, "Speak up, Bill, I can't hear you."

"I wasn't talking to you," Moyers replied.

—Terry Marchal

—Herb Hillman, Humbug's Nest, P.O. Box 135, Whitingham, VT 05361.

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003	023	043	063	083	103	123	143	163	183	203	223	243	263	283
004	024	044	064	084	104	124	144	164	184	204	224	244	264	284
005	025	045	065	085	105	125	145	165	185	205	225	245	265	285
006	026	046	066	086	106	126	146	166	186	206	226	246	266	286
007	027	047	067	087	107	127	147	167	187	207	227	247	267	287
008	028	048	068	088	108	128	148	168	188	208	228	248	268	288
009	029	049	069	089	109	129	149	169	189	209	229	249	269	289
010	030	050	070	090	110	130	150	170	190	210	230	250	270	290
011	031	051	071	091	111	131	151	171	191	211	231	251	271	291
012	032	052	072	092	112	132	152	172	192	212	232	252	272	292
013	033	053	073	093	113	133	153	173	193	213	233	253	273	293
014	034	054	074	094	114	134	154	174	194	214	234	254	274	294
015	035	055	075	095	115	135	155	175	195	215	235	255	275	295
016	036	056	076	096	116	136	156	176	196	216	236	256	276	296
017	037	057	077	097	117	137	157	177	197	217	237	257	277	297
018	038	058	078	098	118	138	158	178	198	218	238	258	278	298
019	039	059	079	099	119	139	159	179	199	219	239	259	279	299
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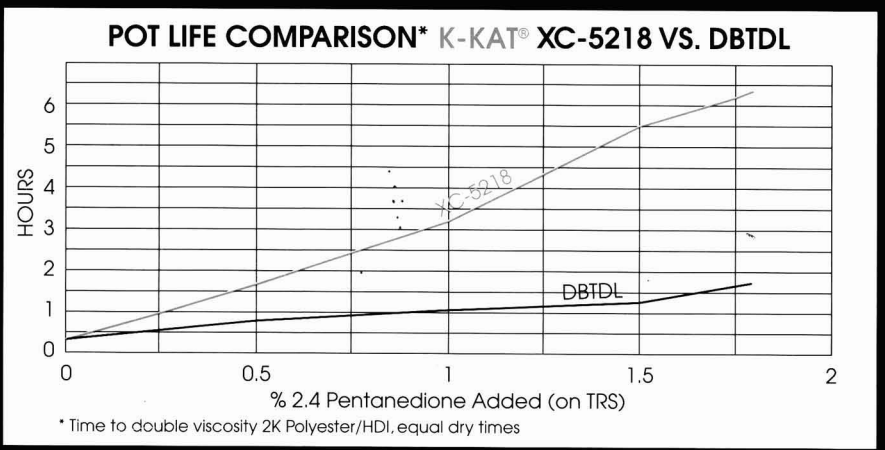

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