July 1995

JCT
JOURNAL OF COATINGS TECHNOLOGY

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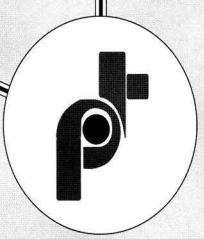

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Technical Articles

Feature Article

Federation News

Departments

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JOURNAL OF COATINGS TECHNOLOGY

Guide for Authors

GENERAL

The JOURNAL OF COATINGS TECHNOLOGY is published monthly by the Federation of Societies for Coatings Technology for its membership of approximately 7,000 in 26 Constituent Societies in the United States, Canada, Great Britain, and Mexico. The JOURNAL is devoted to the advancement of knowledge in the science and technology of surface coatings, the materials comprising such coatings, and their use and performance.

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 All manuscripts will be assumed to be previously unpublished writing of the authors, not under consideration for publication elsewhere.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

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

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

SUBMISSION OF MANUSCRIPTS...

...for the Journal

Four complete copies should be sent to the Editor, JOURNAL OF COATINGS TECHNOLOGY, 492 Norristown Rd., Blue Bell, PA 19422. The cover letter should address copyright, clearance, and release issues discussed above and should specify paper category: *Original Research, Reviews, Open Forum*, or *Back to Basics*.

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

...by Constituent Societies For Annual Meeting Presentation

Ten complete copies of the manuscript are required for committee review. The set of copies should be addressed to Mike Bell, Director of Educational Services, FSCT, 492 Norristown Rd., Blue Bell, PA 19422.

...for Roon Foundation Award Competition

Ten complete copies of the manuscript are required, and should be submitted to Mike Bell at the address previously listed.(For complete details, see "Roon Awards" section of the JOURNAL in the January 1995 issue.)

MANUSCRIPT PREPARATION

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

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

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

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

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

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

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

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

Title

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

Authors' Biographies and Photographs

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

Abstracts

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

Text

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

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

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

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

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

Metric System

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

Tables, Graphs, and Drawings

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

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

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

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

Photographs

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

Color prints and slides are unacceptable.

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

Nomenclature

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

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

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

Equations

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

Summary

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

Acknowledgment

If used, it should follow the summary.

References

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

(1) Pascal, R.H. and Reig, F.L., "Pigment Colors and Surfactant Selection," *Official* DIGEST, 36, No. 475 (Part 1), 839 (1964).

(2) Davidson, H.R., "Use and Misuse of Computers in Color Control," JOURNAL OF COATINGS TECHNOLOGY, 54, No. 691, 55 (1982).

(3) Stephen, H.G., "Hydrogen Bonding—Key to Dispersion?," *J. Oil & Colour Chemists' Assoc.*, 65, No. 5, 191 (1982).

(4) Patton, T. (Ed.), *Pigment Handbook*, Vol. 1, John Wiley & Sons, Inc., New York, 1973.

(5) Henderson, W.A. Jr. and Singh, B. (to American Cyanamid Co.), U.S. Patent 4,361,518 (Nov. 30, 1982).

OTHER INFORMATION

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

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

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FSCT Board of Directors—1994-95

The Road Taken

I shall be telling this with a sigh
Somewhere ages and ages hence:
Two roads diverged in a road, and I—
I took the one less travelled by,
And that has made all the difference.
—Robert Frost, "The Road Not Taken"

For many years, the path followed by the Federation has been a straightforward one. Its contributions, through educational programs, publications,and the Paint Industuries' Show, have been long recognized — and respected — by the industry.

So, what's with all this talk about change? About strategic plans? Hasn't anyone paid attention to the old adage: "If it ain't broke — don't fix it"?

For those individuals who have spent many grueling hours over the past three years grappling with critical issues facing this organization, the focus wasn't on the need to fix anything, but, rather, on how to effectively respond to the changing needs of its members. They recognized the prudence of another, more recent adage, "Planning is making decisions *now* which affect the future."

This group, made up of FSCT officers, committee chairs, Past-Presidents and staff, examined the current status of the Federation, proposed a possible direction for its future, and developed a plan of how to get there. This plan, strengthened by input from each of the Federation's 26 Constituent Societies, was presented recently to the Board of Directors at its Spring Meeting in Cancun, Mexico. (A full report of the Board Meeting begins on page 27.)

To achieve the goals and objectives enumerated at the Board Meeting, the FSCT will need to diverge from the comfortable and familiar as it explores new ways to improve services to the membership and to the industry. It is a path which only can be taken with continued input from its members. From the lively debates and discussions which enlivened the Board Meeting to the feedback received from individual Societies, this support will make "all the difference" as the Federation begins to travel down this exciting, challenging road.

Patricia D. Viola
Editor

Translations provided by: French—Montreal Society Member Mario Côte, of Eastman Chemical Canada Inc.–Montreal; and Spanish—Beatriz Alonso Torres, of Instituto Mexicano de Tecnicos en Pinturas y Tintas.

Study on the Chemistry of Polyguanidines as Precursors for Polycarbodiimide Crosslinkers in Powder Coatings—J.W. Taylor, M.J. Collins, and D.R. Bassett

JCT, Vol. 69, No. 844, 43 (July 1995)

Polyguanidines thermally decompose into polycarbodiimide crosslinkers. The decomposition rate to polycarbodiimides is shown to accelerate in an acrylic polymer matrix. The half-life of the guanidine moiety is 178 min at 180°C; however, when the polyguanidine is blended in poly (methyl methacrylate), the half-life is reduced to 4.8 min. As a result of the acceleration effect of acrylic polymers, blends of polyguanidines and carboxylic acid-containing polymers which are neutralized with diethyl amine can be processed to form powder coatings which crosslink at elevated temperatures. The gel fractions of cured powder coatings show that adequate crosslinking occurs at about 180°C.

Une étude sur la chimie de polyguanidine comme précurseur d'agent réticulants de polycarbodiimide dans les revêtements en poudre—J.W. Taylor, M.J. Collins, et D.R. Bassett

Les polyguanidines se décomposent sous l'influence thermique en agents réticulants polycarbodiimide. La vitesse de décomposition en polycarbodiimides est montré accélérer en matrice polymère acrylique. La demi-vie de la guanidine est 178 minutes à 180 C; cependant lorsque le polyguanidine est mélange en polyméthylméthacrylate, la demi-vie est réduite à 4.8 minutes. Comme résultat de l'effet d'accélération de polymères acryliques, des mélanges de polymères de polyguanidine et d'acide carboxylique qui sont neutralisé avec le diéthylamine peut être processé pour former des revêtements en poudre qui réticulent à des températures élevées. Les fractions de gel des revêtements en poudre durcis montrent qu'une réticulation adéquate se produit à environ 180 C.

Estudio de la Quimica de la Poliguanidina Como Precursor de Policarbodiamida de Entrecruzamiento en Recubrimientos en Polvo—J.W. Taylor, M.J. Collins, and D.R. Bassett

Las poliguanidinas se descomponen térmicamente en policarbodiamidas de entrecruzamiento. Se ha visto que la velocidad de descomposición a policarbodiamidas se incrementa en una matriz de polímero acrilico. La vida media de la guanidina es 178 minutos a 180°C; sin embargo, cuando la poliguanidina es suavizada en poli (metil metacrilato), la vida media se reduce a 4.8 minutos. Como resultado de efecto de aceleración de los polímeros acrílicos, los suavizadores de poliguanidina y ácido carboxilico-conteniendo polímeros que son neutralizados con dietilamina, pueden ser procesados para formar recubrimientos en polvo con enlaces entrecruzados a temperaturas elevadas. Las fracciones de gel de el recubrimiento en polvo curado muestra que el adecuado enlazamiento entrecruzado ocurre alrededor de los 180°C.

Estimation of the Glass Transition Temperature of Acrylic Copolymers—M.K. Gupta

JCT, Vol. 69, No. 844, 53 (July 1995)

The physical and chemical properties of copolymers influence the end properties of coatings. The glass transition temperature (T_g) of copolymers is one such property. A typical copolymer used in coatings can have five or six monomers. However, most of the literature data for T_g is limited to homopolymers or copolymers of two or three monomers. The Fox equation has therefore been used to estimate the T_g of the copolymer. The Fox equation uses the fraction of monomers and the T_g of homopolymers of each monomer.

A series of 18 acrylic copolymers was synthesized and characterized by GPC for molecular weight and by DSC for the T_gs. It was found that measured T_g values (using DSC) differ from estimated values (using the Fox equation) by as much as 60°C. It was observed that both molecular weight and monomer type influences the difference between measured and estimated T_g values.

It was therefore concluded that the Fox equation should be used only as the starting point but actual T_gs should be measured for copolymers. An alternate way is to generate a T_g versus molecular weight curve for each homopolymer and use these adjusted T_g values in the Fox equation to estimate the T_g for copolymers.

Estimation de la température de transition vitreuse de compolymères acryliques—M.K. Gupta

Les propriétés physiques et chimiques de copolymères influencent les propriétés finales de revêtements. La température de transition vitreuse (T_g) de copolymères est une de ces propriétés. Un copolymère typique utilisé dans les revêtements peut avoir cinq ou six monomères. Cependant, la plupart des données de littérature pour le T_g est limité aux homopolymères ou copolymères de deux ou trois monomères. L'équation de Fox a été utilisé pour estimer le T_g du copolymère. L'équation de Fox utilise la fraction de monomères et le T_g d'homopolymères de chaque monomère.

Une série de 18 copolymères acryliques fut synthétisé et caractérisé par CPG pour le poids moléculaire et par DSC pour les T_gs. Il fut montré que les valeurs T_g mesurés (Utilisant le DSC)

diffèrent des valeurs estimées (utilisant l'équation de Fox) par plus de 60 C. Il fut observé que le poids moléculaire et le type de monomère influence la différence entre les valeurs T_g estimés et mesurés.

Il fut conclut que l'équation de Fox devrait être utilisé seulement comme point de départ mais les valeurs actuelles de T_g devraient être mesuré pour les copolymères. Une façon alternative est de générer un T_g versus la courbe de poids moléculaire pour chaque homopolymère et utiliser ces valeurs ajustés de T_g dans l'équation de Fox pour estimer le T_g pour copolymères.

Estimación de la Temperatura de Transición Vitrea de Copolímeros Acrílicos—M.J. Gupta

Las propiedades fisicas y químicas de copolímeros influyen en las propiedades finales de los recubrimientos. La temperatura de transición vitrea (T_g) de los copolímeros es una de éstas propiedades. Un copolímero tipico usado en recubrimientos puede tener cinco o seis monímeros. Sin embargo, mucha de la información de la literatura para T_g es limitada a homopolímeros o copolímeros de dos o tres monómeros. La ecuacion de Fox ha sido utilizada para estimar la T_g de un copolímero. La ecuación de Fox utiliza la fracción de monómeros y la T_g de homopolímeros de cada monómero.

Una serie de 18 copolímeros acrílicos fue sinetizada y caracterizada por GPC para peso molecular y por la DSC para T_gs. Fue encontrado que los valores de T_g medidos (utilizando DSC) difiere de valores estimados (utilizando la ecuación de Fox) a lo mucho por 60°C. Fue observado que tanto el peso molecular como el tipo de monómero influyeron en la diferencia entre los valores de T_g medidos y estimados.

Finalmente se concluyó que la ecuación de Fox podria ser utilizada unicamente como un punto de arraque, pero la T_g actualmento podría ser medida para copolímeros. Un camino alternativo es generar una curva de T_g vs. peso molecular para cada homopolímero y usar éstos valores de T_g ajustados en la ecuación de Fox para estimar la T_g para copolímeros.

Stabilization of Aluminum Pigments in Aqueous Alkaline Media by Styrene Copolymers—B. Müller

JCT, Vol. 69, No. 844, 59 (July 1995)

Aluminum pigments react in alkaline aqueous media (e.g., waterborne metallic paints) with the evolution of hydrogen. Low- and high-molecular weight styrene-maleic acid copolymers inhibit the corrosion of aluminum pigments in a mixture of water and butyl ether of ethylene glycol at a pH value of 10 very effectively and are much better corrosion inhibitors than high-molecular weight polyacrylic acids or a styrene-acrylic acid copolymer. There is a correlation between the composition of the styrene-maleic acid copolymers and the evolved hydrogen volume: the lower the acid number the lower the hydrogen volume—that means higher is the corrosion inhibiting effect.

Stabilisation de pigments d'aluminum dans un milieu alcalin aqueux par des copolymères de styrène—B. Müller

Les pigments d'aluminum réagissent dans les milieux aqueux alcalins (e.g. peintures métalliques à base d'eau) avec l'évolution d'hydrogène. Des copolymères d'acide maléiques-styrènes de bas et haut poids moléculaires inhibent la corrosion de pigments d'aluminum dans un mélange d'eau et d'éthylène glycol butyl éther à un pH de 10 de façon très efficace et sont de meilleurs inhibiteurs de corrosions que les acides polyacryliques de haut poids moléculaires ou les copolymères d'acide acrylique-styrène. Il y a corrélation entre la composition de copolymères d'acide maléique-styrène et le volume d'hydrogène produit. Plus le numéro acide est faible, plus le volume hydrogène est bas ce qui augmente l'effet inhibiteur de corrosion.

Estabilización de Pigmentos de Aluminio en un Medio Acuoso Alcalino por Copolímeros de Estureno—B. Müller

Los pigmentos de aluminio reaccionan en un medio acuoso alcalino (por ejemplo, pinturas metálicas acuosas) con la producción de hidrógeno. Los copolímeros de estireno-acido maleico de bajo y alto peso molecular inhiben la corrosión de los pigmentos de aluminio en una mezcla de agua y eterbutílico del etilenglicol a un pH de 10 de una manera efectiva y siendo mejores inhibidores que los ácidos poliacrilícos de alto peso molecular o el copolimero de estireno-ácido acrillico. Existe una correlación entre la composición de los copolímeros de estireno-ácidio acrillico y el volumen de hidrógeno: Mientras menor sea el número de ácidos y menor sea volumen de hidrógeno, mayor es el efecto inhibidor de la corrosión.

Dr. Frank Jones, of Eastern Michigan University, Named Mattiello Lecturer for FSCT Annual Meeting

"Toward Solventless Coatings" Is Focus of 1995 Lecture

Citing his "genuinely insightful and valuable contributions to the literature and to the field of protective coatings," the Federation of Societies for Coatings Technology is pleased to announce that Frank N. Jones, Professor at Eastern Michigan University, will present the Joseph J. Mattiello Lecture during its 73rd Annual Meeting. The Annual Meeting & Paint Industries' Show will be held October 9-11 at the Cervantes Convention Center in St. Louis, MO. Dr. Jones' lecture, entitled, "Toward Solventless Liquid Coatings," will be given on Wednesday, October 11 at the Convention Center.

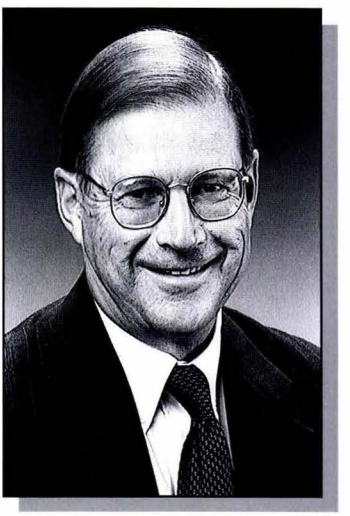
The lecture, considered one of the Federation's most prestigious, commemorates the contributions of Dr. Mattiello, former President of the FSCT (1943-44). Dr. Mattiello was instrumental in expanding the application of the sciences in the decorative and protective coatings fields. He was Vice President of Hilo Varnish Corporation, Brooklyn, NY, when he died in 1948.

The lecturer, chosen from among those who have made outstanding contributions to science, is selected to present a paper on a phase of chemistry, engineering, human relationships, or other science fundamental to paint, varnish, lacquer, or related protective or decorative coatings.

Career Highlights

A Professor at Eastern Michigan University, Dr. Jones also serves as Director of the National Science Foundation Industry/University Cooperative Research Center in Coatings at Eastern Michigan University, Michigan Molecular Institute, and North Dakota State University.

He moved to EMU in 1990 after seven years as Professor and Chair of the Department of Polymers and Coatings at North Dakota State University. Previously he held research and management posts with Du Pont, Celanese, and Cargill, working mainly in the fields of synthetic polymer chemistry, polymeric materials, and coatings. He received an A.B. in Chemistry from Oberlin College and a Ph.D. in Organic Chemistry from Duke University.



Industry-Related Activities

Dr. Jones is author of over 100 papers and has been awarded about 15 U.S. patents, most in the areas of synthetic polymer chemistry and coatings. He is co-author, with Zeno Wicks and Peter Pappas, of a two-volume test and reference book, *Organic Coatings: Science and Technology*, published by John Wiley & Sons in 1992 and 1994. Current research interests include polymer synthesis and crosslinking, properties of industrial coatings, and methods to eliminate solvent from liquid coatings.

Dr. Jones is a frequent contributor to the JOURNAL OF COATINGS TECHNOLOGY and has been the recipient of three Roon Foundation Awards from the FSCT. He is a member of the Detroit Society.

Active in the American Chemical Society Division of Polymeric Materials: Science and Engineering, Dr. Jones currently serves as Vice-Chair. He has been an organizer and chair of symposia at American Chemical Society National Meetings.

Dr. Jones serves as a reviewer for the JCT, the *Journal of Applied Polymer Science*, *Journal of Polymer Science, Polymer Chemistry*, and the *Journal of Physical Chemistry*.

* * *

For additional information, or to register for the FSCT Annual Meeting & Paint Industries' Show, contact FSCT, 492 Norristown Rd., Blue Bell, PA 19422-2350, or call (610) 940-0777.

FSCT Adds Marketing Director to Staff; Names National Advertising Representative

In keeping with the goals established as part of its recent strategic planning inititiative, the FSCT has named **Lyn Pollock** to the newly created position of Director of Marketing.

Lyn most recently served as Associate Manager, Marketing Services, of the Members Benefits Corp., a subsidiary of the National Education Association. There, she generated and managed $2 million annual budget for advertising and fulfillment of products and services for the 2.3 million-member organization.

She will be responsible for the promotion and marketing of all Federation services and products.

Among the many areas on which she will initially focus are: increasing advertising in FSCT publications; enhanced promotion of the FSCT Annual Meeting & Paint Industries' Show; and marketing of the soon-to-be-published *Coatings Encyclopedic Dictionary*.

Lyn has relocated from the Washington, D.C. area to Blue Bell, where she resides with her husband, Jeff, and son, Nick.

In addition, the FSCT has retained the services of **Mike Venezia,** of Tolland, CT, to serve as National Advertising Sales Representative.

Mike will be directly responsible for selling advertising in the JOURNAL OF COATINGS TECHNOLOGY, as well as the *FSCT Year Book*, and the *FSCT Annual Meeting & Paint Industries' Show Program Book*.

PANORAMA™

Coatings MSDS CD Retrieval System

— For IBM™ and IBM-Compatible Computers—

SUBSCRIPTION AND LICENSE AGREEMENT

DATA PUBLISHED ON COMPACT DISC BY
FEDERATION OF SOCIETIES FOR COATINGS TECHNOLOGY
492 Norristown Rd., Blue Bell, Pa 19422
Tel. — 610-940-0777 Fax — 610-940-0292

Shipment is expressly made subject to the terms and conditions contained herein, including a limitation of warranty and a limitation of liability.

• • • •

Based on the terms and conditions herein, we hereby order the number of subscriptions (indicated below) to "Panorama™ Coatings MSDS CD Retrieval System" database (the "Product"). We understand that the Product will be delivered to us within 30 days after release of the current version of the Product and receipt of a signed purchase order and prepayment of the subscription fee plus shipping and handling charges and taxes and duties where required, and that our license to use the Product will terminate 12 months or 24 months, depending on the length of the subscription term selected, after delivery of the Product. A subscription is defined as the initial compact disc containing the current database and additional updates to be shipped quarterly over the term of the subscription period.

INSTRUCTIONS — Please complete information below in full. Indicate quantity and length of subscription. Include Purchase Order number, or remittance by check or credit card

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or
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1. Parties to Agreement

The parties to this agreement are Federation of Societies for Coatings Technology (hereinafter "Licensor") and the Licensee identified on the first page of this Agreement ("Licensee" or "us").

2. The Product

The Panorama™ Coatings MSDS CD Retrieval System, "the Product," consists of the database listed above stored on CD-ROM disc(s) issued quarterly during the term of the subscription agreement, a user's manual, and the software (the "Personal Librarian Software") required to access the database. The database consist of information contained in Material Safety Data Sheets ("MSDS") for raw materials, as well as technical specifications contained in a Raw Material Index for raw materials used in the manufacture of paint, coatings, and inks. The CD-ROM discs are designed to be accessed through a CD-ROM drive coupled to either an IBM-compatible personal computer (PC/AT™ 386 or greater with MS.DOS 3.3 or later, with Microsoft Windows™ 3.0 or later, and 2 MB or RAM minimum). Host adapters and SCSI interface cables are also required.

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For one year from the date of delivery of the Product, Licensor will have consultants available by telephone during its normal business hours to answer questions and provide assistance for Licensee. Use of such hotline will be at Licensee's sole risk and Licensor shall not be liable for any loss or damage arising therefrom, whether resulting from negligence or otherwise.

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The Product ordered on this Agreement will be updated on a quarterly schedule in the form of completely new current discs with the new information added. Upon receipt of an updated disc, Licensee shall return the outdated disc to Licensor within 30 days. Failure to return the outdated disc will result in the withholding of subsequent updated discs. If and when software updates become available, Licensee shall have the right to purchase such updates at Licensor's then current prices.

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13. Term

The term of this Agreement shall be one year or two years, depending on the applicable subscription fee paid, and may be renewed at the fees current on the renewal date.

14. Termination of License

If Licensee breaches any term of this Agreement, in addition to all other legal remedies, Licensor may immediately terminate the License granted hereunder. Upon termination of the License by Licensor or Licensee for any reason, Licensee shall, unless otherwise agreed to in writing by Licensor, immediately return to Licensor the Product and all copies thereof, whether modified, merged or included with other data or software and shall certify in writing to Licensor that Licensee has not retained the Product or copies thereof. The provisions of this Agreement which protect the proprietary rights of Licensor shall continue in force after termination.

15. Indemnification

Licensee agrees to indemnify and hold Licensor harmless from and against any and all claims of third parties (including copyright infringements) arising out of or related to the use of the Product by Licensee.

16. Notices

All notices, consents or other communications referred to herein shall be in writing, and shall be sent to the other party by first class mail addressed to that party at the address specified in this Agreement or to such alternate address as either party may furnish in writing to the other.

17. No Assignment by Licensee

This Agreement, and the License contained herein, may not be assigned by Licensee.

18. Force Majeure

Licensor shall not be responsible for any failure to perform (or delay in performance), in whole or in part, due to unforeseen circumstances or circumstances beyond Licensor's control, including but not limited to acts of God, war, riot, embargoes, acts of civil or military authority, fire, flood, accidents, strikes and shortages of transportation, facilities, fuel, labor, or materials.

19. Entire Understanding

This Agreement represents the entire understanding of the parties with respect to the subject matter hereof, and there are no representations, promises, warranties, covenants or understandings with respect thereto other than those contained in this Agreement. Without limiting the generality of the foregoing, it is expressly agreed that the terms of any purchase order issued by Licensee with respect to this Agreement of the Product shall not be applicable and that any acceptance of such purchase order by Licensor shall be for acknowledgment purposes only.

20. Illegality and Unenforceability

If a term or condition of this Agreement is found by a court or administrative agency to be invalid or unenforceable, the remaining terms and conditions shall be enforceable to the maximum extent permitted by law.

20. Governing Law

This Agreement shall be governed by and construed in accordance with the laws of the Commonwealth of Pennsylvania without giving effect to the principles of conflict of law thereof.

Paint Industry Convenes to Discuss EPA's AIM Coatings Rule

A report released by the National Paint and Coatings Association (NPCA), Washington, D.C., stated that a meeting was held in late June to discuss the paint industry's strategy and response to the U.S. Environmental Protection Agency's (EPA) current draft Architectural Industrial Maintenance (AIM) Coatings rule.

According to David Lloyd, NPCA's Director, Governmental Affairs Division, EPA will issue a proposed national standard severely limiting volatile organic compound content (VOC) in AIM coatings. In early May, the agency rejected NPCA's proposal on AIM coatings, a reasonable proposal that would reduce overall emissions from these products by nearly 18-19%, more than the industry's fair-share contribution to the problem.

NPCA issued an "Action Alert" to its members and the state paint councils. The Action Alert urges members of the industry to protest the draft rule by writing members of Congress, state governors and EPA's Mary D. Nichols, Assistant Administrator for Air and Radiation, before the rule is published for comment. Similar letters with copies of the Action Alert were also issued to sister trade organizations.

These actions are all part of NPCA's overall strategy to address state/federal AIM coatings regulations which has also included asking pertinent Congressional committees and chairmen to begin oversight hearings on the Clean Air Act and specifically, the 183 (e) study, and soliciting support of the National Governor's Association.

Air Products Invests Over $50 Million for Expansion

Air Products and Chemicals, Inc., Allentown, PA, will invest more than $50 million to expand the overall capacity of its seven emulsion production facilities in the United States. The investment program—currently underway and slated for completion by the end of next year—calls for the installation of new emulsion reactors at four facilities and debottlenecking projects at three other plants.

Eastman to Build Manufacturing Facility in Malaysia; Construction on PET Plant in Spain Set to Begin

Eastman Chemical Co., Kingsport, TN, has revealed plans to build the company's first wholly owned manufacturing facility in Asia Pacific. Kuantan, Malaysia, has been selected as the site for the polyester copolymer plant with about 30,000 metric tons annual capacity.

Construction on the new site is slated to begin this year with production on stream by late 1997.

In addition to manufacturing spectar copolymer for plastic sheeting, the new plant will produce copolyesters such as PETG (glycol-modified polyethylene terephthalate) for use in electronics, medical, interior refrigerator parts, and heavy-gauge sheeting for point-of-purchase displays, indoor signs, and industrial machine guards

In other news, construction is expected to begin on a 120,000 metric ton (265 million pounds) polyethylene terephthalate (PET) plant in San Roque, Spain. Mechanical completion of the project is expected by the end of 1996. The first quarter of 1997 is the anticipated on-line date for the facility.

PPG Alliances Open Access to South America's OEM and Refinish Coatings Businesses

Two alliances within South America's automotive original equipment (OEM) and refinish coatings businesses have been formed by PPG Industries, Pittsburgh, PA.

According to Kears Pollack, PPG's Vice President of Coatings and Resins, the company signed a memorandum of intent with Akzo Nobel NV of The Netherlands to form a joint venture to produce automotive OEM coatings in Argentina and Brazil.

Mr. Pollack also stated that PPG's electrodeposition products have been available in Brazil for the past two years through a distributor agreement with Akzo, which has been producing and marketing topcoats and primers there.

In a separate agreement, PPG formed an alliance with Bunge Paints and its associate companies for continentwide distribution of automotive refinish products. A division of Bunge & Born Corp. of Argentina, Bunge Paints will occupy positions in Alba, Argentina; Coral, Brazil; and Inca, Uruguay.

OM Group Forms Venture with Dainippon Paint

OM Group Inc., Cleveland, OH, and Dainippon Ink have formed a joint venture in Japan named D & O Inc. With equal capital participation by DIC and OMG, the new venture will produce cobalt and nickel inorganic chemicals and nonstearic acid-based metal carboxylates. Operations are scheduled to begin on June 1, 1995. D & O Inc. will focus on producing materials with applications for the rechargeable battery industry.

Bayer Corp. Opens Maleic Anhydride Plant

A new $93 million maleic anhydride facility was opened recently by Bayer Corp., Pittsburgh, PA. The Baytown, TX, facility features two new reactors for converting basic raw materials, such as n-Butane, into maleic anhydride. This product is used in the manufacture of unsaturated polyester resins, lube oil additives, agricultural chemicals and other specialty products.

Cookson Increases Capacity; Opens Laboratory

Cookson Pigments, Inc., has announced an $8 million expansion of its U.S. pigment facility in Newark, NJ. The expansion, which will take place in phases, is expected to be completed in 1996, and will affect all product lines.

An increase in dalamar yellow, watchung red, naphthanil red, and phthalocyanine blue is anticipated, as well as in krolor yellow and orange production capacity.

In other news, Cookson Pigments is opening a new technical service laboratory for the European plastics, coatings, and printing ink markets. Located in Oxford, United Kingdom, the facility will provide technical assistance to the European market.

New Address

CSM Environmental Systems, Inc., has moved their headquarters to:

CSM Environmental Systems, Inc.
2333 Morris Ave., Ste. C-4
Union, NJ 07083
Phone: (908) 688-1177
Fax: (908) 688-1045

ASTM Subcommittee Considers Whole Paint Standard

Since the Environmental Protection Agency (EPA) has increased its attention on setting limits on whole paints, Committee D-1 on Paint and Related Coatings, Materials, and Applications of the American Society for Testing and Materials (ASTM), Philadelphia, PA, may develop a standard that establishes the physical and chemical properties of paint products.

Subcommittee D01.42 on Architectural Coatings, part of D-1, is considering a specification for a flat interior latex paint. The proposed document is intended to provide the paint community with a standard similar to the cement industry's standard C 1157, Performance Specification for Blended Hydraulic Cement. C 1157 covers blended hydraulic cements for both general and special applications. The specification gives performance requirements and sets no restrictions on the composition of the cement or its constituents.

A questionnaire was sent to the paint manufacturing community in order to provide feedback. The following are questions that were included in the survey:

- Do you think that ASTM D-1 should develop a specificaiton on whole paint?
- Does your company currently market interior flat wall paints using a multiple quality line, such as, good/better/best?
- Do you agree that if ASTM D-1 were to develop a specification, it should categorize flat paints into multiple categories?
- Should the specification only include minimum performance requirements for properties such as leveling, sag, opacity, abrasion, etc.
- Would your company be willing to participate or comment either by attending meetings or reviewing documents, if D-1 decides to proceed with this development?

For additional information on this standard, contact Thomas Sliva, Chairman of ASTM D01.42.32, D/L Laboratories, 116 E. 16th St., New York, NY 10003.

Mergers & Acquisitions

Betz Labs Acquires Taiwanese Business

Betz Laboratories, Inc., Trevose, PA, has acquired Taiwan Peitz Co. Ltd., Taipei, Taiwan, a water, paper process, and refinery process treatment business. Taiwan Peitz Co. Ltd., has been a licensee of Betz products since 1974.

Details of the cash transaction were not disclosed; however, the purchase included facilities located throughout Taiwan and equipment.

Gibson Paint Acquires Wunder-Plast Swiss Systems

The acquisition of Wunder-Plast Swiss Systems, a manufacturer of acrylic stucco and related concrete coating products, by Gibson Paint, Surrey, British Columbia, was announced recently.

According to Dave Pasin, President of Pasin Industries Ltd., Wunder-Plast acrylic stucco will now be manufactured and marketed under the Gibson plas-tex stucco label. In addition, all manufacturing and marketing will be relocated to the Surrey office.

CCP Purchases SUVAR

Cook Composites and Polymers, Kansas City, MO, has purchased SUVAR, a company that manufactures and sells products to the coating and ink markets.

The acquisition includes SUVAR's two operating divisions, C.J. Osborn and Superior Varnish. Physical properties consist of plants and administrative facilities in Pennsauken, NJ, and a plant in Guelph, Ontario. Financial details of the transaction were not disclosed.

OMG Announces the Acquisition of Lubrizol's Additives

OM Group Inc., Cleveland, OH, acquired the plastics additives business of The Lubrizol Corp. The terms of the transaction were not reported.

Thames Water PLC Sells Permutit Group to U.S. Filter

United States Filter Corp., Palm Desert, CA, has acquired The Permutit Co., Ltd. and The Permutit Co. Pty. Ltd. (The Permutit Group) from Thames Water plc. The transaction was effected through a share purchase agreement whereby U.S. Filter's United Kingdom subsidiary acquired all of the capital stock of The Permutit Group for an aggregate purchase price of approximately $10 million.

X-Rite Broadens Market with Labsphere, Inc. Acquisition

X-Rite, Inc., Grandville, MI, has completed the purchase of the New Hampshire-based Labsphere, Inc., which manufactures products that measure color and light through transmission and reflectance technology.

The completion of the Labsphere deal marks X-Rite's third acquisition since May 1994. X-Rite has purchased H. Miller Graphic Arts Products Ltd., Congleton, England, and Colorgen's customer database software, paint formulations, and other assets.

Global Alliance Formed by Grace Dearborn and Allied Colloids

Grace Dearborn, Boca Raton, FL, a unit of W.R. Grace & Co., and Allied Colloids, Bradford, United Kingdom, have announced a worldwide strategic sales and marketing alliance to deliver a broader range of products and services to the water treatment and pulp and paper industries. The alliance will provide both companies access to a global market estimated at $6 million.

Through the alliance, Grace Dearborn and Allied Colloids will leverage their resources in technologies, expertise, and service to meet increasing customer needs in a more cost-effective, added-value approach.

Grace Dearborn provides products and services to treat wastewater and water for cooling towers and boilers. Allied Colloids produces water-based acrylic polymers and associated technology.

Union Carbide Forms Venture in Korea to Produce VAM

Union Carbide, Danbury, CT, has formed a joint venture with BP Chemicals and Samsung Fine Chemicals Co. to manufacture vinyl acetate monomer (VAM) for the Asia Pacific market. The new joint venture company, Asian Acetyls Co., Ltd. will build a new VAM plant in Ulsan, Republic of Korea.

Construction is scheduled to start in mid-1995, with completion set for the third quarter of 1996.

The new 150,000 metric-ton unit will be built adjacent to an existing 200,000 metric- ton acetic acid unit, currently operated by BP Chemicals and Samsung. This facility will supply the joint venture with acetic acid, the main raw material for VAM production.

ASTM Training Course Focuses on Paint VOCs

A two-day technical and professional training course presented by the American Society for Testing and Materials (ASTM), Philadelphia, PA, will focus on how to obtain precise, meaningful volatile organic compound data from laboratory tests on paint and related coatings. The course will be held on November 1-2, 1995, in Philadelphia, and on May 1-2, 1996, in Cleveland, OH.

This course is designed for chemists and others who use the Environmental Protection Agency's (EPA) tests to determine whether paints or coatings meet VOC requirements. Individuals from the paint industry, government regulatory bodies, commercial laboratories, and paint users will also benefit from this course.

The program includes: laboratory demonstrations on the use of gas chromatography; the Karl Fisher titration method; paint density; and other test methods needed to determine the VOC of coatings. In addition, instructive demonstrations will be held at DuPont Marshall Laboratory in November, and at The Glidden Co. in May. The basic principles of the ASTM test methods used to measure VOC in the U.S. EPA's new source performance standard will be covered.

The course fee is $670 and includes ASTM's Manual on Determination of VOC in Paints, Inks, and Related Coatings, copies of all referenced ASTM standards covered in the course, lecture notes, visual aids, refreshment breaks, lunches, and transportation to and from the demonstration sites.

To register for the course, or for additional information, contact Tina Falkenstein, ASTM, 1916 Race St., Philadelphia, PA 19103.

PRA Seeks Papers on Industrial Coatings

Due to the increasing environmental considerations, meeting regulatory constraints has become the principal guideline for development of industrial coatings. To address these industry needs, The Paint Research Association (PRA), Teddington, England, is seeking special interest papers to be delivered at their 15th International Conference "The Future of Industrial Coatings: Technical Innovation vis-à-vis Legislation."

Slated for November 13-15, 1995, this conference will examine innovations that will supply environmental friendliness.

For more information, contact Dip Dasgupta, The Paint Research Association, 8 Waldegrave Rd., Teddington, Middlesex TW11 8LD, England.

Varian Releases Schedule for Instrument Courses

Varian Associates, Inc., Palo Alto, CA, has published its 1995 schedule of analytical instruments technology training courses.

The schedule includes a list and brief descriptions of classes offered, and registration information. Courses are designed to familiarize new users with instrumentation and tutor more advanced users on modern analytical techniques.

This year's classes will be located in Palo Alto; Walnut Creek, CA; Atlanta, GA; Wood Dale, IL; Raleigh, NC; Florham Park, NJ; and Sugar Land, TX.

For a copy of the training schedule or more information, contact Varian Analytical Instruments, Dept. VIS223, P.O. Box 9000, San Fernando, CA 91341-9981.

Call For Papers

23rd Annual Waterborne, High-Solids, and Powder Coatings Symposium

Co-sponsored by:

The Southern Society for Coatings Technology
and
The University of Southern Mississippi

New Orleans, LA
February 14-16, 1996

The Southern Society for Coatings Technology and the Department of Polymer Science at The University of Southern Mississippi invite all interested persons to submit papers for presentation at the 23rd Annual Waterborne, High-Solids, and Powder Coatings Symposium.

Papers relating to the chemistry, formulation, and marketing of waterborne, high-solids, powder and other advanced coating systems are solicited. Papers relating to engineering aspects of coating systems or solvent abatement are also solicited.

Title, abstract, and authors' names (speaker's name underlined) should be submitted not later than August 15, 1995 to:

Dr. Robson F. Storey or Dr. Shelby F. Thames, Co-Organizers. WHS&PC Symposium, Department of Polymer Science, The University of Southern Mississippi, P.O. Box 10076, Hattiesburg, MS 39406-0076

The completed paper should be submitted by December 1, 1995. The preliminary program will be developed based on the submitted abstracts. Manuscripts are required for inclusion in the Symposium Proceedings.

It is required that all papers be original and of scientific value.

For additional information, call (601) 266-5193 or -4475.

"Focus on the Future" Theme Highlights CSCT's 38th Annual Technical Symposium

The 38th Annual Technical Symposium of the Cleveland Society for Coatings Technology (CSCT) was held May 4-5, at the Quaker Square Hilton, in Akron, OH. Fifty-two participants attended the event which was themed "Focus on the Future."

The CSCT Educational Committee adopted a new approach to the afternoon session by dividing the group into three small sections for a hands on approach. Each group attended separate sessions for group discussions and practical problem solving. Tim Ball, of The Sherwin-Williams Co., passed out specific problem sheets for the group to discuss and solve paint problems.

In another session Marty Johnson, also of The Sherwin-Williams Co., addressed color matching history and development. Carol Bass, of Perelandra Systems, discussed computer generated MSDS, lab analysis, purchasing, and formulating.

Following the groups rotation to each of the three sessions, everyone reconvened for a trip to Inventure Place—The National Inventors Hall of Fame.

The seminar culminated with the award of a plaque and $250 to Dr. Darlene Brezinski, of Consolidated Research, Inc., for her presentation "The Future of the Coatings Scientist."

At the conclusion of the two-day seminar, the attendees gathered for a reception.

Plast-Ex '95 Draws Over 10,000 Attendees in Toronto

Plast-Ex '95, the triennial trade show sponsored by the Society of the Plastics Industry of Canada, attracted over 10,200 people to the Toronto International Centre, Toronto, Ont., on May 1-4.

Exhibitors displayed machinery, equipment, materials and new technology for plastics processing. In addition to the exhibits, a display area demonstrated the recyclability of plastic materials such as PVC, polystyrene, and polyethylene.

For further information, write SPI, 1262 Don Mills Rd., Ste. 104, Don Mills, Ont. M3B 2W7 Canada.

ASOMA Offers Energy Dispersive Classes

Two- and three-day classes in energy dispersive X-ray fluorscence (EDXRF) analysis are being offered by ASOMA Instruments Inc., Austin, TX.

The course will cover the basics of XRF theory to basic interference theory to effective instrument calibration. Practicum sessions allowing hands-on time with actual ASOMA bench-top and process analyzers are a part of the classes, and attendees are encouraged to bring their own samples to use during calibration training.

These classes are held at ASOMA headquarters in Austin, but can also be held at customer sites or other locations if requested.

For more information, contact ASOMA Instruments, Inc., 11675 Jollyville Rd., Austin, TX 78759.

DuPont's Design of Experiments Seminar Schedule Announced

DuPont's Quality Management and Technology Center, Wilmington, DE, has announced the schedule for public seminars on design of experiments methodology throughout 1995.

Design of experiments allows scientists and engineers to test variable factors concurrently to make reliable business decisions. The seminars require no previous knowledge of statistics or higher mathematics.

"Strategy of Experimentation" seminars are slated for: Sept. 19-21—Boston, MA: Oct. 17-19—San Francisco, CA; Nov. 28-30—Wilmington, DE; and Dec. 12-14—Orlando, FL.

The schedule for "Strategy of Formulations Development" seminar is Oct. 24-26, in Wilmington.

A seminar on "Experimentation for Robust Product Design" will be offered on Sept. 26-28, in Wilmington.

In addition, the "Focus on Data" seminar will be held in Wilmington on Nov. 14-16.

For information on registration, contact DuPont Quality Management and Technology Center, 1007 Market St., Nemours Building 6498, Wilmington, DE 19898.

NACE Introduces Two New Seminars; Schedule of All Courses Available

Two new seminars have been announced by the National Association of Corrosion Engineers (NACE) International, Houston, TX.

"Water Treatment and Corrosion Control in Water Systems" presents effective water treatment methods to prevent corrosion in industrial and municipal water systems. The second new seminar, "An Introduction to High Temperature Corrosion," teaches industrial personnel why corrosion and oxidation occur in high temperature environments and how to prevent it in processing equipment.

In addition, NACE will also conduct seminars on MR0175 (based on NACE's industrial standard for materials recommendations to prevent stress corrosion cracking in oil field equipment): "Successful Coating and Lining of Concrete" and "Industrial Lead Abatement."

NACE is also offering intensive, five-day courses designed to provide students with practical information they can immediately apply in their workplace. NACE offers the following general education courses: "Basic Corrosion," "Cathodic Protection—An Introduction," "Cathodic Protection—Theory and Data Interpretation," "Cathodic Protection—Design I," "Corrosion Control in Oil and Gas Production," "Protective Coatings and Linings," and "Designing for Corrosion Control."

For a copy of the 1995-96 Education and Training Guide, contact NACE, P.O. Box 218340, Houston, TX 77218-8340.

Papers from NYSCT Symposium Available

Bound volumes of the 14 papers presented at the recent symposium on "Recent Advances in Additives and Modifiers for Coatings" are available from the New York Society for Coatings Technology for $50.00. Please contact the Society office at (908) 354-3200.

ISA/95 Slated for Oct. 1-6 in New Orleans, LA

On October 1-6, 1995, The International Society for Measurement and Control (ISA), Research Triangle Park, NC, will host ISA/95 at the Ernest N. Morial Convention Center, New Orleans, LA.

ISA/95 will offer 75 technical sessions and 50 training courses on measurement and control, ranging from one to three days in duration. Exhibit space of 280,000 square feet will also be available for viewing.

The event will incorporate the Industrial Computing Society's conference, which features 50 sessions, including tutorials and presentations focused on the latest trends in industrial computing.

For registration information, contact ISA, 67 Alexander Dr., P.O. Box 12277, Research Triangle Park, NC 27709.

Regulatory Update July 1995

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
May 23, 1995—60 FR 27282
Regulatory Reinvention (XL) Pilot Projects
Action: Solicitation of Proposals

EPA has announced the establishment of three regulatory reinvention pilot programs. The actions will give regulated sources the flexibility to develop alternative strategies that will replace or modify specific regulatory requirements on the condition that they produce greater environmental benefits.

The pilot programs are as follows: the XL program for facilities; the industry-wide or sector-based XL program; and XL program dealing with government agencies regulated by EPA. EPA is soliciting proposals in these areas from private and public entities or groups of entities regulated by EPA under its various statutory authorities.

These pilot programs are in response to President Clinton's March 16 document, Reinventing Environmental Regulation, in which he announced that EPA would implement new programs to develop innovative alternatives to the current regulatory system. EPA will be implementing a total of 50 projects in the four program areas. Each project will involve regulatory flexibility by EPA in exchange for a commitment on the part of the regulated entity to achieve better environmental results than would have been attained through full compliance with all applicable regulations.

This is an open solicitation of proposals with no set end date, and project proponents may submit more than one project proposal. Project proposals and all comments should be sent to: Regulatory Reinvention Pilot Projects, FRL-5197-9, Water Docket, Mail Code 4101, U.S. EPA, 401 M Street, S.W., Washington, D.C. 20460.

For further information, contact Jon Kessler, Office of Policy, Planning and Evaluation, U.S. EPA, Washington, D.C., (202) 260-4034.

Department of Transportation
Research and Special Programs Administration
May 23, 1995—60 FR 27231
Hazardous Materials Transportation Registration and Fee Assessment Program
Action: Final rule

The Department of Transportation's Research and Special Programs Administration is maintaining the current annual registration fee of $300 for persons engaged in transporting or offering for transportation certain categories and quantities of hazardous materials in intrastate, interstate, and foreign commerce. RSPA is also adopting two changes to the statutorily mandated registration and fee assessment program. Applicability of the registration requirement to materials that are extremely toxic by inhalation (Hazard Zone A) is expanded to include materials in a hazard class or division other than Division 2.3 or Division 6.1. RSPA is also adopting an exception from the registration requirement for foreign offerors, as authorized by the amended statute.

For further information, contact David Donaldson, Office of Hazardous Materials Planning and Analysis (202) 366-4484, or Joan McIntyre, Office of Hazardous Materials Standards, (202) 366-4488, RSPA, U.S. DOT, Washington, D.C.

Toll-Free HazMat Number Established—The U.S. Department of Transportation's Research and Special Programs Administration (RSPA) has established a toll-free number for its Hazardous Materials Information Center. The number (1-800-HMR-4922 or 1-800-467-4922) is menu driven when calling from a touchtone phone. Non-touchtone phone and other callers can continue to use the current telephone number (202) 366-4488. Callers will be directed through an automated menu that provides options to obtain assistance on the hazardous materials regulations, to receive recent copies of *Federal Register* publications or training materials, and to report violations of the HMR. Callers needing assistance on questions relating to the hazardous materials regulations will be forwarded to a Hazardous Materials Regulation Information Center after selecting the correct menu item. The Hazardous Materials Information Center is staffed by agency specialists. Calls to the center are handled on a first-call first-answered manner through an automatic stacking system. Callers also have the option of leaving a voice mail message that will be returned within 24 hours. The office of Hazardous Materials Standards anticipates a surge of phone calls as information about the toll-free number is disseminated and has increased the number of specialists staffing the Information Center accordingly.

Environmental Protection Agency
May 19, 1995—60 FR 26828
Hazardous Waste Treatment, Storage, and Disposal Facilities and Hazardous Waste Generators; Organic Air Emission Standards for Tanks, Surface Impoundments, and Containers
Action: Notice of postponed effective date

On December 6, 1994, the U.S. EPA published in the *Federal Register* a final rule setting standards for hazardous waste treatment, storage, and disposal facilities and hazardous waste generators; and organic air

emission standards for tanks, surface impoundments, and containers. At that time, the compliance for the rule was June 5, 1995.

On May 19, 1995, EPA published a notice postponing the effective date until December 6, 1995.

For further information, contact the RCRA Hotline at (800) 424-9346 or (703) 920-9810.

Department of Transportation
Research and Special Programs Administration
May 18, 1995—60 FR 26796
Implementation of the United Nations Recommendations, International Maritime Dangerous Goods Code, and International Civil Aviation Organization's Technical Instructions
Action: Final rule; editorial revisions and response to petitions for reconsideration.

On December 29, 1994, the Department of Transportation's Research and Special Programs Administration (RSPA) published a final rule which amended the hazardous materials regulations to maintain alignment with corresponding provisions of international standards. Recent changes to the International Maritime Dangerous Goods Code (IMDG Code), the International Civil Aviation Organization's Technical Instruments for the Safe Transport of Dangerous Goods by Air (ICAO Technical Instructions or ICAO TI), and the United Nations Recommendations on the Transport of Dangerous Goods (UN Recommendations) necessitated amendments to domestic regulations to provide consistency with international transport requirements and to facilitate the transport of hazardous materials in international commerce. This final rule corrects errors in that final rule and responds to petitions for reconsideration.

Of particular interest are the following two sections:

Section 172.402—a footnote to the subsidiary labeling table in paragraph (a) (2) is revised to clarify that only a Class 3 packaging Group III material with a flash point at or above 38°C (100°F) being transported by highway or rail is excepted from the requirement to apply a subsidiary Class 3 label.

Section 173.24—newly adopted provisions in paragraphs (c) (1) and (d) (2), authorizing the use of UN-standard packaging manufactured outside the U.S., are revised to clarify that these packagings are not subject to the specification requirements in Part 178.

The rule is effective October 1, 1995.

For further information, contact Beth Romo or John Gale, Office of Hazardous Materials Standards, RSPA, U.S. DOT, Washington, D.C., (202) 366-4488.

Environmental Protection Agency
May 11, 1995—60 FR 25492
Universal Waste Rule (Hazardous Waste Management System; Modification of the Hazardous Waste Recycling Program)
Action: Final rule

The U.S. EPA is promulgating a final rule streamlining universal waste management regulations. This final rule is similar to regulations proposed by EPA in February 1993 governing the collection and management of certain widely generated wastes (universal wastes).

The new streamlined hazardous waste regulations are intended to facilitate the environmentally sound collection and increase the proper recycling or treatment of, among other things, certain hazardous waste pesticides. Because current RCRA regulations have been an impediment to national collection and recycling campaigns for these wastes, the new rule will ease the regulatory burden on retail stores and others that wish to collect or generate these wastes.

The rule will serve as a prototype system to which EPA may add other similar wastes in the future. A petition process is also included through which additional wastes could be added to the universal waste regulations in the future. The rule went into effect on May 11, 1995.

For further information, contact the RCRA Hotline at (800) 424-9346. In Washington, D.C. metropolitan area, call (703) 412-9810.

Clean Water Act Passes House; Clinton Threatens Veto—The Clean Water Act Amendments of 1995, H.R. 961, passed the full House on May 16. During floor debate, several amendments seeking to eliminate regulatory reform provisions were defeated. The legislation seeks to ease some fundamental anti-pollution mandates in response to complaints from businesses, states and localities that the law has lead to overly burdensome and expensive requirements. The bill is broad in nature and authorizes over $2 billion annually for state water quality projects.

While House Republicans were triumphant in their efforts to keep Democratic amendments at bay, efforts in the Senate will not be so easy. Senator John Chafee (R-RI), Chairman of the Environment and Public Works Committee, is not inclined to address such a broad Clean Water bill. Departing from his Republican colleagues, the chairman prefers a Clean Water Act reauthorization that addresses a limited number of issues, specifically nonpoint sources of pollutants, stormwater discharges, wetlands protection and funding for treatment system construction. Other committee members as well as the Republican leadership support the House bill.

Meanwhile President Clinton has threatened to veto the current version of H.R. 961. In a statement released shortly after passage of the bill, Clinton said that House members "operating with major industry lobbyists have come up with a bill that would roll back a quarter-century of bipartisan progress" in health and environmental protection. Both Houses acknowledge they do not have the requisite number of votes to override a veto.

RCRA Reauthorization Language Offered by EPA—In response to recommendation by a "broad-based stakeholder group," EPA staff have drafted legislative proposals addressing several provisions of the Resource Conservation and Recovery Act (RCRA).

The group had identified certain aspects of RCRA as costly with minimal environmental benefits.

Targeted for reform in the draft proposals are changes to RCRA's corrective action rules, hazardous waste recycling regulations, land disposal restrictions, and RCRA's integration with other environmental statutes. EPA is quick to point out that the draft proposals are not intended to reflect EPA-endorsed options but rather are approaches that received significant interest by the dialogue group.

EPA expects to release additional legislative language before July 15 for any additional topics receiving a high level of interest from stakeholder.

Agreement on Regulatory Reform Legislation Sought—For the last several weeks, Senate Republicans have been trying to win the support of Senator Bennett Johnston (D-LA) for an omnibus regulatory reform bill that would impose new risk assessment and cost benefit requirements on federal agencies, requiring regulators to justify the costs of their rules with potential

benefits. Senator Johnston is seen as crucial to the Republican initiative, reportedly carrying eight to ten Democratic votes. Should the bill get to the floor, those votes could be the ones to sustain a potential filibuster.

Senator Johnston lead the charge for similar regulatory reform legislation during the last Congress. He has balked this year at several versions of the current legislation raising concerns that the bill leaves far too much room for parties to challenge rules in court.

Johnston had indicated a few weeks ago that a tentative agreement with Majority Leader Robert Dole (R-KS) on two key provisions had been reached; the extent to which agency risk decisions would be subject to judicial review, and the interaction of new risk and cost/benefit requirements with existing statutes which require technology-based rules. However, in Johnston's quest to "strengthen" the bill's judicial review process, the agreement appeared to be unraveling as new draft language was continually submitted and rejected.

Small Businesses Gets Regulatory Boost Under New Legislation— Legislation that would give small businesses a louder voice in EPA's rulemaking process was introduced June 13 by Senators Peter Domenici (R-NM) and Christopher Bond (R-MO).

S. 917, the Small Business Advocacy Act, would require the agency to establish a panel to make recommendations for all major agency regulations. The panel would be chaired by a senior executive service employee and would include three representatives from the small business community, a representative from both the office of Information and Regulatory Management and the Small Business Administration, and three agency staff responsible for drafting the regulations.

The panel would have 45 days to develop all recommendations on EPA regulations, and would require EPA to employ a contractor to survey a cross-section of the small business community that would be affected by the regulation.

States Proposed Legislation and Regulations

Alabama

Lead—AL H. 296 (Johnson) authorizes the development of an indoor lead hazard reduction program and requires the certification of persons engaged in lead abatement. On May 11, the House Committee on Health released the bill with revisions.

Arizona

Hazardous Materials Transportation (Regulation)—A proposed rule issued by the Arizona Department of Transportation (DOT) would incorporate federal standards for the transportation of hazardous materials, substances, and waste. Comments are due July 3, 1995. Contact Randall Ramsey, DOT, (602) 255-7737.

California

General Rulemaking Information (Notice)—The California Office of Administrative Law (OAL) has issued a 1995 rulemaking calendar which lists the regulatory activities of all state agencies, including dates for proposed rulemaking notices, hearings, and final adoptions. Contact OAL, (916) 323-6225.

Lead (Regulation)—A final rule of the California Department of Health Services (DHS) requires the accreditation of providers of lead-related construction training and interim certification of trained and qualified individuals engaged in lead-related construction activities. The rule became effective April 5, 1995. Contact Ron Wetherall, DHS, (916) 657-0692.

Packaging—CA S. 605 (Mello) exempts rigid plastic packaging containers which are manufactured for use in the shipment of hazardous materials from specific sales requirements. The bill was approved by the Senate on May 11 and is currently under consideration by the Assembly Committee on Appropriations.

Colorado

Air Quality—CO H. 1326 (Schauer) concerns procedures related to the formulation of stationary source air pollution policies by the state. On June 5, the bill was signed by the governor.

CO H. 1336 (Adkins) creates an air quality commission to develop plans for the implementation of national ambient air quality standards within the Denver metropolitan area under the federal Clean Air Act. On May 8, the Senate adopted the Conference Committee version of the bill.

CO S. 110 (Norton) concerns legislative procedures for the approval of state implementation plans and regulations related to air pollution. The bill was signed on May 31.

A final rule of the Colorado Air Quality Control Commission (AQCC) revises the definitions of "volatile organic compound (VOC) liquid" to clarify distinctions between various volatile organic liquids. In addition, the rule also details the applicability of the general provisions for the storage and transfer of VOCs. The rule went into effect May 30, 1995. Contact AQCC, (303) 692-3180.

Connecticut

Air Quality—CT H. 6614 (Committee on Environment) requires public hearings on certain air pollution permits and penalties for violations of air pollution control laws. The legislation has passed both the House and the Senate as of May 30.

A final rule of the Connecticut Department of Environmental Protection (DEP) amends regulations concerning the control of emissions from the coating of miscellaneous metal parts and products. Among other things, the rule permits the use of high performance architectural aluminum coatings that meet certain industry specifications. The rule became effective March 1, 1995. Contact Susan March, DEP, (203) 424-3027.

Household Hazardous Waste—CT S. 849 (Peters) allows municipalities to provide for a temporary storage site for house paint to discourage the illegal disposal of paint. The legislation was released from the Joint Committee on Planning and Development on May 12 with a favorable recommendation.

Lead—CT H. 5974 (Knopp) authorizes the use of encapsulation products which have been approved by Massachusetts or by the U.S. EPA. On June 2, the bill passed the Senate.

CT H. 6845 (Committee on Housing) extends the eligibility period for emergency housing when families have a child who has been determined to have an unsafe level of lead and is undergoing lead chelation

treatment. The bill passed the House on May 16 and the Senate on June 1.

Toxics-in-Packaging—CT H. 6880 (Committee on Environment) amends toxics in packaging laws to exclude the following: packaging to which lead, cadmium, mercury, or hexavalent chromium have been added in the manufacturing or distribution process for which there is no feasible alternative; packaging that exceeds contaminant levels provided the product is regulated under certain state and federal regulations; and packaging that is reusable provided that the manufacturer petitions and is granted such an exemption. The governor signed the bill on May 22.

Florida

Graffiti—FL S. 520 (Diaz-Balart) requires that the court revoke or suspend issuance of a minor's driving privilege if the minor is convicted of placing graffiti on public or private property. The bill became law without the governor's signature on May 9.

Illinois

Air Quality—IL S. 461 (Karpiel and Mahar) amends provisions concerning the Clean Air Act permit program. The bill was sent to the governor for signature on May 24.

The Illinois Pollution Control Board (PCB) proposed updating the definition of volatile organic material (VOM) to conform with the federal definition of VOC. The proposal would, among other things, add one compound (para-chlorobenzotrifluoride) and a class of compounds (cyclic branched or linear completely methylated siloxanes) to the list of chemicals that are exempted from the definition of VOM and from regulation for the control of ozone precursors. Contact Michael McCambridge, PCB, (312) 814-6924.

Lead—IL H. 2330 (Zickus and Lyons) provides that physicians shall screen children through 6 years of age for lead poisoning who live in high risk areas. The House approved Senate revisions of the bill on May 25.

Indiana

Air Quality (Regulation)—The Indiana Department of Environmental Management (DEM) plans to adopt regulations which would limit VOC emissions from shipbuilding and ship repair operations in specific counties. Contact Patricia Troth, DEM, (317) 233-5681.

Kansas

Environmental Compliance—KS S. 76 (Committee on Energy) establishes procedures for voluntary environmental audits. The governor signed the bill on April 22.

Kentucky

Air Quality (Regulation)—The Kentucky Department of Environmental Protection (DEP) adopted a final regulation which modifies the definition of VOCs used throughout the air quality standards in order to remain consistent with the federal definition. The rule became effective April 6, 1995. Contact John Hornback, DEP, (502) 573-3382.

Louisiana

Air Quality (Regulation)—The Louisiana Department of Environmental Quality (DEQ) adopted a final rule regulating VOC emissions from reactor processes and distillation operations in the synthetic organic chemical industry, batch chemical processes, and cleanup solvent operations. The rule establishes control requirements for the affected processes, adopts standards for measuring emissions and flow rates, and specifies recordkeeping and reporting requirements. The rule became effective April 20, 1995. Contact Patsy Deaville, DEQ, (504) 765-0399.

Lead—LA H. 1442 (S.H. Theriot) makes changes in lead hazard reduction, licensure, and certification programs. The bill was released on May 23 from the Senate Committee on Environmental Quality with a favorable recommendation.

LA H. 1838 (Flournoy) requires the establishment of a statewide program for the prevention and treatment of lead poisoning. On June 11, the bill was sent to the governor.

Maine

Automotive Refinishing—ME S. 492 (Bustin) requires that automobile refinishing facilities be located outside residential zones and at least 300 feet from any home, that all coating and refinishing operations take place in a completely enclosed building and that the state enforce VOC and hazardous air pollutants emission standards for such facilities. The bill was released from the Joint Committee on Natural Resources on May 25 with an unfavorable report.

Lead—ME H. 560 (Daggett) establishes the Lead Poisoning Fund for the purpose of providing low-interest loans for lead paint abatement and chelation treatments. A section of this bill which would have imposed a tax on the sale of paint has been removed. On June 1, the Joint Committee on Human Resources released the bill with an unfavorable recommendation.

ME H. 1069 (E. Mitchell) requires the maintenance of a central registry of information from health-care facilities on lead poisoning; limits the award of damages for all losses involving lead poisoning to $250,000; and establishes lead warning requirements on the sale of paint and related items. Introduced on May 4, the legislation was sent to the Joint Committee on Human Resources.

Packaging—ME H. 411 (Volenik) repeals the sales tax exemption for sales of packaging materials. On May 4, the bill was released from the Joint Committee on Taxation with an unfavorable report.

Toxics-in-Packaging—ME H. 766 (Gould) amends the toxics-in-packaging law consistent with revisions endorsed by the Coalition of Northeastern Governors' Source Reduction Task Force. The bill was signed by the governor on May 31.

Maryland

Air Quality (Regulation)—The Maryland Department of the Environment (DOE) adopted final regulations which incorporate by reference federal requirements concerning emissions increases for particulate matter. The rule is effective May 8, 1995. Contact Deanna Miles-Brown, DOE, (410) 631-3173.

A final rule of the Maryland DOE adopts regulations which allow batch-type hot dip galvanizing installations to use emissions control devices instead of meeting certain flux limitations. This rule, which will be submitted to the federal EPA as part of the state implementation plan revision, became effective May 8, 1995. Contact Deanna Miles-Brown, DOE, (410) 631-3173.

Final rules of the Maryland DOE amend regulations to expand reasonably available control technology (RACT) requirements to include point sources in serious non-attainment areas which have VOC emissions of 25 tons per year or more and set compliance dates for such sources. The rules, which will be submitted to the federal EPA as part of the state implementation plan

revision, became effective May 8, 1995. Contact Deanna Miles-Brown, DOE, (410) 631-3173.

Automotive Refinishing (Regulation)—A final rule of the Maryland DOE establishes reasonable control measures for automotive and other vehicle refinishing operations, including the use of lower VOC content coatings, improved application methods, and improved cleanup methods. The rule, which will be submitted to the federal EPA as part of the state implementation plan revision, became effective May 22, 1995. Contact Deanna Miles-Brown, DOE, (410) 641-3173.

Environmental Regulations—The Maryland DOE has announced the availability of evaluation reports which review the clarity, effectiveness, and simplicity of existing environmental regulations concerning air quality and hazardous materials. Contact Deanna Miles-Brown, DOE, (410) 631-3173.

Lead—MD H. 1238 (Guns) establishes lead hazard reduction grant and loan programs. The governor signed the legislation on May 9.

Occupational Safety and Health—MD H. 259 (Barve) prohibits the assessment of a civil penalty against an employer who receives a citation for certain occupational safety and health violations if the violation is a nonserious first violation, is identified during a first inspection, and the employer corrects the violation within 30 days. The governor vetoed the legislation on May 24.

MD H. 1236 (Busch) requires an employer to report within eight hours an accident that results in the death of an employee or the hospitalization of three or more employees. The legislation was signed into law by the governor on May 9.

Massachusetts

Toxic Substances (Regulation)—The Massachusetts Administrative Council on Toxics Use Reduction (ACTUR) proposed amending its regulations to revise the list of toxic or hazardous substances used for reporting purposes under the state's Toxics Use Reduction Act. Contact Gina McCarthy, Executive Office of Environmental Affairs, (617) 727-9800.

Minnesota

Environmental Compliance—MN H. 1479 (Long), among other things, modifies procedures relating to the voluntary investigation and cleanup program; requires the adoption of rules to determine appropriate cleanup standards for voluntary response action plans; and sets up a pilot project to promote voluntary compliance with environmental requirements. The governor signed the legislation on May 17.

Lead—MN S. 801 (Berglin) requires statewide lead surveillance system and reporting, sets lab and inspection standards, specifies obligations of property owners under lead orders, and establishes license and certification standards for lead contractors and inspectors. On May 25, the legislation was signed by the governor.

Toxics-in-Products—MN S. 462 (J. Johnson) among other things, extends the deadline one year for manufacturers to comply with the state's ban on the intentional introduction of lead, cadmium, mercury or hexavalent chromium into products. This extension only applies to manufacturers who previously submitted a request for an exemption. The bill was signed by the governor on June 1.

MN S. 1778 (Stevens) repeals the toxics-in-products law prohibiting the distribution of certain materials containing lead, cadmium, mercury, or hexavalent chromium. Introduced on May 22, the bill was referred to the Senate Committee on Environment and Natural Resources.

Nevada

Air Quality—NV S. 247 (Committee on Natural Resources) authorizes the establishment of a program for the receipt and exchange of credits to reduce and control air pollution, and the adoption of regulations which are consistent with the Federal Clean Air Act. The bill was approved by the Assembly on May 17 and was sent to the Assembly Committee on Natural Resources, Agriculture and Mining.

New Hampshire

Lead—NH S. 25 (Lovejoy) relates to the case management by the state in lead paint poisoning cases. On May 25, the governor signed the legislation.

NH S. 54 (Wheeler) relates to lead paint. The governor signed the legislation on June 1.

NH S. 156 (Roberge and Lovejoy) relates to lead paint and poisoning prevention and control. On June 6, both the House and Senate approved an amended version of the bill.

New Jersey

Air Quality (Regulation)—A final rule of the New Jersey Department of Environmental Protection (DEP) (1) modifies the definition of "source operation"; (2) revises the method for calculating annual emissions from VOC transfer operations; (3) extends the applicability of such operational standards to certain tanks other than storage tanks; (4) exempts permitted sources from the demonstration requirement under certain conditions; and (5) amends the applicability threshold for chemical plants for implementing leak detection and repair programs. The rule became operative June 19, 1995. Contact Janis Hoagland, DEP, (609) 292-0716.

New York

Lead—NY A. 70 (Clark) increases the penalty for the failure to comply with a notice and demand for the discontinuance of a paint condition conducive to lead poisoning to $5,000. The legislation was approved by the Assembly on May 15 and sent to the Senate Committee on Rules.

NY S. 4914 (Galiber) requires that clinical laboratories provide a parent of a child with information on lead poisoning prevention whenever examining specimens of a child six years of age or under and implements a program of public service announcements concerning the hazards of lead paint. The bill, which was introduced on May 3, was sent to the Senate Committee on Health.

North Carolina

Community Right-to-Know (Regulation)—The North Carolina Department of Labor (DOL) has announced its intent to adopt regulations to implement the Hazardous Chemicals Right-to-Know Act. The proposal would establish a list of hazardous substances, specify labeling requirements, and set forth requirements regarding emergency information, exemptions, and the protection of trade secrets relating to hazardous substances. The proposed action is set to be effective on January 1, 1996. Contact Jill Cramer, DOL, (919) 733-3900.

Recycling—NC H. 1066 (Luebke) imposes a disposal tax on containers that fail to recycle sufficiently. Introduced on May 15, the bill was referred to the House Committee on Business and Labor.

Oregon

Lead—OR H. 2971 (Repine) establishes lead-based paint activities programs to conform to federal law including training, licensing and registration programs for persons who engage in lead-based paint activities. The bill passed the House on May 25 and the Senate on May 31.

Packaging—OR S. 949 (Committee on Agriculture) exempts manufacturers from recordkeeping requirements relating to rigid plastic containers if records relate solely to rigid plastic containers which are recycled at a rate equal to or exceeding 25%. The Senate approved the amended Conference Committee version of the bill on June 7.

OR S. 950 (Committee on Agriculture) exempts rigid plastic containers containing hazardous material from recycling or reuse requirements. On May 26, the Senate concurred with House amendments to the bill; however, the governor has threatened to veto the legislation.

Rhode Island

Environmental Marketing—RI H. 6020 (Henseler) requires that accurate and useful information about the environmental impact of products and packages be made available to consumers and prohibits a person from making any untruthful, deceptive or misleading environmental marketing claims about a product or package. The Senate approved the bill on June 7.

Spray Paint Restrictions—RI S. 403 (Palazzo) prohibits minors from purchasing spray paint; requires sellers of spray paint to ask for a purchaser's license for proof of age; and requires sellers to place spray paint in a glass case under lock and key. On May 19, the House Judiciary Committee released the bill with an unfavorable recommendation.

Tennessee

Occupational Safety and Health (Regulation)—A proposal of the Tennessee Department of Labor (DOL) would incorporate by reference amendments to the federal general industry hazard communication standard. The rule is proposed to be effective July 28, 1995. Contact DOL, (615) 741-7151.

Texas

Air Quality—TX S. 1126 (Nixon) relates to the definition of modification of existing facility under the Texas Clean Air Act. The legislation was signed by the governor on May 23.

Environmental Compliance—TX H. 2473 (Chisum) encourages voluntary compliance with environmental and occupational health and safety laws through the use of environmental or health and safety audits. The legislation was signed by the governor on May 23.

Hazardous Waste (Regulation)—A proposed rule of the Texas Natural Resource Conservation Commission (NRCC) would align the existing due date of March 1 for the source reduction and waste minimization annual report with the federal toxics release inventory (TRI) Form R reporting due date of July 1. Contact Sam Wells, NRCC, (512) 239-1441.

Lead—TX S. 269 (Truan) relates to the identification of children suffering from lead poisoning and to control measures for lead contamination. The bill was released on May 8 from the House Committee on Public Health with a favorable recommendation.

TX S. 544 (Turan) relates to the regulation of lead-based paint activities and hazards. On June 8, the governor signed the bill.

Spray Paint Restrictions—TX S. 707 (Rosson) relates to the accessibility of certain paints to business patrons in specified municipalities. On May 25, both the House and Senate approved amended versions of the bill.

Vermont

Air Quality (Regulation)—A final rule of the Vermont Agency of Natural Resources (ANR) amends existing state regulations and adopts new regulations to require air contaminant sources with the potential to generate 10 tons per year of air pollutants to apply for and obtain an operating permit. The permit establishes monitoring and recordkeeping requirements, and also mandates document compliance with all existing air pollutant requirements. In addition, the rule identifies the source categories which will be required to use reasonably available control technology or pollution prevention techniques to limit the discharge of air contaminants. The rule became effective March 31, 1995. Contact Richard Valentinetti, ANR, (802) 241-3860.

Washington

Air Quality—The Puget Sound Air Pollution Control Agency (PSAPCA) issued a proposal which would incorporate guidelines for evaluating toxic air contaminant emissions into the regulations. Contact Dennis McLerran, PSAPCA, 110 Union St., #500, Seattle, WA 98101.

West Virginia

Air Quality (Regulation)—A final rule of the West Virginia Division of Environmental Protection (DEP) revises requirements for obtaining permits for construction and modification of major stationary sources of air pollution for the prevention of significant deterioration (PSD). The rule incorporates by reference federal requirements which establish maximum allowable emissions increases for particulate matter and also clarifies certain PSD preconstruction review requirements. The rule became effective May 1, 1995. Contact Dale Farley, DEP, (304) 558-4022.

A final rule of the West Virginia DEP adopts regulations which incorporate by reference federal national emission standards for hazardous air pollutants (NESHAP). The regulation defines relevant terms, establishes NESHAP permitting requirements, and incorporates associated reference methods, performance specifications, and test methods. The rule became effective May 1, 1995. Contact Dale Farley, DEP, (304) 558-4022.

Wisconsin

Recycling—WI S. 204 (Lean) authorizes the sale of by-products of paint from prison industry recycling operations in the open market. Introduced on May 16, the legislation was sent to the Senate Committee on State Government Operations and Corrections.

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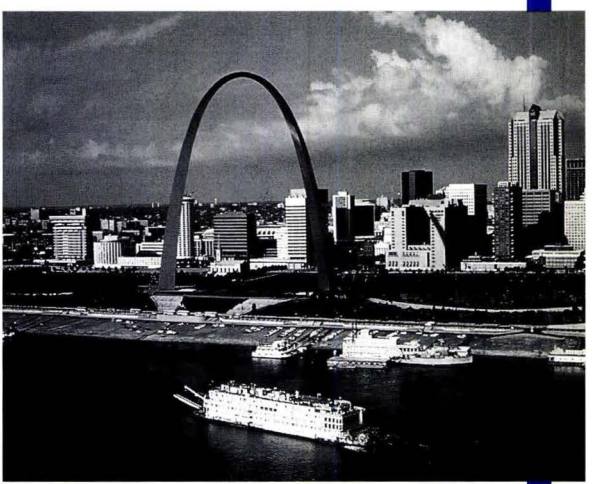

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The combined Annual Meeting and Paint Industries' Show, to be held at the St. Louis Cervantes Convention Center, is a major educational activity of the Federation of Societies for Coatings Technology. This international coatings manufacturing industry event consists of three days of technical program sessions and exhibits, running concurrently.

Registration is required for admission.

From the FSCT President:

"Opportunities Abound!" was the call from St. Louis to the American pioneers who ventured from this city on the Mississippi River to settle the early frontier. No less today, this message echoes to the pioneers of the Coatings Industry who will find opportunities in the "Gateway City" at the FSCT's 73rd Annual Meeting and 60th Paint Industries' Show.

The newly expanded and remodeled Cervantes Convention Center will serve as the backdrop for both a technical program addressing the breadth and scope of the industry, and an exhibition featuring a multitude of products and services. With the theme "Creativity + Adaptability = Gateway to Success," the FSCT event will feature a variety of dynamic topics that will open the door to improved productivity.

We invite you to join thousands of your fellow colleagues from around the world and learn of the new and exciting things happening in today's Coatings Industry. Review the program and make your plans now to venture to St. Louis, your "Gateway to Success."

Joseph P. Walton
President, FSCT

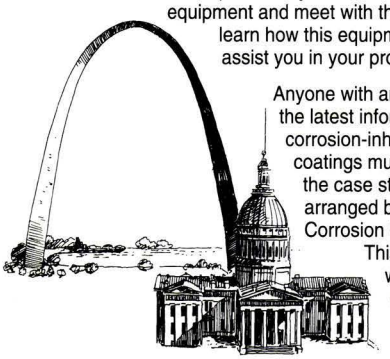
Creativity + Adaptability = Gateway to Success

Success starts with a vision. A vision for the coatings industry must include the creative use of all available technologies. Only by expanding one's knowledge of new and parallel technologies can industry practitioners adapt to the ever-changing requirements of the marketplace. Above all else, education is the key that unlocks the "Gateway to Success."

With this in mind, the 1995 FSCT Annual Meeting Technical Program will provide attendees with a vast amount of information on a variety of topics pertinent to the industry. In both presentation and information, attendees will find this year's event has the data needed to achieve success in the fast-paced coatings arena.

Four tutorials are scheduled during the event, on topics ranging from adhesives and inks to powder coatings and EB/UV curable coatings. These tutorials are designed to allow attendees to learn about the latest information and where the similarities exist between these disciplines and the more familiar liquid coating technologies. Each of the tutorials will be presented by an industry expert, with ample time available to ask questions on the presented information.

The program will also feature a presentation on Computer Applications in the Coatings Industry. This session includes a report on the benefits of computer use and will also feature hands-on workshops where you can sample the equipment and meet with the experts to learn how this equipment can assist you in your profession.



Anyone with an interest in the latest information on corrosion-inhibitive coatings must attend the case study being arranged by the FSCT Corrosion Committee. This session will feature experts in a panel type setting discussing scenarios related to the best uses of corrosion-inhibiting coatings. Attendees will select the discussion subjects from a series of pre-arranged topics.

The highly popular "Early Bird" sessions will return in 1995. These sessions are one hour in length, focus on specific areas related to the industry and feature one speaker. Early Bird sessions are held on Tuesday, October 10, at 8:00 a.m.

Making the opening of the "Gateway to Success" complete are the Roon Award Papers, the Technical Focus Speaker, the Mattiello Lecture, the APJ/Voss Award Papers and the Manufacturing Committee session. All of these highly attendee favorites will again be held this year.

World's Premier Paint Show Features Over 280 Exhibits

The largest coatings-related exhibition in the world—the FSCT Paint Industries' Show—will be held in conjunction with the Annual Meeting at the Cervantes Convention Center. Over 280 supplier companies to the coatings manufacturing industry will be present to discuss their newest products and services. In over 90,000 sq. ft. of exhibits will be displayed a wide variety of raw materials, production equipment, containers and filling equipment, laboratory apparatus, and testing devices for the paint and coatings producer.

Key personnel from the top technical and sales staff of supplier companies will be available to provide attendees with an opportunity to learn of the latest developments in their products and services.

Exhibit hours will be:

Monday, October 9 ..... 10:30 a.m.-5:00 p.m.
Tuesday, October 10 ..... 9:00 a.m.-5:00 p.m.
Wednesday, October 11 ..... 9:00 a.m.-12:00 Noon

Hotel Information

Whether you desire the value of a moderately priced hotel, or the luxury of an upscale property, the choice is yours. The FSCT has arranged for convention rates at 12 official convention hotels. All reservations must be placed through the FSCT Paint Show Housing Bureau, serviced by Destination, Inc., to obtain the preferred rates. The Housing Bureau will mail an acknowledgment of the reservation and the hotel assigned will then forward a confirmation.

Do it Your Way and Save!

You have the convenience of placing a phone call or faxing your request for hotel accommodations to the FSCT Paint Show Housing Bureau. If you place your request by phone you have the added convenience of scheduling your air travel as well.

Call! 800-243-4019

Have the information requested on the Hotel Reservation Form available before you place your call. Reservationists are available 9:00 a.m. - 5:30 p.m., Monday through Friday, Eastern Time. Reservations will be immediately acknowledged over the phone and also by mail or fax, when fax number is provided International participants, please call 404-584-7458.

Fax! 404-584-0685

Anytime, any day. Fax the Hotel Reservation Form at your convenience. Be sure to include a phone and fax number and retain your copy of the form for your records. Acknowledgments will be sent via fax within three working days of receipt of request.

Mail!

Send your form to the FSCT Paint Show Housing Bureau for processing. Be sure to include a phone and fax number and keep a copy of the form for your records. Your acknowledgment will be mailed or faxed, when a fax number is provided.

To avoid duplication of reservation, please use one reservation method only.

Guarantee

A credit card guarantee, or check for the first night's deposit is required in order to process requests. Checks should be made payable to the hotel selected. Credit card choices include American Express, MasterCard, Visa, or Discover. The credit card will only be charged if the reservation is cancelled within 72 hours of arrival or if the reservation is a no-show.

Deadlines

To obtain the convention rates, reservations must be placed by September 8. Reservations placed after September 8 will be on a space available basis.

Changes/Cancellations

For changes or cancellations, call the FSCT Paint Show Housing Bureau at 800-243-4019 or fax your change to 404-584-0685.

Photo courtesy of St. Louis Convention & Visitors Commission

America's Center, site of the newly remodeled Cervantes Convention Center.

Registration Information

Advance Registration fees include three days' admission to the Paint Industries' Show, the Opening Session, and all concurrent program sessions of the Annual Meeting. To register, complete the Advance Registration Form and forward it with payment to FSCT **by August 30**. Advance Registration prices will be available only for registrations received by **August 30**. Registration options include:

Full Time	Advance	On-Site
FSCT Member	$ 75	$ 90
Non-member	$100	$125
Social Guest	$ 60	$ 70

Registration credentials for U.S. attendees will be mailed in advance, provided the registration form and payment are received by August 30. International attendees may pick up their badges on-site at the Registration Services Area at the Cervantes Convention Center. Badges for all registrations received after August 30 will also be available in the Registration Services Area.

The Registration Area will be open over the following days and times to assist you.

Day	Time
Sun., Oct. 8	8:00 a.m. - 5:00 p.m.
Mon.-Tues., Oct. 9-10	7:30 a.m. - 5:00 p.m.
Wed., Oct. 11	7:30 a.m. - 12 Noon

Method of Payment

Acceptable types of payment include checks in U.S. funds made payable to FSCT, as well as credit cards: VISA, MasterCard, American Express, or Discover. Payment is due with registration form. Forms received without payment will not be processed. Please note: **if payment is made with a credit card, the form may be faxed to FSCT Headquarters Office. If faxing, please do not mail original form.**

Cancellation and Refund Policy

All cancellations must be submitted in writing to the FSCT Headquarters Office. All badges that have been mailed must be returned to FSCT for refund processing. Cancellations received by August 30 will be subject to a $10 handling charge. A $25 charge will apply after that date. Refunds will be issued after October 15.

1995 Paint Show Hotel Summary

Hotel	Room Type and Rates: Single	Double**	Suites: 1 BR	Suites: 2 BR	No. of Restaurants/ Bars	Health Club	Shuttle Service to Conv. Ctr.
*St. Louis Marriott	$113	$113	$250-350	$350-450	2/1	yes	yes
*Adam's Mark	129	139	375-1200	510-1405	2/2	yes	yes
Doubletree Mayfair	110	110	225-400	-	1/1	yes	no
Drury Inn-Arch	94	94	-	-	1/1	no	yes
Drury Inn-Union Station	99	99	120-150	-	1	no	yes
Embassy Suites	107	107	-	-	1/1	yes	yes
Hampton Inn-Union Station	89	89	-	-	1	no	yes
Holiday Inn-Conv. Ctr.	90	90	250-295	275-350	1/1	yes	no
Holiday Inn-Riverfront	89	89	-	-	1	no	yes
Hotel Majestic	114	114	290-375	650	1/1	no	yes
Hyatt Regency-Union Station	119	119	280-300	395-440	2	no	yes
Regal Riverfront	99	99	250-500	375-1000	3/2	yes	yes

Sold Out

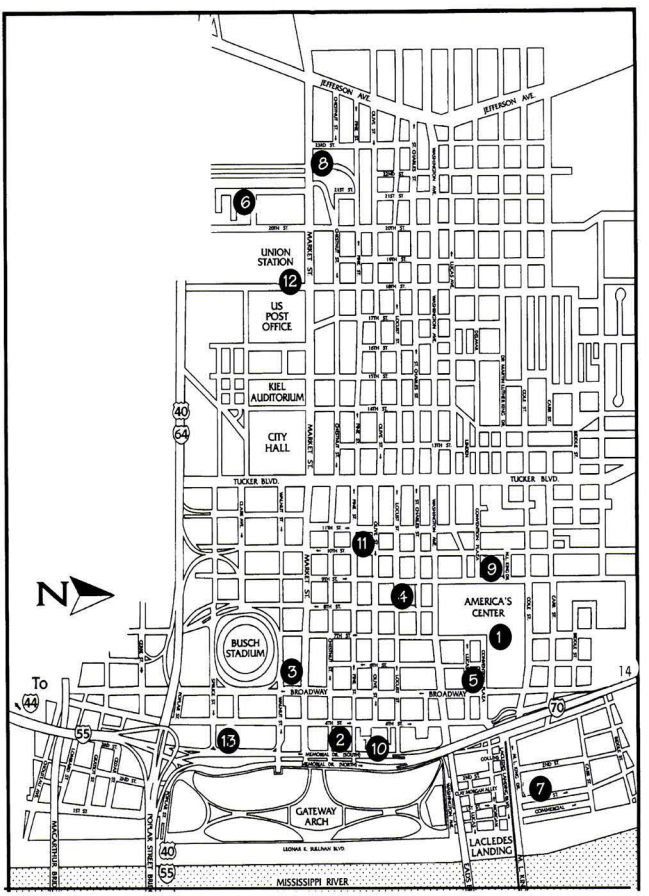
*Marriott and Adam's Mark will be co-headquarters. Guest rooms at both hotels will be limited to 10 per company.
**The Double rate applies to Double/Double room type as well.

Legend

1 America Center (Cervantes Convention Center)
2 Adam's Mark (Co-Hq.)*
3 Marriott's Pavilion (Co-Hq.)*
4 Doubletree Mayfair Suites*
5 Drury Inn-Gateway Arch
6 Drury Inn-Union Station
7 Embassy Suites*
8 Hampton Inn-Union Station*
9 Holiday Inn-Convention Center*
10 Holiday Inn-Riverfront
11 Hotel Majestic*
12 Hyatt Regency
13 Regal Riverfront*

*Sold Out

Additional Hotels Available!



St. Louis Hotel Reservation Form

73rd Annual Meeting & 60th Paint Industries' Show
FSCT 1995
Cervantes Convention Center
St. Louis, MO
October 9-10-11, 1995

MAIL FORM:

FSCT Housing
Destination, Inc.
240 Peachtree St., Ste. 13A11
Atlanta, GA 30303

PHONE/FAX:

(800) 243-4019 Continental U.S. and Canada
(404) 584-7458 International
FAX: (404) 584-0685

HOTEL PREFERENCE

List the hotels of your preference. First choice will be assigned if available. List other preferences to avoid delay. If your first choice is not available, your deposit will be applied to your next available choice. **The deadline is September 8.**

(1) _____ Hotel

(2) _____ Hotel

(3) _____ Hotel

RESERVATION REQUEST

Number of rooms requested ☐

Names of Occupants	Room Type	Arrival	Departure
	❑ single ❑ dbl/dbl ❑ double ❑ suite __(BR)		
	❑ single ❑ dbl/dbl ❑ double ❑ suite __(BR)		
	❑ single ❑ dbl/dbl ❑ double ❑ suite __(BR)		
	❑ single ❑ dbl/dbl ❑ double ❑ suite __(BR)		
	❑ single ❑ dbl/dbl ❑ double ❑ suite __(BR)		

* Room Type: single (1 person, 1 bed); double (2 people, 1 bed); double/double (2 people, 2 beds); suite (1 or 2 bedrooms (BR) plus parlor).

For additional reservation requests, feel free to copy this form.

Requests for the Marriott and Adam's Mark will be limited to 10 rooms per company.

Guarantee

A credit card guarantee, or check for one night's deposit, is required for processing requests. Credit cards will be billed only if the reservation is cancelled within 72 hours or if the reservation is a no-show.

Credit Card: ☐ AMEX ☐MasterCard ☐ VISA ☐ Discover

Cardholder's Signature: _____

_____ Card Number

_____ Expiration Date

_____ Print Cardholder's Name

DIRECT CONFIRMATIONS TO:

Name: _____ Telephone: _____

Company: _____ FAX: _____

Address: _____

City/State (Province): _____ Zip Code (Mailing Code): _____

Country (if other than U.S.): _____

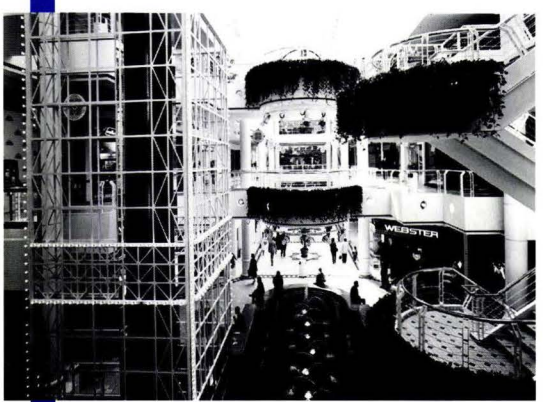
If requested accommodations are not available, the reservationists will call for further information. We cannot guarantee that the accommodations will be assigned to your preferred hotels.

☐ _____ requires special assistance. Please call: _____

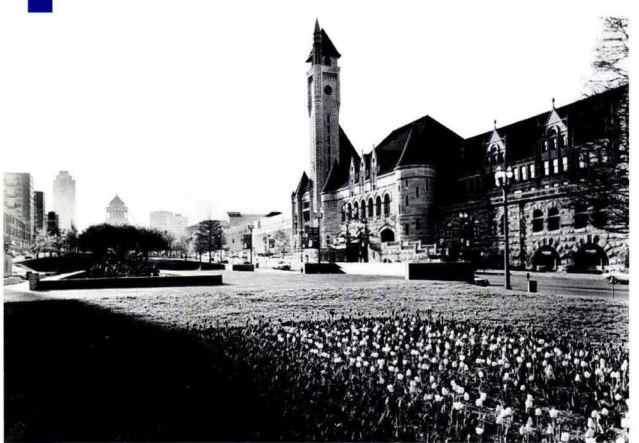
Name

Phone Number

The new Educational and Discovery Center adds a high-tech dimension to the world-class St. Louis Zoo in Forest Park.



More than 100 stores on four levels await shoppers at St. Louis Centre, America's largest enclosed urban shopping mall, located in downtown St. Louis.



St. Louis Union Station, built in 1894, has become an exciting festival marketplace and popular attraction for visitors.

Slash Air Fare Expense

Convention discounts are available on TWA and United Airlines. Contact the FSCT Travel Desk:

FSCT Travel Desk: mention Paint Show

Domestic U.S. 800-448-FSCT
International 215-628-2549
Fax: 215-628-0310

Airport & City Transportation

From Lambert-St. Louis International:
Airport shuttle (service to downtown hotels, provided by Airport Express) is $8.00 one way or $14.00 round trip. The shuttle may be boarded by the baggage claim area. The trip takes approximately 30 minutes.

Taxi Service from the airport to downtown hotels is a flat rate of $18.00. For a second passenger, add $1.00; for a third passenger, add $2.00.

In addition, transportation from the airport to downtown St. Louis may be made on the Metrolink, a new light rail system which charges only $1.00. The trip takes approximately 30 minutes.

FSCT Industry Luncheon

The Federation's Industry/Awards Luncheon will be held on Tuesday, October 10. Luncheon tickets can be purchased in advance or on-site at $25.00 each.

Social Guest Program

The activities arranged for Social Guests (formerly referred to as Spouses) begin on Monday, October 9, with a Welcome Social at the Adam's Mark.

On Tuesday, following a continental breakfast at the Adam's Mark, Social Guests will depart on deluxe motorcoaches for a visit to St. Charles, the oldest city on the Missouri River and the first capital of Missouri. After a guided tour of the historic area by motorcoach, participants will have an opportunity to stroll the streets and visit the many types of shops located throughout the area.

From St. Charles, the tour travels to the Randall Gallery where lunch will be served. Originally used for supply storage during the Civil War, the renovated building offers a unique setting for the many pieces of art displayed there.

Following lunch, participants will visit Forest Park, site of the 1904 World's Fair and home to the Art Museum, St. Louis Science Center, and History Museum, as well as other points of interest. Participants will have their choice of which attraction to visit.

Social guest registration includes admission to the Welcome Social, continental breakfast, tour, and luncheon.

1995 Advance Registration

FSCT Annual Meeting & Paint Industries' Show

St. Louis, MO • October 9-11, 1995
DEADLINE—AUGUST 30

Registration credentials for U.S. registrants will be mailed to the address noted if received at FSCT Headquarters by **August 30**.

If received after that date, they may be picked up on-site at the Cervantes Convention Center.

International registrations will be available on-site.

INDUSTRY ATTENDEE BADGE INFORMATION:

(How your badge will read and where it will be mailed)

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.

SOCIAL GUEST BADGE INFORMATION:

(Will be mailed to industry attendee)

FIRST NAME (nickname)

FIRST NAME LAST NAME

CITY STATE/PROV.

COUNTRY (OTHER THAN U.S.)

BUSINESS CLASSIFICATION DATA FOR INDUSTRY ATTENDEE:

YOUR COMPANY (CHECK ONE ONLY)

- A ❑ Manufacturers of Paints, Varnishes, Lacquers, Printing Inks, Sealants, Adhesives
- B ❑ Manufacturers of Raw Materials
- C ❑ Manufacturers of Equipment and Containers
- D ❑ Sales Agents for Raw Materials and Equipment
- E ❑ Government Agency
- F ❑ Research/Testing/Consulting
- G ❑ Educational Institution/ Library
- H ❑ Paint Consumer
- Y ❑ Environmental Services
- J ❑ Other

YOUR POSITION (CHECK ONE ONLY)

- K ❑ Management/Adm.
- L ❑ Mfg. & Engineering
- M ❑ Quality Control
- N ❑ Research & Development
- P ❑ Technical Sales Service
- Q ❑ Sales & Marketing
- R ❑ Consultant
- S ❑ Educator/Student/Librarian
- T ❑ Other

Registration Fees:

1	❑ FSCT Member FSCT Society _____	$75.00
2	❑ Non-Member	$100.00
4	❑ Social Guest	$60.00
7	❑ Special Fee for Retired Member	$25.00
8	❑ Special Fee for Social Guest of Retired Member	$25.00
24	❑ Student	$25.00

FSCT Industry Luncheon Tickets: (Tues., Oct. 10)

❑ NUMBER REQUIRED: _____
$25 EACH

Method of Payment:

Payment is due with registration form.
We are pleased to accept faxes for credit card payment only.

Total Amount Due $_____

Please Check One:

❑ Enclosed is Check # _____
payable in U.S. Funds to FSCT

❑ Charge to the following card:

___AMEX ___VISA ___MC ___DIS

Card No.

Expiration Date: ___ ___ Mo. Yr.

Signature (credit card registrations only)

Please print cardholder's name

All U.S. registrations received **by August 30** will be processed and registration credentials will be mailed to the address provided. Registration materials for international attendees and all registrations received after August 30 will be processed and can be picked up at the Paint Show Registration Services Area. A $10 charge will be made for cancellations received prior to August 30. A $25 charge will be made for cancellations received after that date.

Mail completed form to:

FSCT ◆ 492 Norristown Rd. ◆ Blue Bell, PA 19422-2350 ◆ (610) 940-0777

(For credit card registrations only—**FAX: 610-940-0292**—do not mail original)

1995 Paint Industries' Show List of Exhibitors
(As of 6/16/95)

Aceto Corp.
ACS/Member Services
ACT Laboratories, Inc.
Advanced Software Designs
AI Process Systems Ltd.
Air Products & Chemicals, Inc.
Air Quality Sciences, Inc.
Air Technologies, Inc.
Akzo Nobel Chemicals & Akzo Nobel Resins
Alar Engineering Corp.
Alcan Toyo America, Inc.
Alcoa Industrial Chemicals
AlliedSignal Corp.
Allied Colloids
Alnor Oil Co.
American Paint & Coatings J.
Amoco Chemicals
ANGUS Chemical Co.
Anker Labelers USA Inc.
Aqualon
Arco Chemical Co.
Ashland Chemical, Inc.
Atlas Electric Devices
Aztec Peroxides, Inc.

B.A.G. Corp.
BASF Corp.
BatchMaster Software, Inc.
Bayer Corp.
Bohlin Instruments, Inc.
Bowers Process Equipment Inc.
Brookfield Engineering Lab.
Brookhaven Instruments Co.
George Brown College
Buckman Laboratories
Buhler Inc.
Bulkcon Systems Intl. USA Ltd
Burgess Pigment Co.
BYK-Chemie USA
BYK-Gardner, Inc.

Cabot Corp./CAB-O-Sil & Special Blacks Divs.
Caframo Ltd.
Calgon Corp.
Cardolite Corp.
CB Mills, Div. Chicago Boiler Co.
CCP Polymers
Celite Corp.
Center for Applied Eng. Inc.
C&E News/ACS
CIBA-GEIGY Corp.
Ciba Additives, Ciba Polymers, Ciba Resins
Cimbar Performance Minerals
CMI International
The Coatings Laboratory Inc.
Coatings Magazine
Color Communications, Inc.
Color Corp.
Color Tec Associates
Consolidated Research Inc.
Cortec Corp.
Coulter Corp., Scientific Inst.
CR Minerals Corp.
Crosfield Co.
CYTEC Industries Inc.

D/L Laboratories
Daniel Products Co., Inc.
Datacolor International
Day-Glo Color Corp.
Degussa Corp.
University of Detroit-Mercy

J. De Vree & Co. N.V.
Disti-Kleen, Inc.
Dominion Colour Corp.
Dow Chemical Co.
Dow Corning Corp.
Draiswerke, Inc.
Drew Industrial Division-Ashland
Dry Branch Kaolin Co.
DSA Consulting, Inc.
DSM Resins U.S., Inc.
DuPont Nylon Inter. & Spec.

Eastern Michigan University
Eastman Chemical Co.
Ebonex Corp.
Eiger Machinery, Inc.
Elcometer, Inc.
Elf Atochem North America, Inc.
EM Industries, Inc.
Engelhard Corp.
Engineered Polymer Solutions
Epworth Mfg Co., Inc.
ERO/Goodrich Forest Prods., Inc.
Etna Prods. Inc., Spec. Chem. Div.
European Coatings Journal
Exxon Chemical Co.

Fanuc Robotics North America
Fawcett Co., Inc.
Federation of Societies for Coatings Technology
Filter Specialists, Inc.
Fischer Technology, Inc.
Fluid Management
FMJ International Publications Ltd.
Fuji Silysia Chemical Ltd.
H.B. Fuller Co.

Paul N. Gardner Co., Inc.
Georgia Pacific Resins, Inc.
BFGoodrich Co., Spec. Chems.
Goodyear Tire & Rubber Co., Chemical Div.
Guertin Polymers

Haake, Inc.
The C.P. Hall Co.
Halox
Harcros Pigments Inc.
Heraeus DSET Laboratories, Inc.
Heucotech Ltd.
Hickson Specialities, Inc.
Hilton Davis Co.
Hockmeyer Equipment Corp.
Hoechst Celanese Corp.
Hoover Materials Hand. Group
Horiba Instruments Inc.
J.M. Huber Corp.
Hüls America, Inc.
Hunterlab
Huntsman Corp.

Ideal Manufacturing & Sales Corp.
IKA Works
INDCO, Inc.
Industrial CoPolymers Ltd.
Industrial Paint & Powd. Mag.
Inmark, Inc.
Intl. Compliance Center Ltd.
International Specialty Prod.
ITT Marlow Pumps/ITT A-CPumps

S.C. Johnson Polymers

Kady International
Kemira Pigments, Inc
Kenrich Petrochemicals, Inc.
King Industries, Inc.
KTA-Tator, Inc.

Labsphere, Inc.
LaQue Center , Kure Beach Atmospheric Testing
Lawter International
The Leneta Co.
Liquid Controls Corp.
Littleford Day Inc.
Longview Fibre Co.
The Lubrizol Corp.
Lucas Meyer, Inc.
Luzenac America

3M/Zeelan Industries, Inc.
3M, Specialty Chem Division
MacBeth, Div. of Kollmorgen
Magnesium Elektron, Inc.
Malvern Instruments
Malvern Minerals Co.
McWhorter Technologies, Inc.
The Mearl Corp.
Micro Powders, Inc.
Micromeritics
Mid-States Eng & Mfg Co.
Millipore Corp.
Milwhite, Inc.
Mineral Pigments Corp.
MiniFIBERS, Inc.
Minolta Corp.
Mississippi Lime Co.
University of Missouri-Rolla
Modern Paint & Coatings
Morehouse-Cowles, Inc.
Morton International - UCD
Myers Engineering

Nacan Products Limited
Nametre Co.
National Paint & Coatings Assoc.
Netzsch Incorporated
Neupak Inc.
New Way Packaging Mach. Inc.
North Dakota State University

Obron Atlantic Corp.
Ohio Polychemical Co.
Olin Chemicals
Omnimark Instrument Corp.
OSi Specialities, Inc.
Oxy Chem

Paar Physica USA, Inc.
Paint & Ctgs Ind. Magazine
Parker Hannifin Corp.
Peninsula Polymers
Phenoxy Associates
Polar Minerals
Polyesther Corp.
Poly-Resyn, Inc.
PPG Industries, Inc., Specialty Chemicals Group
P Q Corp./Potters Industries
Precision Dispensing
Premier Mill Corp.
Progressive Recovery, Inc.
Purity Zinc Metals Co.
Pyosa S.A. De C.V.
Q-Panel Lab Products

Raabe Corp.
Radtech Intl. North America
Ranbar Technology, Inc.
Reichhold Chemicals Inc.
RHEOX, Inc.
Rhone-Poulenc
Rohm and Haas Co.
Ronningen-Petter
Charles Ross and Son Co.
Russell Finex, Inc.

Sandoz Chemicals Corp.
San Esters Corp.
Sartomer Co. Inc.
Schenectady Chemicals
Schold Machine Co.
Schuller International Inc.
Schutz Container Systems, Inc.
Semi-Bulk Systems Inc.
SEPR (Ceramic Beads & Powders)
Shamrock Technologies Inc.
Shell Chemical Co.
Sherwin-Williams Chemicals
Silberline Mfg Co., Inc.
Snyder Industries
Software 2000 Inc.
Sonoco Products
South Florida Test Services
Southern Clay Products Inc.
Univ. of Southern Mississippi
Specialty Minerals Inc.
Spencer Machine & Tool Co., Inc. Spraymation, Inc.
Startex Chemical Co.
Steel Shipping Container Inst.
Sub-Tropical Testing Service
Sud-Chemie Rheologicals
Summit Precision Polymers Corp.

21st Century Containers Ltd.
Taotek North America, Inc./ Corob North America Div.
Tayca Corp.
Tech Pak, Inc. Bulkcon Systems Intl. Ltd.
Tego Chemie Service USA
Thiele Engineering Co.
Transac, Inc.
TRICOR Systems, Inc.
Troy Corp.

U.F. Strainrite
U.S. Aluminum, Inc.
U.S. Borax, Inc.
U.S. Polymers, Inc.
U.S. Silica Co.
Union Carbide Corp.
Union Miniere
Union Process, Inc.
United Mineral & Chem. Corp.

Van Waters & Rogers Inc.
R.T. Vanderbilt Co., Inc.
Vero Dispersion Mach., Inc.
Versa-Matic Pump Co.
Vorti-Siv Div./MM Ind., Inc.

Wacker Silicones Corp.
Western Equipment Co.
Wilden Pump
Witco Corp.
World Minerals Inc.

X-Rite, Inc.

Yamada America, Inc.

Zaclon, Inc.
Carl Zeiss, Inc., Microscope Div.
Zeneca Biocides/Zeneca, Inc.
Zeneca Resins

1994 ANNUAL REPORT
FEDERATION OF SOCIETIES FOR COATINGS TECHNOLOGY

Spring 1995 Board of Directors Meeting

Thirty-four members and 33 guests attended the Spring Meeting of the Board of Directors of the Federation of Societies for Coatings Technology, on May 20, 1995, in Cancun, Mexico.

The following persons were in attendance:

Officers

President ..... Joseph P. Walton
President-Elect ..... Darlene Brezinski
Secretary-Treasurer ..... M. Jay Austin

Society Representatives

Baltimore ..... Joseph D. Giusto
Birmingham ..... Gerry J. Gough
C-D-I-C ..... William M. Hollifield
Chicago ..... Evans Angelos
Cleveland ..... Brenda Carr
Dallas ..... Charles Kaplan
Detroit ..... Van Evener
Golden Gate ..... Timothy Donlin
Houston ..... Joseph Caravello
Kansas City ..... Mark Algaier
Los Angeles ..... Philip Bremenstuhl
Louisville ..... Larry Pitchford
Mexico ..... Martha Colin
Montreal ..... Suzanne Richardson
New England ..... Maureen Lein
New York ..... John Du
Pacific Northwest ..... William E. Shackelford
Philadelphia ..... Donald Denny
Piedmont ..... Forest Fleming
Pittsburgh ..... William C. Spangenberg
Rocky Mountain ..... J. Dick Mullen
St. Louis ..... Terry Gelhot
Southern ..... R. Scott McKenzie, Jr.
Toronto ..... Arthur Hagopian
Western New York ..... Michael DePietro

Other Members

Freidun Anwari ..... Cleveland
J. Andrew Doyle ..... NPCA
F. Louis Floyd ..... Baltimore
John Lanning ..... Louisville
John Oates ..... New York
Rose A. Ryntz ..... Detroit

Guests

Joseph M. Walton, President, and Kenneth Zacharias, Director of Membership Services, National Paint & Coatings Association.

David Domsch, Vice President, Lawrence-Leiter and Company.

Federation Past-Presidents and Planning Committee members James Geiger, James McCormick, and Colin Penny.

Jorge Hijuelos, President, Mexico Society.

The following Society Officers who attended the meeting of the Incoming Society Officers the following day: Jane Allen (Detroit); Eve Blackburn (Golden Gate); Alex Blahnik (Piedmont); Thomas Brown (Philadelphia); Joseph Brown (Birmingham); Teresa Case (C-D-I-C); Michael Coad (Northwestern); Daniel Fortney (Louisville); Jeffrey Gundry (Northwestern); Marcelo Herrera (Mexico); Albert Holder (Baltimore); Christine Lescamela (Rocky Mountain); Jayne Mallwitz (Western New York); Richard Mikol (Cleveland); Joanne Monique (New England); Ken Mundy (Houston); Walter Naughton (Southern); Chip Newcomb (Dallas); Kevin Pelling (Toronto); James Rediske (Pittsburgh); Curry Sanders (Kansas City); Robert Skarvan (Los Angeles); Beverly Spears (Pacific Northwest); Janet Webb (Philadelphia); Kenneth Wenzel (Pacific Northwest).

Federation Staff Members Michael Bell, Director of Educational Services; Victoria Graves, Director of Meetings & Conventions; Lyn Pollock, Director of Marketing; Charles Schmidt, Controller; Patricia Viola, Director of Publications; and Robert F. Ziegler, Executive Vice President.

Following the roll call of members, on a motion by Mr. McKenzie, seconded by Mr. Gough, the report of the Fall 1994 Meeting of the Board of Directors was approved as published in the December 1994 issue of the JOURNAL OF COATINGS TECHNOLOGY.

Reports of the Officers and Staff

PRESIDENT WALTON

My term in office started out quickly as I accompanied Bob Ziegler back to Chicago to represent the FSCT at the NDPA Annual Meeting and Show of the National Decorating Products Association.

November activities included a visit to the Toronto Society on the occasion of their 75th Anniversary; a two-day meeting in Blue Bell on strategic planning; and a meeting at NPCA Headquarters on the subject of Superfund.

In December Kathy and I joined the Pittsburgh Society for their annual Christmas party. I also went back to Blue Bell for an additional strategic planning meeting.

January was relatively quiet with the only meetings being the annual Executive/Finance Committee meetings in Blue Bell.

February was the beginning of the busy season. It started out with a meeting in Mexico City with representatives of the Mexico Society and ANAFAPYT to get things started on a joint FSCT-ANAFAPYT

From left: Secretary/Treasurer Jay Austin (Chicago) and Executive Vice President Robert F. Ziegler

Latin American Coatings Show. This was followed by a meeting in Blue Bell to interview candidates for the new Marketing Manager position, and a joint meeting in Chicago with the NPCA on our continuing effort to improve working relations between our two groups. The month closed with a trip for Kathy and me to San Francisco for the Western Coatings Societies' 22nd Biennial Symposium and Show.

March began with a trip to England to visit the Birmingham Club where I had an opportunity to meet with their Officers and Executive Committee to present the strategic planning issues and also to meet with their members at a regularly scheduled monthly meeting. This was followed with another trip to Blue Bell to meet with the Officers and Staff to develop some strategic planning for our publications efforts in order to have guidelines for our new marketing person, as well as our current Staff.

By the time the Spring Meetings take place, I will also have attended the following functions:

—in Dallas for the 52nd Annual Southwestern Paint Convention;

—with the Pittsburgh and Cleveland Societies to present the strategic planning issues;

—at the CDIC Society for its celebration of their 75th Anniversary;

—in Savannah for the Southern Society's 59th Annual Meeting;

—in Portland for the Pacific Northwest 48th Annual Spring Symposium.

As you can see, this has been a rather full travel schedule and I would like to thank all our hosts for their wonderful hospitality and assistance in making all of this possible. I would also like to thank all of the FSCT Headquarters Staff and the many volunteers throughout the Societies for their invaluable service to the FSCT.

I believe the direction we are attempting to go with our strategic planning issues will make the FSCT a stronger organization which is able to continue to provide the best services for its membership. There is a lot of work still to be done and I feel confident it will be accomplished because of the dedication of our members and our Staff.

JOSEPH P. WALTON
President

PRESIDENT-ELECT BREZINSKI

Since the last Board of Directors Meeting the following activities occurred:

Strategic Planning meetings were held in late fall 1994 to evaluate our mission statements and goals of the Federation. As a result of planning sessions, a task force was formed to communicate key goals to all Societies and solicit their feedback, suggestions, and support.

During the past six months, I had the opportunity to visit the following Societies: Baltimore, Cleveland, Philadelphia, Chicago, Northwestern, Montreal, and Toronto. As usual, it was a wonderful opportunity to meet more of our members and observe their working and planning together to achieve common goals. Each of the Societies is very active and provide beneficial programs for their members.

At four Societies (Chicago, Northwestern, Montreal and Toronto), I was fortunate in being able to present our strategic planning overview. With the exception of a negative response concerning centralized membership from one Society, all were very enthusiastic in their discussions and reception of the goals of the Federation. Three of the Societies recognized the advantages of centralized membership for the Societies and the members —particularly in view of other professional organizations. The Societies were enthusiastic about our future goals and planning, and offered numerous valuable suggestions. Several members volunteered to assist in any way they could to help us achieve our overall goals.

Meetings of the Finance Committee and the Executive Committee were held in December and January, respectively. The 1995 balanced budget was approved and, while there is great concern regarding the 1994 deficit, there is also belief that implementation of a number of the strategic planning recommendations shall greatly improve our future financial status.

The NPCA/FSCT Industry Advisory Committee Meeting was held in February and we continue to explore and work together in areas of common interest to both groups. Plans continue toward future concurrent annual meetings and exploring various ways of marketing and promoting Panorama.

The Professional Development Committee Chair and myself attended the Pittsburgh Conference with the goal of exploring the scope and opportunities in technical programming, educational activities, and professional development activities this conference offers to attendees and exhibitors. Several ideas from this show could be incorporated into our Annual Meeting to benefit the educational training and development of the membership.

The past six months have been rewarding and challenging as we explore and strive to meet the opportunities presented by a global and changing coatings industry.

DARLENE BREZINSKI
President-Elect

SECRETARY/TREASURER AUSTIN

Since the last Board of Directors Meeting held in New Orleans, I have had the opportunity to participate in the following activities:

Strategic Planning —I attended the Strategic Planning Session held at headquarters in October and December. There are several key areas that will significantly affect the successful operation of the Federation over the next 10 years. These planning sessions have helped to clarify both the threats and opportunities that confront us. And most importantly, they have aided us in developing definite plans to insure the continued success and future of the Federation.

Additionally, I had the pleasure of moderating a specific strategic planning session dealing with the publication area. This session was held at FSCT Headquarters on March 14th and attended by Federation Staff and Officers.

Local Society Meetings—I, together with Staff, visited the following five Societies: Chicago—November 7th; San Francisco—January 16th; Kansas City—February 9th; Piedmont—February 15th; and Detroit—March 28th. At each of these meetings we had the opportunity to present an overview of current Federation activities and make a detailed presentation of the current Strategic Plan. I was very pleased with the positive reception that our discussions had at all of these visits.

Joint Industry Advisory Committee—On February 13th, together with other FSCT Officers and Staff, we met with our counterparts from NPCA. The main topics of discussion was the status of our 1995

grant and the efforts to combine overlapping activities at our 1996 Annual Meetings.

Professional Development Committee—I had the pleasure of joining the meeting of the PDC of both December 6-7 and March 22-23. During the March meeting, I reviewed the Federation's Strategic Plan and we discussed the potential role that the PDC would play in these plans. If the overall strategic plan is to be successful, the PDC will have to play a vital role in it. In order to further develop this role, I will be moderating a strategic planning session for the PDC later this summer.

Finance and Executive Committees—These meetings were held in January at FSCT Headquarters. The Finance Committee held an extensive review of the deficit from last year's operations. A number of strategies were discussed to insure maintaining the recommended balanced budget for fiscal 1995. The most important items from these discussions were that the Federation must become more competent in marketing its services and competing in our industry's current environment.

In spite of last year's deficit, the current balance sheet shows that the Federation is still financially sound.

I have greatly enjoyed my Federation duties of the last six months and enthusiastically look forward to the remainder of this year.

M. Jay Austin
Secretary/Treasurer

EXECUTIVE VICE PRESIDENT ZIEGLER

1994 Financial Statement

The final, audited report of revenue and expenses for 1994 shows income at $2,712,478 and expenses at $3,308,919. The deficit on the annual budget of $2,991,500 was caused by a significant reduction in income due to sluggish advertising revenue, less than anticipated sales of Panorama® subscriptions, and the sale of *Series on Coatings Technology* booklets and *Infrared Atlases* being under budget. On the expense side, the unanticipated increase in the cost of producing the CD-ROM product and the single year amortization of its developmental expenses exacerbated the situation.

The statement has been forwarded to all Board Members and will be reviewed by Staff at the May 1995 Meeting.

1995 Operating Budget

The Finance and Executive Committees have approved the 1995 Operating Budget, balanced at $2,844,500, allocated as follows *(1994 budget allocations are shown in parentheses)*:

Income: Publications —25.7% *(28.4)*; Membership Dues —1.8% *(1.6)*; Annual Meeting and Paint Industries' Show —67.4% *(65)*; Educational Activities —2.1% *(1)*; Miscellaneous —3% *(4)*.

Expenses: Headquarters Administration —39.9% *(35.8)*; Publications —29.9% *(25.9)*; Annual Meeting & Paint Industries' Show —16.4% *(18)*; Officers/Board/Committees —5.9% *(5.3)*; Educational Activities —6.9% *(13.6)*; Miscellaneous —1% *(1.4)*.

Based on the recommendations of the Finance and Executive Committees, the balanced budget reflects the deletion of the $100,000 annual grant in support of NPCA State Paint Council Network. In addition, the 1995 grant to CIEF was reduced from its historical high of $150,000 in 1994 to the pre-1993 budget of $50,000. These adjustments have been made to bring the FSCT financial status back into line. In addition, as detailed later in this report, steps have been taken to increase marketing activities.

Publications

JCT —The redesign of the FSCT's flagship publication took effect with the January 1995 issue. The Publications Committee and Staff are to be congratulated for their efforts. We encourage both the Board and membership to comment on the new look and contents of the JCT.

Total pages published in 1994 were 1,319, compared with 1,296 in 1993, and 1,177 in 1992.

With the addition of a Marketing Director to Staff, promotional efforts will be focused to increase advertising.

Year Book —The 1995 Annual Membership Directory was published on-time and within budget. Through the use of the new membership data system now being installed, it is expected that, with the cooperation of the Societies, the 1996 Year Book will be more up-to-date and accurate, providing a very useful publication for the membership.

Series Booklets —Three manuscripts are in-hand: "White Pigments," by Juergen H. Braun; "Methodologies for Predicting the Service Lives of Coating Systems," by J.W. Martin, et al.; and, "Silicones," by William Finzel and Harold Vincent. To be published this year, the three booklets will increase the number of *Series* offerings to 26. Published in 1994 were: "Metal Surface Characteristics Affecting Organic Coatings," "Painting of Plastics," and "Color and Appearance." Series Editors Drs. Thomas Miranda and Darlene Brezinski are evaluating the current booklets for possible candidates for revision. To date, one booklet, "Organic Pigments," has been revised.

Paint Stone Newsletter —While the newsletter continues to serve as an effective means of publicizing both Society and FSCT activities, its future is dependent on the outcome of planning discussions. The Federation Staff continuously monitors the effectiveness of this vehicle and several suggestions to improve the publication have been noted and acted upon. Due to budget restraints, the newsletter was published nine times during 1994 and it is expected that this frequency will continue through 1995. We thank the many Societies who have taken advantage of this communication tool to promote their activities.

Paint/Coatings Encyclopedic Dictionary —The revised and expanded edition of the very successful volume of definitions (first published in 1978) is well-underway. It is anticipated that the encyclopedic edition will be ready for publication by the 1995 Annual Meeting. We thank Stan LeSota, Editor of the edition, for his good work in preparing the manuscript.

Panorama Coatings MSDS CD Retrieval System —During its initial year the system has grown from containing 8,000 documents to over 21,000 MSDS. This unanticipated increase (over 300% more than expected) served to greatly increase the production costs of the CD system, reflected in the above financial statement. Currently, there are 104 subscriptions to Panorama, or about 75% of projected sales. We have found that although there continues to be much interest in the product, many companies (especially small-to-medium paint

President Joseph P. Walton (Cleveland) and President-Elect Darlene Brezinski (Chicago)

Martha Colin (Mexico) and Suzanne Richardson (Montreal)

companies) do not have the necessary computer equipment to operate CD-ROM drives. It is expected that the increasing amount of CD products being introduced will provide an incentive for companies to upgrade their computer equipment. The results of promotion and marketing efforts will be monitored to see if this trend develops.

Meanwhile, efforts continue to be made to increase the number of companies/products contained in the system. Most major suppliers are represented.

Membership

Despite the trend towards consolidation, membership totals have increased over this period last year. As of March 31, 1995, membership totals are: Active—4,318 *(4,430)*; Associate—2,219 *(2,164)*; Other (Honorary, Educator/Student, Retired—640 *(629)*; Affiliate—147 *(144)*, for a total of 7,324 *(7,290)*.

Staff efforts in retention and recruitment have been successful with 512 membership leads being forwarded to Societies since the beginning of the year. These leads were acquired through inquiries to headquarters and from promotional mailings to non-renewing members. Society Membership Chairs are encouraged to follow-up on these leads.

Outstanding increases by Societies will be recognized at the Fall Meeting of the Board of Directors in St. Louis.

Annual Meeting and Paint Show

The 1994 convention was very successful with 7,935 attendance and the participation of 308 exhibiting companies in 90,950 net sq.ft. of exhibit space, second only to the 1992 (Chicago) event. We sincerely appreciate the continuing support of the manufacturing and supplier industries.

Based on recommendations from the 1993 survey of attendees and the planning discussions held in 1994, the programming of the 1995 Annual Meeting will see several changes improving the content and addressing the practical concerns of the industry. Program Chair Louis Holzknecht (Louisville Society) and his Committee are preparing the technical program sessions under the theme, "Creativity + Adaptability = The Gateway to Success." Program, housing and registration information will be forwarded to all members in May. We especially thank the St. Louis Society (Host) and its Committee Chair, Dennis Cahill, for its assistance.

Spring Week

For the first time, FSCT Spring events will be held outside the U.S. Recognizing that the FSCT is an international organization, both the Board of Directors meeting and the meeting of the Incoming Society Officers will be held May 20-21 in Cancun, Mexico. We are very pleased to be able to bring these important gatherings to our southern neighbor and we sincerely thank the Mexico Society for its able assistance and support. At the same time, we very much regret that the current downturn in the Mexico economy caused the cancellation of the Spring Seminar. Scheduled to be held immediately prior to the above events, the program was to feature topics on regulatory issues, new coatings technologies, and ISO 9000 certification. Unfortunately, the recent —and rapid —fall of the peso made it impossible for the Mexico Society membership to attend.

This type of situation, coincidentally, was discussed in the strategic planning sessions. At the time, it was noted that the traditional holding of a seminar in conjunction with the Spring Week meetings may not be at the best time, nor at the best location, for the industry or the FSCT. Recommendations were made to consider the seminar as a separate event which could be scheduled at a more conducive time and location.

FSCT/NPCA Cooperative Efforts

The Joint FSCT/NPCA Industry Advisory Committee, composed of the Officers and Staff of the organizations, met on February 13 to review current programs and to discuss potential areas of cooperation. Reviewed were the activities of the Joint Manufacturing Committee, Panorama System, and concurrent annual meetings, which are scheduled to initially occur in 1996 in Chicago. Also discussed was the FSCT decision not to extend its grant in support of the NPCA State Paint Council network in 1995. While, naturally, concerned with the decision, NPCA leadership understood the financial constraints being faced by FSCT and hoped that the grant would be continued in succeeding years. The FSCT advised that it would continue to encourage the participation of its Societies in the Paint Councils and would consider the limited financial support for the continuance of communication of Paint Council activities to the Societies.

Strategic Planning

Since the Fall 1994 meeting of the Board of Directors, the Executive Committee, Planning Committee, and Staff have met to discuss long-range issues affecting the FSCT. Recommendations arising from these discussions have been presented to Society Boards of Directors by a Task Force composed of FSCT Officers (Joseph P. Walton, Darlene Brezinski, and Jay Austin), FSCT Past-Presidents (William Holmes, John Lanning, John Oates, and Colin Penny), and the Planning Committee Chair Richard Himics. We sincerely thank this group for its dedication and service to the FSCT and the Societies. A summary of the proposed objectives and goals was published in the March 1995 JCT.

At the Spring 1995 meeting, the Board will be asked to consider these proposals and reach a determination on the future direction of the FSCT. We encourage all Societies to instruct their representatives in preparation for this discussion.

Officer/Staff Visits

Since the last report and prior to the Board Meeting, Officer and Staff travel will have included attendance at the following Society/industry events: monthly meetings of the Baltimore, Chicago, Cleveland, Toronto, Philadelphia, Kansas City, Golden Gate, Piedmont, Montreal, and Birmingham Societies; the 75th anniversary celebrations of the Toronto, CDIC, and Philadelphia Societies; the Southern Society annual meeting, Southwestern Paint Convention, and Pacific Northwest Society Symposium; Joint FSCT/NPCA Industry Advisory Committee; NPCA Board of Directors Meeting; and the National Decorating Products convention. For the Officers and Staff, we sincerely thank all of the groups for their generous hospitality and courteous attention.

Headquarters Staff

As referenced in this report and in the attached summary of planning objectives, long-range discussions have indicated there was an immediate need to increase the marketing and promotional efforts of the FSCT to respond to growing competition. We are there-

fore pleased to welcome to the headquarters Staff Lyn Pollock, who assumes the position of Director of Marketing. Lyn comes to the FSCT with considerable experience in this area. She was formerly the Associate Marketing Manager for the Member Benefits Div., of the National Education Association. In her new capacity she will be responsible for the marketing of all FSCT products and services. To assist her in this effort, Christine DeLissio has also joined Staff as Marketing Assistant. Christine has a customer service background and has worked since coming to Staff in promoting supplier participation in the Panorama System. As noted above, her efforts have been overwhelmingly successful. We welcome both Lyn and Christine to the FSCT family.

Covering the areas of administration, meetings and conventions, membership services, educational activities, publications, and now marketing, the following Staff individuals continue to serve well the Federation membership and the industry: Michael Bell, Director of Educational Services; Victoria Graves, Director of Meetings and Conventions/Membership Services; Patricia Viola, Director of Publications; Charles Schmidt, Controller; Kathleen Wikiera, JCT Managing Editor; Jonna Coachman, JCT Assistant Editor; Mary Evangelisto, Editorial Assistant; Audrey Boozer, JCT Subscription Fulfillment; Lisa McGlashen, Secretary to Mr. Ziegler; Mary Sorbello, Secretary to Mr. Bell; Marie Wikiera, Meetings Coordinator; Linda Madden, DTP Operator; Meryl Simon, Order Dept.; and Dorothy Kwiatkowski, Secretary/Receptionist.

ROBERT F. ZIEGLER
Executive Vice President

DIRECTOR OF EDUCATIONAL SERVICES BELL

COMMITTEE LIAISON

Educational Coordinating Committee —The Educational Coordinating Committee has met once since the last meeting of the FSCT Board of Directors, on November 7, 1994 in Cleveland, OH. The next meeting of the Committee will be held on Thursday, June 1, 1995 at FSCT headquarters in Blue Bell, PA. This meeting will precede the ECC's meeting with the FSCT Educational Committee, which is comprised of the Educational Chairs of the 26 Constituent Societies, on Friday, June 2, 1995 at a location near FSCT Headquarters. The Committee has been involved with two major projects over the last six months:

High School Science Teachers Kit —The Committee is preparing to unveil the High School Science Teachers Kit at the Educational Committee meeting in June. The packet will provide information on basic experiments which can be used by interested parties when addressing both science classes and other outreach programs. It includes sections on various levels of experiments (basic to advances) and information on mentoring to young students. Each experiment can be conducted with materials which may be purchased at the local hardware store. The kit has already generated a great deal of interest from many sections of the Federation. The kit will be a living document and will be formatted to allow the sections to be updated and replaced as new ideas are received.

Society Speakers Program —The Society Speakers program was launched by the Pittsburgh Society at its March meeting. The Committee will review this test run at its next meeting and hopes to begin the program in the fall of 1995.

Additional Activities —The Committee also continues to work on the following projects: Administering the activities surrounding the Southern Society's A.L.Hendry Award (Best Student Paper); reviewing the applications and distributing funds for the Small Society Scholarship program (distributed $3,600 in funds in 1995); and finishing work on the industry educational needs survey, in conjunction with the NPCA Management Information Committee.

The Educational Coordinating Committee also plans to begin work on several new test drilling projects in the near future, in addition to maintaining its current projects.

Technical Advisory Committee—The last meeting of the Technical Advisory Committee was held on March 16-17, 1995 in Baltimore, MD. The Committee attended the monthly meeting of the Baltimore Society for Coatings Technology on Thursday evening and met on Friday. The next meeting of the TAC is scheduled for August 16-18, 1995 in Washington, DC. This meeting will include the annual meeting with the Constituent Society Technical Chairs. The Committee is currently working on the following projects:

Society Technical Committees—The TAC Adoptive Society program has continued to be the direct line to the Societies for the Committee. Each Committee member has assigned responsibility to maintain contact with four to five Societies. This program has assisted in meeting notification and gives each Society a resource for project development and Committee management information.

APJ/Voss Award—The Committee will assume the responsibility of the administration of the APJ/Voss Awards beginning with those submitted for the 1995 FSCT Annual Meeting. The awards are presented for the outstanding Society papers submitted for the program. The TAC spent a considerable amount of time at its last meeting reviewing the status of the program and revised the judging form used in the event.

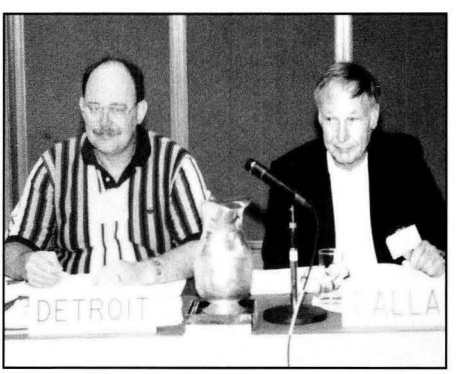
Society Speakers Program —The Committee will also assume this role at the 1995 Annual Meeting. This award is given to the best Society technical paper presenters at the Annual Meeting. Steps have been taken to update the judging form used by the Committee and this information will be provided, with definitions at the next meeting with the Society Technical Committee chairs.

Mission Statement —The Committee developed the following Mission Statement at its last meeting:

"The mission of the FSCT Technical Advisory Committee is to establish guidelines, facilitate technical projects and encourage Constituent Societies to participate in programs in a way that will advance understanding in coatings and related areas so that there will be a continuity of technical projects which will result in the presentation of a technical paper at the Annual Meeting and publication in the JOURNAL OF COATINGS TECHNOLOGY."

Joint Coatings/Forest Products Committee —The last meeting of the Joint Coatings/Forest Products Committee was held in Madison, WI on March 27, 1995. The next meeting of the Committee will be held on September 6-7, 1995 in Chicago, IL.

The Committee is currently involved in the preparation of a series of articles which have been published in the American Painting Contractor. The titles currently being prepared are: Changing Wood Resources, Finishes Checklist, Mildew, New Wood Treatments, New Wood Products, Finishing Shakes and Shingles, and Water Repellents. Each of the papers is prepared by a subcommittee



Van S. Evener (Detroit) and Charles A. Kaplan (Dallas)

Joseph Caravello (Houston) and Timothy J. Donlin (Golden Gate)

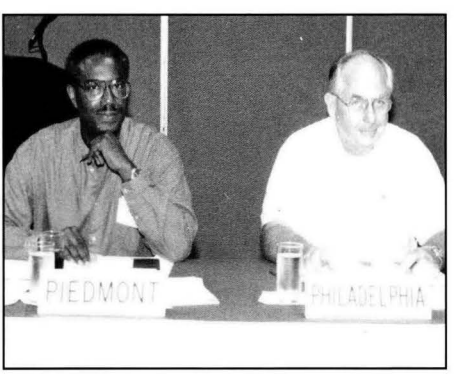
of participants, with representatives of the wood and coatings committees represented. The Committee is also investigating ways to assist the Pacific Northwest Society with the content of the 1996 Spring Week technical program.

Corrosion Committee —The Corrosion Committee last met on February 7, 1995 in Philadelphia and will next meet on July 25, 1995 in Philadelphia. The Committee is currently involved with the following projects:

1995 Annual Meeting Symposium —The Committee is changing the format for this symposium from the traditional four or five technical papers to a panel discussion. This format has been adopted to encourage more interaction between the speakers and the attendees and to attract a more varied audience. The theme for the session is: "High Solids or Waterborne: Selecting the Appropriate Corrosion Inhibitive Coating."

Monograph—The Committee is currently seeking an author for the monograph it has outlined for the FSCT Series on Coatings Technology. The title of the manuscript is "Methodology for Assessing Corrosion Inhibiting Performance in Coatings." A general outline has been prepared and will be passed on to the selected author.

Interaction with Corrosion-Related Organizations—The Committee continues to maintain contact with the following related organizations: NACE International, Steel Structures Painting Council (SSPC), and ASTM. It has also been decided that the activities of the Electrochemical Society will also be monitored.



Forest Fleming (Piedmont) and Donald F. Denny (Philadelphia)

Corrosion Committee Publication Award—The Committee is revising the rules for the award. As it stands now, the award is given to the best paper that has appeared over the last 12 months in the JOURNAL OF COATINGS TECHNOLOGY. The Committee would like to actively solicit papers for the competition, which would in turn provide a larger selection of corrosion-related papers for the *JCT*. The change should be implemented after the July 1995 meeting, for the 1996 contest.

Manufacturing Committee—The transformation of the Manufacturing Committee continues to run smoothly. The Committee is now known as the Joint FSCT/NPCA Manufacturing Management Committee and last met on March 8-10, 1995 in San Francisco, CA. The next meeting will be held in St. Louis, MO on October 10, 1995. The Committee is currently involved in the following projects:

1995 FSCT Annual Meeting Symposium—The Committee is currently preparing a symposium for the 1995 FSCT Annual Meeting. The theme for the session will be "Small Batch Processing" and will include case studies on architectural, industrial, automotive, and heavy maintenance. The session is tentatively scheduled for October 10, 1995.

Society Interaction—A booklet entitled "The Guide for Society Manufacturing Chairs" has been distributed to each Society. The purpose of this document is to provide guidance to Society Manufacturing Committee chairs regarding the position and also provides information for Societies interested in forming a Manufacturing Committee.

Professional Development Committee —The Professional Development Committee has met twice since the last Board of Directors meeting, on December 6-7, 1994 in Chicago and on March 22-23, 1995 in Cleveland, OH. The next meeting will be held in August at FSCT Headquarters in Blue Bell, PA for the purpose of Strategic Planning. Listed below are the projects currently being worked on by the Committee:

"Formulating for the New Clean Air Act" —The first of two scheduled seminars was held on March 21-22, 1995 at the Airport Marriott in Cleveland, OH. There were 65 attendees, which was in line with the budgeted figure for the event. The seminar will be repeated in Denver on November 6-7, 1995. The Committee is expecting that the second seminar will draw from the western states and has made adjustments based on the review of the Cleveland session to further improve the offering. The initial program drew mainly from states east of the Mississippi River.

"Polymer Chemistry for the Coatings Formulator" —The "Polymer Chemistry for the Coatings Formulator" seminar is scheduled for the Chicago Marriott-Schaumburg in Schaumburg, IL on June 20-21, 1995. This seminar will be formatted to include maximum time for attendee interaction with the speakers and a group of expert presenters have been assembled for the program.

1995 Annual Meeting Session —The PDC will produce a session entitled "Computer Applications for the Coatings Industry." The session will feature a unique format to encourage "hands-on" interaction for the attendees and will be held twice at the Annual Meeting. The session will include a general overview of computers and also have breakout sessions where attendees can learn about specifics on formulating, spread sheets, and design of experiments.

Adhesives Symposium —The Committee has begun investigating the possibility of conducting an adhesives symposium in the near future and has contacted an industry expert regarding his interest in leading such a program.

Strategic Planning —The Committee reviewed the FSCT Strategic Plan at its last meeting. FSCT Secretary-Treasurer Jay Austin presented a report on the status of the program to the Committee. The PDC has decided to devote two full days of meetings in August to develop its plan for the future.

Mission Statement— The Committee has developed the following Mission Statement:

"The purpose of the FSCT Professional Development Committee is to promote and maintain individual technical competence from basic techniques through state of the art technologies within the coatings and related industries in a way that will meet the needs of the individuals through appropriate training mechanisms (short courses, technical symposia, and Annual Meeting sessions) so that coatings professionals can effectively contribute to the success of their respective employers within the global marketplace."

Annual Meeting Program Committee —The 1995 Annual Meeting Program Committee has met twice and held two conference calls to plan this year's technical program. The theme for the 1995 event is "Creativity + Adaptability = Gateway to Success." The program will include tutorials on Powder Coating, Radiation (EB/UV) Curing, Adhesives and Inks, in addition to Early Bird Sessions, the Technical Focus Speaker, sessions from the Professional Development, Corrosion and Manufacturing Committees, Roon and APJ/Voss Award papers, and the Mattiello Lecture. The Committee also received a record number of abstracts for consideration as presentations and those passing the review phase will be incorporated into the program.

Other Activities —The following activities are being done independent of committee activity or as a result of several committees working in unison:

Technical Focus Speaker—This again will be held as the initial technical presentation during the Annual Meeting. This year's speaker will be selected by the Professional Development, Technical Advisory, Educational Coordinating and Annual Meeting Program Committees.

FSCT Video Offerings—The video "VOC Determination" continues to be available to interested parties. The video was prepared by the Technical Committee of the New York Society for Coatings Technology.

Two other videos, "Good Tests, Bad Testing" and "Structure/Property Relationships for Thermoset Coatings" continue to be made available to Societies for their monthly meetings.

List of Talks Available—This again will be made available to the Societies. The list has become a valuable resource for Societies when planning monthly meeting presentations. The list has been purged for 1995 to ensure it is current and timely.

Roon Awards—The Committee is currently waiting to begin reviewing the papers for the 1995 competition. The selections will be made in September.

FSCT Travel—Since the last meeting of the FSCT Board of Directors, I attended the Strategic Planning meeting in Chicago, monthly meetings of the Chicago and Kansas City Societies, and addressed the technical seminar held by the New York Society, in addition to the meetings cited in the course of this report.

MICHAEL G. BELL
Director of Educational Services

Nominations

The Committee is pleased to place into nomination the following individuals for 1995-96 FSCT Officer, Board, and Executive Committee positions:

President-Elect —Jay Austin (Chicago Society), Halox Pigments, Hammond, IN.

Secretary-Treasurer —Thomas E. Hill (Western New York Society), Pratt & Lambert Co., Buffalo, NY. *(One-Year Term).*

Executive Committee —J. Dick Mullen (Rocky Mountain Society), G-3 Industries, Aurora, CO. *(Three-Year Term).*

Board of Directors (Members-at-Large) —Ronda Miles (Dallas Society), Union Carbide Corp., Garland, TX.; and, Dennis R. Owen (Golden Gate Society), Technical Coatings Co., Santa Clara, CA. *(Two-Year Terms each).*

Board of Directors (Past-President Member) —William F. Holmes (Dallas Society), Ameritex Chemical & Coatings, Inc., Irving, TX. *(Two-Year Term).*

Dr. Darlene Brezinski, current President-Elect, will assume the Presidency on October 11, 1995, in St. Louis, MO.

Members of the Nominating Committee are: Terry Gelhot (St. Louis Society); Colin Penny (Baltimore); Rose Ryntz (Detroit); and, William Shackelford (Pacific Northwest).

JOHN A. LANNING
Chair

Annual Report
on Statement of Income and Expense for Year Ending December 31, 1994

The following Statement of Income and Expense for the year ending December 31, 1994 was reviewed by the Board and is presented here in accordance with the Articles of Incorporation under the laws of the Commonwealth of Pennsylvania.

BALANCE SHEET
December 31, 1994
Final —Audited

Assets	1993	1994
Current		
Cash	78,023	15,216
Investments-Mellon Money Market	174,767	77,292
Hendry Southern Soc.Mem.Award	25,000	25,000
Accounts Receivable - Trade	59,904	57,264
Accounts Receivable - O.C.C.A.	0	0
Inv- Paint/Coatings Dictionary (12/31)	14,069	0
Inv- Infrared Spec.Books (12/31)	103,435	97,632
Prepaid Expense	56,592	59,220
Prepaid Expense—Show Rent	35,563	14,500
Prepaid Expense—Life Ins. Premium	9,683	9,964
Prepaid Pension Expense	69,591	67,910
Total Current Assets	626,987	423,998
Non-Current		
Investments - Mellon Bank	1,399,446	1,192,712
Investments - Vanguard MM	357,017	121,656
Land	287,478	287,478
Building: Net of Depreciation	1,170,134	1,128,446
Furniture & Equipment: at Cost, Net of Accum. Depreciation	75,169	61,464
Computer Equipment.	187,049	306,160
Res. for Depreciation: Computer Equipment	<122,338>	<146,369>
Exhibit Equipment. - FSCT Booth	30,000	0
Res. for Depreciation. - FSCT Booth	<30,000>	0
Total Non-Current Assets	3,353,955	2,951,547
Other Assets		
Advances & Deposits	6,862	6,862
Value - Deferred Compensation	133,984	141,337
Unamortized Software Costs - MSDS	107,507	0
Total Other Assets	248,353	148,199
Total Assets	4,229,295	3,523,744
Liabilities and Fund Balance		
Current		
Accounts Payable - Trade	169,236	102,722
Accounts Payable - O.C.C.A.	0	0

Accounts Payable - Hendry Award	32,113	32,418
Accounts Payable - Tenant Security Dep.	7,611	7,611
Accrued and Withheld Taxes	829	807
Mortgage Payable	100,000	100,000
Pension Liability (Money Purchase)	0	0
Sales Tax Payable	9	52
Deferred Income	479,934	550,118
Total Current Liabilities	789,732	793,728
Non-Current		
Deferred Income	6,240	8,371
Deferred Compensation Liability	49,904	34,666
Mortgage Payable	241,666	141,666
Total Non-Current Liabilities	297,810	184,703
Total Liabilities	1,087,542	978,431
Fund Balance	3,141,753	2,545,313
Total Liabilities and Fund Balance	4,229,295	3,523,744

Statement of Income and Expenses

(1993 Final; 1994 Final; 1995 Operating Budget)

	1993 Final	1994 Final	1995 Budget
Income			
Publications	655,410	615,303	731,500
Dues	46,675	46,545	48,000
Annual Meeting & Paint Show	1,968,781	1,943,542	1,918,000
Other Educational Activities	13,540	29,258	60,000
Misc. (includ. investment int.)	133,048	77,830	87,000
Total Income	2,817,454	2,712,478	2,844,500
Expense			
Headquarters Admin.	985,513	1,056,124	1,135,000
Publications	650,302	1,067,048	851,700
Annual Meeting & Paint Show	610,331	560,328	466,500
Officers/Board/Committees	155,368	180,763	168,000
Educational Activities	229,479	387,190	195,300
Miscellaneous	56,524	57,466	28,000
Total Expense	2,687,517	3,308,919	2,844,500

(signed) Joseph P. Walton, President, FSCT
(signed) M. Jay Austin, Secretary-Treasurer, FSCT

Mr. Schmidt, FSCT Controller, reviewed the financial accounts and gave historical comparisons for the Board's consideration.

Members of the Board discussed the Panorama accounts. Mr. Ziegler advised that with the addition of a Marketing Director the FSCT will be more aggressive in promoting the system, and the 1995 budget was developed accordingly. Marketing plans will be distributed to the Board when completed. On the same subject, Ms. Viola advised that Batchmaster is developing software which will utilize Panorama MSDS information and that this was a non-exclusive arrangement with the FSCT. The sharing of net income from the sale of Panorama with NPCA was also discussed. It was suggested that the net income may be based on the gross sales less the developmental costs plus any unrealized interest which would have been made on these costs. Mr. Ziegler noted that this was not a part of the arrangement with NPCA, but that this area will be considered.

On a motion by Mr. Mullen, seconded by Mr. Bremunstuhl, the Board unanimously approved the 1994 Statement of Income and Expenses.

On a motion by Mr. Evener, seconded by Mr. Gough, the Board unanimously approved the 1995 Operating Budget.

Review of Actions of the Executive Committee

OCTOBER 14, 1994

That the FSCT initiate licensing discussions with Consolidated Research, Inc. for marketing its CD-ROM Tutorials for Coatings Technology

That Lawrence-Leiter and Company be contracted to continue strategic planning discussions.

On a motion by Mr. Shackelford, seconded by Mr. Denny, the actions of the Executive Committee for October 14, 1994 were unanimously approved.

JANUARY 18-19, 1995

That the 1994 Preliminary Statement of Income and Expense be accepted at: Income—$2,738,989; Expense—$3,291,685.

That the following recommendations of the Finance Committee be approved:

(1)That the 1995 Operating Budget be balanced at $2,844,500.

(2)That the total developmental costs of the Panorama CD-ROM System of $190,311 be amortized in 1994.

(3)That Panorama marketing expenses be allocated to the Panorama account.

(4)That the Federation reinvest unallocated reserve funds in one-year U.S. Treasury notes.

(5)That the balance of the 1994 committed funding to CIEF be transferred from reserves and, that the 1995 grant to CIEF be set at $50,000.

(6)That investments be overseen by a Finance subcommittee composed of Mr. Geiger, Mr. Schmidt, and one other person selected by the President with the advice of the Finance Committee.

That the proposal to market CD-ROM Coatings Technology Tutorials, developed by Consolidated Research, Inc., be approved.

That the nomination to Federation Honorary Membership of J. Richard Kiefer, by the Philadelphia Society be approved and returned to the Society for processing according to the Bylaws.

That every attempt be made to cancel the current agreement with Nicolet with regard to the Infrared Spectroscopy Atlas Library, and to enter into an agreement with Sadtler.

That the FSCT apply for partial affiliation with the Chemical Heritage Foundation.

Ms. Lein noted that there may be a question of conflict of interest with regard to the FSCT support of the CD-ROM Coatings Tutorial produced by Consolidated Research, Inc., since Dr. Brezinski, FSCT President-Elect, is President of the company. Dr. Brezinski discussed the project, noting that Consolidated Research will assume all developmental and production costs of the tutorial series, with the FSCT efforts being limited to the marketing of the product. Mr. Walton advised that this topic was thoroughly discussed by the Executive Committee and that there was a consensus that the joint effort was in the best interests of the Federation. The Board was then asked to vote on the question of conflict of interest as required in the Bylaws (Article VI, Section A). On a motion by Ms. Lein, seconded by Mr. Mullen, the Board unanimously determined that there was no conflict of interest present.

On a motion by Mr. Spangenberg, seconded by Ms. Lein, the actions of the Executive Committee for January 18-19, 1995 were unanimously approved.

MAY 18, 1995

That the Paint Industries' Show exhibit space rate be increased for 1996 from $16.75 to $17.50 per sq.ft.

That the Federation publications' basic per page advertising rates be increased as follows: *Journal of Coatings Technology*—from $1,595 to $2,390; *Paint Show Program Book*—from $630 to $785; *Annual Membership Directory*—from $760 to $1,065.

That it be recommended to the Board of Directors that the Bylaws be revised to note the actual amount of annual membership dues in the Standing Rules, deleting this item from Bylaws Article XII (Dues), in order to simplify future dues increases.

That an agreement in principle be reached in which the FSCT Travel Policy shall stipulate that all Federation reimbursable travel be placed through the FSCT Travel Desk (i.e., Uniglobe Travel). Staff shall make recommendations of an appropriate policy statement for Executive Committee consideration.

That the Federation sponsor a Latin American Coatings Show in Mexico City in 1996.

That the report of the Publications Strategic Planning meeting be approved in principle and that goals reached at the meeting be monitored and adjusted annually, if needed.

That future meetings of the Incoming Society Officers be held in Blue Bell, PA, to allow better communication between the Societies and Staff. (The initial meeting will be held in 1997.)

Mr. Ziegler reviewed for the Board the logistical and financial details and projections for the 1996 Latin American Coatings Show, noting that the FSCT would donate a minimum of $30,000 to ANAFAPYT for co-sponsoring of the show. Also reviewed was the proposed revision to the FSCT Travel Policy. Mr. Ziegler stated that the goal of any recommendations would be the cost effectiveness of all reimbursable travel. On a motion by Ms. Lein, seconded by Mr. Shackelford, the actions of the Executive Committee for May 18, 1995 were unanimously approved.

Bylaws

Proposed Revisions to FSCT Bylaws

The following proposed amendments to the FSCT Bylaws were presented for first reading at the Spring 1995 Board Meeting:

I. Dues Increase

WHEREAS the Federation of Societies for Coatings Technology Board of Directors approved the following action on May 15, 1994 be it

RESOLVED that the first paragraph of the Bylaws Article XII, Section A be amended to read as follows:

Bylaws Article XII—Dues

A. Active and Associate Members

Each Constituent Society shall pay to the Federation Office annual dues of twenty five dollars ($25.00) in U.S. funds per capita for each Active and Associate Member of the Constituent Society.

On a motion by Dr. Ryntz, seconded by Mr. Shackelford, the first reading of the above amendment regarding a dues increase to $25.00 for Active and Associate Members was unanimously approved. Affected by the passage of this amendment would be that the annual dues for Retired and Society Honorary Members, which currently are set at one-half the amount of Active and Associate Members, would increase to $12.50 per annum. The second and final reading of this proposed amendment will take place at the Fall Meeting of the Board on October 8, 1995.

Michael L. DePietro (Western New York) and Arthur K. Hagopian (Toronto)

II. Society Representative—Eligibility

Following the defeat of the amendment on October 11, 1994 to allow any class (except Educator/Student) to sit on the Board as a Society Representative, the Detroit Society proposed:

That a Society that cannot find an Active Member to serve as Society Representative be allowed to petition the Board for a waiver of hardship to allow the use of an Associate Member. This hardship waiver would be judged by a formal set of criteria that the Executive Committee would utilize before granting or rejecting the request, with the Board establishing said criteria. The Bylaws Committee was requested to draft appropriate language and criteria for consideration by the Board of Directors.

Bylaws Article IV (B) —Organization

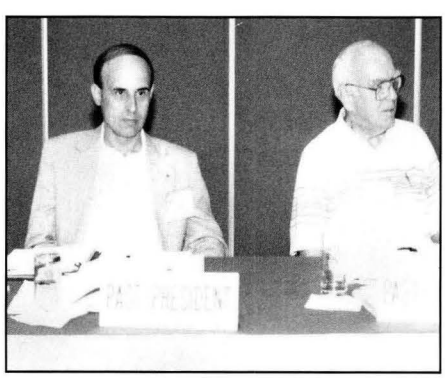
WHEREAS the Detroit Society has proposed and upon proper action by the Board of Directors be it

RESOLVED that a new and an additional paragraph be added to the Bylaws under Article IV (Organization) and as an addition to Section B. The new Paragraph to be added just prior to the list of "Duties of the Board."

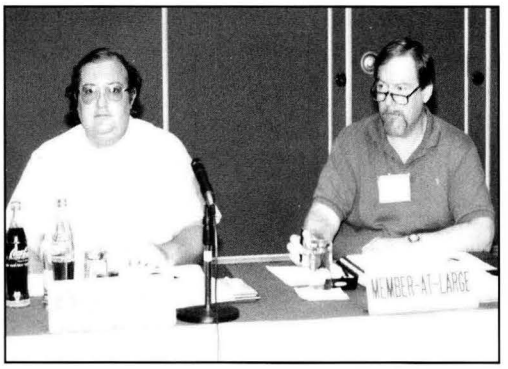
Any Society that is unable after diligent effort to secure an Active Member to serve as Society Representative may petition the Board of Directors for a waiver of hardship to allow an Associate Member to serve as Society Representative. The petition must satisfy the following criteria to be acceptable by the Board of Directors.

(1) A specific candidate must be presented.

(2) The candidate must be an Associate Member of the local Constituent Society.



John A. Lanning (Louisville) and John J. Oates (New York)



Freidun Anwari (Cleveland) and F. Louis Floyd (Baltimore)

(3) The candidate must have a history of participation in the local Constituent Society and the FSCT. This history must cover a period of not less than 10 years.

(4) The candidate must be able to serve as an FSCT Board Member without any bias toward the product or services of his/her present employer. Further, the candidate's employer must give unconditional permission for the candidate to fulfill the duties of a member of the FSCT Board.

(5) The candidate must be a representative of a small Society that has polled all Active Members and has found it impossible to find a suitable and willing Active Member to serve as Society Representative. (For the purpose of this action a small Society is defined as one with no more than 200 total members and no more than 100 Active Members.)

(6) The candidate must be able and willing to carry out all duties as a Board Member as presented throughout Article IV.

(7) The candidate must first be presented to the Executive Committee and the Executive must recommend or not recommend to the Board.

Following a motion by Mr. Evener, and second by Ms. Richardson, the proposed amendment was discussed at length. Comments were heard regarding possible limitations on the number of Societies which could elect Associate Members as Board Representatives. This concept was thought to be untenable. Further comments regarding the technical interests of the Societies were more persuasive, including the comment that Alternate Society Representatives are allowed for in the Bylaws. Final comments related to the responsibility of the Societies to represent the technical interests of the industry. By a vote of 17-16, the Board disapproved the first reading of the above proposed amendment.

THAD T. BROOME
Chair

Election to FSCT Honorary Membership

Having been duly nominated and approved by their Societies and approved by the Federation Executive Committee, the following individuals were presented to the Board for election to Federation Honorary Membership:

(1) J. Richard Kiefer, Jr., of the Philadelphia Society

On a motion by Mr. Denny, seconded by Dr. Kaplan, Mr. Kiefer was unanimously elected to FSCT Honorary Membership.

(2) Fred G. Schwab, of the Cleveland Society

On a motion by Mr. Gough, seconded by Mr. Giusto, Mr. Schwab was unanimously elected posthumously to the Federation Roll of Honor.

Review of Strategic Planning Proposal

David Domsch, Vice President of Lawrence-Leiter and Company, who has facilitated the Strategic Planning discussions throughout, presented to the Board an overview of the issues and goals and objectives reached during these discussions and the results of presentations to the Societies' Boards of Directors.

FSCT Mission Statement

"The Mission of the FSCT is to provide technical education and professional development to its members and the industry through its Constituent Societies and collectively as a Federation."

The above mission statement, developed in planning discussions, was reviewed during Society presentations. The statement reflects the overall interests of both the Societies and the FSCT, and provides a focus for all future efforts.

Strategic Issues

Planning discussions addressed both the historical perspective of the FSCT, and the current and future state of the industry. Key questions were discussed: How has the Federation operated in the past? What changes need to be made to serve its members and the industry in the future? In answering these questions, various issues were considered:

FSCT's Past Focus on a Mature Market

The Federation and its Societies have historically maintained its roots in the "liquid" coatings industry. Most programs and services have not addressed the other technologies, such as powder coatings, inks, UV and EB, thin film coatings. It was felt strongly that services and programs need to be developed for these areas of the industry.

Show Revenue Dependent

A significant issue is that the FSCT is extremely dependent on the success of the Paint Industries' Show to fund its operations. Over 67% of FSCT annual revenue comes from the exhibition, subsidizing many of the FSCT activities, including the JOURNAL OF COATINGS TECHNOLOGY. This degree of exposure is unacceptable and plans need to be made now to expand into other areas of revenue.

International Opportunities

The trend towards industry consolidation and internationalization was recognized as a key issue to be considered. A plan for the future operations of the FSCT should incorporate the utilization of resources and talents toward the development of overseas/international opportunities.

Constraints

With a changing industry, a major issue is the general lack of in-depth knowledge of membership interests, concerns, and needs. For the most part, Constituent Societies have operated independently from the FSCT in membership development and records. A basic constraint was seen as the lack of a centralized membership data base to develop and coordinate future programs and services for the membership and the Societies.

Strategic Goals and Objectives

Fundamentally, the strategic plan focuses on the following goals:

(1)To include under the technical umbrella of the FSCT all coatings technologies.

(2)To become truly international in providing services and programs.

To accomplish these overall goals, the Board was asked to consider the following objectives:

a. Expansion of the technical offerings of both the programming and exhibits at the Paint Industries' Show.

b. Development of programs for the Constituent Societies in various technology and manufacturing topics.

c. Formation of non-geographic special interest groups.

d. Development of opportunities to interact internationally, both to individuals and to allied industry groups.

e. Expansion of headquarters support, including increased marketing efforts and support, and a centralized membership records system.

Society Comments:

In reviewing the feedback provided by the Society presentations, Mr. Domsch noted the following:

On the key elements provided in the plan, comments were extremely favorable, indicating that the general direction is correct, and that the mission statement is appropriate. The Societies all expressed their appreciation in being consulted.

While the overall goals were seen positively, some Societies noted that the specifics were unclear, especially the role of the Societies. Mr. Domsch indicated that this is not an uncommon feeling when changes are discussed.

Specific Actions

Specific actions being contemplated or already underway, include:

a. Addition of a Marketing Director to Staff Headquarters.

b. Modification and updating of FSCT publications

c. Broader focus for the Annual Meeting Program and Paint Industries' Show.

d. Beginning internationalization through the sponsorship of a Latin American Coatings Show.

e. Creation of a central membership records system.

f. Development of special interest groups.

Society Comments:

Marketing Director—Societies were completely favorable and looked forward to the additional support that such a position would provide, especially in the areas of promotion of Societies' activities to management and potential members.

Publications—The FSCT needs to define the role of the JCT and other publications. What niches do they fit? Regarding the Panorama CD-ROM System, comments reflected the feeling that this is a new product utilizing somewhat unfamiliar technology. Refinement of the system should be considered.

Broader Focus of Annual Meeting/Paint Show—Societies were fully in favor of this action, noting that the event can be used as a site for sales meetings, etc.

Latin American Coatings Show—While caution was advised regarding the cost and potential dilution of the Paint Industries' Show, the overwhelming feeling was that this area should be addressed as soon as possible.

Central Membership Records—Most Societies saw a real need for a systematic approach to maintaining membership files. The FSCT, however, should approach this topic carefully and develop a consensus in policy and protocol in handling Society records.

Special Interest Groups—While all comments on the establishment of special interest groups were favorable, it was felt that this area was not fully understood.

Perspective

As a facilitator, Mr. Domsch said, he has seen expressions of overall support for the strategic plan. The comments made at Society presentations indicate a clear interest by the Societies in the success of the FSCT, as well as in their own success. The Societies want to play a role in the plan.

Suggested Follow Through:

Mr. Domsch suggested that the plan covered much area and that not all of the actions can be done immediately. The Societies, while wanting to be part of the plan, need clarification of their role and need the tools and programs to succeed. This is especially true with regard to the establishment of special interest groups. Not all Societies may wish to implement or cooperate in a central membership records system. However, as experience grows in the use of such a system, the benefits will become apparent.

Finally, he recommended that the time is right to take a new direction, and to implement the plan.

Mr. Walton thanked Mr. Domsch for his efforts over the past two years and for his help in providing advice and direction to the several groups involved in the development of the proposed plan. He then opened the topic for discussion among the members of the Board. The following is a summary of comments:

- Raised was the question as to how the above strategic issues were developed, and why the topic of manufacturing was not specifically addressed. Mr. Oates, a member of the strategic planning panel advised that the group analyzed the current and expected future state of the industry, looked at major trends, and set priorities. Manufacturing was among several areas which the group thought important, and he believed that this as well as other topics not specifically mentioned were implicit in the mission statement.
- Several members of the Board commented that this was an excellent example of good communication and congratulated the FSCT in its method of completing the planning process. They noted that in proceeding with programs and increasing services it was important to control finances and the advance into international areas should initially be limited to North America.
- The development of special interest groups and expanding into allied technical areas was thought long overdue. The FSCT should refer to the activities of the American Chemical Society in pursuing programs in these areas.
- While the mission statement was noted to be adequate, generally, it was suggested that there was a need to establish values and operating principles to further guide future activities.
- In providing expanded services and programs, especially internationally, it was noted that the FSCT should consider the effects of such activities on both the national and local Society activities.
- The Board encouraged the development of membership data, including complete information on company specifics, and increased marketing and promotional efforts.

Mr. McKenzie made the motion to accept the strategic planning proposal as presented; seconded by Mr. Lanning and approved by a vote of 32-1.

Society Business

Mexico—Ms. Colin requested that the Federation consider expanding educational scholarships to Mexico and Latin America. *Mr. Walton thanked Mexico for its comments and advised that the subject will be brought to the attention of the Coating Industry Education Foundation which provides educational funding on behalf of the FSCT.*

Los Angeles—Mr. Bremenstuhl brought to the attention of the Board current areas of interest in the Society:

The Society is renewing its efforts in providing educational scholarships and grants; seeking ways to expand its manufacturing efforts; increasing support to educational curriculum at CalPoly San Luis Obispo, including a possible expansion of these efforts to CalPoly Pomona.

He also informed the Board that the Southern California Paint & Coatings Association (SCPCA) had made a proposal to merge all of

the coatings-related organizations in California into one umbrella group which incorporated both management, legislative and technical areas. He reported that the SCPCA, in anticipation of merging technical activities into the new organization, has indicated that its member companies would cease all support of their employees' participation in LASCT activities. Both the Los Angeles and Golden Gate Societies oppose such a merger and Mr. Bremenstuhl noted that the Society has received advice and support from the FSCT in addressing the situation.

Mr. Doyle provided the perspective of the NPCA, noting that the national organization has supported consolidation of efforts where efficiencies would be enhanced, and not merger for the sake of merger. He said that NPCA saw a need to consolidate the lobbying efforts in California and that a June meeting was scheduled to discuss the issue further.

The Board was seriously concerned about the situation and indicated its support of the West Coast Societies efforts to oppose such a merger. Individual comments from Societies were made regarding similar pressures locally and speculation of a coordination of these efforts. Mr. Doyle advised that although NPCA was aware of some concerns from manufacturers about the cost of supporting several organizations and the withdrawal of financial grants from FSCT, there was no coordinated effort.

Mr. Bremenstuhl noted that the Society is studying the SCPCA proposal and that it would make a statement in early June.

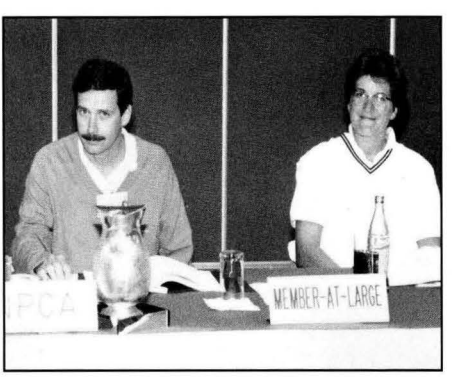
New York—Mr. Du reported the Society's concern about the reduction of educational funding provided in the 1995 budget and the status of capital investments. Mr. Geiger, a member of the Finance Committee, provided information on the investment policies of the FSCT, indicating that the FSCT continues to utilize conservative measures in investing. Mr. Ziegler mentioned the current survey being held to discover the future technical personnel needs of the industry. The results of this survey will provide direction for educational funding. Also noted was the support needed for the professional development programs for current technical personnel.

Rocky Mountain—Mr. Mullen reported on the recent illness of former Board member John Delmonico. He also noted that the Society's Phoenix Section has become quite active, with about 40 persons attending monthly meetings.

Southern—Mr. McKenzie advised the Board that the Society has started a Birmingham, Alabama Section.

Toronto—Mr. Hagopian reported the Society's concern about the dropping by CIEF of scholarship funding to the University of Waterloo. Mr. Austin, Treasurer of CIEF, advised that the decision was based on the amount of funding available to CIEF and the decision to support undergraduate and graduate scholarships.

Western New York—Mr. DePietro reported on the status of the Society's activities. The group is currently conducting one technical meeting per year and dues are being paid individually directly to the FSCT. It is looking to expand into other areas of the industry.



J. Andrew Doyle (NPCA) and Rose A. Ryntz (Detroit)

Other Business

Staff Personnel—Mr. Oates, noting that the Staff has begun to contribute to a 403(b) retirement plan (similar to a 401(k), but legislated specifically for not-for-profit organizations), made a motion that the Federation Finance Committee develop policy for the support of Staff's initiative by providing for an FSCT matching funding. The motion was seconded by Mr. Shackelford and unanimously approved.

CIEF—The report of the Coatings Industry Education Foundation was discussed. The report noted the Trustees concern about the decreased funding made available by the FSCT. Mr. Walton indicated that it was only recently that the funding was increased, over 400% in the past three years, and that funding has only been reduced to pre-1993 levels. Future funding will be based on need and the availability of resources.

NPCA Planning—Mr. Doyle advised the Board of NPCA's future planning discussions. He invited the FSCT to attend a July 26 meeting involving the NPCA planning group as well as other industry organizations to provide input and to discuss proposals reached in planning meetings.

Statement of Independence—With regard to the Southern California situation, Mr. Floyd made the motion that the Executive Committee be directed to prepare a draft "statement of independence," which would make clear the FSCT and Society stand on future direction. Seconded by Mr. Bremenstuhl and approved with one abstention.

Committee Reports

ANNUAL MEETING PROGRAM

The 1995 Annual Meeting Program Committee met on September 27, 1994 to develop a theme and support paragraph for the 1995 program. This was the first opportunity for the Committee to meet before an Annual Meeting and allowed the Committee to really get a head start on the process. At the September meeting, "Creativity + Adaptability = Gateway to Success" was chosen as the theme of the St. Louis Annual Meting Program. The theme recognizes that only with knowledge of new and parallel technologies may we adapt to the changing marketplace. As always we realize education is the key that unlocks the Gateway to Success.

Since the initial planning meeting the Committee has met once in New Orleans and twice via conference call. Deadlines have been established, and contacts have been made with allied industries such as powder coatings, radiation cure, and adhesives. It is the intent of the Committee that 1995 program sessions will be of more practical nature overall then in the past. Effort is being made toward tutorial session in the above mentioned parallel technologies. Early Bird Sessions are being planned after last year's successes and a Poster Session will also be held to showcase student research. Forty-three abstracts have been received for possible transom papers on a wide

variety of subjects and the Committee expects this year's program to begin a new trend for programs.

LOUIS F. HOLZKNECHT
Chair

ANNUAL MEETING HOST

The following St. Louis Society members have been carefully selected to serve as Sub-Committee Chairmen and were introduced at the February 21, 1995 regular meeting.

John Folkerts, Futura Coatings ..... Information
Terry Gelhot, Carboline ..... Program Operations
Steve Crouse, Brod Dugan ..... Registration
Mike Hefferon, Walsh & Associates ..... Federation Exhibit
Dave Rickard, Chemsac Chemicals ..... FSCT Hospitality Suite
Marisa McGruther, U.S. Paint ..... Spouses Program

The subcommittee and the St. Louis membership is very excited about the 73rd Annual Meeting being held in St. Louis. We have many men and women volunteers that have come forward from our members to include chemical raw material manufacturers, equipment and container manufacturers, distributors, and coatings manufacturers.

Our first subcommittee meeting will be held in April. The purpose will be to review the duties of each subcommittee, assign volunteers, discuss specific schedules and dates, and discuss recommendations for distinguishing our volunteers, i.e., special caps, jackets, ribbons, etc.

The Host Committee will be addressing the following projects:

(1) Staffing a welcome desk at Lambert-St. Louis International Airport to assist travelers in using taxis, shuttles, and metrolink.

(2) Assessing the need for a restaurant guide that is non-commercial.

(3) Creating an interesting spouses program that in itself will be a big draw.

The St. Louis Society members look forward to this years show and will cooperate in any way needed with the Federation Staff and officers.

DENNIS CAHILL
Chair

CORROSION

On February 7, 1995, the Corrosion Committee held its first yearly meeting at the Guest Quarters Hotel-Philadelphia Airport. There were several key items discussed in preparation for the new year. They were as follows:

- Review of the 1994 Annual Meeting Symposium
- 1995 Annual Corrosion Symposium
- Corrosion Monograph Project

Review of the 1994 Annual Meeting Symposium—The Committee reviewed the results of the audience survey conducted. All members were quite pleased with the response to the quality of speakers and their subject matter. Another concern prior to this year's session was attendance, which had decreased somewhat in 1993. However, this year's program produced a very consistent audience of 100 attendees. The attendance actually increased from the fourth to the fifth, which is quite unusual in these sessions regardless of the topic.

1995 Annual Corrosion Symposium—Preparation for the 1995 session got off to a somewhat slow start due to the Committee's decision to change the symposium format. This year's session will feature a panel discussion. The topic selected is entitled "High Solids or Waterborne: Selecting the Appropriate Corrosion Inhibitive Technology." This symposium will focus on several specific application scenarios for VOC compliant corrosion inhibitive coatings. Panel members will be asked to state their position of the use of high solids and waterborne technologies in the application scenarios described.

As of this writing, all scenarios have been generated and will be disseminated to perspective panel members prior to March 31. A letter describing the program, the timetable, and a review of the format will accompany the scenarios selected.

The Committee believes that the interactive format and the relevance of the topic selected could well result in one of the more interesting sessions yet.

Corrosion Monograph Project—Status of the proposed Corrosion Monograph was reviewed and the Committee is now in the process of contacting potential authors. Interested parties should contact Mike Jackson, Corrosion Committee Chairman, for additional information.

Additional Items Reviewed—Also discussed were: Interaction with affiliate associations (i.e., NACE), the annual Corrosion Committee Publication Award, and the proposed new standing rules for the Committee. Specifics reviewed were as follows:

(1) Association Update—Presently the Committee monitors the activities of NACE, SSPC, and ASTM in search of new trends, and, more importantly, common goals which would allow for more association interaction. The Committee has decided to add the Electrochemical Society to the organizations listed due to common interest in evaluation of corrosion protection using accelerated methodologies.

(2) Corrosion Committee Publication Award—The Committee had previously discussed change in the status of this award. It was decided that the Committee would conduct this award in 1995 as it has been done in the past and take proper steps to change the award in 1996. The new award will encourage submission of papers and will be run similar to the Roon Awards.

(3) Standing Rules—The Committee reviewed a letter from Chairman Jackson to FSCT President Joe Walton regarding the proposed changes in eligibility requirements and term limits for Committee members. Changes proposed were introduced to assure continuity, productivity, and membership turnover required to maintain a fresh approach to assisting FSCT members in resolving their coating corrosion problems.

The next meeting of the FSCT Corrosion Committee will be held on July 25 in Philadelphia.

MICHAEL A. JACKSON
Chair

EDUCATIONAL AND EDUCATIONAL COORDINATING

The Educational Coordinating Committee (ECC) serves many functions. We define the projects and resources necessary to further the educational and informational work of the Educational Committees of the Constituent Societies. We request and administer Federation funds for identified educational resources. Another function is to manage the small Society scholarship program. Finally, we administer the annual A.L. Hendry Award.

The ECC met in Cleveland on Monday, November 7, 1994. We continue to work on several major projects that are developing into useful reference tools for each Society's educational activities. It is our purpose to develop and execute projects that provide "practical" tools for the Society's projects. Results and updates of our activities are detailed below.

Coatings/Science Resource Package—Most of our Constituent Societies participate in educational programs wherein members go into communities to promote scientific literacy in general, and the coatings industry in particular. A binder has been developed with leadership being provided by Committee member, Paul Baukema. He has provided a tremendous amount of leadership and hard work in this effort. This binder will act as a reference tool to help our members with their local school programs. This "living document" will be

Terry Gelhot (St. Louis) and J. Dick Mullen (Rocky Mountain)

presented to each education chairperson at the annual Federation educational meeting, which is being held June 1-2, 1995, in Blue Bell, PA. The binder will contain demonstrations to use in the classroom. Further experiments will be added. There is a section on research and science fair projects. Lastly, a section on mentoring ideas has been provided. It is important to note that this binder is intended to be ongoing, with additional experiences added by our members. Tremendous thanks go to Paul and his subcommittee for their efforts.

Improving Monthly Meetings—the FSCT Society Speakers Program—Strong technical program, absent of commercial promotion, has been identified as an important issue by the Society educational chairs. As provided at the last Board of Directors meeting, we are developing a list of notable speakers for whom the FSCT would sponsor and fund travel expenses. Our goal continues to be that the FSCT-sponsored speakers be available to each Society every two years. Certain leaders in the industry have been identified. Abstracts are being obtained. This project has many details to work out, so implementation of this program is progressing with the expectation of speakers being provided this fall.

The Southern Society A.L. Hendry Award—This award emphasizes undergraduate work, and increases interest by also rewarding the sponsoring laboratory. The 1994 A.L. Hendry Award was presented to Jason Giles and William Dechent of the University of Missouri-Rolla, for their paper entitled "Synthesis of High Performance Clear Coat Systems Involving Tetrachlorohydroquione." Greater participation is always encouraged. We encourage local Society members to aid participation in their region; the announcement has gone out for the 1995 award.

FSCT Small Society Scholarship Program—Our Committee awarded eight Societies with matching funds for their educational activities. Support is limited to $400 per Society per year, with the focus being assistance of small-to-medium sized Societies, and sections of Societies which have limited funds for educational efforts, especially in the areas of scholarships and grants. Please encourage your Society to participate.

FSCT Technical Focus Award—The Technical Focus Award Speaker, initiating the Annual Meeting Program, drew an audience of 134 people in New Orleans. This award recognized current and timely contributions of an educational or technical nature, especially those of a younger member of the Federation. The cash prize for the award is $500. The Annual Meeting Program Committee (AMPC) is currently managing this program, with members from the ECC, PDC, the Technical Advisory Committee (TAC) and AMPC participating in the selection process. This Committee will select a speaker in April for the Annual Meeting in St. Louis.

Next Meeting Date and Location—The next meeting of the FSCT Educational Coordinating Committee will be held on Thursday and Friday, June 1-2, 1995, in Blue Bell, PA. The ECC will meet on Thursday afternoon, and the full Educational Committee will meet on Friday. A reception will be held at FSCT Headquarters on Thursday evening.

We have term limits in place on our Committee to guarantee an influx of new members to insure the generation of fresh ideas. We thank you for your continuing support and guidance.

MELINDA K. RUTLEDGE
Chair

INTER-SOCIETY COLOR COUNCIL

The 64th annual meeting of the ISCC was held in Greensboro, NC, April 23-25, 1995. Because this meeting was cosponsored with the American Association of Textile Chemists and Colorists (AATCC) most of the papers dealt with textile applications of color science.

Because of a business commitment in Kentucky, I was not able to attend the meeting.

RALPH STANZIOLA
Chair

MANUFACTURING

On May 8-10, 1995, the joint FSCT/NPCA Manufacturing Committee met in San Francisco, CA. The meeting was attended by 27 members and guests. The Committee toured the Fuller-O'Brien Paint plant in South San Francisco and the Rohm and Haas resin manufacturing plant in Hayward, CA. The Fuller-O'Brien plant demonstrated a recent plant renovation of a facility that was approximately 50-years old. This plant was converted from an automotive/industrial paint manufacturing plant to a multi-purpose trade sales plant. The Rohm and Haas factory is a state-of-the-art water-based resin manufacturing facility that utilizes several innovative techniques for manufacturing as well as statistical process control and total quality management. The Committee members found both tours very worthwhile.

The San Francisco meeting marked the third joint meeting of the FSCT/NPCA committees. The joint agendas appear to be working very well and we continue to be optimistic about the combined relationship. As part of the meeting, Whitney Long, Manager of Health Affairs for NPCA, gave a presentation on OSHA's review of paint companies. In recent months OSHA has targeted the paint and coatings industry and Ms. Long's presentation explained some of the reasons for the increased number of inspections. Approximately 40% of the members that were in attendance at the meeting had recent OSHA inspections. The presentation touched on common violations and the correct procedures to follow during an OSHA inspection. The presentation was very informative.

The Committee reviewed the presentation given at the FSCT Annual Meeting titled, "The Human Side of Process Safety Management." All agreed that it was well done and well attended. Plans are underway for the 1995 Manufacturing Session to be given on October 10 from 9:00-11:00 a.m. in St. Louis. Some of the topics being explored are ISO 9000, Computer Technology in Paint Manufacturing, and Plant Renovations to keep the pace with current regulatory requirements.

The Committee is beginning to plan for a one- or two-day manufacturing seminar in the spring of 1997. The topic will more than likely revolve around the retrofitting of existing plants or the plant design/how to build a new plant concept. It was unanimously agreed that when the "How to Build a New Paint Plant Seminar" was presented a few years ago, it was very well received and the timing is good for an update.

The Committee will be making a recommendation for the Golden Impeller Award which is awarded annually to an individual who has made a significant contribution in the area of dispersion technology. This award is presented by Morehouse-Cowles annually at the Paint

Show. Last year's award was presented to Horton Russell, of Devoe & Raynolds Co., Inc.

The Committee agreed to work closely with the *JCT* to provide papers that could be published regularly in a manufacturing section of the magazine. It was also agreed to explore the possibility of a questions and answer section that would allow members to ask questions and have them answered by Manufacturing Committee membership.

DON L. MAZZONE
Chair

MEMBERSHIP SERVICES

The annual membership drive is off to a great start with over 397 inquiries about FSCT membership. The annual membership drive starts after the Annual Meeting & Paint Show and targets all non-members who attended the Show. The mailing includes an information packet on the benefits of membership in the FSCT and its Constituent Societies. The FSCT also sends to each Society a set of mailing labels of non-members in their locale.

The "Last Chance to Renew!" flyer was sent to all members who did not renew by the roster deadline. This is a big help to membership chairs who did not have the resources to follow up on members who do not renew.

A "Look What's New" mailing was directed to members who have not renewed in the past two years and also to purchasers of publications who are non-members. These mailings have resulted in some 159 membership inquiries.

The Committee once again made Constituent Society liaison assignments in order to make more personal contact with each Society membership chair. The intent is to get new ideas and suggestions and to answer any questions a membership chair might have.

A suggested Membership Services Committee Structure, shown below, was prepared at the request of the Federation President, Joseph P. Walton.

MEMBERSHIP SERVICES COMMITTEE
SOCIETY LIAISON ASSIGNMENTS

Committee Member:	*Liaison With:*	
Brenda Carr, Cleveland Society	Cleveland CDIC Golden Gate Los Angeles	Philadelphia Piedmont Pittsburgh
Jane Allen, Detroit Society	Baltimore Chicago Detroit	New England New York Western New York
Jeff Shubert, Southern Society	Dallas Houston Kansas City	Louisville St. Louis Southern
Richard Branchik, Pacific NW Society	Birmingham Montreal Northwestern	Pacific Northwest Rocky Mountain Toronto
Jorge Hijuelos, Jr., Mexico Society	Mexico	Expansion Territories
Victoria Graves, FSCT Membership Services Director	Affiliate	

MEMBERSHIP SERVICES COMMITTEE STRUCTURE

(1) Appointments to the position of Committee Chair is made by the FSCT President.

(2) All other appointments to the Committee are made by the Committee Chair.

(3) Committee term limit is two years. Committee members may be re-appointed to up to two additional terms or a total of 6 (six) years.

(4) Appointments to the Committee Chair position should be selected from those Committee members who served at least one term on the Committee.

BRENDA L. CARR
Chair

PROFESSIONAL DEVELOPMENT

The Professional Development Committee (PDC) has developed a mission statement which reads as follows:

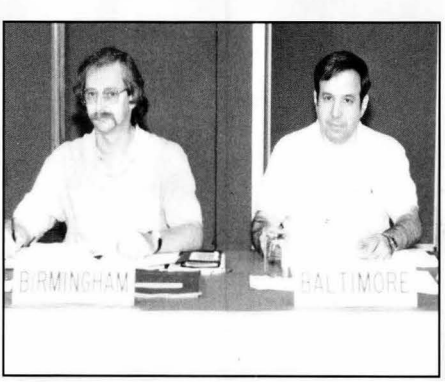
"To promote and maintain technical competence, from basic techniques through state-of-the-art technologies, within the coatings and related industries in a way that will meet the needs of individuals through appropriate training mechanisms, including short courses, technical symposia, seminars, and Annual Meeting sessions, so that coatings professionals can effectively contribute to the success of their respective employers within the global marketplace."

The Committee as such has developed two seminars that will be offered in 1995:

(1) *Formulating for the Clean Air Act* —March 20-21, 1995 in Cleveland; and November 6-7, 1995 in Denver. The program, successfully introduced in 1994, will focus on the status of new regulations that challenge the coating formulator and discuss future legislation that is being considered. Topics to be covered include: solvent selection; formulation; VOC content issues; reactive diluents; abatement technology; additives; and EB/UV curing solutions. The session will also give the attendee the opportunity to "question the experts" through a problem solving panel discussion.

(2) *Polymer Chemistry for the Coatings Formulator* —June 20-21, 1995 in Chicago. The newly created program will review basic polymer chemistry, methods of analysis for polymers thus produced, and will relate attained polymer structures to properties attainable in formulated coatings. Topics to be covered include: condensation polymerization; addition polymerization; polyester/alkyd chemistry and formulation; phenolic chemistry and formulation; reactive diluents and formulation; vinyl polymers and formulation; acrylic polymers and formulation; urethane chemistry and formulation; epoxy chemistry and formulation; melamine crosslinking chemistry; isocyanate crosslinking chemistry; and analytical characterization.

The Committee will also organize a session for the Annual Meeting in St. Louis that will be offered twice (Monday afternoon, October 9, 1995; and Tuesday morning, October 10, 1995): "Computer Applications in Coatings" which will include a general over-



Gerry J. Gough (Birmingham) and Joseph D. Giusto (Baltimore)

view of the topic and presentations on various software packages including: design of experiments; solvent selection; and, formulation.

The Committee solicited monies in the 1995 budget for a state-of-the-art marketing "test drilling" survey of the membership which was denied. The Committee still feels that such a survey is directly needed to direct efforts in technical competence training of the FSCT membership in more effective manners, including developing areas of need, geographical preferences for training, training media types, e.g., CD-ROM, Cdi, seminars, booklets, audio-visual courses, etc., and asks that the monies be allocated in the 1996 budget. This "test drilling" will be similar in content to the PDC survey conducted by Mary Brodie in the 1990-1992 time frame but will incorporate state-of-the-art marketing tools so that timely information can be disseminated throughout the other FSCT Committees.

ROSE A. RYNTZ
Chair

PUBLICATIONS

The JOURNAL OF COATINGS TECHNOLOGY has been redesigned. This is the *JCT*'s first change in appearance in 15 years, and it is strongly supported by the Publications Committee. First appearing with the January 1995 issue, the new format has gained extremely positive reactions. The new format will include Feature Articles designed to appeal to those who are new to the coatings industry and those who are interested in articles of a more practical nature. The number and quality of manuscripts submitted to the *JCT* continues to be good, and the time between receipt of an article and reply to the author remains short. The membership of the Editorial Review Board remains steady at 23. Continuing feedback on the new *JCT* is always appreciated.

The Federation monograph *Series on Coatings Technology* continues to grow. Three new titles appeared in 1994: "Metal Surface Characteristics Affecting Organic Coatings," by Bruno Perfetti; "Painting of Plastics," by Rose Ryntz; and "Color and Appearance," by Robert Marcus and Percy Pierce. At least five new monographs will be published in 1995, including "Organic Pigments," (second edition) by Peter Lewis (to appear in May), "White Pigments," by Juergen Braun (April/May), and "Methodologies for Predicting the Service Life of Coating Systems," by J. W. Martin, S.C. Saunders, F.L. Floyd, and J.P. Wineberg (May/June). With the appearance of five new titles this year, the Series will comprise 27 booklets. Suggestions for additional titles and authors are always welcome.

The second edition of the *Paint/Coatings Dictionary* is being prepared for publication. Copies of this newly expanded, encyclopedic edition should be ready for display at the Paint Industries' Show in early October. We are also investigating publishing a CD-ROM version of the Dictionary.

The Publications Committee will meet in the spring or early summer, and the Editorial Advisory Board will meet on the next day. The Board meets with the Committee every second year. A site for the meeting has not yet been chosen.

ROBERT F. BRADY, JR.
Chair

TECHNICAL ADVISORY

The Technical Advisory Committee (TAC) met in Baltimore, MD, to finalize plans for the joint meeting with the Society Technical Chairs and to discuss the Society Speakers and APJ/A.F. Voss awards which are now the responsibility of the TAC. All TAC members were in attendance.

Joint Meeting with Constituent Society Technical Chairs—Plans for this joint meeting and the tentative agenda were finalized. The site is Washington, DC, and the dates are August 17 and 18, 1995. There will be a reception on Wednesday evening, August 16.

On Thursday, the agenda includes presentations from the individual Societies on the status of technical projects, an update on FSCT activities, and the tour of the FBI paint lab. A reception will follow on Thursday evening.

On Friday, the TAC will update the Technical Chairs on their activities, with particular emphasis on the guidelines for the Society Speaker Award and the APJ/A.F. Voss Award. After the TAC explains the guidelines, there will be a presentation by a speaker and the Society Chairs will have a chance to grade the speaker based on the guidelines just presented. This will be done to ensure that the Society Technical Chairs understand the qualifications for each of the awards. It will also help the TAC in their objective to provide fair competition for these awards. Also on Friday, there will be a brainstorming session on several key topics of interest to the paint industry, where the teams will develop a plan for the actual experimentation of the project.

Lead Abatement—Edward Ferlauto, the TAC liaison to the ASTM subcommittee on Lead Abatement, discussed the value of his continued involvement regarding this topic. The initial involvement included gathering and collating data to ascertain the most accurate updates. This resulted in a presentation by Mr. Ferlauto at the Annual Meeting based on the collaborative efforts of the Northwestern and Baltimore Societies. With the NPCA and FSCT involvement, it was agreed by a consensus vote that Mr. Ferlauto's involvement should be minimized.

New Business—A mission statement was prepared for the Technical Advisory Committee:

"The mission of the FSCT Technical Advisory Committee is to establish guidelines, facilitate technical projects and encourage Constituent Societies to participate in programs in a way that will advance understanding in coatings and related areas so that there will be a continuity of technical projects which will result in the presentation of a technical paper at the Annual Meeting and publication in the JOURNAL OF COATINGS TECHNOLOGY."

GAIL POLLANO
Chair

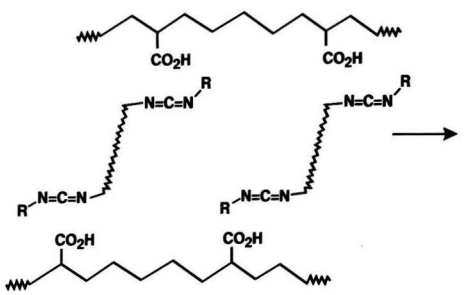
The next meeting of the FSCT Board of Directors will take place on Sunday, October 8, 1995, at 9:00 am, at the St. Louis Marriott, in St. Louis, MO.

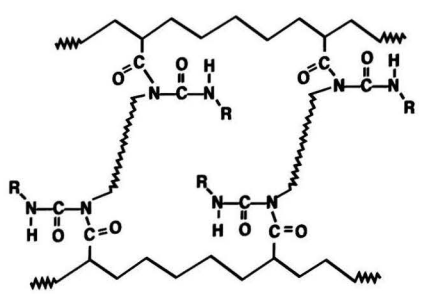
Study on the Chemistry of Polyguanidines as Precursors for Polycarbodiimide Crosslinkers in Powder Coatings

J.W. Taylor*, M.J. Collins*, and D.R. Bassett†—Union Carbide Corp.**

INTRODUCTION

The increasing knowledge of carbodiimide chemistry shows that it can be useful for crosslinking carboxylic acid-containing resins,[1-7] and for imaging photoresists.[8-11] Furthermore, biological studies on animals show that low-molecular weight polycarbodiimides can be prepared which have low toxicity, and no mutagenicity.[12] Although carbodiimides react with carboxylic acids to form anhydrides, at elevated temperatures, in the presence of amines or in polar environments, carbodiimides react with carboxylic acids to form predominately N-acyl ureas; thus, multifunctional carbodiimides are useful as crosslinkers under the appropriate conditions for crosslinking carboxylic acid-containing polymers.





Polyguanidines thermally decompose into polycarbodiimide crosslinkers. The decomposition rate to polycarbodiimides is shown to accelerate in an acrylic polymer matrix. The half-life of the guanidine moiety is 178 min at 180°C; however, when the polyguanidine is blended in poly(methyl methacrylate), the half-life is reduced to 4.8 min. As a result of the acceleration effect of acrylic polymers, blends of polyguanidines and carboxylic acid-containing polymers which are neutralized with diethyl amine can be processed to form powder coatings which crosslink at elevated temperatures. The gel fractions of cured powder coatings show that adequate crosslinking occurs at about 180°C.

The use of polycarbodiimides for powder coatings has not appeared practical because polycarbodiimides react with the carboxylic acid-containing polymer of solvent-borne formulations. Neutralization of the carboxylic acid moiety with amines improves stability, but does not prevent gelation of the coating formulation. To form a stable solid or liquid coating formulation, one solution is to block the carbodiimide with a chemical agent.[13]

It is well known[14,15] that guanidines are obtained by the addition reaction between aromatic carbodiimides and amines. Lyman and Sadri[16] have reported the physical properties of polyguanidines prepared from aromatic polycarbodiimides and primary amines. Iwakura et al.[17-19] studied the addition reaction of p-phenylene bis(alkyl carbodiimides) with benzyl amine, cyclohexyl amine, morpholine, and hexamethylene diamine. They report that pure bis(guanidines) could not be isolated from the reaction product of all-aliphatic bis(carbodiimides) and undisclosed amines; however, the formation of the guanidine moiety was detected by infrared spectroscopy. Attempts at purification of the bis(guanidines) prepared from all-aliphatic bis(carbodiimides) and amines resulted in undefined decomposition products. The unidentified decomposi-

Presented at the 72nd Annual Meeting of the Federation of Societies for Coatings Technology, on Thursday, October 13, 1994, in New Orleans, LA.

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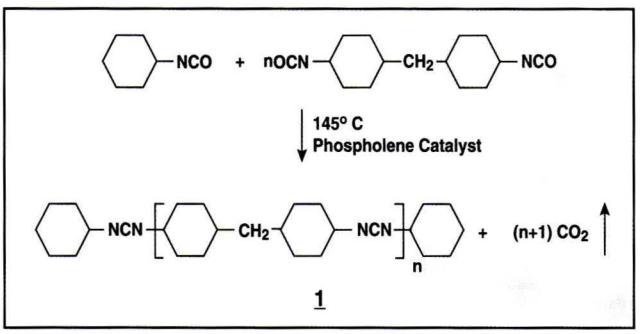
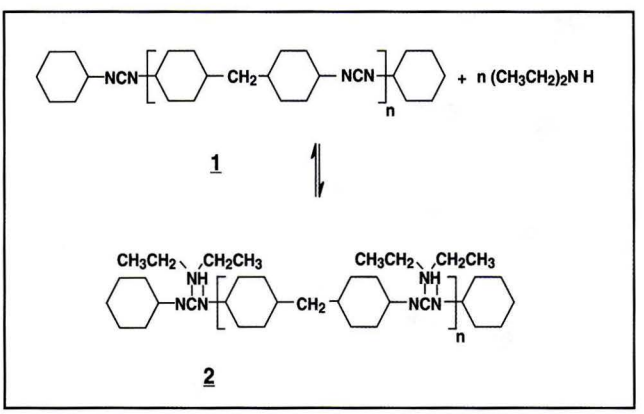
**Technical Center, South Charleston, WV 25303.

tion products from Iwakura's work suggest that guanidines may decompose to form carbodiimides and amines. The reaction would be analogous to many of the deblocking chemistries reported for blocked alkyl or aromatic isocyanates.

The polycarbodiimides 1 (n=3, 4, or 5) used in this study were prepared using a procedure described by Campbell.[20,21] Cyclohexyl isocyanate was reacted with the bis(4-isocyanato cyclohexyl) methane in the presence of a phospholene oxide catalyst. The level of cyclohexyl isocyanate determined the molecular weight of the polycarbodiimide. The reaction scheme is shown in the following:



To demonstrate the general feasibility of blocking and deblocking polycarbodiimides, a model all-aliphatic polyguanidine 2 (n=5) was prepared, and its decomposition kinetics studied as a neat material, as a blend in poly(methyl methacrylate), and as a blend in a carboxylic acid-containing acrylic resin designed for powder coatings. As shown in the following reaction scheme, the polycarbodiimides were reacted with diethylamine to give the desired polyguanidine.



EXPERIMENTAL

Synthetic Procedures

SYNTHESIS OF A SIX-FUNCTIONAL POLYCARBODIIMIDE (1, n=5)—To a round-bottomed flask equipped with a mechanical stirrer, thermometer, nitrogen inlet, and condenser were charged 100.16 g of cyclohexyl isocyanate, 524.0 g of bis(4-isocyanato cyclohexyl) methane (Desmodur W, Mobay), 608.7 g of propylene glycol monomethyl ether acetate, and 60 g of a 10% xylene solution of 3-methyl-1-phenyl-2-phospholene-1-oxide catalyst. A nitrogen purge of the reactants was begun, the reactor heated to 145°C, and the isocyanate absorption at 2260 cm^{-1} monitored by infrared spectroscopy. After 48.5 hr, reaction was essentially over. A carbodiimide absorption is visible in the infrared spectrum at 2122cm^{-1}.

SYNTHESIS OF FOUR AND FIVE FUNCTIONAL POLYCARBODIIMIDES—The syntheses of 1, (n=4 and n=5) were essentially the same as 1 (n=5) except that the level of cyclohexyl isocyanate was adjusted to give the theoretical carbodiimide functionality.

SYNTHESIS OF 2 (n=5)— Polycarbodiimide, 1 (n=5), was placed in a roto-evaporator, and the majority of propylene glycol monomethyl ether acetate removed under vacuum at 55°C, yield=596 g. The sample was then dissolved in THF to a solid level of 44%.

To a large screw cap bottle were charged 536 g of the THF solution of 1 (n=5), and 158.3 g of diethylamine. After 13 days, infrared spectroscopy showed only a trace of carbodiimide. A large guanidine absorption band was observed at 1635 cm^{-1}. Infrared analysis showed that 95% of the carbodiimide absorption had disappeared. Most of the excess diethylamine and THF were removed with a roto-evaporator under vacuum at 43°C. The sample was further dried by placing the sample in a vacuum oven and drying under house vacuum overnight then under mechanical pump vacuum at 50°C. A yield of 260 g was obtained with a melting range from 80 to 85°C.

SYNTHESIS OF 2 (n=3 AND 4)—The syntheses of 2 (n=3 and 4) were similar to the synthesis of 2 (n=5). The yield of 2 (n=3) was 110 g with a melting range of 54 to 56°C. The yield of 2 (n=4) was 198 g with a melting range of 64 to 65°C.

Kinetic Procedures

The decomposition of 2 (n=5) to 1 (n=5) was monitored by FTIR, TGA, and DSC. To determine the decomposition kinetics of 2 to 1, three-micron films (dry film thickness) of 2 were cast from tetrahydrofuran (THF) over sodium chloride discs. Samples were heated to a constant temperature; then, the collection of FTIR data was begun. Spectra were collected using a BioRad FTS-40 spectrometer equipped with a Spectra-Tech heated cell (model HT-32) and Omega microprocessor programmable controller (model 0019-019). Samples were heated in a nitrogen atmosphere to a designated temperature, then the collection of interferograms was begun. Typically, four scans were taken with a resolution of 4 cm^{-1}. After the kinetic runs, the spectra were computed, and the guanidine absorption at 1635 cm^{-1} was measured. To determine the decomposition kinetics of 2 in poly(methyl methacrylate) or in a diethyl amine-neutralized carboxylic acid-

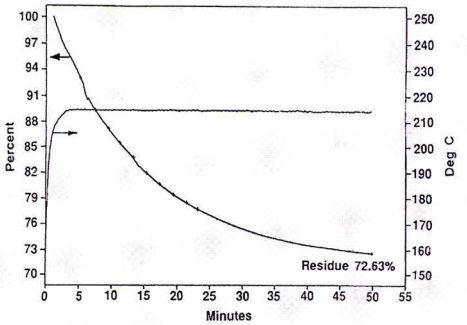


Figure 1—TGA of a polyguanidine held at 215°C under He.

containing resin (S.C. Johnson, SCX-817C), a polymer blend of 2 and the polymer were prepared by casting 1 mil films from a tetrahydrofuran solution containing a 9% (by weight) of 2 and the polymer.

Preparation of Powder Coatings

The carboxylic acid-containing resin used was SCX-817C, a commercially available resin developed for powder coatings and manufactured by S.C. Johnson (Mn=7,900; polydispersity, 2.2 (by GPC); methacrylic acid, 7.5%). A 40% solution was prepared by dissolving 210 g of SCX-817C in 315 g of tetrahydrofuran. To the solution were added 21 g of diethylamine. After stirring overnight, the resin was then precipitated by slowly dropping the diethylamine-neutralized SCX-817C resin into 3500 mL of hexane. (Note: attempts at precipitating the resin in methanol or water were unsuccessful). The diethyl amine-neutralized acrylic resin was dried overnight in a vacuum oven at 45°C. FTIR analysis of the neutralized resin shows a broad band at 1558 cm^{-1} which represents the diethylamine carboxylate salt.

A powder coating was prepared by dissolving 50 g of diethyl amine-neutralized SCX-817C in 162 g of tetrahydrofuran. The appropriate level of 2 (followed by 0.5 phr of 2,6-di-tert-butyl-4-methylphenol) was dissolved in the neutralized SCX-817C solution. After a solution was obtained, samples were poured into a Pyrex glass tray, then the tetrahydrofuran removed under vacuum at 50°C. The samples were then rolled in a ballmill overnight. Analysis of the powders showed the size of the particles ranged from 2 to 10 microns.

Powder coatings were applied to Bonderite #40 stainless steel test panels, and were baked in a forced-air oven which had been previously calibrated and the time to achieve metal temperature determined with a thermocouple. In each case, the coated metal panel was held in the oven until the desired cure profile was achieved.

Gel Fraction Determinations

Cured coating samples were obtained by baking one-gram samples of powder in an aluminum weighing dish or by baking of Bonderite steel panels as described. After cure, 50 mg of sample (measured ± 0.0002 g) were taken from the aluminum dish or scraped from the bonderite steel panel, placed in a fritted glass thimble, and extracted for 18 hr with THF in a micro soxhlet extractor. The sample-containing thimble was removed and dried in a forced-air oven at 110°C. The thimble was equilibrated to room temperature and the amount of residual powder determined. The gel fraction was calculated using the following equation:

$$\% \text{ Gel Fraction} = (\text{Residual wt.} \times 100)/\text{Initial Sample wt.}$$

Panel Evaluations

Coating thickness was determined using an electromatic coating thickness tester. The value was an average of eight measurements. Gloss was measured at both 20 and 60° using glossmeters. For both angles, the highest value of six was used. Distinctness of reflected image (DOI) was evaluated using a portable ATI meter. The highest value of three measurements was used. Yellowness index was measured utilizing a colorimeter. The higher of two values was used. Methyl ethyl ketone (MEK) double rubs were determined following the Powder Coating Institute (PCI) solvent cure procedure number eight. Knoop hardness numbers (KHN) were measured following ASTM E 384 with a 25 g load.

RESULTS AND DISCUSSION

The model polyguanidine, 2 (n=5), now referred to as 2, was chosen for kinetic studies because its decomposition product is analogous to N,N′-dicyclohexyl carbodiimide, a carbodiimide which has been extensively evaluated in its reaction with acetic acid.[22] In addition, N,N′-dicyclohexyl carbodiimide does not readily dimerize or trimerize at temperatures below 225°C.

The decomposition of 2 to 1 was confirmed by TGA, DSC, and FTIR. The TGA result of 2 held at 215°C is shown in *Figure* 1. After 50 min the decomposition reaction was essentially complete. The polyguanidine lost 27.4% of its initial weight (theoretical loss, 25.3%). The DSC result in *Figure* 2 shows a small endothermic absorption at 54.6°C and a large endothermic absorption at 240°C which show that the decomposition of 2 requires energy.

Figure 3 shows the FTIR spectra of three micron films of 2 held at a constant temperature of 210°C for various lengths of

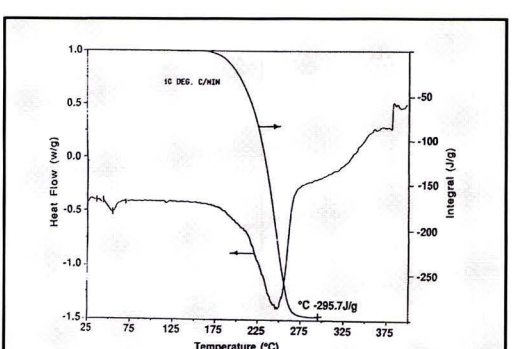


Figure 2—DSC of a polyguanidine heated at 10°C per min.

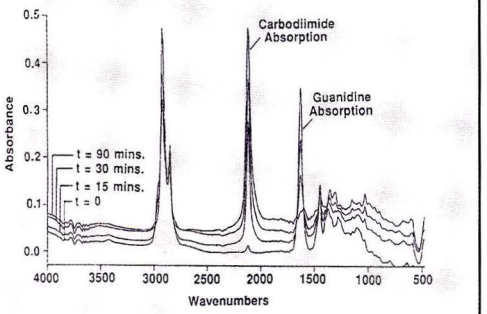


Figure 3—FTIR spectra of a polyguanidine film heated at 210°C.

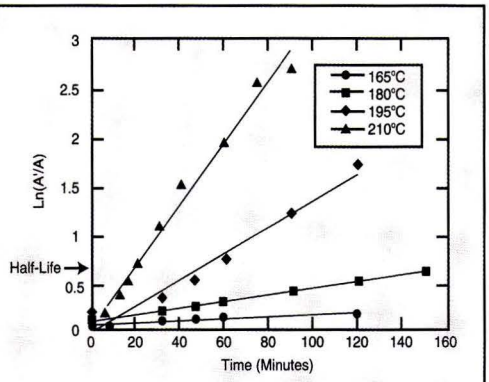


Figure 4—The first order kinetic plots of a six-functional poly(guanidine) obtained by FTIR.

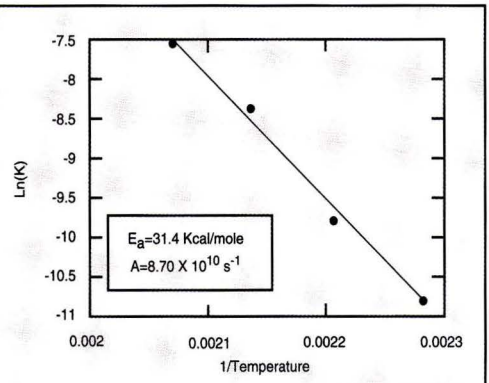


Figure 5—An Arrhenius plot from the decomposition of a six-functional poly(guanidine) using data from Figure 4.

time. The carbodiimide absorption at 2120 cm^{-1} increases with time while the guanidine absorption at 1635 cm^{-1} decreases. To evaluate the decomposition kinetics of 2 to 1, the decomposition was followed by FTIR. The disappearance of the guanidine absorption at 1635 cm^{-1} was monitored at increasing times while holding the sample at a constant temperature.

The first order kinetic law is:

$$\ln(c'/c) = kt \quad (1)$$

where c′ is the initial concentration, and c is the concentration at time t. The first order rate constant k is in reciprocal time. It is evident from equation (1) that to determine the rate constant for a first-order reaction, it is only necessary to determine the ratio of the concentration at two times. Quantities proportional to concentration such as absorbance may be substituted for the concentrations in equation (1), since the proportionality constants cancel.

To evaluate the rate of deblocking from polyguanidine to polycarbodiimide, first order kinetics were assumed. Using the Arrhenius equation

$$\ln(k) = -E_a/RT + \ln(A) \quad (2)$$

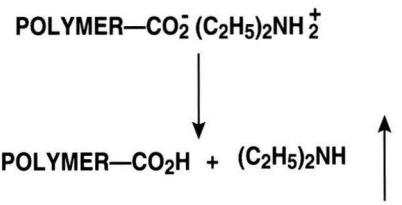
where E_a is the activation energy, A is the Arrhenius constant, T is the temperature in degrees Kelvin, and R is the ideal gas law constant, it is possible to obtain ln(k) as a function of temperature for a particular first order reaction. As shown in *Figure* 4, the decomposition follows first order kinetics. The Arrhenius plot (*Figure* 5) gives an activation energy of 31.4 Kcal/mol and an intercept (pre-exponential factor) of 8.7×10^{10} s^{-1}. The half-life of 2 (n=5) at 180°C is 178 min.

Using the procedure described for 2, FTIR spectra were obtained for blends of 2 and poly(methyl methacrylate) at 180°C. The appearance of the carbodiimide absorption at 2120 cm^{-1} (*Figure* 6) supports the decomposition of 2 to 1. To semiquantify (±10%) the amount of carbodiimide groups formed, standards were prepared from blends of poly(methyl methacrylate) and 1. At 12 min, the carbodiimide absorption is 80 to 90% of theoretical. The decomposition of the guanidine moieties of 2 in poly(methyl methacrylate) follows first order kinetics (*Figure* 7). The rate constant at 180°C (k=0.1503 min^{-1}) gives a half-life of 4.6 min. In a powder coating environment, once 2 is inside an acrylic-based coating, the previous results suggest that at 180°C, the deblocking rate would be rapid enough for a practical powder coating formulation.

For a heterogeneous mixture of 2 and an acrylic polymer, the kinetic experiments suggest that the decomposition of 2 to 1 is a slow process at 180°C. Since the guanidine groups are basic, they can be protonated by the carboxylic acid groups of a carboxylic acid-containing resin. During cure, 2 slowly diffuses into the polymer as crosslinking occurs. If the diffusion rate is too slow, there likely will be premature crosslinking before the crosslinker and acrylic resin are homogeneous. In addition to premature covalent crosslinking, protonation of the guanidine groups by the carboxylic acid groups of the acrylic resin results in ionic crosslinking by the formation of a polysalt species. This problem is illustrated by the following controlled experiment. When a tetrahydrofuran solution of 2 is added to a tetrahydrohydran solution of a carboxylic acid-containing acrylic resin such as SCX-817C, the solution gels. Premature crosslinking, or more accurately, gelation of the polymer by formation of polysalts will prevent good film

formation, and decrease the accessibility of the crosslinker to the polymer.

This experiment shows that the preparation of a polymer solution of 2 and SCX-817C is not possible. The solution to this problem was to neutralize the carboxylic acid groups attached to the resin with diethyl amine. Controlled experiments show that the addition of a tetrahydrofuran solution 2 to a tetrahydrofuran solution of SCX-817C, in which carboxylic acid groups have been neutralized with diethylamine, gives a homogeneous solution. No gel formation is observed. To obtain optimal film properties in a cured powder coating, it is desirable that film formation occurs before crosslinking begins; thus, the diethylamine carboxylate moieties should decompose to carboxylic acid moieties and diethylamine at a reasonable rate after film formation.



To study the deblocking reaction, the decomposition of the diethylamine-neutralized, SCX-817C, acrylic resin was followed by FTIR. One-mil films of the diethyl amine-neutralized acrylic resin were cast over sodium chloride discs, and the absorbance of the carboxylate moiety at 1558 cm^{-1} was followed as a function of time at various temperatures. As shown in *Figure* 8, the decomposition follows first order kinetics. The half-life at 180°C is 1.7 min. The Arrhenius rate plot is shown in *Figure* 9. This result shows that the deblocking of the carboxylate salt is slow enough to allow film formation but fast enough to allow the coatings to cure.

Using the procedure described, kinetic measurements were carried out on 1 mil films of a polymer blend of 9% 2 (by weight) and diethylamine neutralized SCX-817C acrylic resin. The carboxylate absorption at 1558 cm^{-1}, and the guanidine absorption at 1635 cm^{-1} disappear as the film cures at 180°C (*Figure* 10). The decomposition of the guanidine moieties follow first order kinetics to about 70% conversion. Above 70% conversion, the N-acyl urea absorption begins to contribute to the guanidine absorption; hence, a curvature in the data is observed (*Figure* 11). The initial slope of the plots was used to obtain an Arrhenius rate plot (*Figure* 12). The results show that the half-life of 2 in the neutralized acrylic resin is 7.8 min^{-1} at 180°C. As previously described, the half-life of 2 in poly(methyl methacrylate) is 4.6 min at 180°C. Although the half-life of 2 is neutralized SCX-817C resin increased 70% over that of poly(methyl methacrylate), at 180°C, 83% of the polyguanidine moieties decompose in 20 min to carbodiimide moieties. A summary of the thermodynamic data and half-life data calculated using the Arrhenius rate plots in this study is shown in *Table* 1 for a cure temperature of 180°C.

The FTIR shows no formation of carbodiimide during the reaction which indicates that the carbodiimide reacts with the carboxylic acid moieties as it forms. Calculations show that under these conditions, a hexafunctional polyguanidine will decompose to give a polycarbodiimide with an average functionality of 5; thus, powder coating with the appropriate

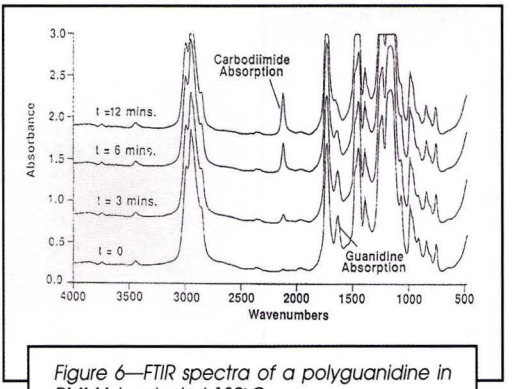


Figure 6—FTIR spectra of a polyguanidine in PMMA heated at 180°C.

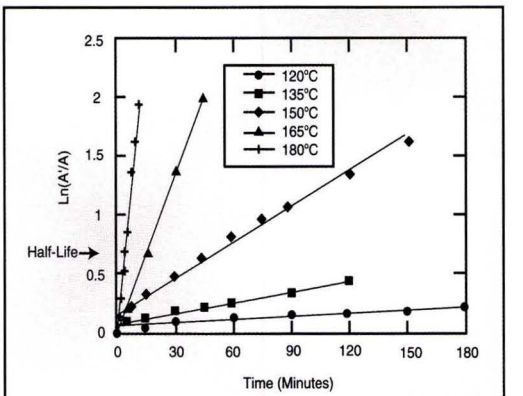


Figure 7—The first order rate plots of a six-functional poly(guanidine) in poly(methyl-methacrylate) obtained from FTIR data.

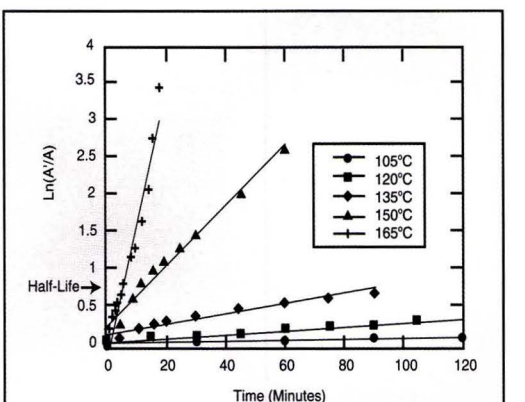


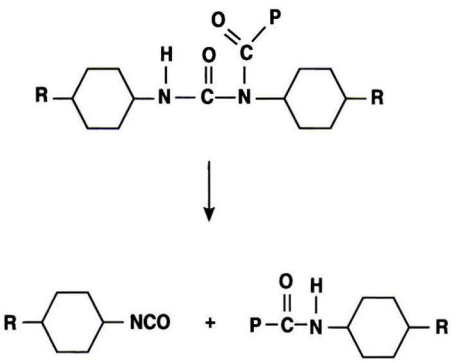
Figure 8—The first order rate plots from the decomposition of a diethylamine-neutralized carboxylic acid-containing resin.

Table 1—Thermodynamic and Half-Life Data at 180°C

Composition	ΔS° (cal/K-mol)	ΔG° (Kcal/mol)	t1/2 (mins)
Polyguanidine	-11.3	35.6	178
Polyguanidine in PMMA	-3.6	32.3	5
Polyguanidine in neutralized SCX-817C	3.6	32.8	8
Diethyl amine-neutralized SCX-817C	-6.3	31.4	2

(a) The thermodynamic and half-life data above were calculated for 180°C.

amount of crosslinker should cure to give reasonable gel contents at 180°C. Although no carbodiimide absorption appears during cure, a small isocyanate absorption (*Figure* 10) appears at 2260 cm^{-1}. The isocyanate absorption likely results from some decomposition of the N-acyl urea moieties at the high cure temperature.[1] This reaction is illustrated in the following:



where R is a residual organic moiety and P represents a polymer chain. This reaction does not effect the kinetic conclusions obtained previously. The crosslinking efficiency of the crosslinker could be maximized by preparing a coating which contains hydroxyl groups; thus, the isocyanate group could react with the hydroxyl groups during cure to form urethane crosslinks. To prevent isocyanate residuals from escaping the coating during cure, the organic residual, R, would be adjusted upward in molecular weight to the desired range. Another option would be to redesign the crosslinker. The model crosslinker has cyclohexyl groups on each side of the N-acyl urea moiety. Replacing one of the cyclohexyl groups with a methylene would alleviate some of the steric hindrance between the cyclohexyl groups and the polymer chain of the N-acyl urea moiety. A crosslinker prepared using isophorone as the base organic residual would accomplish this task.

Intuitively, the crosslinking efficiency of a blocked crosslinker will be a function of the number of blocked crosslinking units per molecule, as well as the efficiency of the deblocking chemistry. The previous discussions quantify the rate of polyguanidine decomposition to polycarbodiimide and diethyl amine; however, relating the deblocking chemistry to the desired functionality of a polyguanidine was highly desirable.[1] It was postulated that as the functionality of 2 increased, its crosslinking efficiency would increase while the time of initial gelation (gel point) would occur earlier in the filming formation process. While gelation of a film is a desirable event, it stops the film formation process. If it occurs too early during the cure cycle, poor film integrity will occur resulting in poor shear resistance, and reduced optical properties such as distinctness of reflected image (DOI), and gloss. Additionally, in solvent-borne coatings, this effect will be less pronounced than in a powder where the filming process may be competing with the crosslinking process; thus, while a blocked crosslinker with a high rate of decomposition is desirable at the cure temperature, polymer flow (film formation) will essentially cease at the gelation point. For an ideal coating system, film formation occurs at temperatures well below the decomposition temperature of the blocked crosslinker. A series of experiments was designed to establish the appropriate functionality, cure time, and cure temperature for polyguanidine crosslinkers in powder coatings.

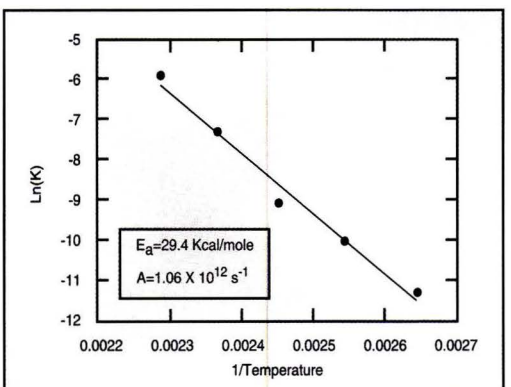


Figure 9—An Arrhenius plot from the decomposition of a diethylamine-neutralized carboxylic acid-containing resin (S.C. Johnson), using data from Figure 8

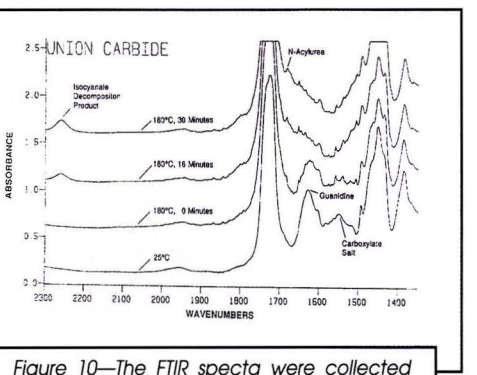


Figure 10—The FTIR specta were collected during the cure of a polymer blend prepared from 2 (9% by weight) and NSCX-817C, a neutralized, carboxylic acid-containing, acrylic resin. The film thickness was 1 mil. The resolution was 4 cm^{-1}, and the number of scans was four.

Table 2—Evaluation of Polyguanidines in Powder Coatings

F	Cure Temperature	Level (phr)	Gel Fraction	MEK D.R.[a]	Percent Guanidines Decomposited	DOI	Yellowness Index	Tukon Hardness
5	176	11.25	59.8	100	69.8	1.9	7.0	17
4	166	8.75	13.0	18	57.8	29.0	4.6	22
6	166	8.75	50.0	38	55.4	18.3	4.2	20
4	186	8.75	44.3	30	63.9	39.7	5.5	18
6	186	8.75	75.5	67	75.8	16.0	5.1	20
4	166	13.75	35.6	26	86.1	23.0	4.4	23
6	166	13.75	68.8	55	69.9	16.0	3.8	17
4	186	13.75	60.0	73	86.8	47.0	7.5	15
6	186	13.75	81.8	100	74.2	15.3	5.4	16
5	176	11.25	62.0	100	71.8	9.3	6.6	14

(a) The results are an average of two MEK double rubs. The data were generated from a 2^3 factorial designed experiment using blends of diethyl amine-neutralized S.C. Johnson resin SCX-817C (see text), and 2. The independent variables were F (functionality of the polyguanindine), cure temperature, and level of polyguanidine (grams of 2 per 100 grams of dry neutralized SCX-817C. The cure time was 15 min at metal temperature.

Evaluations

Designed experiments[23] are highly effective techniques for investigating the effects of independent variables such as the functionality of the crosslinker, bake temperature, and bake time. Designed experiments allow the experimentalists to:

(1) Screen from many candidate variables the few which are truly important;

(2) Gain understanding about how variables affect product properties;

(3) Discover the direction in which one should change a variable in order to move toward more desirable properties; and

(4) Find "winning combinations" of variables.

A 2^3 factorial designed experiment was used to examine the effect of the independent variables, polyguanidine functionality, metal bake temperature (166-186°C), and level of crosslinker (phr, 8.75-13.75) in diethyl amine-neutralized acrylic resin (SCX-817C) on the dependent variables gel fraction, percent of polyguanidine decomposed, methyl ethyl ketone (MEK) double rubs, DOI, gloss, yellowness index, and Tukon hardness. The results are shown in *Table* 2.

Crosslinking Efficiency

Although the rate of decomposition of 2 has been quantified, a measure of its crosslinking efficiency is highly desirable. The fraction of insoluble polymer produced during a crosslinking process, or gel fraction, is a measure of crosslinking efficiency. Flory and Stockmeyer related the gel fraction of crosslinked polymers to crosslink density in the 1940s.[24-27] For polydispersed polymers, Flory derived a general integral equation which shows that gel fraction is related to both polydispersity and crosslink density; however, it does not have an exact solution. Solutions to the equation were obtainable only by long-hand numerical integrations. Around 1980, Reiser and Pitts recast Flory's equation into a form amenable to computers.[28] The results of Pitts' calculations showed the importance of polymer design in optimizing the crosslinking chemistry and crosslinking physics of crosslinkable coatings. Analysis of the results in *Table* 2 shows that the gel fractions (GF) of cured coatings give the best correlation. The mathematical mode is shown in the following:

$$GF \times 100 = 55.08 + 15.4\,(F\text{-}5) + 1.1775\,(T\text{-}176) + 3.17\,(C\text{-}11.25) \quad (6)$$

where F (F=n+1) is the number of gunanidine groups (functionality) of 2, T is the metal temperature for 15 min, and C is the concentration of crosslinker measured as grams of dried crosslinker per 100 g of dried acrylic resin (phr). Equation (6) explains 95% of the variation in the data. It should be noted that although the MEK double rubs in *Table* 2 were averaged values, they did not correlate with any of the independent variables. The use of MEK double rubs as an indicator of crosslinking is discussed later.

Of particular interest was the comparison between the crosslinking efficiency of 2 (n=5) to a control system using a commercial crosslinker for powder coatings, triglycidylisocyanurate (TGIC). For this comparison, a second 2^3 designed experiment using TGIC as the crosslinker and 817C as the resin was performed. The independent variables in the designed experiment were phr of TGIC, bake time at metal temperature, and bake temperature. The results are shown in *Table* 3.

Analysis of the gel fraction data for the TGIC system gives the simple model below, which explains 96% of the variation in the data.

$$GF \times 100 = 81.04 + 0.4677\,(T\text{-}174) \quad (7)$$

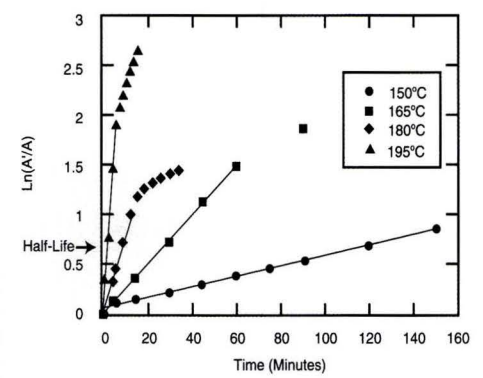


Figure 11—The first order rate plots of a six-functional poly(guanidine) in diethylamine-neutralized S.C. Johnson 817C obtained by FTIR.

Table 3—Evaluation of TGIC in Powder Coatings

Level (phr)	Cure Time	Cure Temp.	Gel Fraction	MEK D.R.	Gloss	Yellowness Index
26.7	13.5	174	89.1	100	75	1.6
13.5	6.0	159	57.4	80	62	1.0
40.2	6.0	159	73.7	28	74	1.4
13.5[a]	21.0	159	—	—	—	—
40.2	21.0	159	82.7	85	82	1.4
13.5	6.0	189	87.2	100	57	2.0
40.2	6.0	189	85.2	100	86	1.9
13.5	21.0	189	93.5	100	57	2.4
40.2	21.0	189	85.8	100	86	3.8
26.7	13.5	174	—	100	59	1.6

(a) Experiment done at 189°C instead of 159°C; thus, the data was left out of the analysis. The data was generated from a 2^3 factorial designed experiment using blends of SCX-817C and TGIC. The independent variables were level with TGIC (grams of TGIC per 100 grams of SCX-817C), cure time, and cure temperature.

The predictions of the polyguanidine model for a poly(guanidine) with a functionality of 6 at 13.75 phr [equation (1)], and the TGIC model [equation (7)] are shown in *Figure* 13. At 165°C, TGIC gives a higher gel fraction than the polyguanidine; however, at 182°C, the crosslinkers give comparable gel fractions at 13.75 phr of crosslinker. At lower temperatures, the TGIC is a more efficient crosslinker. Interestingly, for the TGIC crosslinker, the level of crosslinker used in the designed experiment (13.5 to 40.2 phr) did not have a detectable effect on gel fraction. In addition, the cure time did not have a significant effect which suggests that after six minutes at metal temperature, the crosslinking proceeded very slowly. It is postulated that by six minutes, polymer mobility has essentially ceased making further crosslinking negligible.

As shown by equation (6), a polyguanidine with a functionality of six has a higher crosslinking efficiency than a polyguanidine with a functionality of four; therefore, the higher functionality material was investigated in more detail in an attempt to correlate MEK double rubs with bake temperature or bake time. A third designed experiment was performed where the independent variables were the level of 2 (n=5), bake temperature (159-189°C), and metal bake time (6-21 min) at temperature. The results are shown in *Table* 4. MEK double rubs correlated with bake temperature; but because of the difficulty in obtaining reproducible results, the MEK double rubs results explained only 34% of the variation in the data. The correlation using TGIC as the crosslinker was better. The models have such a poor correlation that they show only trends, and should not be used to quantitatively compare the crosslinking efficiency of 2 (n=5) against TGIC. As expected, the results show a general increase in MEK double rubs with temperature.

The poor correlation of MEK double rubs is not unexpected. Although the coating industry uses MEK double rubs as a measure of crosslinking, it is, in fact, a measure of other properties as well. The experience of this laboratory shows that the value of MEK double rubs is operator dependent. In addition, it is an indicator of film integrity as well as crosslinking. A film may be highly crosslinked, but poorly filmed. The result should be a low value of MEK double rubs due to the low shear resistance of the film. If one is measuring the efficiency of a crosslinker, under these conditions, one may report no crosslinking (a false negative) when, in fact, the crosslinker did its job, but for various undetermined reasons, poor film formation occurred during the curing process. High MEK double rub values do indicate a properly cured coating with high crosslinking; thus, although it may be a useful tool to quickly determine if an optimized coating system is performing properly, it is much less useful when one is developing new crosslinkers using an unoptimized polymer in a coating formulation which is heterogeneous.

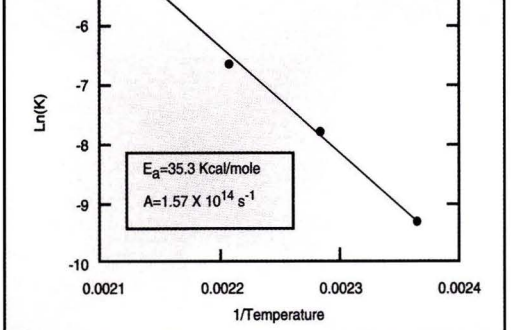


Figure 12—An Arrhenius plot from the decomposition of a six-functional poly(guanidine) in a diethylamine neutralized S.C. Johnson Resin obtained using data from Figure 10.

Optical Properties

It was of interest to examine the effect of functionality on DOI, a number which represents the sharpness of a reflected image, often referred to as distinctness of image. It was postulated that as the functionality of the polyguanidine increased, gelation would occur earlier during the flow of the polymer powder. The only detectable dependent variable which affected DOI was F, the functionality of 2.

$$DOI = 21.55 - 9.13(F-5) \quad (8)$$

The model for DOI equation (8) explains 40% of the variation in the data. The remaining 60% is due to random error. The results show that as the functionality of 2 increases from 4 to 6, there is a statistically significant negative effect of the DOI of the coatings.

Analysis of the gloss data (at 60°) for the TGIC in *Table* 3 and the polyguanidine crosslinkers in *Table* 4 show that the important variable for either type of crosslinker is the level of crosslinker. The other variables are not statistically significant. The correlation coefficient for the polyguanidine crosslinkers is low, R^2=0.4500. Still, as shown in the crude model for polyguanidines equation (9) as the level of polyguanidine crosslinker increases, the gloss decreases.

$$Gloss\ (at\ 60°) = 59.37 - 7.595\ (C-11.25) \quad (9)$$

Analysis of the TGIC gloss data in *Table* 3 shows that the effect of TGIC level on gloss had the opposite effect as shown in equation (10)

$$\text{Gloss (at 60°C)} = 0.8551\ (\text{C-26.7}) - 0.0197\ (\text{TM-13.5})\ (\text{T-174}) \quad (10)$$

where TM is the cure time at metal temperature. For equation (10), R^2=0.9519, and it should be noted that the level of TGIC alone in equation (10) explains 80% of the variation in the data. These results suggest that as the level of polyguanidine increases, gelation occurs earlier in the film formation process. On the other hand, TGIC acts as a plasticizer; therefore, the gloss improves as the level of crosslinker increases. This result may explain the higher MEK double rubs of the TGIC (although the low correlation coefficients would justify additional work to have complete confidence in this statement) compared to 2 (n=5); better filming gives a coating with higher shear resistance which should in general translate into higher MEK double rubs. The effect of the crosslinker level was not detected in the MEK double rub experiment because its correlation may be hidden in the random error of the experiment (reproducing the same experimental conditions from one panel to another may prove to be too difficult).

The Yellowness Index can be used as a measure of undesirable chemical reactions which occur during the curing cycle. Yellowness may result from oxidation of the film during cure which creates an absorbing chromophore. Analysis of the results in *Table* 2 shows that the yellowness of the films cured using polyguanidines is proportional to the bake temperature of the coatings. The model is shown in the following:

$$\text{Yellowness Index} = 5.404 + 0.0816\ (\text{T-178}) \quad (11)$$

Equation (11) explains 38% of the variation in the data. For the coatings containing TGIC, all independent variables, level of crosslinker, cure time, and cure temperature, were significant. The model is shown in the following:

$$\text{Yellowness Index} = 1.6148 + 0.0389(\text{C-26.7}) + 0.0067(\text{TM-13.5}) + 0.0605\ (\text{T-174}) + 0.0043\ (\text{C-26.7})\ (\text{TM-13.5}) - 0.0008\ (\text{C-26.7})\ (\text{T-174}) + 0.0046\ (\text{TM-13.5})\ (\text{T-174}) \quad (12)$$

Equation (12) explains 100% of the variation in the data. For comparison to equation (11), the following substitutions were made into equation (12), TM=15 min, and C=40.2 phr. A cure time of 15 min was chosen for TM because this was the cure time used to determine the Yellowness Index of 2 (n=3,4, and 5) (see *Table* 2). A crosslinker level of 40.2 phr was used because this value gives an equation which predicts coatings with the highest Yellowness Index. After the substitutions were made into equation (12), the following model is obtained:

$$\text{Yellowness Index} = 2.237 + 0.0566\ (\text{T-174}) \quad (13)$$

Although equation (11) is only a qualitative estimate of yellowness because of its poor correlation coefficient, the effect of crosslinker level is statistically significant. Comparison of equation (11) to equation (13) shows that coatings containing polyguanidines yellow more than coatings containing the highest level of TGIC. It is postulated that the more intense yellow color for coatings crosslinked using polyguanidines results from the presence of the amino groups or the amine deblocking groups on the crosslinker. It is also postulated that coatings crosslinked with TGIC will weather better than coatings crosslinked with polyguanidines.

Table 4—Evaluation of 2 (n = 5) in Powder Coatings

PHR	Cure Time	Cure Temp.	MEK D.R.	Gloss
11.25	13.5	174	60	91.4
8.75	6	159	51	55.0
13.75	6	159	54	18.8
8.75	21	159	80	59.3
13.75	21	159	54	38.3
8.75	6	189	81	83.1
13.75	6	189	100	37.8
8.75	21	189	65	84.0
13.75	21	189	100	34.6
11.25	13.5	174	34	91.4

The data was generated from a 2^3 factorial designed experiment using blends of neutralized SCX-817C, and 2 (Functionality, 6). The independent variables were level with crosslinker (measured in phr), cure time, and cure temperature.

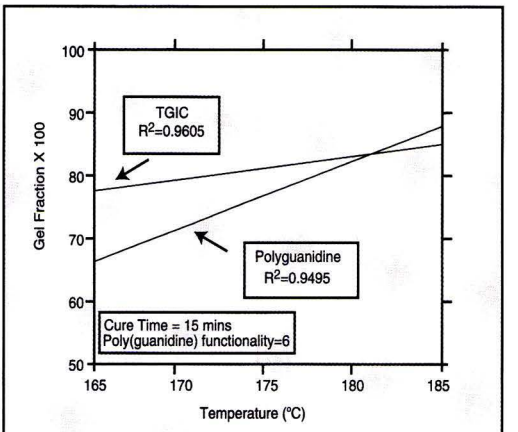


Figure 13—Predicted gel fractions (×100) from models derived from factorial designed experiments.

CONCLUSIONS

Polyguanidines are blocked polycarbodiimides which thermally decompose in carboxylic acid-containing polymers to form polycarbodiimides which then react with the carboxylic acid moieties of the resin to form a crosslinked coating. The crosslinking efficiency of a polyguanidine depends upon the deblocking efficiency of the polyguanidine to the polycarbodiimide, and the number of guanidine moieties per polymer chain. Increasing the number of guanidine moieties per polymer chain increases the crosslinking efficiency at the expense of image clarity. Increasing the level of polyguanidine in carboxylic acid-containing coatings decreases gloss whereas increasing the level of TGIC improves gloss.

The best process conditions for a powder coating based on a polyguanidine with a functionality of six are cure temperatures greater than 179°C. Optimum formulations are obtained at polyguanidine levels less than 11 phr. These levels maximize gloss of the coatings while providing reasonable gel fractions to the cured coatings.

Gel fraction data were found to be a more reliable tool for determining crosslinking efficiency than methyl ethyl ketone double rubs.

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Estimation of the Glass Transition Temperature of Acrylic Copolymers

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A series of 18 acrylic copolymers was synthesized and characterized by GPC for molecular weight and by DSC for the T_gs. It was found that measured T_g values (using DSC) differ from estimated values (using the Fox equation) by as much as 60°C. It was observed that both molecular weight and monomer type influence the difference between measured and estimated T_g values.

It was therefore concluded that the Fox equation should be used only as the starting point but actual T_gs should be measured for copolymers. An alternate way is to generate a T_g versus molecular weight curve for each homopolymer and use these adjusted T_g values in the Fox equation to estimate the T_g for copolymers.

INTRODUCTION

The glass transition temperature (T_g), the temperature at which an amorphous polymer changes from the glassy state to the rubbery state, is very useful in predicting the performance of polymers at different temperatures. T_g is, therefore, an important parameter to consider whether designing homopolymers, polymer blends, block polymers, or copolymers. Today's high-solids coatings use low molecular weight acrylic copolymers with up to five or six monomers. The T_g values in the literature[1] are limited to either homopolymers of high molecular weight or at best the copolymers of two or three monomers. Therefore, it became very challenging for today's synthetic chemist to estimate T_g of such copolymers.

The Fox equation[2] has been used to estimate the T_g of copolymers from the literature values of T_gs of homopolymers. This equation uses the weight fractions of different monomers to calculate the T_g of the copolymer. The Fox equation could be written as:

$$1/T_gc = W1/T_g1 + W2/T_g2 + W3/T_g3 + ... \quad (1)$$

where T_gc is the T_g of copolymer and W1, W2, and W3 are weight fractions of monomers, 1, 2, and 3. T_g1, T_g2, and T_g3 are the T_gs of the homopolymers of monomers 1, 2, and 3 respectively. All T_gs are reported in Kelvin.

The Fox equation and its modifications[3-5] have been used for estimating T_g of copolymers and in many instances the estimated and experimental T_g values did not agree. This was attributed to the molecular weight dependence, composition of copolymers, and the sequence distribution of monomers. The purpose of this study was two-fold: (1) to study the copolymers used in today's high-solids coatings, i.e., low molecular weight acrylic copolymers containing four or more monomers; and (2) to isolate the effects of molecular weight and other factors on the difference between estimated and measured T_gs.

EXPERIMENTAL

Polymer Syntheses

All monomers, solvents, and initiators used in this study were commercial grade. The copolymers were synthesized by continuous feed process as follows: the solvent was first charged to a four-necked round bottom flask to which a thermocouple, an air driven stirrer, a water condenser, and a monomer feed line were attached. First, the solvent was heated to reflux and then (monomer + initiator) mix was added over a period of about four hours. After the feed was over, the system was held on reflux for about two hours to complete the monomer conversion.

Two sets of copolymers were synthesized using design of experiments (DOE) technique. Each set consisted of nine copolymers of varying chemical compositions and estimated T_gs. The first set consisted of glycidyl methacrylate (GMA), styrene (STY), 2-ethyl hexyl acrylate (EHA), and methyl methacrylate (MMA). The monomer ratios were varied such that estimated T_gs were approximately 293, 313, and 333 K. The second set consisted of GMA, STY, lauryl methacrylate (LMA), and n-butyl methacrylate (n-BMA). *Table* 1 summarizes the monomer composition and estimated T_g of two sets of copolymers.

Molecular Weight Measurements

Gel permeation chromatography (GPC) was used to measure the number- and weight- averaged molecular weights and

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Table 1—Monomer Composition of Experimental Acrylic Copolymers

Set 1

System	GMA	STY	2-EHA	MMA	Estimated T_g (K)
G1-1	63	15	20	2	293
G1-2	63	15	10	12	313
G1-3	63	15	2	20	333
G1-4	47	15	23	15	293
G1-5	47	15	14	24	313
G1-6	47	15	5	33	333
G1-7	38	15	25	22	293
G1-8	38	15	16	31	313
G1-9	38	15	7	40	333

Set 2

System	GMA	STY	LMA	n-BMA	Estimated T_g (K)
G2-1	63	15	22	0	307
G2-2	63	15	17	5	313
G2-3	63	15	3	19	333
G2-4	47	15	26	12	293
G2-5	47	15	11	27	313
G2-6	47	15	0	38	328
G2-7	38	15	22	25	294
G2-8	38	15	7	40	313
G2-9	38	20	1	41	325

molecular weight distributions. A Hewlett-Packard 1090 liquid chromatograph system equipped with HP 1037A refractive index detector, and HP 9000/300 chromatography data station was used for data acquisition and data analyses. Polystyrene samples of varying molecular weight and GPC columns were obtained from Polymer Laboratories Inc., Amherst, MA. All samples were analyzed with 10 µm particle size PL gel columns. Five columns of different pore sizes (50 to 10,000 A) were used for maximum resolution. THF was used as the effluent and the flow rate was 1.5 ml/min. Polystyrene standards were used for the calibration for molecular weight.

T_g Measurements

Glass transition temperatures of copolymers and polystyrene were determined by differential scanning calorimeter (DSC). TA Instruments' 910 DSC cell and 9900 data station were used for data acquisition and data analyses. All samples were dried at 110°C for one hour to eliminate the effect of solvents on the T_g of copolymers. A series of well-characterized monodisperse polystyrene samples of varying molecular weight were also analyzed by DSC. DSC sample size was about 10-15 mg, and the scanning rate was 10°C/min. Samples were

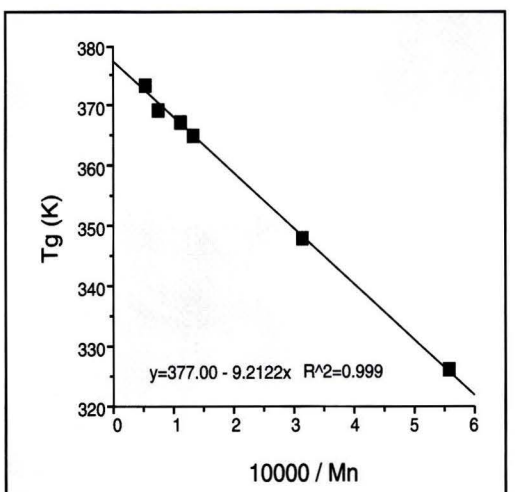

Figure 1—T_g versus 1/Mn for polystyrene standards.

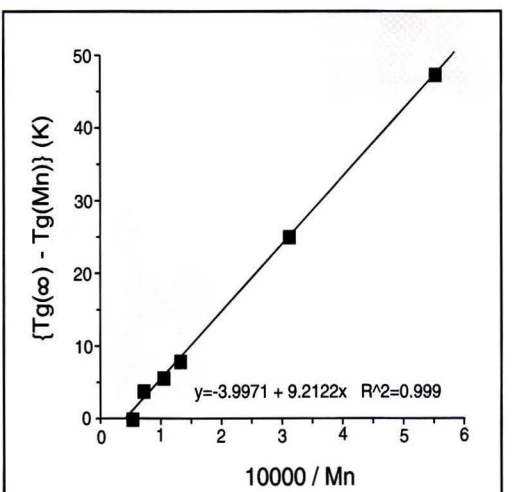

Figure 2—Shift in T_g (ΔT_g) versus 1/Mn for polystyrene standards.

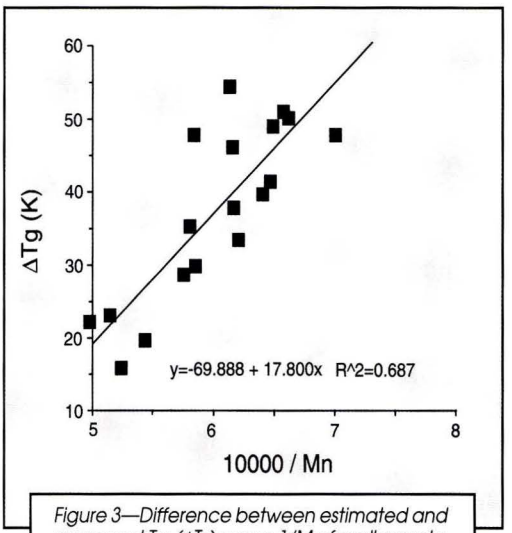

Figure 3—Difference between estimated and measured T_gs (ΔT_g) versus 1/Mn for all copolymers.

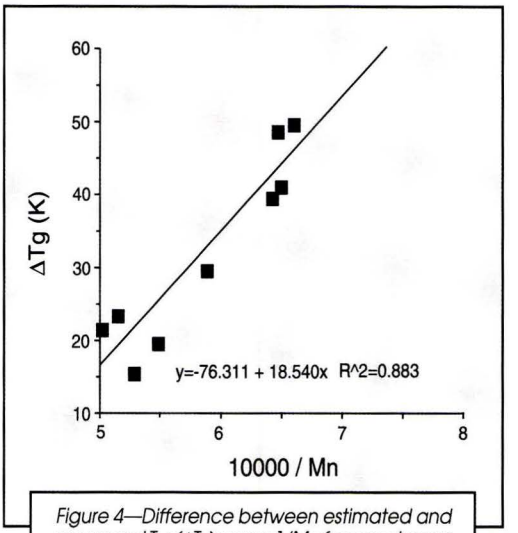

Figure 4—Difference between estimated and measured T_gs (ΔT_g) versus 1/Mn for copolymers (set I).

scanned from –50° to 120°C under nitrogen atmosphere. Each specimen was run twice and T_g values were calculated from the second run. The mid-point in the glass-rubber transition was reported as the glass transition temperature. Each sample was run twice and the average of two T_g values were reported.

RESULTS AND DISCUSSION

Table 2 summarizes the number- and weight-averaged molecular weights, estimated T_gs, measured T_gs, and the difference between estimated and measured T_gs for all 18 copolymers and the polystyrene standards. The copolymers had a number-averaged molecular weight between 1500 and 2000 daltons, whereas weight-averaged molecular weights ranged between 2700 and 3800 daltons. The polydispersity index ranged between 1.8 and 2.0 for copolymers. The polystyrene standards had number-averaged molecular weights between 1800 and 190000 daltons, and polydispersity index was about 1.05. The T_g values for homopolymers were obtained from the *Polymer Handbook* to estimate T_gs for copolymers [see equation (1)]. The difference between estimated and measured T_gs for copolymers ranged between 16° and 54° (see *Table* 2). This discrepancy between estimated and measured T_gs could be attributed to low molecular weight of copolymers, chemical composition of copolymers, or even inaccuracies in reported literature T_g values for homopolymers. These possible sources of the discrepancy will be discussed in the following sections.

Effect of Molecular Weight

The T_g of homopolymers is related to their number-averaged molecular weight as follows:[6]

$$T_g = T_g(\infty) - A/Mn \qquad (2)$$

where T_g and $T_g(\infty)$ are the glass transition temperatures for polymers of number-averaged molecular weight Mn and infinitely high molecular weight, respectively. This equation represents a linear relationship where A is the slope and $T_g(\infty)$ is the intercept. *Figure* 1 shows a plot of T_g against 1/Mn for polystyrene standards. As expected, there is an excellent correlation between T_g and inverse Mn. This T_g data could also be presented as the shift in T_g (ΔT_g) from the T_g value of a very high molecular weight polystyrene (see *Figure* 2). This data also shows an increase in shift, ΔT_g, with decreasing number-averaged molecular weight and the correlation is almost perfect. This implied that for this homopolymer, the shift in T_g was mainly caused by the lowering of molecular weight.

From *Table* 2, at first there appears to be a correlation between number-averaged molecular and the difference between estimated and theoretical T_gs for acrylic copolymers. However, a plot of this difference in T_gs against inverse number-averaged molecular weight does not show a good correlation (see *Figure* 3). The molecular weight alone could

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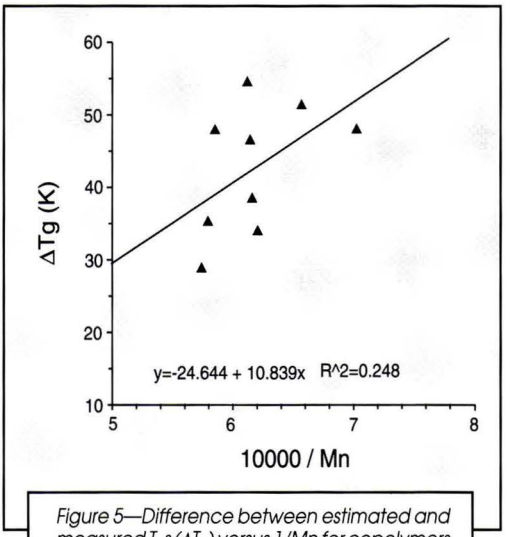

Figure 5—Difference between estimated and measured T_gs (ΔT_g) versus 1/Mn for copolymers (set II).

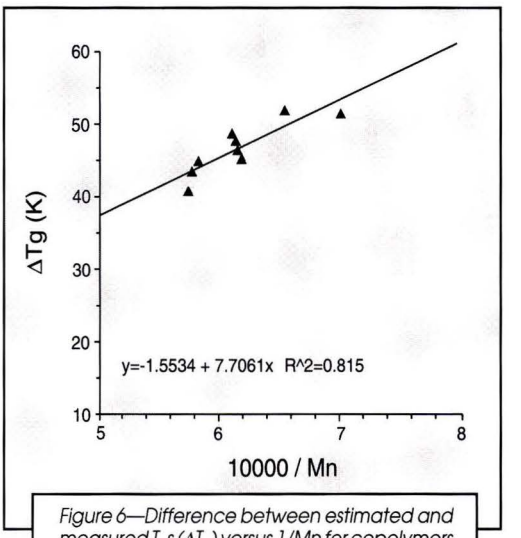

Figure 6—Difference between estimated and measured T_gs (ΔT_g) versus 1/Mn for copolymers with modified homopolymers T_g (set II).

Table 2—Molecular Weights and T_gs for Acrylic Copolymers and Polystyrene Standards

Acrylic Copolymers

	Mn	Mw	Estimated T_g (K)	Measured T_g (K)	Difference ΔT_g (K)
G1-1	1940	3760	293	270	23
G1-2	1700	3180	313	283	30
G1-3	1550	2870	333	292	41
G1-4	1900	3610	293	277	16
G1-5	1550	2850	313	273	40
G1-6	1510	2890	333	283	50
G1-7	2000	3830	293	271	22
G1-8	1830	3450	313	293	20
G1-9	1540	2940	333	284	49
G2-1	1610	3080	307	273	34
G2-2	1620	3170	313	275	38
G2-3	1520	2900	333	282	51
G2-4	1730	3390	293	264	29
G2-5	1420	2740	313	265	48
G2-6	1630	3040	328	274	54
G2-7	1720	3390	294	259	35
G2-8	1620	3000	313	267	46
G2-9	1710	3220	325	277	48

Polystyrene Standards

	Mn	Mw		Measured T_g (K)	$(T_g(\infty) - T_g)$ ΔT_g (K)
PS-1	1800	1890	—	326	47
PS-2	3250	3410	—	348	25
PS-3	7600	7980	—	365	8
PS-4	9200	9660	—	367	6
PS-5	13000	13650	—	369	4
PS-6	19000	19950	—	373	0

Table 3—Comparison of Homopolymer T_g Values from *Polymer Handbook* and Van Krevelen Method

Polymer	*Polymer Handbook*	Van Krevelen Method
Polystyrene	373 K	373 K
Poly (MMA)	378 K	378 K
Poly (n-BMA)	293 K[a]	283 K
Poly (2-EHA)	223 K[b]	210 K
Poly (LMA)	208 K[c]	236 K
Poly (GMA)	349 K (Supplier data)	—[d]

(a) 286 K to 308 K reported in the handbook.
(b) Determined by Brittle Point. Supplier reported value was 203 K.
(c) Conflicting data reported in the literature.
(d) Value could not be calculated because the coefficients for epoxy group were not available.

not be responsible for the discrepancy between estimated and measured T_gs of copolymers. Therefore, the effect of chemical composition and/or the reported literature, T_g values might also contribute to this difference between estimated and measured values.

Effect of Chemical Composition

The two sets in *Table* 1 have two common monomers (GMA and STY), but 2-EHA and MMA in set I were replaced by LMA and n-BMA in set II. This allowed us to vary chemical composition of copolymers while maintaining similar estimated T_gs (see *Table* 1) and molecular weight between the two sets. *Figure* 3 showed that the difference between estimated and measured T_gs did not correlate very well with inverse number-averaged molecular weight. However, when the two sets were plotted separately (see *Figures* 4 and 5), set I showed a good correlation, whereas set II showed no correlation. This led us to believe that factors other than the molecular weight also influenced the shift in T_g of copolymers. This was not surprising because Johnston[3,4] showed that sequence of monomers in copolymers played an important role in controlling the T_g of copolymers. Myers[5] also showed that the difference between estimated and measured T_gs depended on the ratio of acrylonitrile to methyl methacrylate in acrylonitrile-methyl methacrylate copolymers, which was also attributed to the effect of sequence distribution.

T_g Data Literature

For many homopolymers, multiple T_g values are reported in literature[1] and T_g values may differ by as much as ~100°C. In other cases, the homopolymers had different tacticities or T_g values were measured by different techniques. In cases where T_g values are very different, Van Krevelen's[7] additive approach could be used for calculating the T_g of homopolymer. Van Krevelen's approach is being used in the modern molecular modeling software packages for estimating physical properties of polymers and blends. Van Krevelen's approach for determining T_g is as follows:

$$T_g = Y_g/M \qquad (3)$$

where M is the molecular weight of the repeat unit and Y_g is the molar glass transition function. Y_g values are reported in literature[7] for common functional groups and polymeric systems. *Table* 3 compares literature and calculated T_g values for homopolymers used in this study.

In the previous section, it was shown (*Figure* 5) that the plot of ΔT_g versus inverse number-averaged molecular weight had at the best very poor, if any, correlation. It was suspected that literature T_g values for LMA and n-BMA homopolymers were not accurate. The T_g values for homopolymers of LMA and n-BMA were, therefore, taken from *Table* 3 and substituted in the Fox equation. *Figure* 6 shows the plot of ΔT_g versus inverse number-averaged molecular weight for copolymers in set II (with calculated T_g values for homopolymers). With new T_g values, the plot had a significant improvement in the correlation factor. This shows that inaccuracies in the literature, T_g values were at least partly responsible for the poor correlation between ΔT_g and 1/Mn.

Figure 7 shows the plot of ΔT_g versus inverse number-averaged molecular weight for both sets of copolymers using calculated T_g values of homopolymers (from *Table* 3). The copolymers in set I have higher slope than copolymers in set II. This is not surprising because copolymers in the two sets have different monomer lineup. The coefficient "A" in equation (1) has been reported[8] to depend not only on the monomer, but also on the tacticity of the homopolymer. The value of "A" for different polymers varied between 25,000 and 460,000.

Estimation of T_g of Copolymers

To account for the effect of molecular weight, it is preferred to synthesize for each monomer, a series of homopolymers with varying molecular weight and developing a T_g versus 1/Mn curve for each monomer. The estimated T_g of a copolymer (e.g., containing four monomers) of molecular weight Mn could be calculated in the following.

First, determine the T_g for homopolymer of molecular weight Mn from T_g versus 1/Mn curves for all four monomers. Then, using T_g values for four homopolymers in the Fox equation [see equation (1)] estimate the T_g of copolymer. This is, however, a tedious method because one has to synthe-

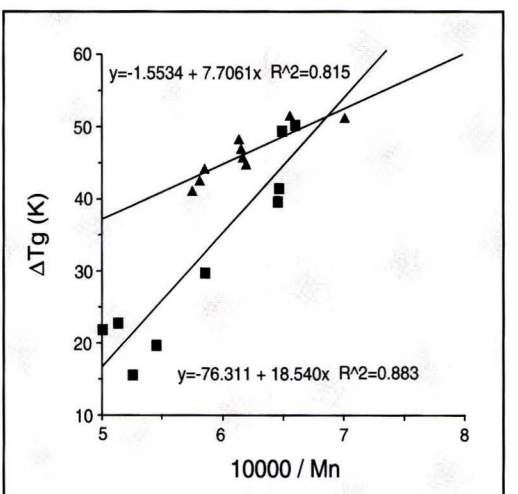

Figure 7—Difference between estimated and measured T_gs (ΔT_g) versus 1/Mn for all copolymers with modified homopolymer T_g. Set I (■); set II (▲).

size and characterize a series of homopolymers for all four monomers, i.e., about 25 to 30 homopolymers in total. This method will take into account the effect of molecular weight as well as the nature of monomer.

CONCLUSION

In this study, the glass transition temperatures of copolymers containing four monomers were analyzed. It was found that there were three possible causes for the discrepancy between estimated and measured T_gs of copolymers:

(1) The molecular weight of copolymers in high-solids coatings was very low, and as expected, T_g of copolymers was very sensitive to number-averaged molecular weight.

(2) For similar molecular weight, the difference between estimated T_g and measured T_g was also influenced by the monomer composition.

(3) For some homopolymers, there were multiple T_g values in literature and also covered a wide range. Van Krevelen's additive approach was used in calculating the T_g of homopolymers.

It was proposed to develop T_g versus 1/Mn relationship for all homopolymers involved and using the appropriate T_g values from these curves into the Fox equation. It was extremely difficult to include the effect of sequence distribution for copolymers having four or more monomers.

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Stabilization of Aluminum Pigments in Aqueous Alkaline Media by Styrene Copolymers

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Aluminum pigments react in alkaline aqueous media (e.g., waterborne metallic paints) with the evolution of hydrogen. Low- and high-molecular weight styrene-maleic acid copolymers inhibit the corrosion of aluminum pigments in a mixture of water and butyl ether of ethylene glycol at a pH value of 10 very effectively and are much better corrosion inhibitors than high-molecular weight polyacrylic acids or a styrene-acrylic acid copolymer. There is a correlation between the composition of the styrene-maleic acid copolymers and the evolved hydrogen volume: the lower the acid number the lower the hydrogen volume—resulting in a higher corrosion inhibiting effect.

INTRODUCTION

Aluminum pigments have been used in solvent-borne metallic paints or inks for many years.[1] Waterborne metallic color coats have been introduced to the automotive industry to reduce the emission of organic solvents to the atmosphere during the paint application.[2] One of the problems of waterborne metallic color coats is the corrosion reaction of the aluminum pigments with the alkaline aqueous paint medium (pH value about 8), which causes the formation of hydrogen[3]:

$$2\,Al + 6\,H_2O \longrightarrow 2\,Al(OH)_3 + 3\,H_2$$

Furthermore, the color of the paint changes from silver to gray.[3] Therefore, an inhibition of this corrosion reaction is necessary. An overview about different stabilization methods for aluminum pigments is presented in reference (3). The commonly established stabilization methods (chromatic treatment and stabilization with organic phosphorus compounds) show some disadvantages such as reduced intercoat adhesion after humidity test (organic phosphorus compounds); the chromatic treatment is problematic because chromium (VI) compounds are carcinogenic.[3] Therefore, alternative methods for the inhibition of this corrosion reaction are required.

The corrosion reaction of the aluminum pigment in aqueous alkaline media can be inhibited by adding corrosion inhibitors like chelating agents[4] or antioxidants.[5] Another possibility is the stabilization by polyacrylic acids,[6] which are well-known paint additives (e.g., dispersing agents) and are, therefore, suited for an application in waterborne metallic paints. It was pointed out[6] that the corrosion inhibiting effect of polyacrylic acids has a maximum at low molecular masses and decreases with increasing molecular mass; polyacrylic acids with molecular masses of 178,000-250,000 are only poor corrosion inhibitors. Better results as with addition of polyacrylic acids are obtained with maleic acid copolymers and especially with an olefin-maleic acid copolymer[6]; therefore, a positive influence of hydrophobic olefin co-monomers on the corrosion inhibiting effect of maleic acid copolymers was presumed in this study.[6] Styrene is a hydrophobic monomer and can be copolymerized easily with acrylic acid or maleic acid. Different styrene-acrylic acid or styrene-maleic acid[7] copolymers (S-MA) are available on the raw material market. These copolymers are used as dispersing agents, binders for printing inks, and for many other applications.

The subject of the present investigation is the assessment of styrene-maleic acid copolymers and a styrene-acrylic acid copolymer as possible adequate corrosion inhibitors for aluminum pigments in alkaline aqueous medium.

EXPERIMENTAL

Stability Test

An unstabilized nonleafing aluminum pigment paste for solvent-borne metallic paints, which contains 65 wt % aluminum and 35 wt % hydrocarbon solvent, is used (specific surface about 5 m^2/g). Five grams of such a paste are dispersed for five minutes by a magnetic stirrer in a glass beaker in 100 ml of a mixture of water and butyl ether of ethylene glycol in the ratio 9:1. To improve the wetting of the hydrophobic aluminum paste by the aqueous medium, 2 wt % of a wetting agent (adduct of 10 moles of ethylene oxide to nonylphenole) is added. To accelerate the corrosion reaction, the pH of the solvent is raised to 10 with 2-(dimethylamino)ethanol (dimethylethanolamine, DMEA), a commonly used amine

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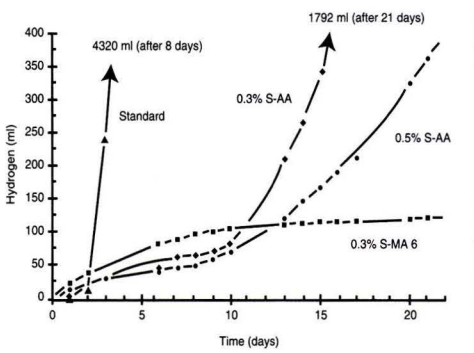

Figure 1—Time dependency (days) of the hydrogen formation in water/butyl ether of ethylene glycol at pH = 10 of the standard aluminum dispersion (only DMEA) and with addition of the styrene-acrylic acid copolymer S-AA and the styrene-maleic acid copolymer S-MA 6.

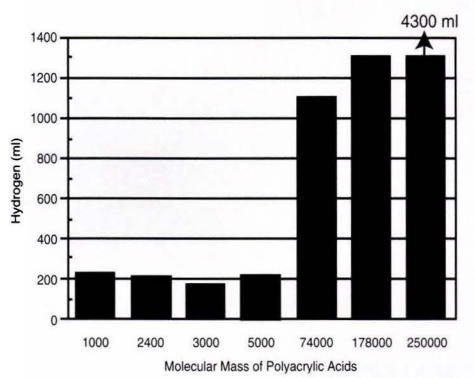

Figure 3—Comparison of hydrogen volumes evolved within 21 days from dispersions of an aluminum pigment in water/butyl ether of ethylene glycol at pH = 10 with addition of different low- and high-molecular weight polyacrylic acids (0.50 wt %).

for waterborne baking enamels. This unstabilized dispersion reacts to a colorless precipitate (presumably aluminumhydroxide) in appromimately one week at room temperature. With addition of suitable corrosion inhibitors that were dissolved in the solvent mixture before addition of the pigment these aluminum pigment dispersions are stable for more than 10 weeks and keep their metallic sparkle.[4-6]

The commercial copolymers of styrene and maleic acid anhydride and the styrene-acrylic acid copolymers (see *Table* 1) are converted into their soluble salts by heating them in water with addition of an appropriate amount of DMEA. The stability test is carried out with all styrene-maleic acid copolymers (S-MA 1-13) and the styrene-acrylic acid copolymer (S-AA) summarized in *Table* 1 (addition level 0.30 resp. 0.50 wt %).

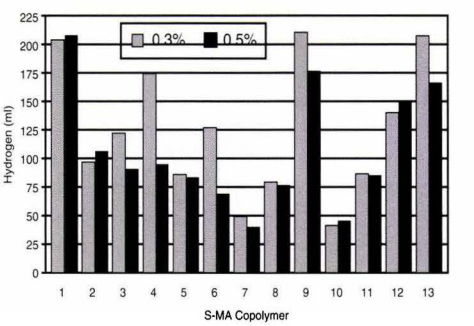

Figure 2—Comparison of hydrogen volumes evolved within 21 days from dispersions of an aluminum pigment in water/butyl ether of ethylene glycol at pH = 10 with addition of different styrene-maleic acid copolymers.

Gas Volumetry

In the second step, the temporal progress of the corrosion reaction is studied by volumetric measurement of the evolved hydrogen over a period of 21 days at room temperature.[4-6] The hydrogen volume by total turnover of the aluminum pigment is calculated to 4.3 L. All styrene-maleic acid copolymers (S-MA 1-13) and the styrene-acrylic acid copolymers (S-AA) summarized in *Table* 1 are tested (additional level 0.30 resp. 0.50 wt %). Furthermore, seven polyacrylic acids[6] with molecular masses from 1,000 to 250,000 are tested for comparison (addition level 0.50 wt %).

RESULTS AND DISCUSSION

Stability Test

First, the influence of the wetting agent (adduct of 10 moles of ethylene oxide to nonylphenole) on the stability of the aqueous aluminum pigment dispersions is examined because without wetting agent the dispersibility of the hydrophobic aluminum paste in water/butyl ether of ethylene glycol = 9:1 is not sufficient. In a mixture of water and butyl ether of ethylene glycol in the ratio 1:1, the aluminum pigment is dispersible without wetting agent; the stability of this dispersion at pH 10 (DMEA) is one to two weeks. With addition of 0.5, 1.0, 1.5, 2.0, and 3.0 wt % of the wetting agent (adduct of 10 moles of ethylene oxide to nonylphenole), the stability of the five aluminum pigment dispersions in water/butyl ether of ethylene glycol = 9:1 at pH 10 (DMEA) is about one week. So, it can be concluded that the wetting agent used in this study has no significant influence on the stability of the aqueous aluminum pigment dispersions.

The addition of 0.30 resp. 0.50 wt % of the styrene-maleic acid copolymers S-MA 1-13 (*Table* 1) inhibit the corrosion of aluminum pigments at pH 10 very effectively. The aluminum pigment dispersions are stable for more than 10 weeks; they keep their silver sparkle and are easily redispersible.

Aluminum pigment dispersions with addition of 0.30 resp. 0.50 wt % of the styrene-acrylic acid copolymer (S-AA, *Table* 1) show stabilities of only 8-10 weeks; S-AA seems to be a less effective corrosion inhibitor than the styrene-maleic acid copolymers.

Table 1—Data of the Styrene-Maleic Acid Copolymers (S-MA) and a Styrene-Acrylic Copolymer (S-AA) According to the Specifications of the Suppliers

Copolymer Abbreviation	Molecular Mass (g/mol)	Acid Number (mg KOH/g)	Styrene:MAA (Mole ratio)	Esterification (Partial ester)
S-MA 1	1,600	465-495	1:1	none
S-MA 2	1,700	255-285	1:1	partial ester[a]
S-MA 3	2,500	165-205	1:1	partial ester[a]
S-MA 4	1,700	335-375	2:1	none
S-MA 5	1,900	200-240	2:1	partial ester[b]
S-MA 6	1,900	265-305	3:1	none
S-MA 7	2,300	95-120	3:1	partial ester[a]
S-MA 8	60,000	260-280	2:1	isopropyl
S-MA 9	100,000	500-540	1:1	none
S-MA 10	105,000	175	1:<1	methyl/butyl
S-MA 11	180,000	185	1:<1	methyl/isobutyl
S-MA 12	350,000	405	1:1	none
S-MA 13	400,000	500-540	1:1	none
S-AA	1,200	260-280	1:1[c]	none

(a) The exact esterification is not specified by the supplier.
(b) The molecular masses are approximate data.
(c) Styrene:acrylic acid.

Gas Volumetry

Volumetric measurement of the evolved hydrogen is a better method to differentiate between good and poor corrosion inhibitors than the qualitative stability test. *Figure* 1 shows the typical time dependency of the hydrogen evolution with addition of an effective corrosion inhibitor (S-MA 6) and a poor corrosion inhibitor (S-AA). Also shown, for comparison, is the time dependency of the hydrogen evolution of the standard aluminum dispersion (without corrosion inhibitor) which has completely reacted after eight days. Within the first two days of the corrosion reaction, the standard aluminum dispersion evolves less hydrogen (latency period[8]) than dispersions with addition of the copolymers (see *Figure* 1). A similar time dependency of the hydrogen evolution was observed with addition of polyacrylic acids.[6,8] The neutralized carboxylic groups of the polymer react with the aluminum surface which cause an enhanced evolution of hydrogen within the first days.[8] This reaction may lead to a protective layer on the aluminum surface which can inhibit the corrosion reaction. The comparison of the time dependency of the hydrogen evolution within 21 days with addition of the styrene-maleic acid copolymer S-MA 6 and the styrene-acrylic acid copolymer S-AA (see *Figure* 1) clearly shows the superiority of the styrene-maleic acid copolymer; all examined styrene-maleic acid copolymers show the same type of time dependency of the hydrogen evolution as S-MA 6.

All gas-volumetric results with addition of 0.30 and 0.50 wt % of S-MA copolymers are summarized in *Figure* 2 (for clarity only the hydrogen volume after 21 days is plotted). It is obvious that no correlation exists between the molecular weight of the styrene-maleic acid copolymers and the evolved hydrogen volume (see *Figure* 2). This is an important result because with addition of polyacrylic acids there is a correlation between the hydrogen volume evolved after 21 days and the molecular mass of the polyacrylic acids: the higher the molecular mass of the polyacrylic acids the higher the hydrogen volume—that means the lower is the corrosion inhibiting effect (see *Figure* 3).[6] The comparison of the hydrogen volumes evolved within 21 days with addition of high-molecular weight styrene-maleic acid copolymers S-MA 8-13 (*Figure* 2) and high-molecular weight polyacrylic acids (*Figure* 3) shows the superiority of the styrene-maleic acid copolymers.

Figures 4 and 5 show correlations between the composition of the styrene-maleic acid copolymers and the evolved hydrogen volume (after 21 days): the lower the acid number, the

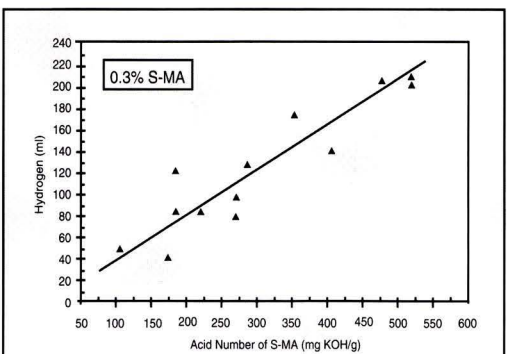

Figure 4—Hydrogen volumes (after 21 days) evolved from dispersions of an aluminum pigment in water/butyl ether of ethylene glycol at pH = 10 versus acid number (average values) of the added styrene-maleic acid copolymers (0.30 wt %).

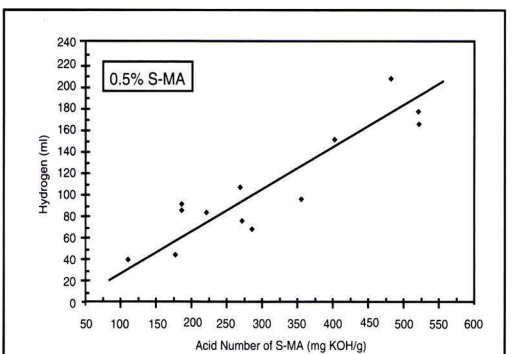

Figure 5—Hydrogen volumes (after 21 days) evolved from dispersions of an aluminum pigment in water/butyl ether of ethylene glycol at pH = 10 versus acid number (average values) of the added styrene-maleic acid copolymers (0.50 wt %).

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lower the hydrogen volume. This correlation is only valid within the series of styrene-maleic acid copolymers. Moreover, this fact supports the assumption[8] that there is a reaction of the neutralized carboxylic groups of the copolymers with the aluminum surface which cause an evolution of hydrogen.

SUMMARY

Styrene-maleic acid copolymers inhibit the corrosion of aluminum pigments in a mixture of water and butyl ether of ethylene glycol at a pH value of 10 very effectively and are much better corrosion inhibitors than high-molecular weight polyacrylic acids[6] or the styrene-acrylic acid copolymer examined in this study. With styrene-maleic acid copolymers, no correlation of the corrosion inhibiting effect and the molecular mass can be observed. This is important because with polyacrylic acids the corrosion inhibiting effect decreases strongly with increasing molecular mass. However, there is a dependence between the composition of the styrene-maleic acid copolymers and the evolved hydrogen volume: the lower the acid number, the lower the hydrogen volume—that means the corrosion inhibiting effect is higher.

The copolymers examined in this study are commercial products used for many different applications; it should be possible to synthesize styrene-maleic acid copolymers with improved properties "tailor-made" for waterborne metallic paints.

ACKNOWLEDGMENT

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Appendix—Materials and Suppliers

Material	Product	Supplier
S-MA 1	SMA 1000	Elf Atochem
S-MA 2	SMA 17352	Elf Atochem
S-MA 3	SMA 1440	Elf Atochem
S-MA 4	SMA 2000	Elf Atochem
S-MA 5	SMA 2625	Elf Atochem
S-MA 6	SMA 3000	Elf Atochem
S-MA 7	SMA 3840	Elf Atochem
S-MA 8	Leumal 533/100	Leuna
S-MA 9	Leumal 501/100	Leuna
S-MA 10	SCRIPSET 550	Monsanto
S-MA 11	SCRIPSET 540	Monsanto
S-MA 12	SCRIPSET 520	Monsanto
S-MA 13	Leumal 501 H/100	Leuna
S-AA	Suprapal WS	BASF

Practical Considerations of Design and Installation of Permanent Total Enclosures

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The Clean Air Act Amendments of 1990 required states to adopt enforceable volatile organic compound (VOC) regulations. As a result, capture efficiency (CE) test methods were required to be included in the state implementation plans (SIPs). In April 1990, the Environmental Protection Agency (EPA) issued guidance on CE measurement procedures, emphasizing procedures that required a total enclosure.

The EPA received comments from parties concerning the potential excessive costs involved in using the recommended protocols that specify a temporary total enclosure (TTE) for measuring CE. The EPA also found that many sources subject to capture efficiency rules have opted to construct permanent total enclosures (PTE) instead of conducting capture efficiency tests using temporary total enclosures.

The objectives of this paper are to provide a review of the following related to PTE:

(1) The variables that must be considered when designing and installing PTE.

(2) The factors that are considered in estimating the cost of implementing PTE.

(3) Health and safety-related considerations.

(4) Occupational Safety and Health Administration (OSHA), American National Standards Institute (ANSI), and other standards that may impact the design and construction of PTE.

Generally, design concepts of PTEs are applicable to the following sources: flexographic printing, rotogravure printing, packaging rotogravure, publication rotogravure, coating rotogravure, coating (paper, film, fabric, plastic, and metal), laminating, offset printing, screen printing, can coating, plastic card coating, pharmaceutical processing, and metal coil surface coating.

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General Design Aspects of Permanent Total Enclosures

A total enclosure is a structure that completely surrounds a process to the extent that all VOC emissions are captured for discharge through ducts or stacks. The only openings in a total enclosure are: (1) forced makeup air ducts; (2) exhaust ducts leading to a control device or the atmosphere; and (3) natural draft openings (NDOs) such as those that allow raw materials to enter and products to leave and/or those that are added to improve ventilation. The airflow through the total enclosure should be engineered to keep the concentration of VOCs within the enclosure below the OSHA health requirements and vapor explosive limits.[1] There are two types of total enclosures: temporary and permanent. These are discussed in the following:

A total enclosure is a structure that completely surrounds a process to the extent that all VOC emissions are captured for discharge through ducts or stacks.

A TTE is an enclosure temporarily installed specifically for the CE test. It completely surrounds the affected facility such that all VOC emissions are captured and discharged through ducts that allow for the accurate measurement of VOC rates. More simply, it is a temporarily installed enclosure that ensures that no VOC escapes without being measured.

A PTE is an enclosure that completely surrounds a source of emissions so that all VOC emissions are contained for discharge to a control device. The enclosure must be permanent, unlike a TTE, which is installed only for the duration of the CE test.

PTEs can be fabricated using several different approaches:

- Retrofitting a PTE around an existing process unit or multiple units of equipment that are sources of VOC emissions is a common practice.
- Installing a PTE coincident with the installation of a new item of equipment or with the relocation of an older piece of equipment would be a recommended approach.
- With proper planning, an entire plant or production room can be made to function as a PTE (see a later section of this report for further discussion of this point).

Enclosure Criteria

Some terms and concepts related to enclosures need to be explained because they are used frequently throughout the remainder of this document. The following describes these terms and concepts:

A **natural draft opening (NDO)** is any opening that remains open during routine operation of the process and that is not connected to a duct with a fan or blower attached. Thus, NDOs are any openings other than exhausts (forced or induced) and forced makeup air ducts. Entrances and exits in the enclosure that allow raw materials to enter and products to leave are examples of NDOs. Natural draft openings that are not related to the process may also be added to improve the ventilation of the enclosure. The airflow direction and rate through the NDO depend on the difference in pressure inside and outside of the enclosure.

Face velocity (FV) is the speed of the air flowing through the NDO. The average FV is calculated by dividing the net exhaust rate out of the enclosure by the total area of all NDOs. The volumetric flow rates are measured using EPA Method 2.[2]

Isolation of affected emissions. A CE measurement is made as part of a compliance determination for a particular affected

> It is more efficient to contain the VOC vapors at the source than it is to recapture the vapors once they have left the immediate area.

facility or, possibly, a group of affected facilities. Thus, it is important that only emissions from the affected facility are measured. In addition, an enclosure should enclose only emission sources that are part of the affected facility. All other sources should be excluded. In cases where such isolation is not possible, it is necessary to determine whether the nonaffected emissions must be accounted for in any CE determination.

Minimum criteria have been developed for an enclosure to be considered a PTE for purposes of the CE test.[3] These criteria are intended to ensure that all VOCs are captured for measurement and to minimize disruption of the capture normally achieved by the existing capture device(s) in the absence of the enclosure. The criteria are included in a document entitled "Draft Capture Efficiency Test Methods," that is referred to in the December 29, 1992, *Federal Register*. An important portion of this document is entitled "Method 30—Criteria for and Verification of a Permanent or Temporary Total Enclosure." The criteria are presented in the following:

(1) Any NDO shall be at least 4 equivalent opening diameters from each VOC-emitting point. An equivalent diameter (ED) is the diameter of a circle that has the same area as the opening. The equation for an ED is:

$$ED = \left(\frac{4 \times \text{area}}{\pi} \right)^{0.5} \qquad (1)$$

For a circular NDO, this equation simply reduces to the diameter of the opening.

(2) The total area of all NDOs shall not exceed five percent of the surface area of the enclosure's walls, floor, and ceiling.

(3) The average FV of air through all NDOs shall be at least 200 ft/min (61 m/min). The direction of air through all NDOs shall be into the enclosure.

(4) All access doors and windows whose areas are not included as NDOs and are not included in the calculation of FV shall be closed during routine operation of the process.

If a facility meets the criteria for a PTE and all emissions are directed to a control device, the CE may be assumed to be 100% and the requirement to measure the CE is waived.

In addition, adherence to the following general principles will lead to efficient and minimally sized enclosures and to efficient production practices.

***Use the minimum amount of air to capture the maximum amounts of VOCs*[4]**—There is no trick to obtaining a high capture efficiency if one is unconcerned about using a large quantity of air to do it. (For example, one can achieve 100% capture efficiency by exhausting the entire production area to one control device.)

Unfortunately, the cost of VOC control is primarily a function of the amount of air to be handled, not the amount of VOCs. If too much air is used to capture the VOCs, there will be severe penalties in capital costs and operating costs.

When there is no need or provision for an operator to enter an enclosure, it may be feasible to recirculate the exhausted air until the concentration of VOCs approaches a level of 18-25% of the lower explosive limit (LEL) of the VOCs. When that level is reached, a portion of the exhausted air can be purged from the recycled air to the control device, and a volume of fresh air equivalent to the purge will be introduced as make-up to the recycle stream. When such a procedure is implemented, the volume of air requiring incineration or other controls is greatly decreased, leading to a significant decrease both in capital and operating expenses.

On the other hand, if a process requires part- or full-time attendance of one or more workers within the enclosure, much lower concentrations of VOCs must be maintained within the enclosure. These levels of VOC concentration are established by OSHA for each VOC or mixtures of VOC.

***Minimize interference with the operators of the production equipment*[4]**—Most production operations require some sort of visual or physical access to the process on a periodic, or even continuous basis. For example, in many processes, samples of the product are removed from time to time, so that they can be checked for color and register. In other processes, the operator must check the coating liquid for viscosity. A capture device which limits this access will be annoying at best, and could wind up being discarded at the first opportunity. Accordingly, the enclosures should be designed to meet the following guidelines:

- Enclose only what is necessary to ensure complete capture. For instance, if a process consists of an unwind stand, a corona treater, a roll coater, an oven, and a rewind stand, and you must choose which portion of the process to enclose, enclose only the roll coater because it is the only potential source of fugitive VOCs.
- Seal all connections between the enclosure and the oven. A balanced oven is already a total enclosure, and sealing the oven sides to the newly built enclosure (around the coater) creates one, overall total enclosure.
- Where visual inspection of the process is needed, use windows made of wire-reinforced safety glass, so that the operator does not need to enter the enclosure. (Clear plastic or plexiglass can also be used, but these tend to become clouded by certain common solvents, such as ketones.)
- Where physical access to the process is needed for short periods of time, use self-closing hinged access doors or windows.
- Because there will be times when complete access to the process is required, the total enclosure should be designed with large doors or spring-loaded panels. These doors and panels could be opened only during such major work as changeovers, and maintenance, both of which take place when no VOCs are being generated.

When PTEs are used, the VOCs are removed by one or more mechanisms. The most common is a top exhaust opening, with a separate exhaust blower, directed either to the VOC control device or to the oven. The second mechanism is present in all systems, whether planned or not, and involves exhausting the fumes into the same oven opening through which the web or parts enter the oven. In fact, because the oven itself is at negative pressure, any enclosure connected to it will exhaust at least partially into the oven. For certain processes it may be feasible to fit the enclosure configuration so close to that of the coater or printer that little or no extra air is required to ensure full capture. The goal here is to make the new enclosure an "extension" of the oven opening, so that all of the VOCs are pulled into the oven with oven intake air.

The third mechanism for exhausting from a total enclosure is a floor exhaust. A floor exhaust in a total enclosure (or one used with a close capture system) is an efficient means of capturing fumes with a minimum of air. This should not be confused with the floor exhausts (or floor sweeps) that have for years been commonly used as "stand-alone" capture devices in many plants. Such stand-alone floor sweeps (even if placed close to the process) are extremely inefficient and require a great deal of air to collect a small amount of solvent. Most enclosures are large enough so that little or no suction can be exerted at floor level by a top exhaust fan.

For good evacuation, it is best to cut one or more openings around the base of the enclosure and connect these openings to the top exhaust fan. (Flex connections will usually suffice.)

It is more efficient to contain the VOC vapors at the source than it is to recapture the vapors once they have left the immediate area—For example, after a web has been coated, the solvent vapors will have a tendency to leave the web immediately, before the web has reached the oven or dryer. One effective way of capturing those vapors would be to enclose the web so that the solvent vapors are contained until they reach the oven, where the vapors can then be picked up by the oven exhaust system.

Whenever possible, use the production room itself as the capture system—In the proposed EPA procedure for total enclosure, there is one sentence which presents an opportunity that should not be overlooked: "An entire building can function as a total enclosure."

The advantages to using the plant or production room as a total enclosure are significant:

- No special structures are needed.
- There is no interference with operator access to the process.
- There are no added safety or health considerations, other than those normally encountered.

All four of the minimum EPA criteria previously listed still apply, but they must be interpreted in light of the real differences between a relatively small sheet metal enclosure and a large production area. The following guidelines constitute our interpretation:

- The room itself must be under negative pressure with respect to the atmospheric pressure outside the room.

This requirement demands something of an attitude change by industry, which for decades has considered negative pressure to be a detriment to a plant. With VOC capture as a goal, however, no plant air must be allowed to escape through windows, doors, or leaks.

- All of the air in the production room must be exhausted to the VOC control device.

For practical reasons, the room should be small enough that the air exhausted from the process will be sufficient to provide the number of room air changes needed to meet the health and safety standards.

For example, if the production room is 50 ft × 40 ft × 25 ft high (50,000 cubic feet) and requires eight air changes per hour (400,000 cubic feet per hour), then the process must exhaust at least 400,000 CFH in order to qualify.

Make sure the process is balanced before starting any work on capture—A balanced process is one in which the amount of air exhausted from the process exceeds the amount of air supplied to the process, by just enough to maintain a slight negative pressure condition within the process enclosure. A balanced process will always draw air into itself at all openings (except, of course, the exhaust opening).

It is a waste of time to try to design a good capture system for an unbalanced process. At best, the resulting capture system will require more air than is economical to use, and at worst, efficient capture will be impossible to achieve.

Originally, the purpose in operating the process at a negative pressure was to keep process fumes from coming out into the plant, where they could become a nuisance or health hazard to plant personnel. Since process conditions could change and since the ambient pressure could vary from day to day, it was important that the exhaust rate be sufficiently high that such changes in process or ambient conditions would not cause "puffing" (a condition where the pressure inside the process momentarily becomes greater than the pressure in the plant thus creating a "puff" of fumes into the plant). When a change occurs that causes a momentary or continuous flow of fumes out of the process, the process is said to have "gone positive."

It is a waste of time to try to design a good capture system for an unbalanced process.

In order to prevent puffing, operators would occasionally over-exhaust the process; that is, they would adjust the controls so that the exhaust greatly exceeded the supply. Unfortunately, while serving the immediate purpose, this can negatively affect the process itself and will definitely increase the process exhaust rate. Thus, it becomes important that the exhaust rate be maintained just high enough to keep the process under negative pressure, but not so high that the process is over-negative.

According to one informed source, a design differential pressure of only 0.002 in. w.g. is sufficient between the inside and outside of any PTE.[5]

The HVAC System—The heating, ventilating and air conditioning (HVAC) system for a building in which the graphic arts operations are taking place should be in place and operational prior to building the final enclosure and sealing the NDOs.[6] If this is not done and the enclosure is built, there may not be enough supply air for the dryers, which could delay the VOCs from exhausting into the dryers, with solvent odor being present to the point of being oppressive to the machine operators.

The air conditioning units that furnish a cool air supply to the PTE provide improved working conditions within the PTE, thus minimizing the heat-related fatigue problems that may be exacerbated by working in the vicinity of drying or curing ovens. These units may also serve another purpose as well: controlling the humidity that may adversely affect solvent evaporation from printed inks. Conversely, as the humidity rises, VOCs do not evaporate as fast from the printed inks, which can cause retained solvent problems within the printed web.

It is acknowledged that air conditioning does increase operating costs. Furthermore, the monetary benefits of improving working conditions and decreasing humidity-related ink problems are difficult to assess. Thus, air conditioning of PTEs is not common. Nevertheless, a number of companies whose workers have to operate in excessively hot PTEs have installed air conditioning in connection with installation of PTEs, or on a retrofit basis.

It should also be noted that in some cases there may be other process-related requirements for refrigeration, and these requirements can, with proper engineering design, be integrated with the other refrigeration requirements described. Two such process requirements are: (1) need for chill rolls in heatset web offset lithography and in flexographic presses, to prevent excess evaporation from these presses; and (2) refrigeration of the fountain solution in the 55°-60°F (12.8°-15°C) range is normally practiced by sheet feed offset printers in order to reduce the evaporation rate of isopropyl alcohol in the damping system.[7] However, further reduction in temperature is not recommended because random water condensation may form on the printing plate and the condensation may affect print quality.

Cost Considerations

There are relatively few companies in the United States that specifically design and construct, or design and supervise the construction of, PTEs in order to be in compliance with EPA requirements. Persons at two companies who design and cost estimate the PTEs independently agreed that every job was different in size, equipment arrangement, and site-specific situations.[5,8,9] Accordingly, no standardized cost estimating techniques, check sheets, or costing algorithms exist at these companies, nor could any cost-estimating techniques for PTEs be found in the literature.

The primary components associated with the design and construction of PTEs are:

- Engineering design—generally very site-specific and very constrained with respect to local, state, and federal regulations.
- Process equipment modification(s) at some sites.
- Materials of construction—must be nonflammable—should be selected on basis of cost and maintainability.
- Construction labor.

Some site-specific situations identified are as follows:

- Air conditioning is a feature associated with PTEs at some locations. A small amount of data (n=6) in which the air conditioning (A/C) equipment costs were broken out, showed that A/C costs alone averaged 170% of all other PTE construction costs.
- Of the total PTE costs (excluding any A/C costs), a major cost factor was the choice of materials of construction. The choice could be unlimited, but there are fairly standardized choices, all of which are nonflammable.
- PTE costs can escalate when there is a need for the PTEs to be decorative as well as functional.[5]
- On occasion, modifications to equipment are necessary before a PTE can be constructed. If these modification costs are considered to be part of the total cost of the PTE, then project costs can be sharply escalated.[5]
- If losses in production occur during equipment down-time during construction of a PTE, these losses may also be charged against the PTE project. In one set of data (n=8) for PTEs, six companies reported no production losses and two companies reported significant production losses (80 and 300%, respectively, of PTE construction cost).
- PTEs will vary greatly in size and configuration depending on the size, configuration, and number of operating units located within the enclosure, and on whether provision has to be made for workers to work inside the enclosure.

Construction cost data for PTEs were found in two publications.[10,11] In the former publication, construction costs for 13 PTEs varied from $20,000 to $140,000, exclusive of air conditioning, with an average of $49,000 per PTE. An attempt to further correlate these data was of no value. For example, the $20,000 PTE housed 15 screen printing machines; the $140,000 unit housed two rotogravure presses and one coater. Furthermore, the cost of the emissions control units was included in two units, but not in the other eleven. The costs of the emission control units were not broken out. Construction materials were:

1. Concrete block ..... 2 PTEs
2. Block and dry wall ..... 4 PTEs
3. Metal walls ..... 6 PTEs
4. Dry wall ..... 1 PTE

In the latter publication,[11] data were presented for nine installations; however, one installation was eliminated because that PTE was based on relatively minor modifications performed in order to use the building that housed the equipment as the PTE. Thus, the average cost of this set of eight PTEs was $24,500, with a range of $6,000 to $100,700 per PTE. Again, an effort was made to make some distinctions in the data set based on type of unit versus cost. However, the types of industries were too diverse and too little was known about most of the processes or the number of pieces of equipment per enclosure.

As noted previously, the one-time cost to design and install a PTE is a significant expenditure but not one of such magnitude that it should financially cripple any viable business. Furthermore, once installed and properly maintained, the PTE is considered 100% effective for emissions capture and no CE tests are required. When compared to the nearly equivalent costs of designing, installing, and removing TTEs, plus performing CE tests on these enclosures (perhaps on repetitive occasions, as may be required by regulatory authorities), it can be readily appreciated that the PTE alternative is generally more attractive from both an economic and technical viewpoint.

Health and Safety-Related Considerations

In any workplace where VOCs are used, care must be taken to maintain a healthful and safe atmosphere. These considerations are paramount when designing and operating a PTE. Fortunately, the hazards presented by using a PTE are no different from those encountered in any setting where VOCs are used, and industrial hygiene practices for worker protection are well-established.

There are two potential hazards associated with gaseous VOCs: (1) worker health effects and (2) fires and explosions. These areas of concern are discussed in the following.

Worker Health Protection

A much lower ambient VOC concentration must be maintained to protect worker health than to protect against fire. Thus, in any PTE that workers must enter, health protection considerations predominate.

Allowable Exposure Levels: To protect the health of the worker, OSHA has established maximum acceptable exposure levels for many substances, including most of the commonly used solvents. The permissible exposure limit (PEL) for a substance is the maximum time-weighted average airborne concentration to which a worker may be exposed in any eight-hour work shift of a 40-hour work week. For solvents, PELs range typically between 50 and 1,000 parts per million by volume (ppmv).

For some substances, in addition to a PEL, OSHA has set a short term exposure limit (STEL). The STEL is the maximum 15-minute, time-weighted average concentration to which a worker may be exposed at any time during a work day. (Some STELs specify other averaging periods.) For those solvents for which a STEL has been established, the STEL is typically about 50% higher than the PEL.

For some substances, OSHA has set ceiling levels, which are never to be exceeded for any time period. Ceilings are primarily established for acutely toxic materials; these substances generally are not subject to a PEL or STEL. Ceilings have been set for very few common solvents.

The PELs, STELs, and ceilings established by OSHA, as well as other pertinent information, are located in the *Code of Federal Regulations*.[12] Listings for over 600 substances can be found at 29 CFR 1910.1000. Other substances are regulated individually.

For a mixture of VOCs, OSHA and industrial hygiene practice dictate that the effects of the various component compounds

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GARY BISONETT is a registered Professional Engineer in Oregon and California with more than 19 years of experience in the air quality field. His experience includes several feasibility studies to determine cost-effective methods to reduce a variety of pollutants. He also has extensive experience in planning and conducting emission tests, permitting, and working with regulatory agencies to resolve issues for his clients. Mr. Bisonett is currently a Principal at Bisonett Environmental Engineering.

be considered as additive. This means that the PEL for a mixture of compounds has been reached when the following equation is satisfied:

$$\frac{C_1}{PEL_1} + \frac{C_2}{PEL_2} + \frac{C_n}{PEL_n} = 1 \qquad (2)$$

where:

$C_1, C_2 \ldots V_n$ = the individual concentrations of the compounds that make up the mixture, ppmv

$PEL_1, PEL_2, \ldots PEL_n$ = the individual PELs of the compounds that make up the mixture, ppmv

The atmosphere is below the PEL for the mixture when the sum is less than one.

The Exhaust System—The exhaust system installed to draw the fugitive emissions out of a PTE for measurement must be designed to keep the VOC concentration in the enclosure below regulatory limits. The system must be sized so that the air that enters the enclosure to replace the air exhausted by the exhaust system is sufficient to dilute the VOCs that are not captured by the capture device(s) to lower the concentration below the PEL. The rate at which this dilution air enters the PTE is equal or slightly less than the exhaust rate.

There are two basic methods for estimating the exhaust rate that is needed to maintain a healthful atmosphere inside the enclosure: the Crumpler Chart method and the calculation method.[1] The accuracy of each method relies on an accurate estimate of one of the parameters that is to be measured subsequently. The selection between the methods often hinges on the information that is already available about the process in question and its emissions.

Fire Safety

There are major safety concerns when building temporary structures around printing, coating, laminating, and other surface coating operations.[10] Most of the surface coating equipment will have gas-fired dryers as a means of drying the sheet or web. Fires that can originate in the coater or dryer are caused by static electricity which builds up on the web and sheets. Virtually all of these plants are equipped with automotive fire extinguishing systems at each coating station for each piece of equipment. Most companies will have overhead sprinklers installed above the presses and have other equipment at the press location to fight fires. Trained firefighting personnel employed at the plant are also standard for this industry.

Table 1 shows the requirements for a fire safety system. It is essential to provide a 20-second delay of the CO_2 system in the event that a fire is detected on the machine. For example, if a pressman was working between the print stations, some type of alarm system is necessary in order to allow the worker ample time to escape from this area before the fire suppression system is started.[10]

Table 1—Fire Safety Control System[9]

Logic

20-second delay after fire detection, CO_2 activated

When fire detected:
- bell and/or alarm sounds and emergency light activated
- equipment shutdown
- incinerator shutdown
- air conditioning shutdown
- air flow from press maintained by blowers

Specifications

20-second delay switch
Bell and/or alarm (to alert worker escape)
Emergency light(s) on
Electrical instrumentation for:
- equipment shutdown
- incinerator shutdown
- air conditioning shutdown
- blowers on
- activate purge/idle damper to purge air flow

PTEs are no different than an open pressroom or lamination room in regard to fire standards.[6] OSHA standards have to be maintained in all instances, no matter what EPA requirements the company has to implement. Proper fire suppressant systems that are approved by the local fire department and the loss prevention/property insurance company are required. Spark-proof and electrically protected tools and parts should be in use on any ungrounded VOC emission points. Material handling equipment (forklifts, pallet jacks, etc.) must be properly rated if operated within 20 feet from a solvent-based deck, solvent-based adhesion deck, and chemical storage areas. If chain hoists are used, all parts and chains should be spark-proof.

This is by no means the full extent of required safety measures that should be in place within any printing operation. Every company has the responsibility to know the applicable OSHA standards for their particular industry and to insure compliance at all times.

As in most industrial processes, good housekeeping practices are needed within a PTE, and should not be considered as an unnecessary expense. Property and loss prevention insurance premiums can be significantly reduced if any company can demonstrate continued good housekeeping practices. Strict control of fugitive VOC emissions, which is a direct result of closed containers, closed ink/adhesive decks, and continually cleaned, between-color dryers that are on the presses, reduces fire risks and industrial hygiene problems. Ink spoilage due to evaporation is reduced when containers are closed. Virgin solvent use is cut dramatically when viscosity control meters are used and when the ink sumps and ink decks are covered. With gravure presses and standard wide-web laminators, plexiglass enclosures can be retrofitted to the open web-paths between the decks and the dryer to capture fugitive emissions. These types of housekeeping issues should be implemented within any printing operation, whether there is a PTE or not.

Explosion Safety

When workers are not required to enter a total enclosure during operations, higher VOC concentrations may be allowed, and these maximum concentrations will then be limited by the vapor explosion limits of the VOC(s) in use within the enclosure. Generally, the upper limit for fire insurance purposes is 25% of the LEL, but with proper design of PTEs and their controls, even this level may never be exceeded.

If these concentrations cannot be met, corrective action must be taken. Corrective actions could include repositioning the capture devices, relocating the exhaust duct(s), repositioning the NDOs, or increasing the exhaust flow rate to the control device.[1]

In most cases in industry, there is considerable overlap in designing equipment and buildings to avoid or to mitigate the effects of both fires and explosions. This situation is also true for PTEs; therefore, most of the discussion in the prior discussion of Fire Safety applies to this section as well.

Governmental and Independent Organizational Standards

There are a number of governmental and cooperative, nonprofit industrial/technical organizations that prescribe or recommend standards for the design, construction, and

operation of equipment and structures used in commercial and industrial applications. Organizations of this type that have standards relevant to the design, fabrication, and operation of PTEs are: U.S. Occupational Safety and Health Administration (OSHA); National Fire Protection Association, Inc. (NFPA); and American National Standards Institute, Inc. (ANSI).

The accumulated relevant standards from these organizations are too voluminous and detailed to abstract in the body of this document; however, they are listed as follows:

1. OSHA (CFR Title 29, part 1910.94, part 1910.107, and part 1910.108)

1910.94: Ventilation concerned with spray finishing operations.

1910.107: Spray finishing using flammable and combustible materials.

1910.108: Dip tanks containing flammable or combustible liquids.

2. ANSI/ASC

Z9.3-1985: Spray finishing operations—safety code for design, construction, and ventilation.

3. NFPA

Spray application using flammable and combustible materials, Standard 33.

Dipping and coating processes using flammable or combustible liquids, Standard 34.

1993 National Fire Codes, Chapter 5, Special Occupancies:

(a) Article 500 Hazardous (Classified) Locations.

(b) Article 501 Class I Locations.

(c) Article 516 Spray Application, Dipping, and Coating Processes.

References

(1) Edgerton, S.W., Kempon, J., and Lapp, T.W., "The Measurement Solution—Using a Temporary Total Enclosure for Capture Efficiency Testing," *EPA Report No. EPA—450/4-91-020A*, August 1991.

(2) *Code of Federal Regulations*, Title 40, Part 60, Appendix A.

(3) "Draft Capture Efficiency Test Method," Referenced in *Federal Register*, Vol. 57, No. 250, December 29, 1992.

(4) McIlwee, R.J. and Sharp, R.C., *The Basics of VOC Capture Systems*, Smith Engineering Co., Ontario, CA, October 1991.

(5) Sharp, R.C., Smith Environmental, personal communication with I. Frankel of SAIC, August 19, 1993.

(6) Warlick, Th. D., "Permanent Total Enclosures within the Printing Industry; A Company's Review of Employee Comfort Factors," 86th Annual Meeting & Exhibition of the Air & Waste Management Association, June 1993.

(7) Air & Waste Management Association, *Air Pollution Engineering Manual*, Von Nostrand Reinhold, New York, 1992.

(8) Øiestad, A., Richmond Tech-Air Corp., personnel communication with I. Frankel of SAIC, August 16, 1993.

(9) McIlwee, R.J., Smith Environmental, personal communication with I. Frankel of SAIC, August 18, 1993.

(10) Lukey, M.E., PES, Herndon, VA, "Designing Effective and Safe Permanent Total Enclosures," 86th Annual Meeting & Exhibition of the Air & Waste Management Association, June 1993.

(11) Pacific Environmental Services, Inc., *Capture Efficiency (CE) Procedures*, Stationary Source Compliance Division, U.S. EPA, March 12, 1993.

(12) Code of Federal Regulations, Title 29, Part 1910 (29 CFR 1910).

CLEVELAND—APRIL

"Wetting and Dispersing Additives"

A moment of silence was held in memory of Ronald C. Ohm.

Elected to serve as Society Officers for the 1995-96 year are as follows: President—Michael A. Wolfe, of Seegott, Inc.; President-Elect—Richard A. Mikol, of Tremco, Inc.; Secretary—James J. Currie, of Jamestown Paint Co.; Treasurer—Jennifer Rumberg, of The Mahoning Paint Corp.; Assistant Treasurer—Lamar Brooks, of Coatings Research Group Inc.; Member-at-Large—Phil Haagensen, of Chem-Materials Co., Inc.; and Society Representative—Brenda L. Carr, of Coatings Development Co.

Edward W. Orr, of BYK-Chemie USA, was the speaker for the evening. Mr. Orr discussed "UNIQUE WETTING AND DISPERSING ADDITIVES—CHEMISTRY AND APPLICATION."

Mr. Orr concentrated on the performance and cost improvement techniques of wetting and dispersing additives. The first part of his presentation focused on terminology, the second part involved structures and corrosion improvement properties, while the third part dealt with tailoring formulations.

The speaker stated that some of the defects wetting and dispersing agents will hopefully cure include: Benard cells, rub out and pigment separation, and sagging. Defects can also be caused by surface tension between the pigment itself and the interface between the pigment and the resin system.

Additive and dispersant types include those used in solvent-based, water-based, and solvent-free systems.

Using additives and dispersing agents change those portions of the wetting equation that can be controlled. For example, a zinc phosphate/resin complex that is very strong in aiding wettability can also increase adhesion and corrosion resistance. Polymeric additives charge pigment particles positive. Mr. Orr followed this statement by describing a set up for charge measurement.

Pigment aggregates (edge-to-edge and point-to-point contact), agglomerates (point-to-point contact), and ideal (no contact) were described. According to Mr. Orr, wetting, dispersing, and stabilization additives can control flocculation, which in turn can aid stabilization.

The speaker then showed slides of pigments with polarity and nonpolarity on the x-axis and resin polarity on the y-axis, as well as wetting and dispersing additives with

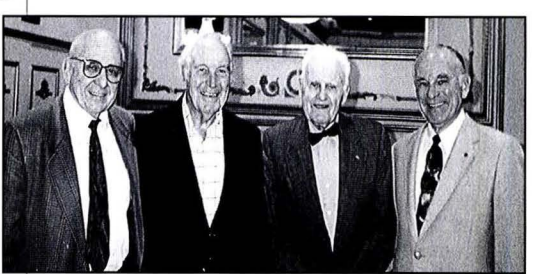
Chicago—May Meeting Annual Awards Dinner

The presentation of Chicago Society annual awards was held during the Society's May 12 meeting which took place at the Drury Lane Oak Brook, in Oak Brook, IL. In addition to the awards, the meeting also included the introduction of the 1995-96 Chicago Society Officers. They are as follows: President—C. David Stromberg, of United Coatings, Inc.; Vice-President—Marcella G. Nichols, of Tru-Test Manufacturing Co.; Secretary—Gerry K. Noren, of DSM Deso-tech, Inc.; Treasurer—William C. Bellman, of The Valspar Corp.; and Society Representative—Evans Angelos, of Omya Inc.

Incoming Society President David Stromberg was presented with the Nuodex gavel.

Immediate Past-President Natu Patel, of Ace Hardware Corp., received a gift and a certificate of appreciation.

The prestigious Outstanding Service Award of the Chicago Society for Coatings Technology was awarded to Darlene Brezinski, of Consolidated Research (left photo) and Walter Krason, of The Valspar Corp. (right photo—first). The award recognizes their extraordinary contributions to the coatings industry through work within the Society and Federation. Also pictured with Mr. Krason are Society President Dave Stromberg, of United Coatings, Inc. and Bill Fotis, of The Valspar Corp.



In attendance at the Chicago May meeting were the 50-year members pictured on the left: Gerry Kraft, Hugh Price, Warren Ashley, and Cliff Schwahn.

Chicago Society members who received 25-year pins at the meeting included (from left): Andy Dichter, Roland Chidley, Evans Angelos, Daryl Luxmore, Jim Thorstad, Walter Krason, James Whiting. Vic Willis, Chairman (far right), made the presentations.

Errata

The speaker at the New York Society March meeting was incorrectly identified in the May 1995 issue of the JCT (see page 94). Richard Ziminski delivered the presentation on "BIOTIN," not Roger Blacker.

We apoligize for any confusion this may have caused.—Ed.

each pigment. Mr. Orr concluded with various molecular weight additives.

RICHARD A. MIKOL, *Secretary*

NEW YORK—MAY

Awards Night

It was announced that the following were elected to serve as Society Officers for the 1995-96 year: President—Cary Grobstein, of LBL Sales; President- Elect—John Du, of Hüls America Inc.; Secretary—Robert Schroeder, of Daniel Products Co.; Treasurer—Larry Waelde, of Troy Corp.; and Society Representative—Michael Frantz, of Daniel Products Co.

Elected to the Board of Directors with terms expiring in August 1997 are: Samuel P. Morell, of S.P. Morell; Jules J. Hermele, of American Safety Technologies; and Edward C. Webb, of Sun Chemical Corp.

The following Society awards were presented at this meeting:

→ *PaVac Award*—Marvin J. Schnall for outstanding devotion to the Society and for his technical developments and educational efforts which contributed to the advancement of the protective coatings industry;

→ *President's Service Award*—Roger P. Blacker, of Jesse S. Young Co., for long and faithful service to the Society and the protective coatings industry;

→ *President's Service Award*—Kenneth J. DePaul, of Whittaker, Clark & Daniels Co., for long and faithful service to the Society and the protective coatings industry;

→ *NYSCT Scholarship Award of $1,000*—Lisa Budman, daughter of Theodore Budman of Superior Materials, Inc.; and

→ *The Melvin Gerson Memorial Scholarship of $1,000* (funded by Daniel Products Co.)—Ronald M. Lau, son of David Lau, of D/L Laboratories;

In addition, the following members were honored as 25-year members: Leonard Schwartz, of Aceto Corp.; Richard Stark, of Empire State Varnish Co., Inc.; and Myron Segal, of Premier Mill Corp.

Technical Committee Chair, Sheila Westerveld, of Standard Coating Corp., reported that the rheological paper has been submitted and will be presented at the NYSCT September meeting prior to the FSCT Annual Meeting presentation in St. Louis, MO.

In addition, it was stated that CI pigment blue 15:1 (phthalo blue) has been delisted as a copper containing compound. Therefore, it does not have to be reported on the Toxic Report Inventory Report Form R for 1994 and subsequent years, but acetone is awaiting the final rule for inclusion of exclusion and may not be in before July 1.

Starting for 1995 reporting year forms, due July 1, 1996, companies will have an alternate threshold of one million pounds if the total release of the 313 chemicals is less than 500 pounds.

Sid Rubin, of Empire State Varnish Co., Inc., informed the members that the New York Senate introduced a bill that will require shelf labeling of household hazardous products and related consumer information such as pamphlets describing toxicity, disposal methods, and alternate products. Members are encouraged to write their Senators in opposition to this bill as it would greatly increase the cost and labeling requirements of doing business in New York. It is also foreseeable that if New York enacts such legislation, New Jersey will do the same.

Eric Johnson, of Rohm and Haas Co., spoke on "RHEOLOGICAL MODIFIERS."

Dr. Johnson stated that rheology modifiers are used to control flow, structure, spatter resistance, nondripping, sag resistance, brush drag, and film build. In addition, package stability, application feel, and open time are also affected by rheology.

According to the speaker, rheological modifiers control or change a portion of the viscosity versus shear curve, whereas thickeners change the whole curve. Dr. Johnson next described the various instruments used to measure viscosity: ICI cone and plate for high shear, Brookfield for the mid range, and actual performance tests for the very low shear ranges due to excessive equipment cost of the instruments capable of measuring the low shear ranges.

Through a series of graphs and micrographs, Dr. Johnson explained hydrodynamic thickening, depletion flocculation, syneresis, and the mechanisms that cause them. He went on to show the corrosion performance of the various thickening mechanisms. In conclusion, Dr. Johnson described how the various thickening mechanisms need to be used in combination to obtain the desired balance of flow control.

Q. How does one choose between using nonionic and anionic associative thickeners?

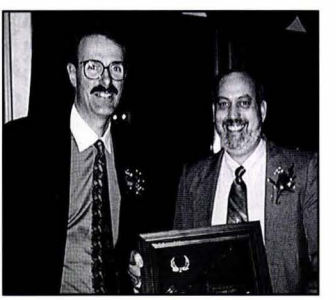
A. Nonionic associative thickeners give good flow, increased ICI viscosity, and good corrosion resistance.

JOHN W. DU, *Secretary*

Philadelphia—April Meeting 75th Anniversary Awards Dinner

The Philadelphia for Coatings Technology celebrated their 75th Anniversary on April 28, 1995, at Williamson's Restaurant in Bala Cynwyd, PA.

Among the presentation made during the banquet were: the Ben Franklin Award for outstanding contributions to the Society, and the President's Plaque.



In the left photo, Don Fritz, Philadelphia Society Honorary Director (right), presents the prestigious Ben Franklin Award to 1995 recipient David J. Engler, retired Technical Director of Finneren & Haley.

In the right photo, PSCT Immediate Past-President Bob Thomas, of M.A. Bruder & Sons (right), accepts the President's Plaque from current President Barry Fisher, of Van Horn, Metz & Co.

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Mexico: Beatriz Alonso Torres, ANAFAPYT, Gabriel Mancera 309, Col. Del Valle, 03100 Mexico, D.F., Mexico

GOLDEN GATE

Associate

Bise, James M. Jr.—Myers Container Corp., Emeryville, CA.
Joseph, Ron M.—Ron Joseph & Associates, Inc., Saratoga, CA.

Retired

Huffman, Constance W.—Walnut Creek, CA.

NEW ENGLAND

Active

Boise, Lawrence H.—Gloucester Co., Inc., Franklin, MA.
Booth, Stuart E.—Roma Color Inc., Fall River, MA.
Chia, Yee-Ho—Polaroid Corp., Waltham, MA.
Mohanty, Chandrasekar—Providence Metallizing, Pawtucket, RI.
Radkowski, Denise A.—Polaroid Corp., Medfield, MA.
Tedeschi, Eugene—CR Bard, Billerica, MA.

NEW YORK

Active

Berningham, John H. Jr.—Super-Tek Products, Woodside, NY.
Bialas, Kamila A.—Insl-X Products Corp., Stony Point, NY.
Chernoff, Leslie M.—Petri Paint Co., Inc., Newark, NJ.
Drucker, Daniel A.—Insl-X Products Corp., Stony Point.
Emmet, Michael M.—King Industries, Norwalk, CT.
Haacke, Gottfried—Cytec Industries, Inc., Stamford, CT.
Incontro, Richard C.—Ridgefield Park, NJ.
Lejins, Artis E.—Insl-X Products Corp., Stony Point.
Nicholas, Richard D.—Enthon-Omi, Inc., New Haven, CT.
Perez, Jose L.—Insl-X Products Corp., Stony Point.
Picci, Marie E.—Insl-X Products Corp., Stony Point.
Poszmik, George—Shamrock Technologies, Newark.
Pauwels, Robert Michael—Hüls America, Inc., Piscataway, NJ.
Tramontano, Valentino—King Industries, Inc., Norwalk.
Zylla, Elizabeth G.—Hüls America, Inc., Piscataway.

Associate

Collins, Jack—Hüls America, Inc., Piscataway, NJ.
Fishman, David H.—Fishman Inc., Berkeley Heights, NJ.
Herzberg, Sheri K.—UOP, Mt. Laurel, NJ.
Leases, Robert F.—G.J. Chemical Co., Inc., Newark, NJ.
Miller, Marguerite J.—Strictly Industrial, Stamford, CT.
Norton, James S.—Norton & Son Inc., Bayonne, NJ.
Pesetsky, Craig J.—Ferro, Newark.
Reis, Dennis C.—EM Industries, Inc., Hawthorne, NJ.
Scott, James P. Jr.—Columbian Chemicals, Jamesburg, NJ.
Weita, J. Marc—Seegott, Inc., Parsippany, NJ.

Educator/Student

Nilsen, Christopher N.—Columbia University, Maywood, NJ.

NORTHWESTERN

Active

Betts, Elaine M.—McWhorter Technologies, Minneapolis, MN.
Eklund, Wayne G.—H.B. Fuller, Oakdale, MN.
Jongewaard, Sue K.—3M, St. Paul, MN.

Associate

Vignetti, Anna M.—Cortec Corp., St. Paul, MN.

PHILADELPHIA

Active

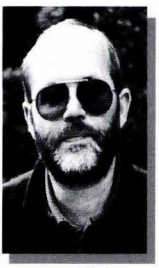
Beloli, Scott M.—Wilmington Leather Coatings, New Castle, DE.
Cavanaugh, Robert J.—DuPont, Wilmington, DE.
Derby, Richard—Air Products & Chemicals Co., Allentown, PA.
Durgin, Charles E.—Wilmington Leather Coatings, New Castle.
Flanagan, Dennis W.—Triple G Coatings, Riverton, NJ.
Iezzi, Robert A.—Elf Atochem, King of Prussia, PA.
Johnston, Willis A.—Arco Chemical Co., Newtown Square, PA.
Latshaw, David R.—Air Products & Chemicals Co., Allentown.
Mangano, John V.—Finnaren & Haley, Inc., Conshohocken, PA.
Masse, Gary M.—Suvar Corp., Merchantville, NJ.
Rieth, Theodore J.—Masonite Corp., Towanda, PA.
Ristey, William J.—Force Industries, Paoli, PA.
Sau, Arjun C.—Hercules Inc., Wilmington.
Yi, Wei—Lehigh University, Bethlehem, PA.

Associate

Breskman, Benjamin S.—Sentry Paint Technology Inc., Darby, PA.
Bryant, William J.—ICI Americas, Inc., Newark, DE.
Caserta, Vic R.—R.T. Vanderbilt Co., Inc., Chester Springs, PA.
Cerles, Bernard J.M.—Rhone-Poulenc, Cranbury, NJ.
Cole, James A.—Zaclon Inc., Wilmington, DE.
Elias, Paul—Sartomer Co., Exton, PA.
Keeley, Craig T.—Zaclon Inc., Ocean City, NJ.
Kirby, Patrick N.—SAI, Reading, PA.
Lehm, Keith R.—Votorantim International North America, Newark.
Marchand, Melanie A.—Air Products & Chemicals Co., Philadelphia, PA.
Martin, Sharon—Rheox, Inc., Atlantic Highlands, NJ.
O'Connor, J. Brian—McWhorter Technologies, Philadelphia.
Osborne, Brian M.—Lenape Industries, Bound Brook, NJ.
Pesetsky, Craig J.—Ferro Corp., Newark.
Pourreau, Daniel B.—Arco Chemical Co., Newtown Square, PA.
Rotar, Frederick D.—Union Process Inc., West Chester, PA.
Vermeychuk, J. Gregory—Seamless Technologies, Hockessin, DE.

Educator/Student

Fuchs, Alfred E.—Northampton Community College, Bethlehem, PA.
Kovaleski, Kevin J.—Lehigh University, Bethlehem.


J.H. Jilek

Joseph H. Jilek has been appointed to the position of P&R Sales Development Manager—Eastern Europe for Rohm and Haas, Austria. Based in Vienna, he will develop business in Eastern Europe for the company.

Mr. Jilek is the author of the monograph entitled "Powder Coatings," which is part of the *Federation Series on Coatings Technology*, published by the Federation of Societies for Coatings Technology.

E.W. Kaufmann Co., Southampton, PA, has named **James Goldsmith** a Sales Representative for Eastern Pennsylvania. The Philadelphia Society member has sales experience in the textile, coatings, metal working, ink, and adhesive markets.

Kerr-McGee Chemical Corp., Oklahoma City, OK, has elected **Luke R. Corbett** President and Chief Operating Officer. He previously served as Group Vice President.

In other news, Dallas Society member **Robert Gibney** was promoted to Regional Sales Manager for the company's new Western Region, headquartered in Dallas, TX. The new region includes Arizona, New Mexico, Texas, Nevada, Oklahoma, Arkansas, Kansas, Colorado, western Canada, and Mexico.

The National Association of Printing Ink Manufacturers, Hasbrouck Heights, NJ, has elected new officers. Elected are: President—**A.C. "Cal" Sutphin**, of Braden Sutphin Ink; Vice-President—**James E. Coleman**, of Heritage Inks International; and Treasurer—**Urban S. Hirsch**, of Ink Systems.

William R. Toller has been asked by the Board of Directors of Witco Corp., Greenwich, CT, to continue serving as Chairman and Chief Executive Officer beyond his retirement date. Mr. Toller has agreed to an extension through December 1996.

FSCT Anniversaries

Los Angeles Society

50-Year Members

Edward Lasher
Charles Munger
Clarence Nelson

At the end of 1995, **Mark Padow** will retire from his position as Director of Industry Affairs for the National Paint and Coatings Association, Washington, D.C. Mr. Padow has been with NPCA for 30 years.

Marilyn Ludwig, Director of Communications, will retire at the same time. She has been with the organization for 14 years.

E. William Ross Jr., Sales Development Manager for Pelmor Labs., Inc., Newtown, PA, has been elected to the company's Board of Directors. Mr. Ross joined the company in 1991, and is responsible for the marketing and sales of Pelmor's line of high performance fluoroelastomer adhesives, sealants, coatings, and caulks.

Troy Corp., East Hanover, NJ, has hired **Frank Kicklighter** as Market Manager for Wood Applications. In this capacity, Mr. Kicklighter will manage wood protection technologies and the development of new wood application markets.

Jeff Nodland has been promoted to the position of Executive Vice President and Chief Operating Officer of McWhorter Technologies, Carpentersville, IL. He most recently served as Senior Vice President and General Manager.

In other news, **Louise Tonozzi-Frederick** has been named Controller and Treasurer. In addition to her financial responsibilities, Ms. Tonozzi-Frederick will oversee shareholder services, bank relations, and communications with financial analysts.

S.P. Morell and Co., Tarrytown, NY, has hired **Rick Mazzariello** as Technical Representative. Mr. Mazzariello, a member of the New York Society, was previously Urethanes Marketing Manager for BFGoodrich.

Russ Steimle has been promoted to Sales Manager Latin America for X-Rite, Inc., Grandville, MI. In his new role, Mr. Steimle will take charge of sales in Latin America.

The company has also appointed **Brian Teunis** to Color and Appearance Product Manager. His new duties include providing global service and product support, assisting in the development of markets and products, and industry relations.


C. Walker

Chicago Society member **Carl Walker** has joined the sales team at Crosfield Co., Joilet, IL, as Territory Manager. Mr. Walker will coordinate sales of micronized silica gel products in the surface coatings and related markets.

Air Quality Sciences, Inc., Atlanta, GA, has announced the appointment of **David W. Nicholas** to President. His new position embraces overall operations, including business development, financial planning, operations management, and strategic planning.

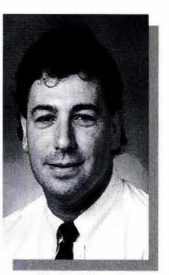
The Dow Chemical Co., Midland, MI, has named **Peter A. Doty** Development Associate within the Technical Service and Development Group of Acrylates Emulsion Polymers. In his new position, Mr. Doty will develop coating systems based on acrylic polymers.

The company has also hired **Theodore J. Fuhs** as Project Leader. Mr. Fuhs, a member of the Chicago Society, will be responsible for developing coating systems based on acrylic polymers.

Marc S. Hirsch, a New York Society member, has been appointed Coatings Technology Manager. His responsibilities include the development of coatings and adhesives.


P.A. Doty


T.J. Fuhs


M.S. Hirsch

The annual Hanna Award in Chemical Coatings for the Best Project in the science and technology of chemical technology of chemical coatings was presented at Ohio Science Day, held at Ohio Wesleyan University, on April 22nd. The winner was **Daniel Thomas Dean**, an 8th grade student at St. Patrick's Catholic School, in Bryan, Ohio, for his project entitled "Moisture 'Keep Out'" in which he made determinations regarding moisture transport through commercially available barrier coatings. The judges found his work to be both comprehensive and well thought-out, exhibiting a balanced regard for both scientific content and practical application. The Hanna Award consists of $500 and an engraved plaque. It is given by the Columbus, Ohio facility of Akzo Nobel Coatings Inc. to help create a greater interest in—and awareness of—the chemical coatings industry at the middle school and high school levels, and to help foster a greater interest in chemical coatings as a potential career field in science and technology.

D.T. Dean

BatchMaster Software Corp., Seal Beach, CA, has announced the appointment of two sales representatives. **Dean Brittain**, of Schanen, Brittain and Associates, will service Seattle, WA; and **Don Scipione**, of Acme Express, Inc., will service Cleveland, OH.

The position of Technical Sales Representative for Boehle Chemicals, Inc., Southfield, MI, has been accepted by **Michael T. Cyranski**. He will be responsible for accounts in Michigan and northern Indiana.

Marcos Cajiao has been appointed Regional Manager, Latin America for positive displacement and electromagnetic flow meters as well as electronic registration equipment and related accessories for Liquid Controls Corp., Lake Bluff, IL. He will oversee marketing, sales, and distribution activities throughout Latin America, including Mexico, Central America, South America, and the Caribbean.

Brian Mauro has been appointed Director of Sales and Service for Seibert Oxidermo Inc., Romulus, MI. He was most recently Vice President of Business Management for the Hilton-Davis Co.

Kelly S. Kirkpatrick has been named 1995-96 MRS/OSA Congressional Science and Engineering Fellow. The Fellowship, which is a one-year appointment, is sponsored jointly by the Materials Research Society and the Optical Society of America. Ms. Kirkpatrick, a graduate student at Northwestern University, is the first recipient of this new fellowship. She will work directly for a member of Congress or on a congressional committee as a resource on scientific and technical matters.

Fred E. Dailey has accepted the position of Plant Manager for OSi Specialties' Sisterville, WV manufacturing facility. Mr. Dailey has been Assistant Plant Manager since 1989.

Gil Burkhart, formerly a Chemist responsible for the mixed metal oxide (MMO) technical service and quality control laboratories of Cerdec Corp., Drakenfeld Products, Washingto, PA, has been appointed MMO Technical Sales Representative with domestic and international sales responsibilities.

Obituary

Sam Leon Bishkin, a 50-year member of the Houston Society, died on May 19, 1995. He was 90.

Mr. Bishkin, a charter member, was instrumental in starting the Houston Society. In 1938, he had the idea to engender a technical society in Houston after speaking at a meeting of the Dallas Society.

He was a Professor and founder of the Chemistry Department of the University of Houston. He was also the founder and President of Eltex Chemical Co.

He is survived by a daughter, Myrna; three grandchildren; and three great grandchildren.

James Ignatow, a Houston Society member, passed away on May 18, 1995, at the age of 53.

Mr. Ignatow was President of the Society in 1988-89. He was President and CEO of Jet-Lube, Inc., and a Director of the Rectorseal Corp., the Whitmore Manufacturing Co., and Jet-Lube, Inc.

He was also a member of the National Fire Protection Association, Building Officials and Code Administrators International, ASTM, and NACE.

Mr. Ignatow is survived by his wife, Ellen; a daughter, Janna; and a son, Brian.

John W. Garrett, a 50-year member of the Houston Society, passed away in January 1995. Mr. Garrett, a charter member, was President of the Houston Society in 1952-53.

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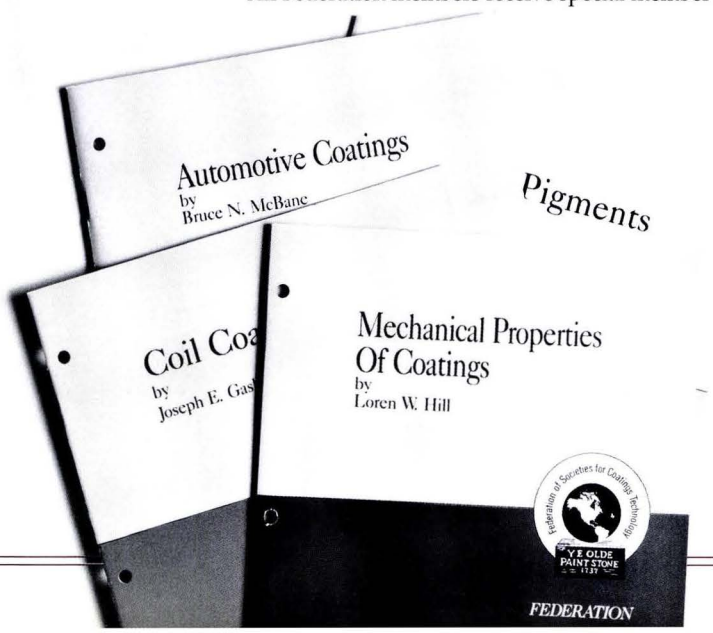

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Circle No. 10 on the Reader Service Card

Industrial Color Testing Fundamentals and Techniques

Written by: Hans G. Volz
Translated by Ben Teague

Published by: VCH, Pappelallee 3, P.O. Box 101161, D-69469 Weinheim, Germany; xiii + 377; $198 DM

Reviewed by: Ralph Stanziola, Neshanic Station, NJ

This book is certainly a scholarly work with some subjects and procedures covered in unusual detail. While reading this book one cannot help but wonder how pigments could have been successfully tested before the advent of the digital computer. There are so many equations presented, that at the end of several chapters, one to three pages were needed just to list the symbols which were used in the formulas. Unfortunately, this fact may make this book less useful to paint technicians unless they are well-versed in mathematics.

There are however a number of "gems," from an industrial application standpoint, which are given in this book. Unfortunately, they have to be "ferreted out" in between all the equations.

This book appears to have been specifically written for those whose work for pigment, and, to a lesser degree, dye manufacturers. However, paint technicians will probably find Chapters 1, 6, and 7 useful.

While it is true that most of the test procedures described in this book deal with single pigment testing, there are two important subjects that appear to have been ignored or at most barely mentioned. First, the author makes a number of references to the inadequacy of a total $DE_{a,b}$ for acceptability tolerances, but there is very little mention of the CMC color metric system. Second, the subject of metamerism (with the exception of a short discussion on page 258) is given very little emphasis.

The Summary and the Historical and Bibliographical Notes Section after each chapter is very helpful and allows the reader to focus in on the important items in each chapter.

Other specific comments stated by the author include the following:

(1) In discussing colorimetry based color order systems (page 39), the author fails to mention the colorcurve system which was developed in the mid 1980s (U.S. Patent #5012,431) before the RAL design system (RAL-DS) and is directly related to the CIELAB system.

(2) The author infers (pages 158-161) that using the Kubelka Munk theory with CIE X,Y,Z values for the determination of pigment tint strength is fairly recent. This procedure was one of several methods used for pigment strength calculation in the standard software package offered by Applied Color Systems, Inc., Princeton, NJ in the mid 1970s.

(3) On page 205 (Summary Section) it is stated that for inorganic pigments only, CIELAB lightness L* (or CIE tristimulus value Y) is the crucial tinting strength criterion. While this might be true for most inorganic pigments including yellow oxide, it is definitely not true for higher chroma inorganic yellow pigments like chrome yellow or cadmium yellow. For the higher chroma yellow, a CIE delta Z=O is much more sensitive.

(4) Chapter 6—"Measurement and Evaluation of Object Color"—contains a number of practical and useful information. However, on pages 256 and 258 the author states that when measuring full shade blacks that the calorimeter requirements include five decimal places for reflectance measurements, three for CIE tristimulus values and reproducibility (standard deviation of CIE tristimulus values less than .001). This is an unreasonable requirement since no commercial instrument (or at best very few research instruments) can achieve those requirements. I doubt that any laboratory could make repeat samples that could take advantage of those requirements.

(5) Many of the figures show computer printouts of color difference calculations. In some cases the values are calculated for illuminant C, 2° observer, while in other cases that output shows calculations for illuminant D65, 10° observer. There are also examples where some measurements were made specular included (SIN) and others were made specular excluded (SEX). While one of the reasons for the different outputs could be due to specific ISO methods, it causes some confusion for the reader. An explanation early in the book would have been helpful.

(6) During the discussion of fluorescence (Special Problems—pages 258-261) the author states that the use of illuminant D65 lacks a technical implementation that can be used for routine measurements. While this statement is technically true from the purest's standpoint, the procedure proposed by Rolf Griesser of Ciba Giegy, and implemented by several instrument manufacturers works well and is used for routine measurements of optical whiteners.

(7) When discussing methods for agreement on color tolerance calculations (page 282) the author should be congratulated for his views which are indicated by the following statement : "A trend that should not be emulated is the practice of some software vendors who deal with the acceptability of textile dyes but do not disclose the color difference formulas or the test criteria used. One might well ask whether this secrecy is an attempt to mask the inadequate scientific basis for the algorithms! Even if it is not, the result is very negative because it prevents discussion of the systems, possible recommendations for improving the color-difference formulas, and— ultimately— advances in what is today the most important specialty area of our field."

Circle No. 65 on Reader Service Card

Proceedings of the Polyurethanes 1994 Conference

Published by: Technomic Publishing Co., Inc., P.O. Box 3535, 851 New Holland Ave., Lancaster, PA 17604-9961; x + 692 pages, $155.00

Reviewed by: Paul R. Guevin Jr., P.R. Guevin Associates, Westerville, OH

Each year the Society of the Plastics Industry's (SPI) Polyurethane Division sponsors a conference on polyurethane chemistry. The papers that are presented are then published in book form. This year's SPI Polyurethane Division Conference resulted in the presentation of more than 90 original papers on new developments by polyurethane specialists from industry and research organizations. Advances in all types of polyurethanes are discussed: adhesives, coatings, elastomers, flexible and rigid foams, and sealants. There are also papers on blowing agents, environmental, health and safety aspects, processing, and properties/testing.

Polyurethanes 1994 will prove to be a valuable book to the coating chemist. It contains three papers which specifically address coatings: "The Use of a New Class of Light-Stable Aliphatic Diamines in Polyurea and Polyurethane Coatings"—D.W. House and R.V. Scott, of UOP; "Synthesis and Characterization of Siloxane-Urethane Prepolymers"—J. Kozakiewicz, M. Cholinska, M. Skarzynski, S. Iwanska, and Z. Czonkowska-Kohutnicka, of Industrial Chemistry Research Institute; and "Crosslinked Polyether Polyurethane Dispersions: Reactions and Thermal Properties"—F-F. Chang, K-L. Cheng, and Y-C. Chang, of China Textile Institute. In addition, the book contains papers which are allied to our industry and will be of interest to supporting groups.

Circle No. 66 on Reader Service Card

Raw Materials

Polyethylene Additives

The Performance Additives business unit of AlliedSignal introduces ACtol® resin modifiers for powder coatings. ACtol 60 low molecular weight polyethylene polyol reportedly improves flexibility and impact resistance of certain thermoset powder coatings without affecting other properties. A brochure describes typical properties and intended application areas for these products.

Circle No. 30 on Reader Service Card

Emulsifiable Waxes

Emulsions prepared from Luwax® oxidized polyethylene, ethylene copolymer, and montan waxes are applicable in floor polishes, textile finishing, printing inks, and leather processing. These BASF Performance Chemicals products are also utilized as protective coatings for products ranging from cars to citrus fruit.

Circle No. 31 on Reader Service Card

Pigment Dispersions

A family of 12 aqueous pigment dispersions for the coloration of paper and paper products is available from Crompton & Knowles Corp. Colors in the nonionic pigment dispersion series, which are also suited for coatings, include yellow, orange, red, violet, blue, green, and black self-shades. The dispersions contain no binding or rewetting agents and can be added directly to the pulper.

Circle No. 32 on Reader Service Card

Reactive Diluent

ANGUS Chemical Co. has a new reactive diluent available. This low viscosity oxazolidine-based reactant reportedly allows for lower VOCs in higher solids polyurethane coatings as well as weathering, abrasion, and impact resistance. Zoldine® RD-20 is also engineered for low color and flexibility for adjusting potlife and cure response to suit a variety of application needs.

Circle No. 33 on Reader Service Card

Foam Control Agents

Ashland Chemical Co.'s Drew Industrial Div. announces that several existing and new foam control agents have Food and Drug Administration (FDA) acceptance. Applicable FDA sections include coatings, adhesives, paperboard, inks, and latex. This information has been summarized in a Product Selection Guide now available from the division's Additives Group.

Circle No. 34 on Reader Service Card

Acrylic Latex

SC Johnson Polymer highlights SCX™-1959, a waterborne acrylic latex for the OEM wood coatings market designed for early print resistance, clarity, and microfoam resistance. A reported benefit of this product is VOC reduction.

Circle No. 35 on Reader Service Card

Epoxy Hardeners

Two new epoxy hardeners for epoxy-based protective coatings are available from Advanced Standards Ltd. HN 19 UV, a cycloaliphatic adduct hardener, is UV resistant and suitable for long-term outdoor applications. PAC-36, a high speed polyaminoamide hardener, can provide variable gel times according to the mixing ratio of between ten minutes and the full pot life of the corresponding conventional polyamide.

Circle No. 36 on Reader Service Card

Salt Remover

Chlor*Rid, a liquid soluble salt remover, cleans chlorides and sulfides from contaminated surfaces in a simple dilution with any potable water source and method, including high-pressure washing, wet abrasive blasting, or hand-cleaning. Applicable surfaces include steel, foam, concrete, and plastics. This Chlor*Rid International Inc. product is biodegradable, nonflammable, and contains no volatile organic compounds.

Circle No. 37 on Reader Service Card

Safety Solvents

A line of safety solvents is offered by Dynaloy, Inc. Applications include general cleaning and degreasing, cleaning of urethane and isocyanate residues from equipment and molds, the removal of mold release residue from plastic molded parts, cleaning of silicone oils and uncured silicone polymers from molds and equipment, and the cleaning and defluxing of printed circuit boards.

Circle No. 38 on Reader Service Card

Testing Equipment

Irradiance Control

Q-Panel Lab Products highlights the QUV with the Solar Eye™ irradiance control system. Irradiance is monitored, controlled, and displayed continuously through the use of a microprocessor controller. This system meets the new specification SAE J2020, "Accelerated Exposure of Automotive Exterior Materials Using a Fluorescent UV and Condensation Device."

Circle No. 39 on Reader Service Card

Laboratory Apparatus

Rheometer

Stresstech, a controlled stress/strain rheometer, couples low position resolution and a wide torque range with a user interface working in Windows. Samples can range from low viscosity fluids to high modulus solid materials. The ATS RheoSystems instrument comes standard with automatic gap setting and quantitative normal force for all measuring systems, i.e., couette, cone/plate, and plate/plate.

Circle No. 40 on Reader Service Card

Aldehyde Analysis

J & W Scientific's thicker film GC columns provide resolution of formaldehyde and other aldehydes. DB™-1 is suggested for resolution of aldehydes and ketones. DB™-WAX is also suitable for this analysis, providing resolution of o- and m-tolualdehyde.

Circle No. 41 on Reader Service Card

Color Measurement

The Color Reader CR-10, a hand-held sensor for measuring the color difference between two samples, is available. This instrument features an 8/d geometry (8° illumination angle/diffuse viewing), an 8-mm measurement area, Standard Illuminant D65, and CIE 10° standard observer. This Minolta Corp. device can be connected to a printer for data downloading.

Circle No. 42 on Reader Service Card

FTIR Sample Accessory

Spectra-Tech Inc. introduces the Sample Wheel, a computer-controlled, motorized FTIR sampling accessory for unattended transmission analyses of multiple solid or liquid samples. Thirty 13 mm diameter sample positions exist on the wheel. The sample holders are capable of handling Kbr pellets, thin films, salt windows, and the company's 3M disposable IR cards for liquid analysis.

Circle No. 43 on Reader Service Card

Coating Thickness

Separate probe models have been added to DeFelsko Corp.'s 6000 series of coating thickness gages. Features include auto-calibration, interchangeable probes, and a combination probe which measures on both ferrous and nonferrous substrates. All probes are hermetically sealed and manufactured with a stainless steel housing, high-flex cable, sapphire tip, and gold-plated connectors.

Circle No. 44 on Reader Service Card

Services

On-Line Capability

Varian Associates, Inc. offers an Internet Home Page on the World Wide Web that allows customers on-line access to information and customer services. A special section is dedicated to the company's instruments business unit. Also included are: general company and financial information, brochures, technical publications, product catalogs, newsletters, press releases, and information on each of the company's business units, including instruments, semiconductor equipment, and electron devices.

Circle No. 45 on Reader Service Card

Bilingual Packaging

The Darworth Co. has developed bilingual English/Spanish packaging for its line of caulks and adhesives. The company has translated its products' directions, cautionary statements, guarantees, and technical services information. The packaging, developed for sale in the United States only, is intended to serve the company's Spanish-speaking customers in the country.

Circle No. 46 on Reader Service Card

Circle No. 7 on the Reader Service Card

Equipment

Shelf Oven

No. 760 from the Grieve Corp. is an electrically heated shelf oven, currently in use for drying water from stainless steel pans and utensils. The oven features four-inch insulation throughout, a stainless steel interior, and a stainless steel exterior with #4 brush finish. The exterior treatment is also included on the control panel and the enclosure for the recirculating blower motor, heater terminal box, and recirculating blower airflow safety switch.

Circle No. 47 on Reader Service Card

Powder Wetting

V Range mixers have been developed for use in applications where a powerful vortex is required to rapidly wet-out and disperse large volumes of powders into liquids. This instrument is designed for dispersion of materials which are difficult to wet out and have a tendency to float or "raft." The Silverson Machines, Inc. apparatus is also suitable for high viscosity mixes where good surface movement is required.

Circle No. 48 on Reader Service Card

Software

ISO Training

A multimedia training series for achieving and sustaining ISO 9000 registration has been developed. The *ISO 9000 Registration Series*, produced by Reality Interactive, Inc. and distributed by the American Society for Quality Control, is a five-title interactive CD-ROM series for Windows. Titles include "The Executive Guide to ISO 9000," "Understanding the ISO 9000 Process," "Preparing for Registration," "The Registration Process," and "Internal Auditing."

Circle No. 49 on Reader Service Card

Process Management

Trackerware™, software for automated data collection and process management, manages the flow of data, prompts, and responses between electronic readers and other operational software applications. Typical uses include warehouse management, time and attendance, work-in-process, materials tracking, finished goods inventory, and security. Built-in backup and recovery are featured in this Hazox product.

Circle No. 50 on Reader Service Card

Books/ Publications

Industrial/Marine Coatings

The Sherwin-Williams Co.'s *1995-1996 Industrial & Marine Coating Specifier's Guide* serves as a sourcebook of the company's paint and coating product and specification information. This edition provides product data on industrial maintenance coating systems for interior, exterior, light and heavy duty industrial, secondary containment, and marine applications. Information on product selection and VOC compliance is included.

Circle No. 51 on Reader Service Card

Bubbles

Bubbles in Polymeric Liquids: Dynamics and Heat-Mass Transfer presents the behavior of macromolecular fluids with vapor-gas bubbles under various processing conditions of heat and mass transfer. This Technomic Publishing Co., Inc. book aids in the production of materials with prescribed homoporous and homogeneous structure, prearranged size, and with optimal physical and mechanical properties. The analysis is based on original laboratory research and international literature.

Circle No. 52 on Reader Service Card

Laboratory Products

Brinkmann Instruments, Inc., has printed its 1995 laboratory products catalog. The 56-page color brochure presents laboratory and industrial products for research, quality control, manufacturing processes, environmental monitoring, and education. Featured items include liquid handling products, homogenizers, overhead mixers, sample preparation equipment, circulating baths and chillers, rotary evaporators, and titrators.

Circle No. 53 on Reader Service Card

Cathodic Protection

"Corrosion Control of Underground Storage Tank Systems by Cathodic Protection," NACE Standard RP0285-95, has been updated and revised. This standard provides guidelines for designing, installing, operating, and maintaining an effective cathodic protection system. Cathodic protection of existing bare and coated mild steel tanks, new coated mild steel tanks, metallic piping and flexible connectors, and other metallic components is addressed.

Circle No. 54 on Reader Service Card

Viscometers/Rheometers

A 1995 color catalog illustrates a line of viscometers and rheometers. This catalog contains application and product information on viscosity measuring instruments, material specific adapters, and other accessories for measurement of liquids, slurries, pastes, creams, and gels. Included in the Brookfield Engineering Labs. Inc. publication are both analog and digital viscometers for data generation, storage, manipulation, and programming along with on-line continuous process control viscometers.

Circle No. 55 on Reader Service Card

Rheology

ChemTec Publishing introduces a new series entitled "Fundamental Topics in Rheology." The volumes in this series are designed to convert rheology from a field familiar to a small group to popularly applied science. The first in the series, *Rheology. Fundamentals*, includes chapters on stresses, deformation and deformation rate, rheological equations of state, rheological viscous fluids, elastic solids, and viscoelasticity.

Circle No. 56 on Reader Service Card

Paints/ Coatings

Polymer Composites

A number of polymer systems for rebuilding, resurfacing, and protecting fluid flow machinery, equipment, and structures are available from Palmer/Enecon. These systems were developed for rebuilding and resurfacing metal components which have been damaged by erosion, corrosion, cavitation, entrainment, impingement, and bi-metallic corrosion. Also available are sealing/waterproofing and concrete repair systems.

Circle No. 57 on Reader Service Card

Wood Finishes

Akzo Nobel Coatings Inc. has introduced a line of Sikkens waterborne interior stains and topcoats intended to include everything needed to prepare and finish any interior wood project. Available are Cetol®: wood conditioner, a sealant; interior stain, a waterborne stain; BL interior clear, a transparent finish; UV interior, a UV-inhibiting formula; and TFF advanced formula, a single-can system.

Circle No. 58 on Reader Service Card

Exterior Cladding

Armadur finish and Armashield primer paints for exterior cladding are designed for weathering, chemical, and chalking resistance as well as color retention. These Johnstone's Paints systems provide a choice of three finish coatings: a polyurethane gloss enamel, a polyurethane semi-gloss, and a polyurethane micaceous iron oxide primer eggshell finish. Two primers, a universal and an aluminum epoxy, are also available.

Circle No. 59 on Reader Service Card

Misc. Miscellaneous

Platinum Spray Gun

A two-piece seal assembly design platinum spray gun for airless paint spraying has been developed by Titan, Inc. This instrument is designed for operating pressures of up to 5000 psi while using stainless steel fluid passages. It features a two finger trigger pull as well as a cam actuated trigger for increased seal and wire life.

Circle No. 60 on Reader Service Card

Fibre Drums

Sonoco Products Co.'s Industrial Container Div. offers lightweight fibre drums featuring an integrally wound lining specifically designed for liquid paints, coatings, adhesives, and raw materials. All drums are custom designed to the customer's packaging requirements. To reduce disposal costs, the company also provides the Mobile Express Recycling Vehicle (MERV) program for its fibre drums on the East Coast, in which a MERV recycling truck collects the fibre drums at end-user locations.

Circle No. 61 on Reader Service Card

Filter Media

CS-17 filter media is engineered for the separation and release of moist, oily, fatty, sticky, and easily agglomerating dust. Each fiber of the felt's construction is encapsulated with a treatment consisting of a fluorocarbon resin applied via a full bath process. Reported advantages of this BWF America, Inc. product are reduced binding and clogging, higher flow rates, longer bag life, lower pressure drop, and high separation rates.

Circle No. 62 on Reader Service Card

Cartridge Filters

Pall Corp. introduces tapered pore cartridge filters with new pleat geometry. Ultipleat™ Profile® Cartridge Filters reportedly provide longer service life and smaller filter systems, resulting in lower filter operating costs and lower fluid hold up.

Circle No. 63 on Reader Service Card

Steel Drums

Stainless steel drums designed for storage, shipping, and handling of foods and chemicals where product integrity is necessary are available in both closed and open head styles. Constructed of Type 304-2B polished stainless steel, these Skolnik Industries, Inc. containers are manufactured in capacities of 20 gallon through 96 gallon. Corrosion resistance, tensile strength, and reusability are reported features of these drums.

Circle No. 64 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.

1995

(Oct. 9-11)—73rd Annual Meeting and 60th Paint Industries' Show. Cervantes Convention Center, St. Louis, MO.

(Nov. 6-7)—"Formulating for the New Clean Air Act." Seminar sponsored by the Professional Development Committee. Embassy Suites and Athletic Club, Denver, CO.

1996

(Aug. 15-17)—Latin American Coatings Show. Cosponsored 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. 23-25)—74th Annual Meeting and 61st Paint Industries' Show. McCormick Place North, Chicago, IL.

1997

(Nov. 5-7)—75th Annual Meeting and 62nd Paint Industries' Show. Georgia World Congress Center, Atlanta, GA.

Special Society Meetings

1996

(Feb. 14-16)—23rd Annual Waterborne, High-Solids, and Powder Coatings Symposium. Sponsored by the Southern Society and The University of Southern Mississippi (USM). New Orleans, LA. (Robson F. Storey or Shelby Thames, Co-Organizers, WBHS&PC Symposium, Dept. of Polymer Science, USM, P.O. Box 10076, Hattiesburg, MS 39406-0076).

(May 8-9)—Eastern Training Conference and Show. Sponsored by the Philadelphia Society for Coatings Technology. Valley Forge Convention Center, Valley Forge, PA. (Wayne Kraus, Hercules Inc., Research Center, 500 Hercules Rd., Wilmington, DE 19808; (302) 995-3435. Booth reservations: Larry Kelly, Eastech Chemical, Inc., 5700 Tacony St., Philadelphia, PA 19135; (215) 537-1000).

(May 8-10)—Southern Society Annual Meeting. Hyatt Regency-West Shore, Tampa, FL. (Walter R. Naughton Jr., Scott Paint Corp., P.O. Box 10218, Sarasota, FL 34278-0218; (813) 371-0015).

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).

73rd Annual Meeting &
60th Paint Industries' Show

October 9-11, 1995

Cervantes Convention Center
St. Louis, MO

Other Organizations

1995 — North America

(July 24-28)—Gordon Research Conference on Chemistry and Physics of Coatings and Films. New Hampton, NH. (Gordon Research Conferences, University of Rhode Island, P.O. Box 98, West Kingston, RI 02892-0984).

(Aug. 7-10)—"Introduction to Powder Coatings Technology." Short course sponsored by University of Southern Mississippi (USM), Hattiesburg, MS. (Shelby F. Thames, Director, USM, Box 10037, Hattiesburg, MS 39406-0037).

(Sept. 11-15)—"Basic Composition of Coatings." Short course sponsored by University of Missouri-Rolla (UMR), Rolla, MO. (Cynthia N. Campbell, UMR Coatings Institute, Dept. of Chemistry, 142 Schrenk Hall, Rolla, MO 65401-0249).

(Sept. 14-15)—"Advanced Radiation (UV/EB) Curing Marketing/Technology." Seminar sponsored by Armbruster Associates Inc. Newport Beach Marriott Hotel and Tennis Club, Newport Beach, CA. (David Armbruster, Armbruster Associates Inc., 43 Stockton Rd., Summit, NJ 07901).

(Sept. 19-21)—"Finishing '95." Conference and exposition sponsored by the Society of Manufacturing Engineers (SME). Albert B. Sabin Convention Center, Cincinnati, OH. (Mary Krome, SME, One SME Dr., P.O. Box 930, Dearborn, MI 48121-0930).

(Sept. 19-22)—"New Horizons '95." Conference jointly sponsored by the American Oil Chemists' Society (AOCS) and the Chemical Specialties Manufacturers' Association (CSMA). Omni Sagamore Resort, Bolton Landing, NY. (Rebecca Richardson, AOCS, P.O. Box 3489, Champaign, IL 61826-3489).

(Sept. 20-21)—"Advanced Radiation (UV/EB) Curing Marketing/Technology." Seminar sponsored by Armbruster Associates Inc. Newark Airport Marriott Hotel, Newark, NJ. (David Armbruster, Armbruster Associates Inc., 43 Stockton Rd., Summit, NJ 07901).

(Sept. 20-22)—"Accelerated and Natural Weathering Techniques for Coatings and Polymers." Short course sponsored by Kent State University, Kent, OH. (Carl J. Knauss, Director, Professional Development Institute, P.O. Box 1792, Kent, OH 44240).

(Sept. 25-29)—"Introduction to Paint Formulation." Short course sponsored by University of Missouri-Rolla (UMR), Rolla, MO. (Cynthia N. Campbell, UMR Coatings Institute, Dept. of Chemistry, 142 Schrenk Hall, Rolla, MO 65401-0249).

(Sept. 26-29)—"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).

(Sept. 29-Oct. 1)—"Fall Decor 1995." Sponsored by the National Decorating Products Association (NDPA). McCormick Place North, Chicago, IL. (Teri Flotron, NDPA, 1050 N. Lindbergh Blvd., St. Louis, MO 63132-2994).

(Oct. 16-20)—42nd National Symposium. Sponsored by American Vacuum Society. Minneapolis Convention Center, Minneapolis, MN. (Andrea Mulligan, American Vacuum Society, 120 Wall St., 32nd Floor, New York, NY 10005).

(Oct. 26-27)—"Production Planning and Inventory Management." Seminar sponsored by the National Paint and Coatings Association (NPCA).The Westin Hotel, San Francisco Airport, Millbrae, CA. (Juliette Benedicto, NPCA, 1500 Rhode Island Ave., Washington, D.C. 20005Robson F. Storey or Shelby Thames, Co-Organizers, WBHS&PC Symposium, Dept. of Polymer Science, USM, P.O. Box 10076, Hattiesburg, MS 39406-0076).

(Nov. 1-2)—"Paint Volatile Organic Compounds (VOC)." Training course sponsored by the American Society for Testing and Materials (ASTM). Philadelphia, PA. (Tina Falkenstein, ASTM, 1916 Race St., Philadelphia, PA 19103).

(Nov. 6-9)—11th Annual Advanced Composites Conference and Exposition. Sponsored by ESD-Engineering Society and SAE International. Hyatt Regency, Dearborn, MI. (Wael Berrached, The Engineering Society, 2350 Green Rd., Ste. 190, Ann Arbor, MI 48105).

(Nov. 7-9)—5th Annual Advanced Coatings Technology Conference and Exposition. Sponsored by ESD-Engineering Society and SAE International. Hyatt Regency, Dearborn, MI. (Wael Berrached, The Engineering Society, 2350 Green Rd., Ste. 190, Ann Arbor, MI 48105).

(Nov. 10-16)—1995 International Conference and Exhibition. Spon-

sored by the Steel Structures Painting Council (SSPC). Dallas, TX. (Dee Boyle, SSPC, 4516 Henry St., Ste. 301, Pittsburgh, PA 15213-3728).

(Dec. 12-16)—Fourth Pacific Polymer Conference. Sponsored by the American Chemical Society, Division of Polymer Chemistry. Hyatt Regency Kauai Resort and Spa, Koloa, Kauai, HI. (ACS, Meetings Dept., 1155 16th St., N.W., Washington, D.C. 20036-4899).

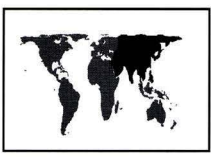
1996 — North America

(Mar. 11-13)—Ninth Annual Industrial Lead Paint Abatement and Removal Conference. Sponsored by Steel Structures Painting Council (SSPC). Pittsburgh Hilton and Towers, Pittsburgh, PA. (Dee Boyle, SSPC, 4516 Henry St., St. 301, Pittsburgh, PA 15213-3728).

(Mar. 20-22)—"Electrocoat '96." Conference sponsored by *Products Finishing*. Clarion Plaza Hotel, Orlando, FL. (Cindy Goodridge, Gardner Management Services, 6600 Clough Pike, Cincinnatie, OH 45244).

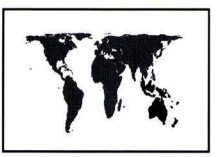
(May 1-2)—"Paint Volatile Organic Compounds (VOC)." Training course sponsored by the American Society for Testing and Materials (ASTM). Cleveland, OH. (Tina Falkenstein, ASTM, 1916 Race St., Philadelphia, PA 19103).

1996 —Africa



(Mar. 25-29)—"Coatings for Africa '96." Sponsored by Oil & Colour Chemist's Association (OCCA). Cape Town Civic Centre, Cape Town, South Africa. (Chris Pacey-Day, SURFEX Ltd., Priory House, 967 Harrow Rd., Wembley HA0 2SF England).

Australia



(July 20-22)—Surface Coatings Association Australia Conference and Exhibition. Southern Cross Hotel, Melbourne, Australia. (Kahren Giles, Conference Manager, SCAA Conference and Exhibition, The Meeting Planners, 108 Church St., Hawthorn, VIC 3122).

New Zealand

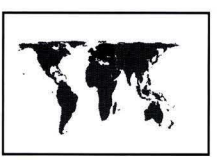
(July 27-30)—SCANZ Convention. Sponsored by Surface Coatings Association New Zealand (SCANZ). Sheraton Hotel, Rotorua, New Zealand. (National Convention Convenor, SCANZ, P.O. Box 5192, Auckland, New Zealand).

1996 — Australia

(Jan. 18-25)—International Schools and Conference on X-ray Analytical Methods—AXAA '96. Sponsored by the Australian X-ray Analytical Association (AXAA), Inc. Sydney, Australia. (The Secretariat, AXAA '96, GPO Box 128, Sydney, NSW 2001, Australia).

(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).

Europe



(Aug. 21-25)—"Advances in Emulsion Polymerization and Latex Technology." Davos, Switzerland. (Gary W. Poehlein, Interdisciplinary Programs, Georgia Institute of Technology, Atlanta, GA 30332-0370).

(Sept. 11-12)—"PolyPropylene '95." Sponsored by Maack Business Services. Zürich, Switzerland. (Maack Business Services, Moosacherstrasse 14, CH-8804 AU/Zürich, Switzerland).

(Sept. 11-15)—"Epitaxial Film Deposition and Characterization of Semiconductors." Short course sponsored by Continuing Education Institute (CEI)-Europe. Seehof Hotel, Davos, Switzerland. (Tina Persson, CEI-Europe AB, P.O. Box 910, S-612 25 Finspong, Sweden).

(Sept. 11-16)—"CMOS/BiCMOS Process Integration and Engineering." Short course sponsored by Continuing Education Institute (CEI)-Europe. Seehof Hotel, Davos, Switzerland. (Tina Persson, CEI-Europe AB, P.O. Box 910, S-612 25 Finspong, Sweden).

(Sept. 11-19)—"Thick and Thin Film Microelectronics and Related Technologies Including Quality and Reliability." Short course sponsored by Continuing Education Institute (CEI)-Europe. Seehof Hotel, Davos, Switzerland. (Tina Persson, CEI-Europe AB, P.O. Box 910, S-612 25 Finspong, Sweden).

(Sept. 11-21)—"Silicon Semiconductor Materials and Process Technology." Short course sponsored by Continuing Education Institute (CEI)-Europe. Seehof Hotel, Davos, Switzerland. (Tina Persson, CEI-Europe AB, P.O. Box 910, S-612 25 Finspong, Sweden).

(Sept. 12-13)—"Merging of Precision Engineering with Micro Fabrication." Short course sponsored by Continuing Education Institute (CEI)-Europe. Seehof Hotel, Davos, Switzerland. (Tina Persson, CEI-Europe AB, P.O. Box 910, S-612 25 Finspong, Sweden).

(Sept. 12-15)—"Flat Panel Display Technology." Short course sponsored by Continuing Education Institute (CEI)-Europe. Seehof Hotel, Davos, Switzerland. (Tina Persson, CEI-Europe AB, P.O. Box 910, S-612 25 Finspong, Sweden).

(Sept. 14-16)—"Semiconductor Wafer Fab Technology." Short course sponsored by Continuing Education Institute (CEI)-Europe. Seehof Hotel, Davos, Switzerland. (Tina Persson, CEI-Europe AB, P.O. Box 910, S-612 25 Finspong, Sweden).

(Sept. 16-23)—"Metallization Systems for VLSI and ULSI Circuits." Short course sponsored by Continuing Education Institute (CEI)-Europe. Seehof Hotel, Davos, Switzerland. (Tina Persson, CEI-Europe AB, P.O. Box 910, S-612 25 Finspong, Sweden).

(Sept. 18-21)—"Yield and Reliability in VLSI Development and Manufacturing." Short course sponsored by Continuing Education Institute (CEI)-Europe. Seehof Hotel, Davos, Switzerland. (Tina Persson, CEI-Europe AB, P.O. Box 910, S-612 25 Finspong, Sweden).

(Sept. 19-21)—"Eurocoat '95." Congress-Exhibition organized by AFTPV. Eurexpo Conference Center, Lyons, France. (E. Andre, UATCM, 5 rue Etex, F-75018 Paris, France).

(Sept. 19-22)—"VLSI Lithography and Nanolithography." Short course sponsored by Continuing Education Institute (CEI)-Europe. Seehof Hotel, Davos, Switzerland. (Tina Persson, CEI-Europe AB, P.O. Box 910, S-612 25 Finspong, Sweden).

(Oct. 16-20)—First International Congress on Adhesion Science and Technology (ICAST). Amsterdam, The Netherlands. (ICAST '95, P.O. Box 346, 3700 AH Zeist, The Netherlands).

(Nov. 13-15)—15th International Conference on"The Future of Industrial Coatings: Technical Innovation vis-à-vis Legislation," sponsored by The Paint Research Association (PRA). Brussels, Belgium. (Dip Dasgupta, PRA, 8 Waldegrave Rd., Teddington, Middlesex TW11 8LD, England).

(Dec. 13-15)—"Speciality Plastics '95." Sponsored by Maack Business Services. Zürich, Switzerland. (Maack Business Services, Moosacherstrasse 14, CH-8804 AU/Zürich, Switzerland).

Advertisers' Index

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Humbug from Hillman

Happiness comes when the mail brings letters from readers with grist for the "Humbug" mail and this past month or so (April-May) brought a bonanza of goodies from a number of good friends. It was a joy to receive encouraging letters with enclosed contributions from Jeff Sturm, Sid Lauren, Frank Borrelle, Saul Spindel, Fred Billmeyer, Dave Platt, Joe Koleske, and our bashful unknown contributor. This month and the next few will feature, as space will allow, the amusing stuff that they have gathered for the care and feeding of "Humbug."

In introducing the following story from the April 7th edition of *New York Newsday*, Saul Spindel hit it on the head with, "Proof positive that truth is stranger (funnier) than fiction. No one could make this story up."

Plane Downed by Pigs

An airliner heading to South Africa was forced to turn back and make an emergency landing in Britain after 72 flatulent pigs triggered its fire alarms.

More than 300 people were also on board the South African Airlines plane when the pigs' urine, gas and body heat sparked the mid-air crisis, an airline spokesman said yesterday.

Fifteen of the 72 prize stud pigs being flown out for breeding died of asphyxiation when halon gas was released in the cargo as part of the plane's automatic fire extinguishing system.

➤ ➢ ➤ ➢ ➤ ➢ ➤ ➢ ➤

Sid Lauren contributing to our technical research department, writes:

Being like so many others, on a no-fat binge, I search, generally in vain, for "low-fat" or better still, no fat versions of formerly pleasurable foods, like cream cheese and sour cream, that owe their taste and texture to their fat content. Thus, I suckered myself recently into trying a fat-free cream cheese tradenamed "Free"—aptly named because that's about what it's worth. My first reaction to the product as I spread it on a piece of toast was, "Gee it has no hiding power!" followed by the half serious thought that if they knew enough, they might have thought of adding some TiO_2. Some time later, while shopping, Sid found a container of "Fat Free" sour cream from a different dairy. Sid continues, "Here are the ingredients as stated on the label: Cultured Pasteurized Grade A Skim Milk, Nonfat Milk, Corn Starch, Titanium Dioxide and Vitamin A Palmitate. I bought the smallest container... Verdict: Taste—Fair to Fair+. Texture—Good. Hiding Power—Wet, Very Good; Dry—Not Tested. Question: What's the CPVC for sour cream?"

➤ ➢ ➤ ➢ ➤ ➢ ➤ ➢ ➤

Jeff Sturm thought that the April *Yetter Letter* was a "pretty good one." Here are some reasons why:

Perry Pascarella says: "The corporate message to managers might as well be cast in bronze and hung in the corporate headquarters for:

—We can't promise you how long we'll be in business.

—We can't promise you that we won't be bought out by another company.

—We can't promise there'll be room for promotion.

—We can't promise your job will exist until you reach retirement age.

—We can't accept your undying loyalty, and aren't sure we want it.

All the company can promise a manager is: We support your efforts to make a contribution to our mission so long as you are employed here.

All the company can ask in return is: We expect you to be supportive of our organization while you work here.

The National Press Club members' restaurant in Washington, D.C. attracts an eclectic crowd of reporters, bankers, brokers, and P.R. types. Over lunch one day, talk centered on how the various news media would play the story of the end of the world. Some suggestions:

—*Washington Post*: White House Aids Knew of Impending Disaster

—*New York Times*: Catastrophe Predicted: Impact Seen Greatest on Third World

—*Los Angeles Times*: No Traffic on Freeways Tonight

—*USA Today*: WE DIE (Late Sports, 1C)

—*Wall Street Journal*: Market Closes Early

—*Variety*: It's Curtains!

—*Time*: The End of Time

—*Newsweek*: The End of Time

—*Sports Illustrated*: The Fat Lady Sings

A tele rep noticed that his commission check included an extra $75 he wasn't expecting. Rationalizing he had it coming anyway, he said nothing. The next check was $50 short. Immediately he informed his manager. She replied: "You didn't mention it last month when you got more than you were supposed to." His response: "Yeah, well, one mistake I can overlook, but two times in a row is getting out of hand, and we need to stop this now!"

➤ ➢ ➤ ➢ ➤ ➢ ➤ ➢ ➤

Joe Koleske brought me a whit of nostalgia when he reminded me that he is the Editor of the *Gardner-Sward Paint Testing Manual* when he contributed this, among a lot of other stuff:

Don't stick your elbow...
Out too far...
It might go home...
In another car...
Burma-Shave

➤ ➢ ➤ ➢ ➤ ➢ ➤ ➢ ➤

Frank Borrelle, for what it's worth says:

—Happiness is merely the remission of pain.

—The facts, though interesting, are irrelevant.

—Someone who thinks logically is a nice contrast to the real world.

—You can't tell which way the train went by looking at the track.

—By the time you make ends meet they move the ends.

—Herb Hillman, Humbug's Nest,
P.O. Box 135, Whitingham, VT 05361.