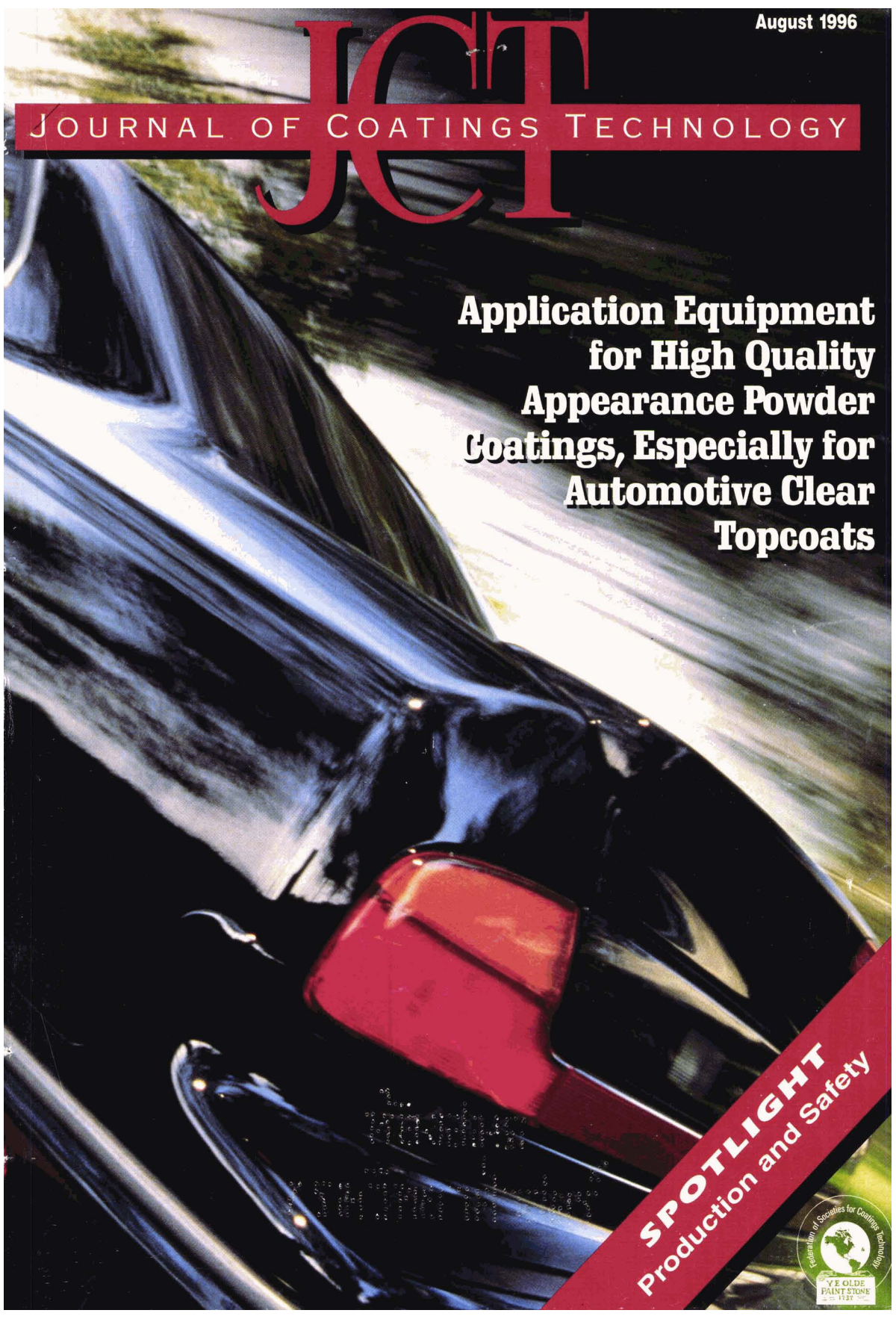
August 1996

JCT
JOURNAL OF COATINGS TECHNOLOGY

Application Equipment for High Quality Appearance Powder Coatings, Especially for Automotive Clear Topcoats



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— Benjamin Franklin

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Supplement to the November 1996 issue of the

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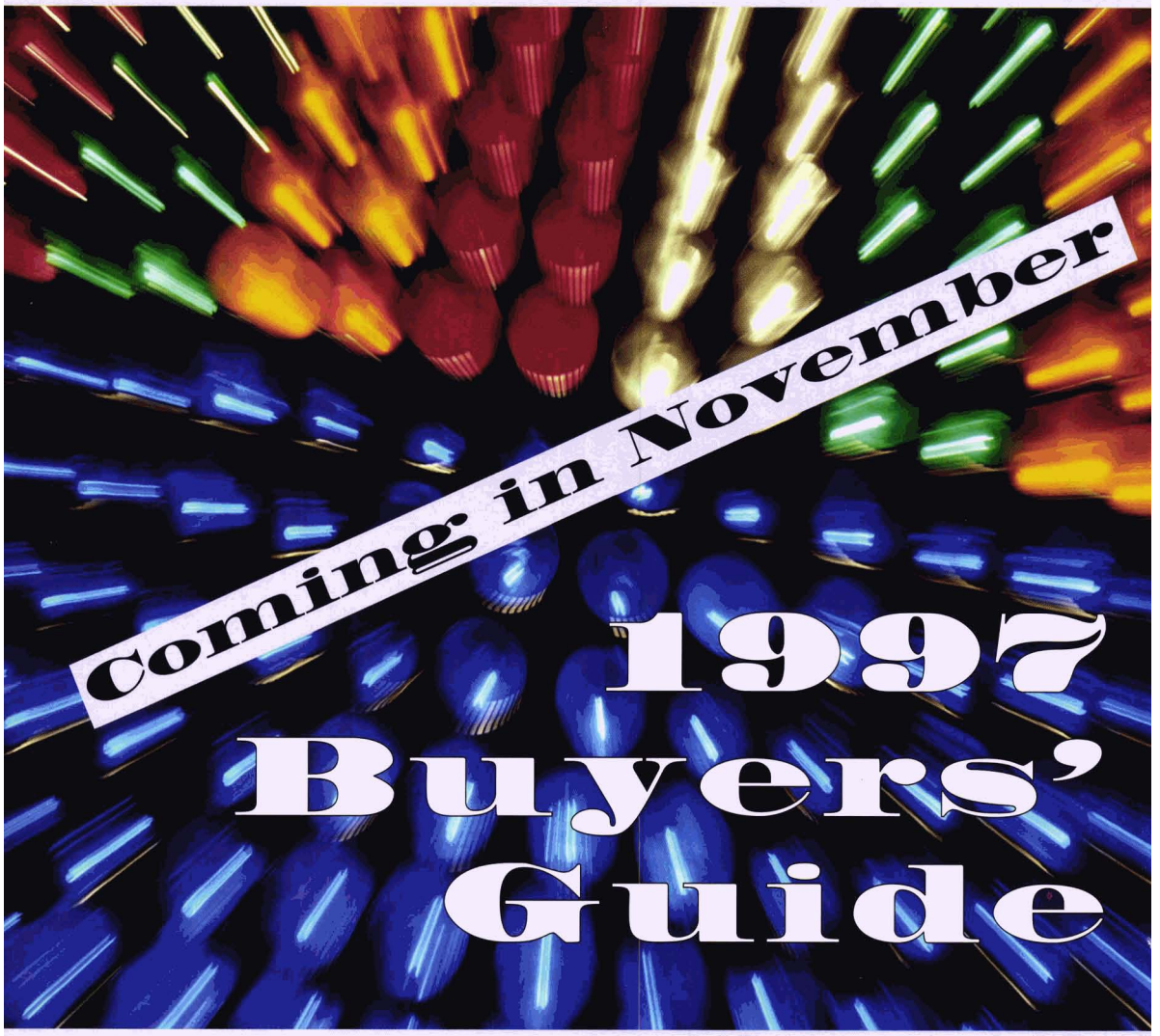

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For advertising information, contact Scott Walter, National Advertising Representative, 22785 Cass Ave., Woodland Hills, CA 91364; Phone: (818) 224-3226; Fax: (818) 222-0194.

JCT JOURNAL OF COATINGS TECHNOLOGY

AUGUST 1996 VOL. 68, NO. 859

Technical Articles

Federation News

Spotlight

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

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

Subscription: U.S. and Canada – 1 year, $40; 2 years, $75; 3 years, $110. Europe (Air Mail) – 1 year, $70; 2 years, $135; 3 years, $200. Other Countries – 1 year, $55; 2 years, $105; 3 years, $155.

Technical Abstracts

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

Application Equipment for High Quality Appearance Powder Coatings, Especially for Automotive Clear Topcoats—K. Yanagida, M. Kumata, and M. Yamamoto

JCT, Vol. 68, No. 858, 47 (Aug. 1996)

Recently developed fine powder can provide a quality appearance as good as that obtained with solvent-based coatings. However, if such a fine powder is applied as is, several problems occur due to the inherent cohesiveness of powder. The purpose of this study is to overcome these problems, to develop the optimum powder coating system to apply fine powder, and to realize the commercial application of the coating system for automotive body topcoats.

Equipo de Aplicación para Recubrimiento en Polvo de Alta Calidad Especialmente para Capas Finales de Recubrimientos Automotivos—K. Yanagida, M. Kumata y M. Yamamoto

El reciente desarrollo de polvo fino puede proporcionar una calidad de apariencia tan buena como la obtenida con recubrimientos base solvente. Sin embargo, si dicho polvo fino se aplica tal cual es, ocurren varios problemas debido a la propiedad coherente del mismo. El proposito de este estudio es vencer los problemas arriba mencionados, desarrollar el sistema de recubrimiento en polvo óptimo para la aplicación de polvo fino y realizar la aplicación comercial del sistema de recubrimiento para capas finales de recubrimientos automotivos.

Rheology Modifiers for Low VOC Bake Coatings—New York Society for Coatings Technology Technical Committee

JCT, Vol. 68, No. 858, 57 (Aug. 1996)

The Technical Committee of the New York Society for Coatings Technology investigated commercially available additives for their influence on the rheology of low volatile organic compounds (VOC) coatings. These rheology modifiers are important because coatings manufacturers must change their formulations in order to comply with government VOC regulations. The committee solicited samples of rheology modifiers from 15 commercial manufacturers. They were tested in both water and solvent-based low VOC coating systems.

The committee received rheology modifiers from 14 generic types. Standard bake enamels using these rheology modifiers were prepared in water and solvent-based systems. The paints were considered for degree of sag, pigment suspension, sprayability, and specular gloss. Sprayability was evaluated and compared with three methods of viscosity determination for possible trend developments and predictions.

Modificadores de Reología para Recubrimientos de Bajo COV para Horneo—New York Society for Coatings Technology Technical Committee

El Comité Técnico de la Sociedad de Nueva York para la Tecnología de Recubrimientos investigó los aditivos comercialmente disponibles en base a su influencia en la reología de recubrimientos de bajo COV (compuestos orgánicos volátiles). Estos modificadores de reología son importantes debido a que los fabricantes de recubrimientos deben cambiar sus formulaciones para de esta forma cumplir con las regulaciones gubernamentales acerca de los COV. El comité solicitó muestras de modificadores de reología a 15 fabricantes comerciales. Estos modificadores fueron probados en sistemas de recubrimientos de bajo COV tanto base agua como base solvente.

El comité recibió modificadores de reología de 14 tipos genéricos. Fueron preparados usando estos modificadores reológicos, en sistemas base agua y solvente, esmaltes normales de horneo. Las pinturas fueron consideradas en base a su grado de hundimiento, suspensión de pigmento, capacidad de dispersión y el brillo especular. El grado de dispersión fué evaluado y comparado mediante tres métodos de determinación de la viscocidad para posibles tendencias de desarrollo y predicciones.

Performance Optimization of 100% Solids, UV-Cure Inks and Wood Fillers Using Aluminum Trihydroxide (ATH) Filler—N.R. Dando, P.L. Kolek, and E.S. Martin

JCT, Vol. 68, No. 858, 67 (Aug. 1996)

This paper employs differential photocalorimetry, color, gloss, and physical test measures to characterize the effects of aluminum trihydrate (ATH) loading (from 13 to 56% by weight) on the ultra-violet (UV) transparency, enthalpy of cure, and cure kinetics of pigmented and unpigmented UV-cure inks and wood fillers. The thixotropic properties and relatively low opacity of ATH allows the use of significant loading levels without whitening pigmented inks or opacifying clear wood fillers. This work demonstrates how increased loadings of ATH, a UV transparent filler, can be employed to increase fully-cured coating thicknesses of UV-cure coatings for a given cure irradiance, and increase cure kinetics (rate of cure) for a given coating thickness, while also offering substantial cost savings by replacing more expensive components.

Optimización del Desempeño de Tintas de Curado UV, 100% Sólidos y Rellenadores de Madera Usando Rellenador de Trióxido de Aluminio—N.R. Dando, T.R. Clever, P.L. Kolek y E.S. Martin

El presente documento emplea mediciones de preubas físicas, brillo, color y fotocalorimetría diferencial para caracterizar los efectos de carga (de 13 a 56% en peso) de ATH (trihidrato de aluminio) en la transparencia UV (ultravioleta), entalpía y cinética de curado de rellenadores para madera y tintas pigmentadas y no-pigmentadas de curado UV. Las propiedades tixotrópicas y la opacidad relativamente baja de ATH permite el uso de niveles de carga significantes sin tintas pigmentadas blanqueadas o rellenadores de madera de opacidad clara. Este trabajo demuestra como cargas incrementadas de ATH, un rellenador transparente UV, pueden ser empleadas para incrementar los grosores de recubrimientos totalmente curados de

recubrimientos de curado UV para una determinada intensidad de curado e incrementa la cinética de la misma (razón de curado) para el grosor de un recubrimiento específico, mientras también ofrece ahorros substanciales en los costos ya que se reemplazan los componentes más caros.

Electrochemical Impedance Spectroscopy Evaluation of Various Aluminum Pretreatments Painted with Epoxy Primer—S.M. Cohen

JCT, Vol. 68, No. 858, 73 (Aug. 1996)

Panels of aerospace aluminum (Al) alloys 2024 (UNS A92024) and 7075 (UNS A97075) were coated with four pretreatments (thin-film sulfuric-acid [H_2SO_4] anodization, chromic-acid anodization, and two commercial silica-based gels). Some of these panels were painted with chromated epoxy primer (MIL-P-23377D). All panels were subjected to several months of monitoring by electrochemical impedance spectroscopy (EIS) at open-circuit potential. Several panels were also subjected to EIS measurements made at various applied potentials. Equivalent circuit simulations indicate that a model like that proposed by van Westing, et al., which includes four time-constants (coating, pore, double-layer, and pretreatments) fits the data well. The epoxy primer is shown to be a higly porous, non-barrier coating.

Evaluación Espectroscópica de la Impedancia Electroquímica para Varios Pretratamientos de Aluminio Pintados con un Primario Epóxico—S.M. Cohen

Fueron recubiertos con cuatro pretratamientos (anodización de película dalgada de ácido sulfúrico, anodización de ácido crómico y dos geles comerciales base silica) los paneles de aleaciones aeroespaciles de aluminio (Al) 2024 (UNS A92024) y 7075 (UNS A97075). Algunos de estos paneles fueron pintados con primario epóxico cromado (MIL-P-23377D). Todos los paneles fueron somentidos a varios meses de monitoreo por Espectroscópica de Impedancia Electroquímica (EIE) a potencial de circuito abierto. También fueron sometidos varios paneles a mediciones de EIE llevadas a cabo a varios potenciales aplicados. Simulaciones de circuitos equivalentes indican que un modelo como aquel propuesto por van Westing, el cual incluye cuatro constantes de tiempo (recubrimiento, poro, lecho doble y pretratamiento) ajusta bien con los datos. Se usa el primario epóxico por ser un recubrimiento sin barrera y de poros grandes.

High-Solids Coatings Using Benzylanilinium Sulfonates-II α,α-Dimethylbenzylpyridinium ρ-toluenesulfonate, an Effective Blocked Sulfonic Acid—S. Nakano, T. Morimoto, and T. Endo

JCT, Vol. 68, No. 858, 83 (Aug. 1996)

α,α-Dimethylbenzylpyridinium ρ-toluenesulfonate (**1**), a new class of blocked sulfonic acids, was synthesized in good yield and some properties of **1** were compared with those of N-(ρ-methoxybenzyl)-N,N-dimethylanilinium ρ-toluenesulfonate (**2**), an effective blocked sulfonic acid.

^{1}H-NMR analysis showed that **1** and **2** was able to release the corresponding amine blocked ρ-toluenesulfonic acid during the reaction with H_2O and that the unblocking temperatures were 80° and 75°C, respectively. Consequently, each aqueous solution turned acidic from neutral around 80°C.

Furthermore, the hydrolysis properties of **1** and **2** were estimated by measuring the rate of hydrolysis for **1** and **2**. It was found that the **1** activation energy (Ea) was higher than the **2** Ea during hydrolysis. Consequently, **1** showed better thermal latency than **2**.

Each amine blocked sulfonic acid, released from **1** or **2** at elevated temperatures, was found to catalyze the crosslinking reaction between hexamethoxymethylmelamine (HMMM) and acrylic polyols, since both the **1** and **2** coating solutions produced curing films at 125°C for 30 min.

However, the **1** coating solution showed superior storage stability at 60-80°C compared to the **2** coating solution due to the effect of the α-methyl groups.

Consequently, **1** was able to provide superior storage stability and curability to coating solutions that consisted of HMMM and polyols.

Recubrimientos de Altos Sólidos Usando Sulfonatos de Bencilanilina II ρ-Toluensulfonato α,α-Dimetilbencilpiridona, un Acido Sulfónico de Bloqueo Efectivo—S. Nakano, T. Morimoto y T. Endo

El ρ-toluensulfonato de α,α-Dimetilbencilpiridona (**1**), una nueva clase de ácidos sulfónicos bloqueados, fué sintétizado en buena cantidad y algunas de las propiedades de **1** fueron comparadas con las de ρ-toluensulfonato N-(ρ-metoxibencil)-N,N-dimetilanilina (**2**), un ácido sulfónico de bloqueo efectivo.

El análisis de H-NMR mostró que **1** y **2** fueron capaces de liberar el correspondiente ácido ρ-toluensulfonico de amina bloqueada durante la reacción con agua y que las temperaturas sin bloqueo fueron de 80°C y 75°C, respectivamente. Consecuentemente, cada solución acuosa cambio de neutra a ácida alrededor de 80°C.

Además, las propiedades de hidrólisis de **1** y **2** se estimaron mediante la medición de la tasa de hidrolización para **1** y **2**. Se encontró que la energía de activación (Ea) de **1** fué mayor que la Ea de **2** durante la hidrólisis. Consecuentemente, **1** mostró mejor retardo térmico que **2**.

Cada ácida sulfónico de amina bloqueada, liberada ya sea de **1** ó **2** a temperaturas elevadas, fué encontrada de catalizar la reacción entrecruzamiento entre hexametoximetilmelamina (HMMM) y polióles acrílicos, a partir de soluciones de los recubrimientos **1** y **2** se obtuvieron como producto películas de curado a 125°C por 30 minutos.

Sin embargo, la solución de recubrimiento **1** presentó superior estabilidad de almacenaje a 60-80°C comparada con la solución de recubrimiento **2** debido al efecto de los grupos α-metilo.

Consecuentemente, **1** fué capaz de proporciconar superior estabilidad de almacenamiento y curabilidad a soluciones de recubrimientos que consistían de HMMM y polioles.

JCT JOURNAL OF COATINGS TECHNOLOGY

492 Norristown Road • Blue Bell, PA 19422-2350

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

Annual dues for Active and Associate Members of the Federation of Societies for Coatings Technology is $25.00. Of this amount, $16.75 is allocated to a membership subscription to this publication. Membership in the Federation is obtained through prior affiliation with, and payment of dues to, one of its 26 Constituent Societies. Non-member subscription rates are:

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1 Year	$40.00	$70.00	$55.00
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When available, single copies of back issues of the JOURNAL OF COATINGS TECHNOLOGY are priced as follows: $10.00 each for current calendar year issues; $15.00 each for all other issues.

Publisher ..... *Robert F. Ziegler*
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FSCT Board of Directors—1995-96

COMMENT

Triumph of the Spirit

Though warm, the day was gray and dreary. And as slate-dark clouds urged on by a brisk wind scuttled across a quiet city the crowds waited patiently in long lines. When it came the rain was steady and hard, driving some for shelter wherever they could find it.

It was the morning of July 27th, a bare seven hours following the explosion of a bomb in Centennial Olympic Park. The previous day there were thousands at play here, gathering to drink in the atmosphere and celebrate. The park was, of course, closed now. In the rain it was as deserted and as foreboding as a ghost town. People would gather here again, but not today.

My daughter and I had traveled to Atlanta to witness one of the greatest examples of global brotherhood — the Olympic Games. Now, however, we stood along with others in queue and, while sharing our umbrellas with two, sometimes more, fellow pilgrims, we came to understand the true meaning of oneness of spirit.

Our line moved slowly toward the Georgia Dome and the security check. People waited patiently, silently, reminding one of a funeral procession. We saw the same kind of nervous smiles one sees at such somber events, as if to cover up the knowledge that, "Yes, it can happen here; it could happen to me."

We also saw something else. Though people were quiet, it was the quiet borne of determination. There was flint in the eyes of anyone who spoke of the "incident". These were not heroic people. They were angry and hurt and fearful. They were also people who would not succumb to intimidation.

By afternoon the sun reappeared and the crowds, though somewhat wary, were again in the streets by the thousands — no, by the hundreds of thousands. The quiet was gone, but the determination was still there.

The people of Atlanta have much to be proud of; they were gracious, caring, solicitous hosts, especially in the trying times of late July. It will be an honor to return to Atlanta in 1997 to celebrate the 75th anniversary of the FSCT. Thank you, again, Atlanta! You did good!

Robert F. Ziegler
Executive Vice President

Thomas E. Hill and Forest Fleming Nominated for FSCT Officer Positions

The Federation of Societies for Coatings Technology (FSCT), Blue Bell, PA, has announced the nominations for Federation Officer positions for 1996-97. At the forefront of this year's list of nominees are Thomas E. Hill and Forest Fleming, of Akzo Nobel Coatings, Inc.

President-Elect

Nominated to serve as President-Elect of FSCT is Thomas E. Hill (Western New York Society), formerly Vice President/Technical Director of the Consumer Group of Pratt & Lambert, Buffalo, NY.

Mr. Hill is a Trustee of the Coatings Industry Education Foundation (CIEF) and is a member of the FSCT Executive Committee. He served as the Western New York Society Representative to the Federation Board of Directors from 1983-90. In addition, Mr. Hill has served on the Program, Investment, and Paint Show Exhibits Committees. He also served on the Program and Educational Committees of the Western New York Society.

A member of the coatings industry for 26 years, Mr. Hill was educated at West Virginia University and the State University of New York at Buffalo.

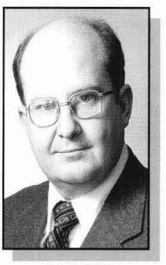
Secretary-Treasurer

Forest Fleming (Piedmont Society), Technical Director of Industrial Wood Building Products Group, Akzo Nobel Coatings Inc., High Point, NC, has been nominated to serve as Secretary-Treasurer of FSCT.

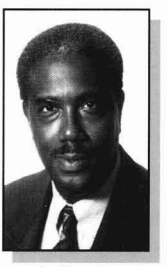
Mr. Fleming currently serves on the Federation Executive Committee and is the Piedmont Society Representative to the Board of Directors.

He was President of the Piedmont Society (1989-90) and served on the Society's Publications and Technical Committees. In 1988, while serving as Membership Committee Chair, Mr. Fleming was presented with a Certificate of Appreciation for the exemplary increase of Society's membership during the 1987-88 year.

He was graduated from Western Carolina University with a Bachelor of Science Degree and has been affiliated with the coatings industry for 19 years.



T.E. Hill



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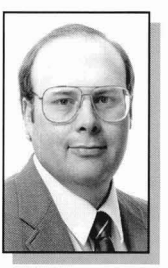


J. Austin

T. Gelhot

President

The current President-Elect, Jay Austin (Chicago Society), Halox Pigments, Hammond, IN, will assume the Presidency of the Federation at the close of the 1996 Annual Meeting, on October 25, in Chicago, IL.

Mr. Austin is a member of the FSCT Finance Committee. He served as Chair of the FSCT Corrosion Committee for six years (1986-92), was a member of the Corrosion Committee, and served on the Editorial Review Board of the JOURNAL OF COATINGS TECHNOLOGY.

As well as being active in the Federation, Mr. Austin is a member of the Steel Structures Painting Council, National Association of Corrosion Engineers, and the American Society for Testing and Materials. He is a regular guest lecturer at Kent State University's coatings courses.

Mr. Austin studied chemistry at Purdue University and coatings technology at both the University of Missouri–Rolla and North Dakota State University. He has worked in the coatings industry for 21 years.

Other Nominations

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

EXECUTIVE COMMITTEE

Society Representative Member:

Terry Gelhot (St. Louis Society), Chemist, Carboline Co., St. Louis, MO, has been nominated to serve a three-year term.

Ms. Gelhot is currently on the FSCT Board of Directors as the St. Louis Society Representative and served on the Host Committee for the 1995 Annual Meeting held in St. Louis.

She served as President of the St. Louis Society and is currently the Society's Membership Chair. She received the Ralph Gatti Scholarship in 1984.

Ms. Gelhot graduated with a B.S. in Biology/Chemistry from Southeast Missouri State University and has been active in the coatings industry for 17 years.

(Continued on next page)

Board of Directors

Past-President Member:

A. Clarke Boyce, retired from Nacan Products, has been nominated for a two-year term.

Mr. Boyce, Past-President of the Federation (1982-83), received the Federation's most prestigious award, the George Baugh Heckel Award, in 1991. He chaired the FSCT Finance, Liaison, Nominating, and Paint History Committees. Mr. Boyce served on the FSCT Board of Directors and was a member of the Annual Meeting Host, Annual Meeting Program, Bylaws, Investment, Liaison, Nominating, Planning, Society Speaker Awards, and Memorial Committees.

Mr. Boyce is a Past-President (1970-1971) and an Honorary Member of the Toronto Society and has chaired the Society's Educational, Technical, Manufacturing, Program, and Bylaws Committees.

He is a graduate of University of Western Ontario with a B.S. Degree and has served the coatings industry for 47 years.

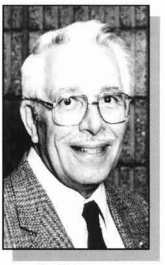
Members-at-Large:

Donald W. Boyd (Pittsburgh Society), Senior Research Associate, for PPG Industries, Inc., Pittsburgh, PA, has been nominated to serve as a Member-at-Large on the Board of Directors for 1996-97.

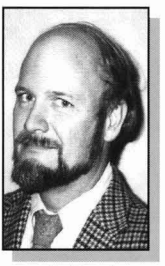
Mr. Boyd served as Educational/Educational Coordinating Committee Chair from 1992-95 and served on the committee from 1989-95. In addition, he performed the duties of Vice President of CIEF in 1996 and served as a CIEF Trustee from 1992-96.

He was Educational Committee Chair of the Pittsburgh Society from 1985-88.

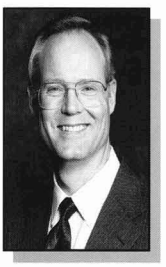
Mr. Boyd has degrees in Chemistry from MIT and Miami University (Ohio), and Paper Technology from Miami University (Ohio). He has been active in the coatings industry for 13 years.



A.C. Boyce



D. Boyd



G.R. Pilcher

George R. Pilcher (CDIC Society), Technical Director, Coil and Extrusion Business Unit, for Akzo Nobel Coatings Inc., Columbus, OH, has been nominated to serve as a Member-at-Large on the Board of Directors for 1996-97. He previously served in this capacity from 1988-90.

Mr. Pilcher has been involved on many FSCT committees, including the Professional Development Committee for which he was Chair from 1987-88. A member of the Annual Meeting Program Committee in 1986 and 1988-91, he chaired that group in 1989. He chaired the Roon Awards Committee in 1991 and served as a member from 1991-96. Mr. Pilcher has been a member of the Mattiello Memorial Lecture Committee (1991-1996) and serves as the 1996 Chair.

He was a member of the APJ/A.F. Voss Award Committee, Finance Committee, and Nominating Committee.

A member of the Editorial Review Board of the Journal of Coatings Technology from 1993 to the present, Mr. Pilcher currently serves as a member of the FSCT Publications Committee.

Mr. Pilcher served on the Board of Trustees of the CIEF from 1987 to the present and as President from 1989-95.

Currently a member of the CDIC Society, Mr. Pilcher began his involvement with the FSCT as a member of the Cleveland Society. He acted as Chair for the Society's Educational Committee in 1979-81 and as a member of that group from 1976-81. The Cleveland Society honored him with their prestigious "Certificate of Award" for "outstanding contributions" to that group.

Mr. Pilcher was graduated from College of Wooster, in 1970 with a B.A. in Chemistry and has been involved in the coatings industry for 26 years.

F. Louis Floyd, of Duron Paints and Wallcoverings, Is Named Technical Focus Speaker of FSCT Annual Meeting

The Federation of Societies for Coatings Technology is pleased to announce that F. Louis Floyd, Vice President for Technology at Duron Paints and Wallcoverings, in Baltimore, MD, has been named Technical Focus Speaker of the organization's Annual Meeting to be held in Chicago, October 23-25.

"Pigment Flocculation is a Figment of Your Imagination"

Technical Focus Speaker: F. Louis Floyd

The coatings industry annually spends millions of dollars on R&D, process engineering, and production troubleshooting trying to increase the efficiency of utilization of titanium dioxide pigments. This is driven by the common assumption that a typical dried paint film contains flocculated pigment, which originates from a less-than-perfect dispersion in the wet state. Evidence for this assumption derives from such measurements as opacity, color and gloss; coupled with microscopic observations which show particle-particle contact in dried films. These observations are paired with models of "perfect" dispersion in the solid state, which clearly show that the contributions from TiO_2 are below theoretical levels. But does that mean that flocculation is the cause? I believe not. I believe that:

- it is our mind-set regarding what "random" looks like which is at fault;
- the models we're using to describe perfect dispersion are flawed;
- we have been utilizing our TiO_2 as efficiently as is possible for a random system; and
- further improvements will require a departure from random systems to more ordered systems, which is the opposite direction from most research going on presently.

If this view is correct, it means that our industry, by pursuing ever better pigment dispersion in the wet state, has been working on the wrong issue.

The Technical Focus Speaker—one of the most popular features of the FSCT Annual Meeting—is selected by the Federation to honor on-going work in critical technical areas. Mr. Floyd's presentation, entitled "Pigment Flocculation is a Figment of Your Imagination," will be given on Wednesday, October 23, at 1:00 p.m. at McCormick Place North.

Prior to joining Duron, Mr. Floyd spent 21 years with Glidden (ICI) Strongsville Research Center leading various research efforts on new consumer, industrial, and maintenance coating systems.

Currently on the Board of Directors of the FSCT, Mr. Floyd served for many years on the Editorial Review Board of the JOURNAL OF COATINGS TECHNOLOGY and was Chair of the FSCT Publications Committee in 1995-96. He holds four FSCT Roon Awards and is a past Chairman of the Gordon Research Conference on the Physics and Chemistry of Coatings and Films. He has contributed about 20 publications and over 50 presentations, both domestic and international. In addition, Mr. Floyd is a regular lecturer at Lehigh University and Kent State University.

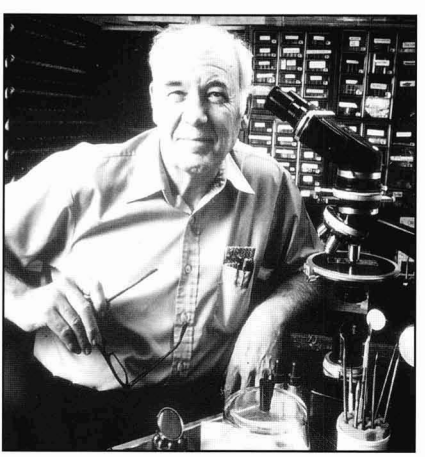
Walter C. McCrone to Present Keynote Address at FSCT Annual Meeting

The Federation of Societies for Coatings Technology is pleased to feature Walter C. McCrone as the Keynote Speaker at the Opening Session of its 74th Annual Meeting. The event will be held October 23-25 at the McCormick Place North, in Chicago, IL.

Dr. McCrone is Director Emeritus of the McCrone Institute, a non-profit corporation devoted to fundamental research in, and teaching of, microscopy and crystallography. Some of his more startling findings occurred in 1974, when he, with his wife Lucy, found the Vinland Map to be a 20th century fake, and, in 1980, reported the Shroud of Turin to be a fine medieval painting.

Dr. McCrone's presentation will focus on "Ten Thousand Dollar Per Square Centimeter Coatings." According to the speaker, there are many compositions of coatings useful for protection, aesthetics, and for providing properties such as electrical conductivity, adhesion, abrasion, etc. None, however, is more expensive than some of the aesthetic coatings. Coatings applied to a canvas by Leonardo da Vinci has sold for more than $20,000/cm. Other Old Masters, such as Rembrandt, Titian, and Raphael are not far from this price range. One result of this, states Dr. McCrone, is the growing temptation for some modern artists to "change their name" to Rembrandt, Titian, Raphael — or even Leonardo.

There is an increasing need for scientific techniques to detect art forgeries. In his presentation, Dr. McCrone discusses how these complex coatings are analyzed by Polarized Light Microscopy supplemented by Fourier Transform Infrared Absorption and Scanning Electron Microscopy with Energy Dispersion X-ray Analysis to detect these mis-attributions.



FEDERATION OF SOCIETIES FOR COATINGS TECHNOLOGY

ice INTERNATIONAL COATINGS EXPO AND TECHNOLOGY CONFERENCE

Federation of Societies for Coatings Technology

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FSCT International Coatings Expo and Coatings Technology Conference

Insights and Innovations

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

Highlights of the Conference Include:

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

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

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

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

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

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

George Pilcher to Receive FSCT Heckel Award

George R. Pilcher, Technical Director, Coil and Extrusion Business Unit, for Akzo Nobel Coatings Inc., Columbus, OH, will be the recipient of the Federation's highest honor, the George Baugh Heckel Award, for 1996.

Mr. Pilcher, a member of the CDIC Society for Coatings Technology, will receive the award at the Opening Session of the Federation's Annual Meeting in Chicago, IL, on October 22.

The Heckel Award recognizes the outstanding contributions that Mr. Pilcher has made to the Federation's interest and prestige.

A member of the Federation since 1976, Mr. Pilcher has been nominated to serve as a Member-at-Large on its Board of Directors for 1996-97. He previously served in this capacity from 1988-90.

Mr. Pilcher's considerable contributions to the organization include active involvement on many FSCT committees, including the Professional Development Committee (1985-89) for which he was Chair from 1987-88. A member of the Annual Meeting Program Committee in 1986 and 1988-91, he chaired that group in 1989. He chaired the Roon Awards Committee in 1991 and served as a member from 1991-96. Mr. Pilcher has been a member of the Mattiello Memorial Lecture Committee (1991-1996) and serves as the 1996 Chair.

He was a member of the APJ/Voss Award Committee (1984-91); Finance Committee (1989-90), and Nominating Committee (1989-90). At the Federation's Annual Meeting, he has chaired sessions for five years.

A member of the Editorial Review Board of the JOURNAL OF COATINGS TECHNOLOGY from 1993 to the present, Mr. Pilcher also currently serves as a member of the Publications Committee.

International Coatings Technology Conference
"Insights and Innovations"

Executive Forum

Managing Technology for Strategic Success in the Coatings Industry

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

COURSE DESCRIPTION

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

Registration limited to 30.

COURSE INSTRUCTORS

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

PROGRAM FEES*

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

Training Seminar

Faster to Market with Better Products Through Design of Experiments

Tuesday, October 22, 1996
Chicago Hilton and Towers

SEMINAR DESCRIPTION

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

INSTRUCTOR

Charles Rooney (Orr & Boss)

PROGRAM FEES*

Member —$195
Non-Member—$295

Training Seminar Workshop

Effective Technical & Scientific Writing

Tuesday, October 22, 1996
Chicago Hilton and Towers

SEMINAR DESCRIPTION

For all levels of laboratory and R&D personnel along with applicators and anyone with responsibility for writing memos, letters, reports, manuals, specifications and proposals on a routine basis. The session includes in-class writing exercises designed for practical application, and allows time for individual attention. Participants are invited to submit writing samples in advance for a confidential review by the instructor.

Registration limited to 25.

INSTRUCTOR

Sal Iacone (Consultant)

PROGRAM FEES*

Member —$195
Non-Member—$295

Training Seminar

Surfactant Chemistry

Tuesday, October 22, 1996
Chicago Hilton and Towers

SEMINAR DESCRIPTION

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

INSTRUCTORS

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

PROGRAM FEES*

Member—$195
Non-Member—$295

Training Seminar

Winning Technical Presentations

Tuesday, October 22, 1996
Chicago Hilton and Towers

SEMINAR DESCRIPTION

For laboratory and R&D personnel at all levels, marketing and sales staff, and anyone else responsible for delivering technical presentations. Attendees will learn how to develop effective visuals; proper speaking techniques and data organization; how to handle question and answer sessions; tips on transferring written information to speaking terms; and how to communicate clearly to all audiences. This program offers a combination of lecture, interaction and small group projects.

INSTRUCTOR

Carter Johnson (Buying Time Seminars)

PROGRAM FEES*

Member —$195
Non-Member—$295

Training Seminar

Coatings Spray Applications

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

SEMINAR DESCRIPTION

Provides both experienced and novice applicators, field service personnel,

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

Registration limited to 40.

INSTRUCTOR

Jerry Hund (Binks Manufacturing)

PROGRAM FEES*

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

Conference Course

Polymer Chemistry for the Coatings Formulator

Wednesday–Thursday
October 23-24, 1996
McCormick Place North

COURSE DESCRIPTION

Provides current information on polymer chemistry for coatings formulators, R&D chemists, and sales and marketing personnel with strong technical backgrounds or interests. Attendees will realize a greater understanding of the essential concepts of polymer science and the underlying principles to determine coatings using scientific principles as opposed to trial and error and is also relevant for ink, sealant, and adhesive industry personnel.

INSTRUCTORS

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

PROGRAM FEES*

Member —$395
Non-Member —$495

Conference Course

Advances in Coatings Characterization

Wednesday–Thursday
October 23-24, 1996
McCormick Place North

COURSE DESCRIPTION

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

INSTRUCTORS

Skip Palenik (MicroTrace Assoc.)
Paula Clark (Air Products)
Marek Urban (North Dakota State)
Andy Gilicinski (Air Products)
Ted Provder (ICI Glidden)
Mike Neag (ICI Glidden)
Richard Eley (ICI Glidden)
Loren Hill (Monsanto)
Rich Granata (Lehigh University)
Peter Kamarchik (PPG Industries)

PROGRAM FEES*

Member—$395
Non-Member—$495

Conference Course

Substrates and Coatings

Wednesday–Thursday
October 23-24, 1996
McCormick Place North

COURSE DESCRIPTION

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

FEDERATION OF SOCIETIES FOR COATINGS TECHNOLOGY
ice INTERNATIONAL COATINGS EXPO AND TECHNOLOGY CONFERENCE

INSTRUCTORS

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

PROGRAM FEES*

Member —$395
Non-Member—$495

Conference Course— "Back to Basics"

General Overview of Coatings Technology

Wednesday–Thursday
October 23-24, 1996
McCormick Place North

COURSE DESCRIPTION

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

PROGRAM FEES*

Member —$395
Non-Member —$495

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

General Information on Expo and Conference

Registration Information

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

Registration Fees

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

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

Technology Conference attendees' registration credentials will be distributed in Chicago at the ICE Conference Registration area located in the Chicago Hilton Hotel on Tuesday, and at McCormick Place North on Wednesday and Thursday.

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

FSCT's Refund Policy

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

Registration Hours

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

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

Hyatt Regency Chicago
Tues., Oct. 22 ..... 7:30 pm - 5:00 pm
Wed., Oct. 23 ..... 7:30 am - 10:00 am

FSCT Convention Hotels

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

Special Airfare Discounts

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

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

Contact the airlines directly by calling
United 800-521-4041
mention code: **563UA**
Delta 800-241-6760
mention code: **I 3633**

Social Guest Program

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

On Thursday, Social Guests enjoy a continental breakfast and afterwards depart on motorcoaches for a tour of Chicago's downtown area. A visit to the Art Institute of Chicago will be included in the tour. Participants will view the traveling exhibition of the works of Edgar Degas. Organized by the National Gallery in London and the Art Institute of Chicago, the exhibit features his later works between 1886 when he participated in the last

International Coatings Expo and Technology Conference Registration Fees

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

Available Programs

	INTERNATIONAL COATINGS EXPO	FSCT ANNUAL MEETING & TECHNICAL PRESENTATIONS	OPENING SESSION	MATTIELLO LECTURE	ONE PRE-CONVENTION TRAINING SEMINAR	EXECUTIVE FORUM DINNER	ONE CONFERENCE COURSE	TECHNOLOGY ASSESSMENT SEMINAR	WELCOME SOCIAL	CONTINENTAL BREAKFAST
International Coatings Expo (ICE)	✔	✔	✔	✔						
Full Coatings Technology Conference & Expo	✔	✔		✔	✔		✔			
Coatings Technology Conference Course	✔	✔		✔			✔			
Executive Forum	✔	✔	✔	✔		✔		✔		
Pre-Convention Training Seminar	✔	✔	✔	✔	✔					
Social Guest Program	✔		✔						✔	✔

impressionists exhibit and 1917, the year of his death.

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

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

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

Shuttle Service

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

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

Ground Transportation

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

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

David Bauer to Deliver Mattiello Lecture

Dr. David R. Bauer, Senior Staff Technical Specialist in the Manufacturing Systems Department of the Ford Research Laboratory, in Dearborn, MI, will present the Joseph J. Mattiello Memorial Lecture during the 73rd Annual Meeting of the Federation. Dr. Bauer's lecture will be given on Friday, October 25 at McCormick Place North.

The lecture 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 and Technical Director of Hilo Varnish Corporation, Brooklyn, NY, when he died in 1948.

Dr. Bauer joined the Ford Motor Company in 1977 as a member of the Polymer Science Department to work on high solids coatings. Previously, he held a Post-Doctoral appointment in the Chemistry Department of the University of Illinois. He received a B.S. Degree in Chemistry from the California Institute of Technology in 1971 and a Ph.D. Degree in Chemical Physics from the Chemistry Department of Stanford University in 1975. He currently directs long-term research in the area of paint application, characterization, and evaluation.

Dr. Bauer is author of over 90 papers in the area of paint and plastics research. He has made over 80 presentations on work in these areas. He has carried out research in the area of cure and network structure in high solids coatings, flow control and coating rheology, polymer photodegradation and stabilization, plastics characterization and recycling, and coating service life prediction.

A.P. Dataweigh Systems
Aceto Corp.
ACT Laboratories, Inc.
Adhesive Age
Advanced Software Designs
Air Products & Chemicals, Inc.
Akzo Nobel Chemicals & Akzo Nobel Resins
Alcan Toyo America, Inc.
Alnor Oil Co.
American Chemical Society, Information & Services
American Colors
American Paint & Ctgs. Journal
Amoco Chemical Co.
ANGUS Chemical Co.
Anker Labelers USA Inc.
Aqualon Co.
Araki Chemical Axis Co.
ARCO Chemical Co.
Arizona Instruments Corp.
Arizona Oxides Inc.
Ashland Chemical Co.
Atlas Electric Devices
Atotech USA Inc.
Aztec Peroxides Inc.
B.A.G. Corp.
BASF Corp.
BatchMaster Software, Inc.
Bayer Corp.
Bergen Barrel & Drum Co.
Blacoh Fluid Control, Inc.
Borden Chemicals Inc.
Bowers Process Equipment
British Standards Institution
Brookfield Engineering Labs.
Buckman Laboratories, Inc.
Buhler, Inc.
Bulkon Systems International
Burgess Pigment Co.
BYK-Chemie USA
BYK-Gardner, Inc.
CB Mills
CCP
C.I.P Products/Sellers Cleaning Systems
Cabot Corp., CAB-O-SIL & Special Blacks Div.
Calgon Corp.
Cardolite Corp.
Center for Applied Engineering
Chemical & Engineering News
Chemical Manufacturers Assoc.
Chemical Marketing Reporter
Chemical Week
Chemicals Incorporated
Chemir/Polytech Laboratories
Ciba (Additives, Pigments, Plastics Divs.)
Cimbar Performance Minerals
Civacon
Clariant Corp.
Clawson Container Corp.
Coatings Magazine
Color Corp.
Color Instruments, Inc.
ColorTec Associates
Columbian Chemicals Co.
Consolidated Research, Inc.
Cortec Corp.
CR Minerals Corp.
Crosfield Co.
Cytec Industries Inc.
D/L Laboratories
Daniel Products Co., Inc.
Datacolor International
J. De Vree & Co. N.V.
DeFelsko Corporation
Degussa Corp.
Disti-Kleen, Inc./Vanwyk Engin.
Dominion Colour Corp.
Dover
The Dow Chemical Co.
Dow Corning Corp.
Draiswerke GmbH
Draiswerke, Inc.
Drew—Industrial Div. of Ashland Chemical
Dry Branch Kaolin Co.
DuPont Nylon Intermediates & Specialties
DuPont Performance Chemicals
Eagle Zinc Co.
Eastern Michigan University
Eastman Chemical Co.
Ebonex Corp.
E.C.C. International
Eiger Machinery, Inc.
Elf Atochem North America Inc.
EMCO Chemical Distributors
Engelhard/Mearl Corp.
Engineered Polymer Solutions
Epworth -Morehouse -Cowles.
Erichsen, Inc.
Erie Chemical Sales
Etna Products Inc.
Eura, Germany
European Coatings Journal
Exxon Chemical Co.
Fabricated Metals, Inc.
Federation of Societies for Coatings Technology
The Feldspar Corp.
Fillite
Filter Specialists, Inc.
Fischer Technology Inc.
Fluid Management
FMJ International Publications
Fuji Silysia Chemical, Ltd.
H.B. Fuller Co.
GAF Filter Systems
Gamry Instruments, Inc.
Paul N. Gardner Co., Inc.
Garrison Industries, Inc.
Georgia Pacific Resins, Inc.
BFGoodrich Co. Specialty Chemicals
The Goodyear Tire & Rubber Co., Chemical Division
Grace Davison
Graco, Inc.
Haake, Inc.
Halox Pigments
Hampshire Chemical Corp.
J.W. Hanson Co., Inc.
Harcros Pigments Inc.
Hedwin Corporation
Henkel Corp.
HERO Industries Ltd.
Heucotech Ltd.
Hickson Specialties, Inc.
Hilton Davis Co.
Hockmeyer Equipment Corp.
Hoechst Celanese Corp.
Horiba Instruments Inc.
J.M. Huber Corp./Engineered Minerals Div.
Hüls America Inc.
Hunterlab
Huntsman Corp.
ICIS-LOR
Ideal Eqipment Co., Ltd.
Ideal Manufacturing & Sales
IGT Reprotest Inc.
INDCO Inc.
Industrial Oil Products
Industrial Paint & Powder
Ink World
Inmark, Inc.
Intellution
Interfibe Corporation
International Compliance Center
Int'l Specialty Chemicals
Int'l Specialty Products (ISP)
ITT Marlow/ITT A-C Pump
S.C. Johnson Polymers
Journal of Coatings Technology
Kady International
M.P. Kenes, Inc.
Kenrich Petrochemicals, Inc.
King Industries, Inc.
Kline & Company, Inc.
Kraft Chemical Co.
Kromachem Inc.
K-T Feldspar Corp.
KTA-Tator, Inc.
Laporte/SCP-Laponite
LaQue Corrosion Services
Lawter International
The Leneta Co.
Liquid Controls Corp.
Littleford Day Inc.
Longview Fibre
The Lubrizol Corp.
Lucas Meyer, Inc.
Luzenac America, Inc.
3M OH and ESD
3M Specialty Chemicals
3M/Zeelan Industries
Macbeth, Div. of Kollmorgen
Magnesium Elektron, Inc.
Mallinckrodt Inc.
Manufacturing Business Systems
Mapico Inc.
The McCrone Group
McWhorter Technologies
Michelman, Inc.
Micro Powders, Inc.
Microfluidics International Corp.
Micromeritics
Micromet Instrument
Millipore Corp.
Milwhite, Inc.
Mineral Pigments
Ming-Zu Chemical Industries
MiniFibers, Inc.
Minolta Corp.
Mississippi Lime Co.
UMR Coatings Institute
Mitsubishi Chemical
Modern Paint & Coatings
Monsanto Co.
Morton International
Muetek Analytic, Inc.
Myers Engineering
Nacan Products Ltd.
NACE International
Nagase Co., Ltd.
Namatre Co.
Netszch Inc.
Neupak Inc.
New Way Packaging Machinery
North America Packaging Corp.
North Dakota State University
Nyco Minerals, Inc.
Ohio Polychemical Co.
Olin Corp.
Omega Recycling Technologies
Omnimark Instrument Corp.
OSi Specialties, Inc.
OxyChem
Paint & Coatings Industry
Paint Research Association
Parasol Systems, Inc.
Parker Hannifin Corp.
Particle Sizing Systems
Peninsula Polymers, Inc.
Pfaudler, Inc.
Phenoxy Associates
Pico Chemicals Corp.
Pioneer Packaging Machinery
Polar Minerals
Poly-Resyn, Inc.
Powder Coatings
PPG Industries, Inc.
PQ Corp./Potters Industries
Precision Dispensing
Premier Mill Corp.
Purity Zinc Metals
Q-Panel Lab. Products Corp.
Q-Sales and Leasing
Quackenbush Co., Inc.
K.J. Quinn & Co., Inc.
Raabe Corp.
RadTech Int'l North America
Ranbar Technology Inc.
Reichhold Chemicals, Inc.
Rheox, Inc.
Rhone-Poulenc Inc.
Rohm and Haas Co.
Ronningen-Petter
Charles Ross and Son Co.
Royce Associates
Russell Finex Inc.
San Esters Corp.
Sartomer Co., Inc.
Schenectady International, Inc.
Schlumberger Measurement Div.
Schold Machine Co.
SEPR
Shamrock Technologies
Shell Chemical Co.
Sherwin Williams Chemicals
Silberline Mfg. Co., Inc.
Singleton Corp.
Software 2000, Inc.
Solartron Tranducers
Southern Clay Products, Inc.
Southern Royal Mining Co.
Univ. of Southern Mississippi
Specialty Minerals Inc.
Spencer Machine & Tool Co.
Spraymation, Inc.
Startex Chemical
Sub-Tropical Testing Service
Summit Precision Polymers Corp.
Sun Chemical Corp.
Taber Industries
Taotek North America, Inc./Corob North America Div.
TAYCA Corp.
Tech Pak, Inc.
Teemark Corp.
Tego Chemie Service USA
Thiele Engineering
Thomas Scientific
Tikkurila/Kemira
Troy Corp.
UCB Chemicals
U.S. Aluminum, Inc.
U.S. Borax
U.S. Silica Co.
U.S. Zinc
UCB Chemicals
Unimin Specialty Minerals
Union Carbide Corp.
Union Process Inc.
United Mineral & Chemical Corp.
Van De Mark Group
Van Waters & Rogers Inc.
R.T. Vanderbilt Co., Inc.
Vero Dispersion Machines, Inc.
Versa-Matic Pump Co.
Vorti-Siv Div. MM Industries, Inc.
Wacker Silicones Corp.
Westerlins Maskinfabrik AB
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 Resins

1996 PRE-REGISTRATION FORM

FSCT International Coatings Expo & Technology Conference

• Chicago, IL •

October 22 • 23 • 24 • 25, 1996

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

Deadline: September 11, 1996. Register Today!

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

1. Industry Attendee Badge Information:

CP ☐

FIRST NAME (Nickname)

FIRST NAME LAST NAME

COMPANY

MAILING ADDRESS (or P.O. Box)

CITY STATE/PROV.

COUNTRY (other than U.S.) POSTAL CODE

TELEPHONE NO. FAX NO.

2. Social Guest Badge Information:

CP ☐

FIRST NAME (Nickname)

FIRST NAME LAST NAME

CITY STATE/PROV.

COUNTRY (other than U.S.) POSTAL CODE

3. Registrant Profile:

FSCT Member? 1 ❐ Yes 2 ❐ No

Society Affiliation _____

Information below must be completed for registration to be processed

Your Company (Check one only)

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

Your Position (Check one only)

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

4. Registration Information:

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

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

Oct. 22 Training Seminars

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

Oct. 23-24 Conference Courses

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

TOTAL DUE $_____

5. Method of Payment:

Total Amount Due $_____

(circle method of payment):

CK Check | MO Money Order | MC MasterCard | VS Visa | AE American Express

Card # _____

Expiration Date _____

Cardholder's Name (please print):

_____

Cardholder's Signature:

_____

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

Cancellation Policy:

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

Hotel Reservation Instructions

To place a reservation, complete the hotel reservation form on the next page and contact the ICE Housing Bureau "One-Stop Chicago" serviced by the Chicago Convention and Tourism Bureau. A one-night's deposit of $125 is required to process each reservation.

You may phone, fax, and mail your reservations to One-Stop Chicago. Use only one method to place your reservation to avoid a duplication of requests and deposits being processed.

A confirmation of your reservation will be mailed to you by One-Stop Chicago.

The cut-off date is September 23. After September 23, reservations will be accepted on a space available basis only.

Deposits are refundable provided that reservations are cancelled with hotels at least 72 hours prior to the date of arrival. Before October 2, notify One-Stop Chicago of cancellations. After October 2, contact the hotel directly.

FSCT Convention Hotels

There are eight official ICE hotels in Chicago. Serving as the headquarters property will be the Chicago Hilton and Towers. Convention rates for each hotel are noted below.

Chicago Hilton & Towers ***(FSCT Headquarters)***
SOLD OUT
Main ..... $140, 165, 190 single
$160, 185, 210 double
Towers level ..... $235 single, 255 double

Palmer House Hilton ***(NPCA Headquarters)***
Main ..... $160, 180, 195 single
$180, 200, 215 double
Towers level ..... $230 single, 250 double

Hyatt Regency ..... $142 single or double

Fairmont ..... $164 single or double

Essex Inn ..... $108 single or double
SOLD OUT

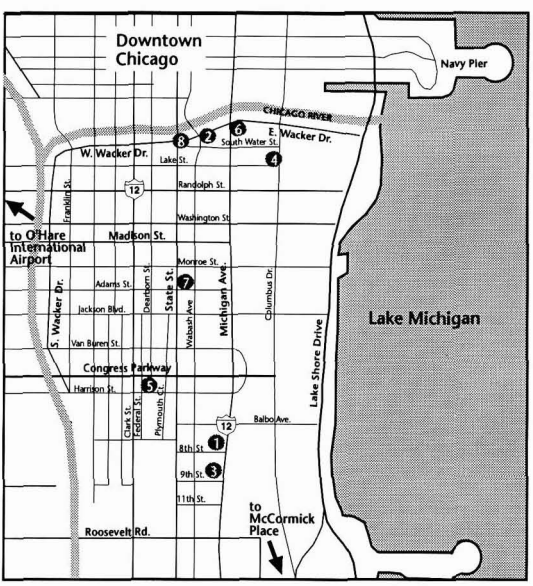
Clarion Executive Plaza ..... $125 single or double

Renaissance Chicago ..... $160 single or double

Hyatt on Printers Row ..... $151 single or double
SOLD OUT

Key to Chicago Map

1. Chicago Hilton and Towers
2. Clarion Executive Plaza Hotel
3. Essex Inn
4. Fairmont Hotel–At Illinois Center
5. Hyatt on Printers Row
6. Hyatt Regency Chicago
7. Palmer House Hilton
8. Renaissance Chicago



FEDERATION OF SOCIETIES FOR COATINGS TECHNOLOGY

ice INTERNATIONAL COATINGS EXPO AND TECHNOLOGY CONFERENCE

1996 Housing Application Form

Reservations must be placed with the Housing Bureau. Hotels will not accept reservations directly. Reservations must be received by **September 23, 1996.**

1. To Make Reservations

TO CALL:
U.S. & Canada (toll-free)
800-424-5248
Domestic & Overseas
847-940-2152

Prior to calling, have the following available:

- Name of Convention (**'ICE 96'**)
- Your 1st, 2nd, 3rd, & 4th choice of hotel
- Arrival/Departure dates
- Number of rooms required
- Type of room needed (single, double, etc.)
- Credit card #, expiration date
- Names of room occupants
- Address
- Phone and fax numbers

TO FAX:
U.S. & Canada (toll-free)
800-521-6017
Domestic & Overseas
847-940-2386

- Please print or type all items to ensure accuracy
- Complete each part below in detail for correct and rapid computer processing
- Form may be duplicated or supplemental room list must be attached using same format as below

TO MAIL:

Send completed form and payment to:
One Stop Chicago
P.O. Box 825
Deerfield, IL 60015-0825

Prior to October 2, all reservations,changes, and cancellations must be made with One Stop Chicago. After this date, these changes must be made with the hotel directly. Reservation depositis are refundable provided that they are cancelled with the hotel at least 72 hours prior to date of arrival.

2. Hotel Information

Select 4 hotels of your choice to facilitate processing. Requests are given priority in the order received. First choice is assigned IF AVAILABLE. Be sure to list definite arrival and departure dates.

1st _____ Rate_____ 3rd _____ Rate_____
2nd _____ Rate_____ 4th _____ Rate_____

Names of Occupants	Room Type*	Arrival	Departure
	❑ single ❑ dbl/dbl ❑ double		
	❑ single ❑ dbl/dbl ❑ double		
	❑ single ❑ dbl/dbl ❑ double		
	❑ single ❑ dbl/dbl ❑ double		
	❑ single ❑ dbl/dbl ❑ double		

* Room Key: single (1 person, 1 bed); double (2 people, 1 bed); double/double (2 people, 2 beds).
Requests for the Chicago Hilton and the Palmer House will be limited to 10 rooms per exhibitor company.

3. Deposit Information

Advance deposit required at the time of booking. Reservations will not be processed without a deposit. Deposits are $125 per room. Deposits may be made by major credit card or check (U.S. dollars). Your credit card will be billed immediately.

❑ Enclosed is my check payable to One Stop Chicago for the amount of $ _____

Please bill my: ❑ AMEX ❑ MC ❑ Visa

Credit Card Number _____ Expiration Date _____

Name of Card Holder _____ Signature _____

4. Send Confirmations to:

Name: _____ Telephone: _____

Company: _____ FAX: _____

Address: _____

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

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

_____ requires special assistance. Please attach a written description of your needs.

1996 Annual Meeting Technical Program

"Insights and Innovations"

Wednesday, October 23, 1996

Opening Session
8:30 a.m.

Seventy-fourth Annual Meeting of the Federation of Societies for Coatings Technology opened by President Darlene Brezinski

FSCT Heckel Award

Presentation of George Baugh Heckel Award, FSCT's highest honor, will be made to **George R. Pilcher,** of Akzo Nobel Coatings Inc.

E.W. Fasig Keynote Address

Keynote Speaker—**Ten Thousand Dollar Per Square Centimeter Coatings**—Walter C. McCrone, of McCrone Research Institute

There are many compositions of coatings useful for protection, for aesthetics, and for providing properties such as electrical conductivity, adhesion, etc. None, however, is more expensive than some of the aesthetic coatings. Coatings applied to a canvas by Leonardo da Vinci have sold for more than $20,000/cm. Other old-masters are not far from the same price range. One result of this is the growing temptation for some modern artists to "change their name" to Rembrandt, Titian, Raphael— or even Leonardo. There is an increasing need for scientific techniques to detect art forgeries. Mr. McCrone's presentation describes how these complex coatings are analyzed by Polarized Light Microscopy supplemented by Fourier Transform Infrared Absorption and Scanning Electron Microscopy with Energy Dispersion X-ray analysis to detect these mis-attributions.

Technical Focus Speaker
1:00 p.m.- 2:00 p.m.

Pigment Flocculation is a Figment of Your Imagination—F. Louis Floyd, Duron, Inc.

Roon Award Competition Papers—
2:00-4:00 p.m.

A Unifying Model for Understanding Associative Thickener Influences on Waterborne Coatings—J. Edward Glass, Mao Chen and Zeying Ma, North Dakota State University, and Robert Buchacek and Jack Dickinson, DuPont

Rheological Changes During the Drying of a Waterborne Latex Coating—Matthew Gebhard, Rohm and Haas Co. and Frank Löfflath, PPG Industries, Inc.

New Developments in Acrylate Modified Epoxy-Amine Cure Coatings—Michael A. Bailey, Tim Cauffman and Richard Costin, Sartomer Co.

Mechanistic Considerations of Particle Size Effects on Film Properties of Hard/Soft Latex Blends—Sarah Eckersley and Bradley Helmer, The Dow Chemical Co.

Thursday, October 24, 1996

APJ/A.F. Voss Award Competition Papers
9:00 a.m.-10:00 a.m.

An Investigation of the Effects of Formulation on Selected Properties of UV Curable IPN Coatings—Detroit Society for Coatings Technology

Direct VOC Analysis of Water Based Coatings by Solid Phase Micro Extraction and Gas Chromatography—Los Angeles Society for Coatings Technology

FSCT Annual Industry Luncheon
12:00 noon

International Papers I
2:30 p.m.-3:30 p.m.

Component Thinking in Paint Production—Ms. Carola Grundfelt-Forsius, Tikkurila OY, *(presented on behalf of SLF)*

High Durable Coating Systems for Steel Structures and Their Performances—Dr. Hiroyuki Tanabe, Masanori Nagai and Masafumi Kano, Dai Nippon Toryo Co., Ltd. *(presented on behalf of JSCM)*

Friday, October 25, 1996

FSCT Annual Business Meeting
9:00 a.m.-10:00 a.m.

International Papers II
9:00 a.m.-10:30 a.m.

Environment-Friendly Antifouling Paint—A. Perichaud and J. Coquillaud, Catalyse Company *(presented on behalf of AFTPVA Section of FATIPEC)*

Solventless Aliphatic Polyisocyanates Hardeners for Low VOC PU Formulations in the Coatings Industry—Pierre Ardaud and Eugenie Perroud, Rhone-Poulenc *(presented on behalf of FATIPEC)*

Title to be determined—Dr. S.G. Lawrence, Ciba Pigments Division *(presented on behalf of OCCA)*

Mattiello Memorial Lecture
10:30 a.m.-11:30 a.m.

Predicting In-Service Weatherability of Automotive Coatings: A New Approach—Dr. David R. Bauer, Ford Motor Company

The Paint Show 5000

A Five Kilometer Fitness Run

For attendees at the 1996 International Coatings Expo in Chicago, IL
Thursday, October 24, 1996 at 7:00 a.m.

Start/Finish: Grant Park Buckingham Fountain

Sponsored by:
Troy Corporation
in Conjunction with the
Federation of Societies for Coatings Technology

All runners are invited to join this year's event on the 1996 International Coatings Expo (ICE) schedule, the Paint Show 5000, a five kilometer fun and fitness run starting and finishing at the Grant Park Buckingham Fountain.

It is scheduled for 7:00 a.m. on Thursday, October 24, 1996. Participants will run on a measured, police-protected five kilometer (3.1 miles) course. A time clock will be located at the finish.

The Paint Show 5000 is designed to be a fun, fitness or training event, open to all who want to take a five kilometer running tour of Chicago.

Everyone will be a winner. T-shirts will be given to all participants, but you must be pre-registered to run. No entries will be accepted on race day.

Entry fee: $5.00. Entries must be received before September 27, 1996. Every runner's registration fee will be donated to the Coatings Industry Education Foundation.

Entry Form

Mail entry forms with a check for $5.00 U.S. funds (no cash please) payable to:
Troy Corporation/Paint Show 5000
8 Vreeland Rd., P.O. Box 955
Florham Park, NJ 07932-0955

In consideration of this entry being accepted, I the undersigned intending to be legally bound, hereby for myself, my heirs, executors and administrators waive and release any and all rights and claims I may have against the Troy Corporation, The Federation of Societies for Coatings Technology, the McCormick Place Convention Center, the City of Chicago, IL, race sponsors, their staff, officials, volunteers and any representatives, successors or assignees for any injuries that may be suffered by me in this event. I further hereby certify that I am physically fit and have sufficiently trained for the completion of this event.

Name _____

Title _____

Company _____

Address _____

City/State/Zip _____

Telephone _____ Shirt Size _____

Name (Please Print) _____

Date _____

Signature _____

1995 ANNUAL REPORT
FEDERATION OF SOCIETIES FOR COATINGS TECHNOLOGY

Spring 1996 Board of Directors Meeting

Thirty-six members and 13 guests attended the Spring Meeting of the Board of Directors of the Federation of Societies for Coatings Technology, on May 5, 1996, in Seattle, WA.

The following persons were in attendance:

Officers

President ..... Darlene Brezinski
President-Elect ..... M. Jay Austin
Secretary-Treasurer ..... Thomas Hill

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 ..... Patricia Shaw
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 ..... Michael Frantz
Northwestern ..... Larry Brandenburger
Pacific Northwest ..... Yvon Poitras
Philadelphia ..... Donald Denny
Piedmont ..... Forest Fleming
Pittsburgh ..... William C. Spangenberg
Rocky Mountain ..... J. Dick Mullen
St. Louis ..... Terry Gelhot
Southern ..... James E. Geiger
Toronto ..... David Jack
Western New York ..... Michael DePietro

Other Members

Freidun Anwari ..... Cleveland
J. Andrew Doyle ..... NPCA
William Holmes ..... Dallas
Ronda Miles ..... Dallas
Joseph P. Walton ..... Cleveland
John Oates ..... New York
Dennis Owen ..... Golden Gate

Guests

Federation Past-President Deryk R. Pawsey (Pacific Northwest)

Society Officers James Currie (Cleveland); Debbie Koss (Kansas City); Brian Fowler (Birmingham); and Robert Schroeder (New York)

Industry Relations Task Force Chair, Rose A. Ryntz (Detroit)

Chuck Reitter, Publisher, *American Paint & Coatings Journal*

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

Following the roll call of the members, on a motion by Mr. Oates, seconded by Mr. Kaplan, the report of the Fall 1995 Meeting of the Board of Directors was approved as published in the December 1995 issue of the JOURNAL OF COATINGS TECHNOLOGY.

Reports of the Officers and Staff

President Brezinski

Immediately following the Annual Meeting, Marty and I attended the NPCA annual meeting. It afforded us the opportunity to informally meet with some association officers as well as our counterparts in NDPA and PDCA.

Following the annual meeting, I also appointed a special task force called the Industry Relations Task Force. Its mission is to review past and current cooperative activities of the FSCT with allied industry groups, recommend future activities with allied groups, and develop plans for us to effectively counter groups that might threaten our growth and our future.

In November, Jay Austin, Sid Lauren, and I attended the second meeting of the North American Coatings Council. It was a very positive meeting, and those in attendance felt that much could be gained by all associations that represent the coatings industry sharing in areas of common interest. We agreed to continue for a one-year period.

I also met with the Professional Development Committee in November and, as with many other groups over the past two years, we spent our time brainstorming strategic planning and the needs of our membership. Recently, I attended the Publications Committee Meeting, which was very fruitful. They are defining their goals and objectives in view of the direction we

see for the organization. It was strongly felt that we need to better serve our membership in all aspects of their work environment.

Since that time, despite weather-related travel problems, our efforts have focused primarily on strategic planning. Several meetings were held with various committees and groups prior to the February Board Meeting. The focus of all the meetings was to brainstorm every aspect of planning for our future survival and growth. The Board Meeting held in February was a working meeting which generated many ideas that have since been dispersed to the members.

By our spring meeting I will have attended the 53rd Annual Southwestern Paint Convention in Houston and the 60th anniversary of the Birmingham Society where I will have an opportunity to further discuss our future plans and goals.

I strongly believe the direction we are taking with our strategic planning will make us a stronger organization for the future and better able to provide many benefits for our membership. It is encouraging to see the healthy and spirited debate about many of these issues because it emphasizes the concern that everyone has for the Federation. We have a great deal of work ahead of us these next years, but with the continued dedication of our membership and our staff, we shall succeed.

DARLENE BREZINSKI
President

President-Elect Austin

Where has the time gone! It seems that only last week I was writing my report for our October Board Meeting in St. Louis. Needless to say, the months since St. Louis have been both hectic and rewarding. Since October, I've had the opportunity to participate in the following activities:

Local Society Meetings—I, together with Mike Bell, visited with the Pittsburgh Society on March 11. The following day, I had the pleasure of accompanying Pat Viola and Lyn Pollock to visit the New York Society. I must express my appreciation to the Boards of both Societies for their time, interest, and input into the strategic plan recently formalized by the FSCT Board of Directors.

Financial Audit and Executive Committee—These meetings were conducted January 16-18 at FSCT Headquarters. Joe Walton and I did a formal account audit of the financial books on January 16. Everything was found to be in order. The Executive Committee met on the 17 and 18. Our significant topic of discussion was preparation for the special Board of Directors meeting in February to begin implementation of the strategic plan.

Allied Industry Visits—In November, I attended the North American Coatings Council Meeting along with President Brezinski and Sid Lauren. The tone of this organization has changed considerably from last year and I believe it could become a positive forum for information exchange between the various industry organizations.

In March, I had the opportunity to meet with SSPC (at their request) to exchange information concerning the strategic direction of our two organizations. I look forward to further exploring potential areas of joint interest and cooperation with them.

Also in March, I was able to attend the CSI meeting with Bob Ziegler. The meeting was held in conjunction with OCCA's first "Coatings for Africa" Exhibition and Conference held in Cape Town, South Africa.

February Board of Directors Meeting—A special meeting of the FSCT Board of Directors was held on February 24 and 25 to discuss implementation of our strategic plan. Results of this meeting have been thoroughly reported, however, I do have some comments and observations. First, the Board of Directors must be commended for their efforts, concerns, and innovative approach to strengthening our organization for future success. Secondly, I don't think that any of us fully appreciated the significance that this meeting really held. The future will view this as a watershed event in FSCT history. Finally, I must say how proud I am to be part of not only what is currently being accomplished by the Federation, but to be associated with such a group of true professionals. I'm always humbled by the caring and dedication of the volunteer members of our organization.

I look forward to being part of a very bright and exciting future. Thanks for taking me along for the ride.

JAY AUSTIN
President-Elect

Secretary/Treasurer Hill

As I look back on my first six months in Federation office I am reminded of the opening line from "A Tale of Two Cities." They have been the worst of times and the best of times. It seems as if I hit the floor running even prior to actually taking office and I have not slowed down since.

By the time this report is published I will have visited the Louisville, New England and L.A. Societies, attended numerous committee meetings, planning meetings and executive meetings. Clearly the most important of the meetings was the special board meeting held in Chicago. I am impressed and encouraged by the honest dialogue and open participation by all who attended.

From a financial perspective the Federation has endured a couple of difficult years. Fortunately, we were blessed with several years that yielded excess operating revenue. I can attest that we remain financially strong. The change in timing of the budget process has been helpful. We have challenged income and expense assumptions. Outsourcing continues to be an option that is considered when there is sufficient payback. Expense control is demonstrated by not filling positions that were anticipated in the budget until revenues match expenses. We, as an Executive Committee, believe that 1996 will return us to a small excess in operating revenue.

One of the strengths of the Federation over the years has been the diversity of backgrounds that can be tapped to address the many issues that we face. As I have had opportunity to get to meet and interact with our various members, I continue to be impressed with the talent pool available. As we look to the challenges before us, I am convinced that coupling the wisdom of the past with the energy of the present will provide a secure future.

THOMAS E. HILL
Secretary/Treasurer

Executive Vice President Ziegler

1995 Financial Statement

The final, audited report of revenue and expenses for 1995 shows income at $2,844,008 and expenses at $3,000,484. The deficit of $155,984 is based almost entirely on unbudgeted expenses caused by year-end adjustment entries for pre-paid defined benefit pension expenses and depreciation of the computer system, as well as the unbudgeted cost of hiring a Director of Marketing to staff. Income was on-budget.

The 1995 Statement of Income and Expense has been forwarded to all members of the Board for review prior to the May 5, 1996 meeting.

1996 Operating Budget

Based on the recommendations of the Finance and Executive Committee, the 1996 Operating Budget initially approved by the Board in October, 1995, was adjusted to reflect planned activities for the current year and is balanced at $3,491,500, allocated as follows (*1995 budget allocations are shown in parentheses*):

Income: Publications—25.7% (*25.7*); Membership Dues—1.8% (*1.8*); Conventions and Trade Shows—69.5% (*67.4*); Educational Activities—0.5% (*2.1*); Miscellaneous—2.5% (*3*).

Expenses: Headquarters Administration—38.5% (*39.9*); Publications—26% (*29.9*); Conventions and Trade Shows—24.1% (*16.4*); Officers/Board/Committees—6.1% (*5.9*); Educational Activities—4.7% (*6.9*); Miscellaneous—0.6% (*1*). *The increase in expenses over 1995 for "Conventions and Trade Shows" reflects the normal increased cost of holding the annual convention in Chicago as well as the cost of the addition of the Pan American Coatings Expo.*

Publications

The reports of the Directors of Marketing and Publications will detail significant activities taking place in 1996 in the area of publications. Noted here are the addition of the "Coatings Encyclopedic Dictionary," the long-awaited update of the very successful "Paint/Coatings Dictionary"; the change in format to the FSCT Annual Membership Directory (*Year Book*) which greatly increases the publication's usefulness; and the continuing development in the redesign and reformatting of the *Journal of Coatings Technology*, including the addition in 1996 of "Spotlights" which highlight and provide useful information on a variety of industry topics.

We wish to thank Stan LeSota, Editor of the Dictionary, for his good efforts. Staff looks forward to working with the Publications Committee in the development of new and useful additions to the volume of FSCT publications.

Membership

Currently, membership totals stand at (*1995 totals are in parentheses*): *Active*—4,210 (*4,318*); Associate—2,237 (*2,219*); Other (Honorary, Educator/Student, Retired)—619 (*640*); Affiliate—194 (*147*), for a total of 7,260 (*7,324*).

A proposal has been received from the Arizona Section of the Rocky Mountain Society applying for Constituent Society status. The Bylaws Committee is currently studying the documentation and will advise the Executive Committee of the application's validity.

International Coatings Expo and Conference

While attendance was less than anticipated (6,853), the 1995 Paint Industries' Show grew in exhibit space to 92,500 net sq.ft., second only to 1992's Chicago show (94,100). The number of exhibiting companies increased as well to a record total of 313. We sincerely thank the manufacturing and supplier industries for their continued support of the FSCT annual event and we are also grateful for the assistance of the Host Society of St. Louis (Dennis Cahill, Chair), for its good work.

As is well-known by now, the format of the event has changed significantly for 1996. The newly-formatted International Coatings Expo and Technology Conference will take place on October 22-25 in Chicago. Emanating from the FSCT strategic plan, the ICE will provide educational and informational opportunities to the wide spectrum of industry areas, including liquid, powder, inks, adhesives, UV and high solids manufacturing processes. To date, 260 companies have secured spots in over 90,000 sq.ft. of exhibit space. Attendance promotional efforts have begun with a mailing of 50,000 announcement brochures to the world-wide industry. It is expected that this and follow-up marketing efforts will produce above average attendance and sold exhibit space.

Meanwhile, the programming for the new Coatings Technology Conference being held in conjunction with the ICE is well along and provides an impressive array of instructional one- and two-day seminars. Under the theme, "Insights and Innovations," the program is being developed by Chair Steve Hodges (Chicago Society) and his committee. We sincerely thank the committee for its hard work in producing this new educational concept.

Pan-American Coatings Expo

The FSCT will co-sponsor an exhibition of coatings manufacturing suppliers with the Mexican Paint and Printing Ink Manufacturers Association and the Mexico Society on August 15-17 in Mexico City. To date, 37 companies have reserved 50 booths or approximately 50% of available exhibit space. Additional promotional efforts, both in the U.S. and Mexico, will be made throughout the spring and summer, incorporating mailings, advertising and telephone and fax. The FSCT will assist the Mexico Society in its development of the technical conference, to be held in conjunction with the Expo.

FSCT/NPCA Cooperative Efforts

Establishing efficiencies with the combined FSCT/NPCA Manufacturing Management Committee, the two organizations have explored additional opportunities to relate their efforts. Although no significant activities other than joint promotional work could be found at this time, the FSCT has agreed to continue with its participation in the North American Coatings Council meetings. The Council, composed of representatives of FSCT, NPCA, and the Canadian Paint and Coatings Association, the Mexico Paint and Printing Ink Manufacturers Association, the Roof Coating Manufacturers Association, and the Powder Coating Institute, will meet next on May 29 in Toronto.

Cooperation will continue in 1996 with the holding, for the first time, of the FSCT's and NPCA's annual meetings over the

same dates. These jointly scheduled events, while being held separately, will make it easier for both suppliers and manufacturers to cover both meetings. Also agreed upon was reciprocal registration for NPCA attendees to go to the ICE and for FSCT registrants to attend NPCA forum sessions.

Strategic Planning

A large portion of staff time has been spent in the organization and dissemination of material developed during strategic planning meetings. Mailings outlining the background discussions and proposals have been sent to all members and have been included in issues of the JCT. It is hoped that the summary of discussions and proposals and the responses to these from members and the Constituent Societies will provide for a meaningful debate at the May 5 Board Meeting, producing a clear focus on the future direction of the Federation.

We are very grateful to the Officers, Board, and many committee members who volunteered their time and energy over the past three years in these strategic planning efforts.

Officer/Staff Travel

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 St. Louis, Louisville, Cleveland, Detroit, Pittsburgh, New England and Los Angeles Societies; Southwestern Paint Convention; Pacific Northwest Society's Symposium (in conjunction with the FSCT Spring Week meetings), 60th Anniversary meeting of the Birmingham Club; meetings of the North American Coatings Council, and the Oil & Colour Chemists' Association SURFEX in Cape Town, S. Africa, in conjunction with the meeting of the Coatings Societies International.

Headquarters Staff

Of significance is the addition to staff of Joe Pontoski as Controller, replacing Charles Schmidt. Joe brings with him the background and knowledge needed for the future financial health of the FSCT. Also joining staff is Tina Vogel as Editorial Assistant, replacing Mary Evangelisto who resigned in February. We welcome both Joe and Tina to the FSCT family.

Continuing to serve the FSCT and its members are the following individuals, noting their longevity on the Federation Headquarters Staff: Michael Bell *(5 years)*, Director of Educational Services; Victoria Graves *(12 years)*, Director of Meetings and Conventions/Membership Services; Patricia Viola *(13 years)*, Director of Publications; Lyn Pollock *(1 year)*, Director of Marketing; Kathleen Wikiera *(16 years)*, JCT Managing Editor; Jonna Coachman *(3 years)*, JCT Associate Editor; Audrey Boozer *(14 years)*, JCT Subscription Manager; Lisa McGlashen *(6 years)*, Secretarial Assistant to the Executive Vice President; Mary Sorbello *(19 years)*, Secretarial Assistant to the Director of Educational Services; Marie Wikiera *(7 years)*, Meetings Coordinator; Linda Madden *(17 years)*, DTP Operator; Meryl Simon *(10 years)*, Order Dept.; and Dorothy Kwiatkowski *(18 years)*, Secretary/Receptionist.

Robert F. Ziegler
Executive Vice President

Director of Educational Services Bell

Committee Liaison

Educational Coordinating Committee—The Educational Coordinating Committee has met twice since the last meeting of the FSCT Board of Directors, on October 27, 1995 in Toronto and on April 19, 1996 in Chicago. The Toronto meeting included a tour of the Distance Learning Centre at George Brown College, which has been used by the Toronto Society of Coatings Technology for its courses. The next meeting of the ECC has been tentatively scheduled for August in Pittsburgh with the Education Chairs of the 26 Constituent Societies. The Chair of the Educational Coordinating Committee is Melinda Rutledge of the Los Angeles Society. The committee has been involved with two major projects:

Science Kit—FSCT Headquarters continues to process requests for the Science Kit. The kit is useful for members who provide guidance to students and thus far over 200 have been distributed. The kit is a "living" document and has been designed to expand to allow for additional experiments.

Society Speakers Program—The Society Speakers Program has had four Societies participate in the test run and is now available for use. The program has enlisted the help of several name coatings speakers for monthly meetings and these are made available to the Societies. The testing of the program allowed the ECC to learn how the program was received and to review the logistics.

Test Drilling Projects—Since the developmental work is complete on the Society Speakers Program and the Science Kit, the ECC has begun the task of developing new projects. The committee is continuing to evaluate the projects suggested by the full Educational Committee at its June 1995 meeting.

Additional Activities—The committee also continues to work on the following projects: Administering the activities surrounding the Southern Society's A.L. Hendry Award for the Best Student Paper; and reviewing the applications and distributing funds for the Small Society Scholarship program.

Technical Advisory Committee—The last meeting of the Technical Advisory Committee was held on February 16, 1996 in Boston, MA. This meeting included attendance at the monthly meeting of the New England Society. In August, the committee will meet in Pittsburgh with the Chairs of the Constituent Society Technical Committees. The Chair of the TAC is Fred Anwari of the Cleveland Society. The committee has the following Mission Statement:

"The mission of the FSCT Technical Advisory Committee is to establish guidelines, facilitate 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*."

The committee is currently working on the following projects:

Society Technical Committees—The TAC Adoptive Society program continues to be the direct line between the Societies

for the Committee. Each committee member has assigned responsibility to maintain contact with four to five Societies. In addition to assisting in meeting notification, this program gives each Society a resource on the TAC for project development and committee management information.

APJ/Voss Award—The committee assumed the responsibility of the administration of the APJ/Voss Awards in 1995. These awards are presented for the outstanding Society papers submitted for the program. The TAC spent a considerable amount of time at its last meeting evaluating the initial program and critiquing committee performance in 1995. The committee also provided constructive critiques to all 1995 participants in hopes of improving the offerings in future years.

Society Speakers Program—The committee also assumed this role in 1995. This award is given to the best presentations of Society Technical Papers at the Annual Meeting. As with the Voss Award, the committee has judged its performance and also provided the participants with constructive feedback aimed at improving the presentation level in the future. Again this year, the attendees of the August meeting will be able to see how the program works first hand by using the judging form on the meeting's guest speaker.

Joint Coatings/Forest Products Committee—The last meeting of the Joint Coatings/Forest Products Committee was held in Madison, WI on March 25, 1996. The next meeting of the committee will be held on September 5, 1996 in Chicago.

The committee is preparing a series of articles which have been published in the *American Painting Contractor* and the *Paint Dealer*. The titles currently being prepared are: Surface Preparation, Changing Wood Resources, Finishes Checklist, Mildew, New Wood Treatments, Finishing Shakes and Shingles, and Water Repellents. The committee is also investigating the following topics for future articles: Log Cabin Coatings, Coatings Adhesion and Performance, Paint Quality, and New Deck Cleaners and Restorers. Each of the papers is prepared by a task group of participants, with representatives from both the wood and coatings committees. The committee also assisted the Pacific Northwest Society with the selection of speakers for the 1996 Spring Week technical program. The Chairman of the Joint Coatings/Forest Products Committee is Bob Springate of the Chicago Society.

Corrosion Committee—The Corrosion Committee last met on January 30, 1996 in Philadelphia, PA. The next meeting will be held on July 16, 1996 in Philadelphia. The Chair of the Corrosion Committee is Charlie Hegedus of the Philadelphia Society. The committee is currently involved with the following projects:

1996 International Coatings Technology Conference—The committee is assisting the Program Committee with the development of the "Advances in Coatings Characterization" program, to be held on Wednesday and Thursday, October 23-24, 1996 in Chicago.

Monograph—The committee is developing a monograph 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 an author is currently preparing the manuscript.

Interaction with Corrosion-Related Societies—The committee continues to maintain contact with the following related organizations: NACE International, Steel Structures Painting Council (SSPC), ASTM and the Electrochemical Society.

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 twelve months in the *Journal of Coatings Technology*. The committee hopes to actively solicit papers for the competition, and in turn provide a larger selection of corrosion-related papers for the *JCT*.

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 7-8, 1996 in Charlotte, NC. This meeting included a tour of the Valspar facility in Statesville, NC. The next meeting will be held in Nashville, TN on September 18-20, 1996. Don Mazzone of the Golden Gate Society is the Chair of the Manufacturing Committee. The committee is currently involved in the following projects:

1996 NPCA Annual Meeting—The committee is working with the NPCA Management Information Systems Committee to develop a symposium on Bar Coding to be held at the NPCA Annual Meeting.

1997 FSCT International Coatings Technology Conference — The committee is planning a one day seminar for the 1997 FSCT International Coatings Technology Symposium on the topic of Re-engineering the Plant/Work Force for the Future. The program will deal with topics such as computers, empowerment, QS 9000 and the like.

Society Interaction—A booklet entitled "The Guide for Society Manufacturing Chairs" has been distributed to each Society. The document provides guidance to Society Manufacturing Committee chairs regarding the position and a list of things to do for Societies interested in forming a Manufacturing Committee.

Professional Development Committee—The Professional Development Committee last met April 2-3, 1996 in Chicago and also met on November 16-17, 1995 in Dallas, TX. The next meeting of the PDC will be held on August 21-22, 1996 in Chicago. The Chair of the PDC is Rose Ryntz of the Detroit Society. The Mission Statement for the PDC is as follows:

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

Listed below are the projects currently being worked on by the committee:

1996 International Coatings Technology Conference—The committee will present the program "Polymer Chemistry for the Coatings Formulator" on Wednesday and Thursday, October 23-24, 1996 as part of the ICTC.

"Computer Uses in Coatings"—This two day seminar is scheduled for August 20-21, 1996 at a Chicago area location. The seminar will provide a general overview of the various uses of computers in formulation, manufacturing, design of experiments, and solvents.

Additional Programs—The PDC has begun investigating the possibility of conducting additional seminars in 1996. Potential topics for future programs include Crosslinking Chemistry, Coatings for Related Industries (Lamination, Inks, Adhesion, Elastomers and Masonry), and Basic Coatings Chemistry.

Strategic Planning—In August, 1995, the committee spent two days at FSCT Headquarters working on the development of a strategic plan. FSCT President-Elect Jay Austin served as facilitator for the project. It continued the process in Dallas in November and provided information to the FSCT Strategic Planning Task Force for its December meeting.

Annual Meeting Program Committee—The 1996 Annual Meeting Program Committee has been actively involved in the restructuring of the technical offerings at the Annual Meeting. The theme of the event, "Insights and Innovations," also describes the activities of the committee in planning the event. The committee has spent the last six months evaluating previous program offerings, conducting interviews with industry participants, developing programming and securing instructors for the event.

In 1996, FSCT will unveil the inaugural International Coatings Technology Conference (ICTC). The conference will run on Tuesday, Wednesday and Thursday, October 22-24, 1996 in Chicago. The conference will consist of a series of one and two day programs designed for specific audiences.

All one day programming will be held on Tuesday, October 22 at the Chicago Hilton and Towers. Topics include: Surfactant Chemistry; Winning Technical Presentations; Effective Technical and Scientific Writing; Design of Experiments; Spray Applications (to be held at Binks Manufacturing in Franklin Park, IL); and Technology Assessment (an Executive Forum that includes a Monday evening dinner).

The two day programs, offered on Wednesday and Thursday, include: Substrates and Coatings; Polymer Chemistry for the Coatings Formulator; Advances in Coatings Characterization; and Back to Basics in Coatings Chemistry.

The registration fees for the event are $195/$295 (member/nonmember) for the one day programs, $395/$495 for the Executive Forum, and $395/$495 for the two day programs. There are early registration and three day discounts available. The registration includes support materials for the program and admittance to the International Coatings Exposition (ICE) which runs on Wednesday - Friday, October 23-25, 1996. The Chairman of the 1996 Program Committee is Steve Hodges of the Chicago Society.

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

Technical Focus Lecture—This again will be held as the initial technical presentation during the Annual Meeting Technical Program. This speaker is selected by the Chairs of the Educational Coordinating, Professional Development, Technical Advisory and Annual Meeting Program Committees.

FSCT Video Offerings—The video "VOC Determination" continues to sell well and is 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" are also offered 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 edited and should be available to all Societies in the near future.

InterSociety Polymer Education Council—This is an organization made up of representatives of the Rubber and Polymer Chemistry Divisions of the American Chemical Society, the Society of Plastics Engineers, and the Society of the Plastics Industry. Its members work to provide educational information on polymer chemistry to high school teachers, through both its Polymer Ambassador program and the MaTR Institute. The Polymer Ambassador program provides funding for several chemistry teachers to conduct polymer chemistry training during "In Service' programs for fellow teachers. The MaTR Institute is a special collaboration between the National Science Foundation, IPEC and the University of Wisconsin - Stevens Point, and serves as an instructional center for 24 chemistry teachers each year from around the country. Between the outreach efforts of both programs, over 3,000 teachers received Polymer Chemistry training in 1995. IPEC has invited FSCT to join the organization and this is under review by the Educational Coordinating Committee.

Roon Awards—The committee is reviewing the papers for the 1996 competition. This year there are six entries seeking the award, which is presented at the Annual Meeting.

FSCT Travel—Since the last meeting of the FSCT Board of Directors, I have attended the monthly meetings of the Pittsburgh, New England and Los Angeles Societies, a meeting of the InterSociety Polymer Education Council, and the special Board of Directors Strategic Planning Meeting, in addition to the committee meetings cited in the report.

MICHAEL G. BELL
Director of Educational Services

Director of Publications Viola

The activity of FSCT Publications reflects what is happening in nearly every area of the Federation. The goal is to examine all of our products and programs and determine

ways to improve our offerings to the membership while remaining responsive and cost-effective.

JCT—Changes in the content, format, and appearance of the JCT have captured the attention of the membership. Over the past year, we have been enhancing the editorial content as well as the design to attract additional readers. The response, particularly since the December 1995 issue, has been very favorable.

Beginning in 1996, the JCT offered a full editorial calendar, highlighting several special issues, such as Low VOC Coatings (January) and Coatings for Wood (May). In addition, we have developed a new editorial feature known as the "Spotlight." The Spotlight focuses on a specific area of interest to the industry. In addition to overview articles on the chosen topic, some of the issues will include a source guide with company and product listings. The first Spotlight was offered in the March issue and the focus was on Pigments. Response from readers and potential advertisers to this feature has been positive and we are looking forward to additional feedback. The editorial calendar for upcoming issues includes:

June:	Educational Update
	Spotlight on Mixing and Dispersing
July:	1996 FSCT Pan American Expo
	Spotlight on Additives
Aug.:	Spotlight on Production and Safety
Sept.:	Pre-Convention Issue—
	International Coatings Expo and Technology Conference
	Spotlight on Resins
Oct.:	Convention Issue—
	FSCT International Coatings Expo and Technology Conference
	Pan American Expo Wrap-Up
Nov.:	Buyer's Guide Supplement
Dec.:	Spotlight on Lab Apparatus and Equipment
Jan. '97:	International Coatings Expo and Technology Conference Wrap-Up Issue

The Paint Stone—This member newsletter has continued as a bimonthly tear-out insert in the *JCT*. The objective is to reduce costs and to avoid duplication of information as had been experienced when similar articles were published in the *Paint Stone* and the *JCT*. A special edition of the *Paint Stone* was published in the March issue and also mailed individually to all members. This newsletter focused solely on the background and details of the FSCT strategic planning meetings and the proposals that were developed at the special Board of Directors Meeting held in February.

Year Book— Published in March, this membership directory has been formatted for easier, quicker referral. A full alphabetized member listing is included, along with a Society listing of members categorized by Federation designation and company affiliation. This should make the directory a more useful guide for our membership. To signal the value of the *Year Book* (and highlight a benefit of membership), the Board of Directors approved an increase in the cost for non-members to purchase the membership directory—from $25 to $150.

The membership data for the *Year Book* was provided, for the first time, from the Federation's new computer system. The computer files have been updated to reflect the changes shown on Society rosters.

The *Year Book* is nearly 200 pages over the 1995 edition. While we feel the additional listings provide a greater service, they also increased production and mailing costs. Some changes, for example in page size, are being considered for next year to reduce these costs.

Coatings Encyclopedic Dictionary—Published in January, sales continue to be strong. Of the 508 copies sold to date, 303 have been in the hard cover version and 205 in the soft cover. Copies of the *Dictionary* have been sent to all major chemical, coatings-related, and affiliated publications for review. Favorable reviews will be incorporated in future marketing efforts.

Monograph Series—By the Board of Directors meeting, 23 monographs will have been published in the Series; the most recent being "Silicones in Coatings" in April. Three others are in production: "Methodologies for Predicting the Service Lives of Coatings Systems," "Adhesion Aspects of Polymeric Coatings," and "Finishing Exterior Wood." Release of these booklets is anticipated for spring.

Panorama—Production costs have remained stable. To date, there are 93 subscribers to the System, which has nearly 26,000 MSDS records in place. Support by suppliers in sending revised MSDS for inclusion in the System has diminished somewhat and we are exploring ways to address this. Panorama and Sci*Quest* were demonstrated at a meeting of the Detroit Society in November and at the Federation booth at the 1995 Paint Industries' Show.

Publications Committee—The FSCT Publications Committee met March 6-7, in Baltimore. The Committee reviewed the proposed changes to the FSCT and examined the impact of these changes on the Federation's publication efforts. The Committee established overall objectives: to help all individuals to do their job better; to grow the Federation globally; to define publications broadly to include books, videos, CD-ROM offerings; to be the pre-eminent source of technical information on coatings and on the coatings industry; to make publications the prime mode of communication with members and others in the industry; to be financially profitable; and to maintain the viability of all FSCT publications. Some suggestions for implementing these objectives were made, and will be discussed in detail at the next meeting.

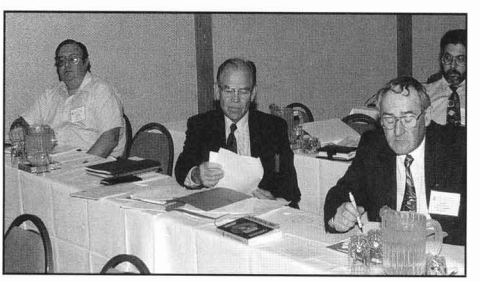
To contribute to the future strength of the Federation, the Publications Committee will explore ways of becoming a profit generator for the organization. In upcoming meetings, the Committee will develop a proposal on how the FSCT publications area might operate as a profit center.

The Committee proposed topics for a JCT editorial calendar for 1997. Also discussed was the possibility of developing co-marketing opportunities with other associations/publishers if it is determined that these other groups offer publications which would be of interest to FSCT members.

At this meeting, F. Louis Floyd announced that he would not be able to fulfill his tenure as Chairman of the group. A new Chairman will be named in the near future.

The next meeting of the Publications Committee will be held on June 7, 1996 in Pittsburgh, PA.

JCT Editorial Review Board—A meeting of the Editorial Review Board is scheduled for June 7-8, 1996 in Pittsburgh. Chaired



by Dr. Robert F. Brady, of U.S. Naval Research Labs, the membership of the Review Board remains at 22.

Editorial Staff—In March, Tina Vogel joined the publications department staff as Editorial Assistant. She will be primarily responsible for maintaining the manuscript tracking of the JCT as well as providing editorial support for all Federation publications. Tina replaces Mary Evangelisto, who resigned from the FSCT in February.

PATRICIA D. VIOLA
Director of Publications

Director of Marketing Pollock

1996 INTERNATIONAL COATINGS EXPO AND TECHNOLOGY CONFERENCE

A global marketing campaign was developed to market the FSCT's Expo and Technology Conference. The most important challenge was to keep the FSCT's image connected to the Expo, while maintaining the financially historical success of the "Paint Show." Second, to market the Expo and Conference as separate, but concurrent and related Federation events.

Marketing activities include ads, news releases, an article, announcement mailers and registration mailings, developed to attract exhibitors and attendees. All CSI organizations were contacted, as well as industry-related organizations and magazines for international coverage.

Twenty-two ads will appear in 14 magazines, beginning with the April issue of the JCT. Magazines represent Germany, Belgium, Australia, Scandinavia, New Zealand, Asia and others in the coatings, adhesives, and ink industries. Reciprocal agreements with eight publishers have resulted in exhibit space in exchange for advertising which will appear around the world. CSI organizations have agreed to carry Expo ads gratis, or send us ads for their events as part of an exchange.

A news release has been sent to 58 related industry organizations, magazines and all CSI organizations, announcing the new name and format of the Expo and Technology Conference.

In early April, announcements for the Expo and Technology Conference will be sent to 50,000 potential attendees. Respondents will be able to obtain details via the Federation's phone, fax and a new fax-on-demand service. A newly-installed fax-on-demand service will be made available to inquirers worldwide. A full registration brochure is currently being developed to fulfill inquiries from the announcements. A summer mailing of the brochure, with an updated list of exhibitors will be mailed out to FSCT members, and will appear in a summer issue of the JCT.

An article written by Bob Ziegler will appear in the NPCA's April issue of *Coatings* under "Viewpoint."

COATINGS ENCYCLOPEDIC DICTIONARY

Updated for the first time since the original printing in 1978, a comprehensive 17-month marketing plan was developed for the *Coatings Encyclopedic Dictionary*. The campaign includes advertising and mailings, both here and abroad. Multiple ads have been placed in nine magazines and 3 mailings have been sent to members and non-members.

Ongoing mailings to FSCT members, non-members, and other groups such as libraries, colleges and bookstores round out the campaign, using self-mailers and postcards.

To date, approximately 500 dictionaries have been sold, with FSCT members representing 85% of sales. The most successful activity was a "pre-printing" mailing offer to FSCT members in August 1995 which brought in 253 sales. JCT ads represent 17% of sales, with 85 dictionaries sold.

The next mailing will drop by mid-April to FSCT members, using a four-color photo of the dictionary which will appear on a postcard, to give the marketing campaign a fresh look. Currently, development of a combination offer is being discussed, combining a discount on a second FSCT publication, such as the Infrared.

PUBLICATIONS ADVERTISING

Last August, a national advertising representative was retained to increase advertising income in the JCT, the *Year Book* and the *Program Book*. FSCT staff and the new ad rep collaboratively produced a new media kit for 1995. This new kit not only had a totally new appearance and a new rate schedule, but included, for the first time, an editorial calendar.

Although many ideas offered by the ad rep were implemented, there was a total lack of responsiveness to FSCT reporting requirements and, combined with disappointing advertising results, the relationship was terminated in December. As an interim step, FSCT staff has been contacting potential advertisers directly with very good results. In the first quarter of 1996, over $40,000 in income has been realized, compared to $26,000 in the same period in 1995. Discussions are currently underway on how to successfully approach publication advertising in the future.

A new Publications Committee met for the first time in early March. Working with FSCT staff, an editorial calendar for 1997 has already been developed. Currently, the kits are expected to be made available on or before the 1996 Expo, giving us timely, competitive edge.

Phone calls have also begun to potential advertisers. Expo exhibitors are part of the first "wave," along with companies producing products or equipment that correspond to upcoming topics in the FSCT editorial calendar.

PAN-AMERICAN COATINGS EXPO

Marketing includes several mailings to potential exhibitors and a news release sent to other industry-related organizations and magazines. Additionally, negotiations are currently under way with a publisher of a Latin America industry magazine. A reciprocal agreement has resulted in advertising support in exchange for a booth space. Currently, discussions are also under way for a Program Book.

PORTABLE DISPLAY FOR FSCT

A portable, "telescopic" display has been purchased for the Federation to use when exhibiting at conventions. This display will be used for the first time at the Philadelphia Society's Conference and Show on May 8-9, followed by the Asia-Pacific Show in Hong Kong on June 5-6, and the Pan American Coatings Expo in Mexico City, August 15-17. Currently being designed, the graphics will be straightforward, depicting the Federation's purpose.

SCI-*QUEST*

FSCT continues to support this educational product through advertising, a news release, demonstrations, mailings, fulfillment and regular reports containing sales and inquiries. A demonstration was conducted in the FSCT's booth at the 1995 Paint Show. Demo discs were provided for incentive, and over 100 have been sent out to date. Ads have been placed in every issue of the JCT since late last year, and two mailings, total of 736 names, have been sent to colleges, universities and libraries. Inquiries are sent regularly to Consolidated Research for follow-up. To date, over 350 inquiries have been processed, with 31 Sci-*Quest* CD-ROM disks sold as of March.

LYN POLLOCK
Director of Marketing

Nominations

The Nominating Committee is proud to place the names of the following individuals into nomination for the 1996-97 Officers, Executive Committee, and Board of Directors positions of the FSCT.

President-Elect—Thomas E. Hill (Western New York Society), The Sherwin Williams Co., Buffalo, NY (one-year term)

Secretary-Treasurer—Forest Fleming (Piedmont Society), Akzo Nobel Coatings Inc., High Point, NC (one-year term)

Executive Committee—Terry Gelhot (St. Louis Society), Carboline Co., St. Louis, MO (three-year term)

Board of Directors/Members-at-Large—Donald Boyd (Pittsburgh Society), PPG Industries, Inc., Allison Park, PA (two-year term);

George R. Pilcher (CDIC Society), Akzo Nobel Coatings Inc., Columbus, OH (two-year term)

Board of Directors/Past-President Member—A. Clarke Boyce (Toronto Society), Oakville, Ontario (two-year term)

M. Jay Austin (Chicago Society), current President-Elect, will assume the Presidency on October 25 in Chicago, Illinois.

I would like to thank all of the members of the Nominating Committee for their participation: John Ballard (Louisville/Southern), Brenda L. Carr (Cleveland), F. Louis Floyd (Baltimore), and William M. Hollifield (CDIC).

JOSEPH P. WALTON
Chair

(Elections will be held at the Fall Meeting of the Board on October 22, 1996, in Chicago.)

Annual Report

on Statement of Income and Expense for Year Ending December 31, 1995

The following Statement of Income and Expense for the year ending December 31, 1995 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, 1995
Final—Audited

ASSETS	YTD 1994	YTD 1995
Current		
Cash	15,216	139,506
Investments-Mellon Money Market	77,292	79,780
Hendry Southern Soc. Mem. Award	25,000	25,000
Accounts Receivable - Trade	57,264	62,071
Inv- Infrared Spec. Books (12/31)	97,632	94,180
Accrued Interest Receivable	0	2,723
Prepaid Expense	59,220	99,135
Prepaid Expense—Show Rent	14,500	38,200
Prepaid Expense—Life Ins. Premium	9,964	11,541
Prepaid Pension Expense	67,910	0
Total Current Assets	423,998	552,136
Non-Current		
Investments - Mellon Bank	1,192,712	201,040
Investments - Vanguard MM Prime Portfolio	121,656	3,792
Investments - Vanguard Life Strategy & Stocks	0	718,160
Investments - Vanguard Allowance	0	39,763
Land	287,478	287,478
Building: Net of Depreciation	1,128,446	1,086,758
Furniture & Equip., at Cost, Net of Accum. Depreciation	61,464	53,321
Computer Equipment.	306,160	404,164
Res. for Depreciation: Computer Equipment	<146,369>	<180,613>
Total Non-Current Assets	2,951,547	2,613,863
Other Assets		
Advances & Deposits	6,862	6,862
Value - Deferred Compensation	141,337	148,313
Total Other Assets	148,199	155,175
Total Assets	3,523,744	3,321,174

LIABILITIES AND FUND BALANCE	YTD 1994	YTD 1995
Current		
Accounts Payable-Trade	102,722	170,383
Accounts Payable-Hendry Award	32,418	32,463
Accounts Payable-Tenant Sec. Dep.	7,611	0
Accrued and Withheld Taxes	807	839
Mortgage Payable	100,000	100,000
Pension Liability (Defined Benefit)	0	46,819
Sales Tax Payable	52	21
Deferred Income	550,118	511,813
Total Current Liabilities	793,728	862,338
Non-Current		
Deferred Income	8,371	4,333
Deferred Compensation Liability	34,666	24,000
Mortgage Payable	141,666	41,666
Total Non-Current Liabilities	184,703	69,999
Total Liabilities	978,431	932,337
Fund Balance	2,545,313	2,388,837
Total Liabilities and Fund Balance	3,523,744	3,321,174

Statement of Income and Expenses
(1994 Final, 1995 Final, 1996 Operating Budget)

Income	1994 Final	1995 Final	1996 Budget
Publications	615,303	596,171	895,500
Dues	46,545	46,882	60,000
Conventions & Trade Shows	1,943,542	1,970,354	2,420,000
Other Educ. Activities.	29,258	49,240	20,000
Other	77,830	181,361	96,000
Total Income	**2,712,478**	**2,844,008**	**3,491,500**

Expenses	1994 Final	1995 Final	1996 Budget
Headquarters/Admin.	1,056,124	1,288,808	1,345,000
Publications	1,067,048	820,792	910,200
Conventions & Trade Shows	560,328	494,241	841,200
Officers/Board/Comm.	180,763	218,234	212,000
Educ. Activities	387,190	128,079	162,600
Other	57,466	50,330	20,500
Total Expense	**3,308,919**	**3,000,484**	**3,491,500**

(signed) Darlene Brezinski, President, FSCT
(signed) Thomas Hill, Secretary-Treasurer, FSCT

Review of Actions of the Executive Committee

OCTOBER 10, 1995

That an Ad Hoc Industry Relations Task Force be created to review past and current cooperative activities with allied industry groups and to make recommendations regarding potential future activities.

That a Strategic Planning Task Force meeting be held December 11-12 in Philadelphia to include the Officers and Past-Presidents and Member-at-Large members of the Board of Directors, and Staff.

(On a motion by Mr. Geiger, seconded by Mr. Gough, the actions for October 10, 1995 were unanimously approved.)

JANUARY 17-18, 1996

That, following adjustments to the 1996 Operating Budget, it be balanced at $3,491,500.

That the Investment Committee investigate the possibility of paying off the building loan early, and that the Federation do so if it is in its best interest.

That, in consideration of staff's recommendation, the proposal to provide Federation contributions to staff 403b pension accounts, be tabled.

That the nomination to Federation Honorary membership of Victor M. Willis, by the Chicago Society be approved and returned to the Society for further action.

That the non-member sale price of the FSCT Annual Membership Director (*Year Book*) be increased to $150 per copy.

That staff short-term efforts be directed primarily to increasing advertising revenue, dictionary sales, and exhibit promotion, and that long-term efforts be directed to establishing overseas promotional activities.

(On a motion by Mr. Evener, seconded by Mr. Evans, the actions for January 17-18, 1996 were unanimously approved.)

May 3, 1996

That the Federation discontinue accepting new subscriptions and renewals while staff investigates the continued viability of Panorama.

That the Federation's grant to CIEF be paid on a quarterly basis.

(On a motion by Mr. Geiger, seconded by Mr. Holmes, the actions for May 3, 1996 were unanimously approved.)

Coatings Industry Education Foundation

The Joseph A. Vasta Memorial Scholarship in Coatings Science—The Joseph A. Vasta Scholarship for 1995 was awarded to Scott Greer of the University of Missouri-Rolla. The 1996 scholarship will go to a student at California Polytechnic State University. Contributions to the Vasta Fund in 1995 totaled $4,500; donations from inception through December 31, 1995, amount to $60,833. Since the interest earned by the fund falls short of the $2,500 scholarship, the Trustees again voted to provide the needed supplement from CIEF general funds.

Transfer of the Ernest T. Trigg Foundation to CIEF—The control of the funds from the NPCA Trigg Foundation, now in the amount of $117,689, is in the hands of the CIEF, although legal ownership of the Foundation has not yet been transferred. The fund value cited above includes recent transfers of stock holdings valued at over $19,000. The increased dollar value of the Foundation should ultimately provide enough income to fully support the two scholarships without supplementation. Disposition of the stock remains to be decided.

The 1995 recipients of the Trigg Scholarships were Victor Vilchiz of California Polytechnic State University and Catherine Schoen of Eastern Michigan University. The recipients for 1996 will be students from North Dakota State University and The University of Missouri-Rolla.

The Coatings Industry Honor and Remembrance Fund—The Coatings Industry Honor and Remembrance Fund, which was established in 1992 at the suggestion of Colin Penny, totaled $20,489 at the end of 1995. Donations in 1995 amounted to $2,100, which brings total contributions since inception to $19,230. The Trustees will address additional ways to make this fund truly an Honor and Remembrance Fund by emphasizing its value as a way to recognize and honor living members of the industry who have made valuable contributions to our profession as well as to eulogize deceased members.

Review Schedule for Recipient Schools—To assure the effectiveness of the coatings programs at the various institutions receiving CIEF financial support, each school is visited on a periodic basis by one (or more) Trustee who appraises the program on site. The 1995 and 1996 visitation schedule program is given: North Dakota State University—G.R. Pilcher (1995); University of Missouri-Rolla—S. Lauren (1995); California Polytechnic State University—G.R. Pilcher or S. Lauren (1996); and DePaul University—D. Boyd (1996).

Note: To minimize costs to CIEF, these visits are scheduled with other business or personal travel, which can affect timing.

Educational Grants for Academic Year 1996-97—Requests for funding for 1996-97 totaled $186,325, which was $129,325 greater than the amount the CIEF Trustees could provide, namely $57,000. This response represents a refusal rate of 69%. Fortunately, the Trustees were able to provide an additional $7,500 in the form of the ongoing (1) Vasta and (2) Trigg Scholarships, which brings the total of CIEF grants to $64,500. This shortfall reflects CIEF's current financial situation rather than the merit

of the programs or their needs. The following table summarizes the funding requests and the CIEF dollar commitments:

Educators Luncheon at the Annual Meeting—At the St. Louis Annual Meeting of FSCT, the CIEF Trustees held the Annual Educators Luncheon. Since all the universities are represented by a coatings faculty member, the luncheon provides a forum where the Trustees and Educators can get to know each other and discuss mutual concerns. At the St. Louis luncheon, the educators were more fully apprised of CIEF's funding problems and indicated their willingness to support funding initiatives where appropriate. Another luncheon is planned for the October 1996 Annual Meeting in Chicago.

Strategic Planning—The past year has seen several discussions of CIEF's future with FSCT officers and management. The outcome of these discussions, namely the need to become at least partially self-sustaining, generated additional strategic planning discussions among the Trustees. A revised mission statement has been formulated and fund raising initiatives considered, encompassing everything from a major campaign to more modest approaches. The Trustees have decided that CIEF does not have the manpower or financial resources to mount a major campaign so a more modest approach has been selected. Our campaign will consist of at least two phases, one directed to corporations and another directed to individuals. A tentative dollar amount has been designated as CIEF's goal for funding capability. The initial phase will address potential corporate sponsors requesting a nominal annual donation with a commitment for five years, and the option to renew if the arrangement is satisfactory to them. The initial steps to implement this approach are currently underway.

Recommendations for Appointment to the Board of Trustees—Two Trustee terms will expire at the end of 1996. Candidate recommendations are being formulated for submission to Jay Austin, the President-Elect of the FSCT. The present status of CIEF and the goals it must accomplish will be considerations in this process.

MARY G. BRODIE
CIEF President

Society Business

Pacific Northwest — President Brezinski thanked the Society for its hospitality in hosting the FSCT's 1996 Spring Week events.

Dallas/Houston— Mr. Holmes noted that the Societies had taken advantage of the FSCT's Distinguished Lecture Series

Coatings Industry Education Foundation—Type of Request

Institution	Capital Grant	Scholarship	Fellowship	Research Grant	CIEF Commitments
De Paul University	—	—	$8,000	$2,000	$8,000 Fellowship
California Polytechnic State University	$24,000	$6,500	—	—	$6,000 Scholarship $2,500 Vasta Scholarship
University of Missouri-Rolla	—	$16,500	$12,000	—	$10,000 Scholarship $2,500 Trigg Scholarship
University of Southern Mississippi	—	$20,000	$12,000	—	$10,000 Scholarship
North Dakota State University	$25,325	$15,000	$12,000 $10,000	— Special	$10,000 Scholarship $25,000 Trigg Scholarship
Eastern Michigan University	—	$18,000	$5,000	—	$13,000 Scholarship
Kent State University	—	—	—	—	No request
Sub-Totals	$49,325	$76,000	$59,000	$2,000	

Scholarships: $49,000
Fellowships: $8,000
Capital Grants: None
Research Grants None
Vasta Scholarship: $2,500
Trigg Scholarship: $5,000
$64,500

TOTAL FUNDS REQUESTED: $186,325
TOTAL FUNDS PLEDGED: $64,500

and urged other Societies to schedule a speaker from the FSCT at the earliest opportunity by contacting the FSCT Headquarters.

Piedmont— Mr. Fleming urged Societies to speak with the management of coatings companies to best gauge their interests and what activities Societies could provide.

Western New York— Mr. DePietro advised that with the closure of the Pratt & Lambert facility, the Society has lost a significant portion of its membership with no prospects for growth. At a recent meeting the members voted to disband the Society.

(On a motion by Mr. Holmes, seconded by Ms. Lein, the Board unanimously approved the dissolution of the Western New York Society in accordance with the Bylaws.)

(On further study, Mr. Anwari, Chair of the Bylaws Committee noted that the dissolution of a Society, while not specifically addressed in the FSCT Bylaws, should follow the procedures set for the establishment of a Society, i.e., 90-day advance notification of surrounding Societies, etc.)

Other Business

NPCA Coatings Care® Program

Mr. Doyle presented an overview of the Coatings Care® Program being developed by the National Paint & Coatings Association. The Program offers to NPCA member companies conformance guidelines which complement those offered by the CMA's program.

Ad Hoc Industry Relations Task Force

Dr. Rose Ryntz, Chair of the Ad Hoc Industry Relations Task Force presented the group's report and recommendations.

(On a motion by Mr. Holmes, seconded by Ms. Lein, the Board accepted the report and forwarded it to the Executive Committee for its consideration.)

Strategic Planning Discussions

Each strategic planning proposal was reviewed by Board Members to determine if there was consensus in moving forward with these proposals. Board members were polled and a straw vote was taken to determine attitudes and opinions. Board members were encouraged to provide feedback from the Society discussions in which they participated prior to this meeting.

Membership

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

(1) A common membership year will be adopted by all Societies.

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

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

(2) Current membership classifications (Active, Associate, Retired, Educator/Student) will be retained but membership criteria will be kept to a minimum.

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

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

(3) New members may be accepted at both national and local levels.

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

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

(4) To allow Federation headquarters to invoice and collect individual annual membership dues and to maintain Society membership rosters.

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

- *Board response: All 36 in favor.*

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

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

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

(5) To increase and improve programs and services and develop targeted membership promotional programs.

- *Board response: All 36 in favor.*

Organizational Restructure

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

(1) To reduce the size of Board of Directors to 12-15 individuals. The restructured Board would include the three Officers, an FSCT Past-President, and 8-11 Society Representatives.

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

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

Board duties is seen to be critical, especially regarding Bylaws approval.

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

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

(2) THE BOARD WOULD MEET AT LEAST FOUR TIMES ANNUALLY.

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

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

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

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

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

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

(5) TO REDUCE THE NUMBER OF FEDERATION COMMITTEES.

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

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

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

- *Board response: All 36 in favor.*

COMMON INTEREST GROUPS

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

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

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

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

It was agreed that further discussion is required.

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

- *Board response: All 36 in favor.*

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

- *Board response: All 36 in favor.*

(5) THAT WHEN THEY HAVE ACHIEVED SPECIFIC GROWTH GOALS, THE CIG WOULD HAVE REPRESENTATION ON SOCIETY REPRESENTATIVES COUNCIL.

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

Although not specifically detailed at the February Board meeting, the possibility of CIG representation has been the subject of discussion. On the negative side, some Societies saw this as a potential threat, that CIGs could become more powerful than Societies. On the positive side, representation is seen as enhancement rather than as a threat. Council representation would serve as an incentive for a growing, successful CIG to remain within the FSCT and not splinter off as separate group.

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

- *Board response: All 36 in favor.*

(7) THAT CIGS MUST BE SELF-SUSTAINING.

- *Board response: All 36 in favor.*

Committee Reports

1996 Annual Meeting Host

Below you will find a timeline and status report for the Host Committee for the 1996 International Coatings Expo and Technology Conference.

Timeline—BY OCTOBER 1995: Select six subcommittee chairs for various areas (Information, Program Operations, Registration, FSCT's Exhibit, Hospitality Suite of FSCT, and Social Guest Program).

The following personnel head the subcommittees:

Registration	William W. Fotis
Information	Natu Patel
Hospitality	Thomas P. Yates
Technical Programs	Karl Schmidt
Spouse Committee	Debra L. McWright
FSCT Exhibit	Victor M. Willis

*BY MAY 1996: Have volunteers required for subcommittee responsibilities selected and scheduled.

Solicitations have been made at our monthly meetings and through our mailings for volunteers. At an upcoming meeting for photos, we will map out plans for volunteer assignments.

Next Steps—BY SEPTEMBER 1996: Reconfirm all scheduling assignments and forward schedule to FSCT staff.

We also need to decide on a clothing item to identify all volunteers at the convention and expo.

These are our activities and plans to date. If you have any questions, comments, or suggestions, please feel free to contact me.

GREGORY E. MCWRIGHT
Chair

Annual Meeting Program

The 1996 Annual Meeting Program Committee held its initial meeting on September 20, 1995, at the O'Hare Hilton Hotel in Chicago, IL. The committee was faced with the challenge of designing this year's technical program under a new format approved by the FSCT Executive Committee at their August meeting. The annual program even has a new name – *"International Coatings Technology Conference."* The committee viewed this change as a new and exciting opportunity to bring the technical program to the forefront at the Annual Meeting.

The committee determined the following factors as "key" to the success for the new program format: Program Theme; Planning Timeline; Program Format; and Marketing for the event.

Program Theme—*"Insights and Innovations"* was chosen as the theme for the 1996 program. The committee felt this theme was best suited in expressing the new design of the program in a very simple yet effective way.

Planning TimeLine—The committee felt the following timeline was attainable and necessary if the new format was to be a success:

Initial Committee Meeting	September 1995
Program review/approval deadline	December 15, 1995
Deadline for session abstracts	January 15, 1996
Deadline for session outlines	March 15, 1996
Outline review by committee deadline	April 15, 1996
Tentative program in place	May 1, 1996

Program Format—After review of potential educational formats, the committee settled on six one-day programs on Tuesday, October 22, 1996, and four two-day programs on Wednesday and Thursday, October 23-24, 1996. Each session was developed to target a specific type of audience and meet required learning objectives for all attendees. The sessions selected were designed to appeal to various levels of coating industry professionals while also having universal industry application to draw on parallel industries such as inks and adhesives.

Sessions topics tentatively scheduled to date:

One-Day Seminars (Tuesday, October 22, 1996)
- -Surfactant Chemistry
- -Winning Technical Presentations
- -Effective Technical and Scientific Writing Workshop
- -Design of Experiments
- -Spray Application
- -Technology Assessment (Executive Forum)

Two-Day Seminars (Wed. & Thurs., October 23-24, 1996)
- -Substrates and Coatings
- -Coatings Characterization
- -Polymer Chemistry
- -Back to Basics in Coatings Chemistry

At the same time the committee did not lose sight of the historical value of the Roon, APJ/Voss, Mattiello Memorial Lecture, Technical Focus Lecture, and International Papers. These lectures and papers will remain a part of the program and will be open to all Conference participants as well as Expo attendees.

A Conference fee schedule was also recommended by the committee since the technical program will now be held in conjunction with the Exposition. The committee felt that allowing the Conference attendees free access to the Expo would also be a way of attracting that section of our membership, as well as other industry professionals, that would be interested in the technical program but do not normally attend the Paint Show.

Marketing for the event—The key to success with anything new or different is the way it is presented. The committee felt strongly that since the technical program was now separate from the Expo, it would require its own marketing program if it was to be a success. This was the main reason the earlier timeline was established, so as to allow more time to properly publicize the program changes. To date several news releases have been sent out highlighting the newly formatted convention programming.

Since our initial meeting in September 1995, the committee has met twice—November 1995 in Chicago and January 1996 at FSCT Headquarters—and three times via conference call. To date we are on schedule per the timeline and should meet the May 1, 1996, deadline for finalizing the program.

The committee is very excited and anxious about the 1996 International Coatings Technology Conference and feels the changes have been long overdue. Our committee mission statement is to meet the educational needs of our members while contributing to the overall success of the Annual Meeting. The format of this year's program should provide the "Insights and Innovations" required to meet our mission goal for 1996 and be a guide for the success of future annual programs.

STEVE A. HODGES
Chair

Armin J. Bruning Award

Nominations for the Armin J. Bruning Award were solicited through a number of channels with a receipt of nomination deadline of May 17, 1996. One nomination has been received to date. It is expected that the Committee will make its decision at the end of May.

ROBERT T. MARCUS
Chair

Corrosion

The Committee last met on January 30, 1996, in Blue Bell, and plans to meet again in June 1996. The following is a summary of current committee projects:

Corrosion Exposure Test Project—The FSCT Corrosion Committee is following and overseeing a project being performed by the Cleveland Society Technical Committee. The goal of this project is to determine how various accelerated corrosion test methods (e.g., salt spray, immersion, Procession®) correlate with exterior exposures. The project is in its third and final year. The results following two years of exterior exposure were statistically analyzed and indicated some correlation between exposures. The most recent results were presented by the Cleveland Society at the 1995 Paint Show in St. Louis and are being prepared in a paper for publication in the JOURNAL OF COATINGS TECHNOLOGY. Following the completion of all the exposures and the appropriate analysis of data, a final presentation and paper detailing the results and conclusions will be prepared. This information will provide essential guidance to those doing accelerated and real-world exposures of coatings.

Monograph—The Corrosion Committee has initiated an effort to prepare a monograph entitled "Methodology for Assessing Corrosion Inhibiting Performance of Coatings" to be part of the *FSCT Series on Coatings Technology*. The objective of this monograph is to provide specific guidelines and rationale for selecting and/or designing corrosion testing of organic coatings. Dr. Richard Granata, Lehigh University, has started to author the monograph based on a detailed outline which was previously prepared. A "first draft" of the document is due to be completed by April. Following a series of reviews

and editing, it is expected that a copy of the manuscript will be submitted to the editors of the monograph series by October 1996.

1996 International Coatings Technology Conference (ICTC)—The Corrosion Committee once again will be contributing to the FSCT annual technical gathering, which will be in a new format this year. The Committee will be participating in the Coatings Characterization Program of the Conference. This program will be a two-day event, with the second afternoon dedicated to characterization of coatings using electrochemical impedance spectroscopy (EIS). Drs. Richard Granata and Peter Kamarchik, both members of the Corrosion Committee, will be providing basic information about the technique and its capabilities, as well as real-world case studies in which the technique has been applied to advance the understanding of coatings technology.

Corrosion Committee Publication Award—Last year the award was won by Drs. Molly Moon and Brian Skerry for their excellent paper entitled "Interpretation of Corrosion Resistance Properties of Organic Paint Films from Fractal Analysis of Electrochemical Noise Data."

The Corrosion Committee has requested that the Planning Committee consider a revision to the rules for the award. Currently, the selection process of eligible papers is from those that have been published in the JCT over the previous 12 months. It has been requested that the award be changed by soliciting papers specifically for award consideration. It is felt that this change will increase the quantity and quality of corrosion-related papers. In addition, the Corrosion Committee is considering obtaining individual or corporate sponsorship for the award to increase its value and stature.

Interaction with Corrosion-Related Organizations—The Committee continues to maintain contact with the following organizations: NACE International, Steel Structures Painting Council (SSPC), American Society for Testing and Materials (ASTM), American Chemical Society (ACS), and the Electrochemical Society. A plan is being established to promote even closer ties and cooperative efforts between the coatings-/corrosion-related efforts within these societies and the FSCT Corrosion Committee.

CHARLES R. HEGEDUS
Chair

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 on Friday, October 27, 1995, in Toronto, Ontario, Canada. Results and updates of our activities are detailed below.

Coatings/Science Resource Binder—The binder, "Presenting Science Through Coatings: A Spectrum of Possibilities," has been sent to over 130 individuals as a result of promotional endeavors. The contents of the loose-leaf notebook include short-term experiments, research ideas, and a section on how to serve as a mentor for a student. This binder is intended to be ongoing, with additional materials added by our members. It is intended to serve as a reference tool to help our members

with their local school programs. Our committee will be reviewing evaluations made by kit users at subsequent meetings. Overall, the feedback from the kits has been positive. This kit is available to all FSCT members at no cost. Contact the Educational Department at FSCT headquarters.

Society Speakers Program—The Society Speakers Program is now being implemented to increase the attendance of local Societies' monthly meetings. The JCT, in the January 1996 issue presented the four FSCT-sponsored speakers available. They are Dr. Kenneth Hoy, Dr. John L. Massingill, Jr., Mr. Sam Morell, and Dr. Richard R. Eley. Travel expenses are picked up by the FSCT. Societies who have taken advantage of these outstanding speakers have not been disappointed. As noted before, the Pittsburgh Society reported a 40% increase in attendance when Dr. Eley spoke on rheology. The list of notable speakers is intended to be updated with different speakers added to the list. If you're looking for a notable speaker to boost your attendance, contact Mike Bell at FSCT headquarters.

The Southern Society A.L. Hendry Award—This annual award emphasizes undergraduate work and increases interest by also rewarding the sponsoring lab. The winner receives $1,000 and expenses covering attendance at the FSCT International Coatings Expo and Technology Conference in Chicago, IL., October 23-25, 1996. In addition, the laboratory of the sponsoring school will receive a grant of $500. An announcement has gone out for student papers to compete for the 1996 A.L. Hendry Award. Our committee is working hard to increase participation. Entries will be discussed at the next ECC meeting.

FSCT Small Society Scholarship Program—The ECC awarded eight Societies with matching funds for their educational activities. Support is limited to $400 per Society with the focus being on assisting the small to medium Societies and sections of Societies that have limited funds available for educational efforts, including scholarships and grants.

FSCT Technical Focus Award—The Technical Focus Award speaker will initiate the technical portion of this year's Annual Meeting. This award recognizes 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 is currently managing this program, with members from the ECC, Professional Development Committee, and the Technical Advisory Committee. The committee selects each year's recipient in the spring.

Distance Learning Center—At our last meeting in Toronto, we toured George Brown College's Distance Learning Center. We were shown examples of the various types of equipment, and the limitless ways information can be disseminated via television. The presentation began with an explanation of how

the need for this type of technology materialized and why it is beneficial. Using this electronic technology, more people can receive the latest information, despite being in diverse geographical regions. The committee is currently evaluating how we can best use this technology to benefit the members of the Federation.

Full Educational Committee—As of late March, the tentative date set for the meeting is August 6-7, 1996, in Pittsburgh, PA. We hope the change from the traditional June dates to August will increase participation by the Society Educational Chairpersons. The ECC will be working hard prior to the meeting to implement a program based upon ideas developed during last year's brainstorming session.

Next Meeting Date and Location—The next meeting of the FSCT Educational Coordinating Committee will be held on Friday, April 19, 1996, in Chicago.

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

MELINDA K. RUTLEDGE
Chair

Inter-Society Color Council

There has not been a program involving the FSCT and the ISCC since the fall of 1995.

The ISCC annual meeting will be held in Orlando, Florida, May 5-7. An ASTM symposium and E-12 meeting will follow on May 8-10. The Doubletree Guest Suites resort at the Walt Disney World Village is the meeting hotel.

RALPH STANZIOLA
Chair

FSCT/NPCA Manufacturing Management

The Committee met in Charlotte, NC, March 6-8, 1996. We were invited to tour the Valspar Corporation Plant in Statesville, NC. This plant is new and has been in operation for approximately one year. It produces latex architectural coatings and utilizes a single-floor mezzanine platform. It is a very impressive state-of-the-art factory/warehouse.

Approximately 50% of the membership of the NPCA Committee has resigned. Some of the reasons include company consolidation, expense budget reductions, members leaving the industry, and members' company's no longer members of the NPCA. It was agreed that the charter would be amended to allow manufacturing executives of raw material suppliers to join the Committee. It was also agreed to invite members of the Mexico and Canadian Paint Associations in an effort to recruit new resources.

The Committee is in the early stages of planning a one- or two-day seminar for the 1997 International Coatings Exposition. The general topic for the workshop/seminar will evolve around updating an old paint plant and/or workforce for the year 2000. Those companies planning a major or minor renovation will be the target audience.

The Committee is evaluating recommendations for the recipient of the Golden Impeller Award, which is given annually by Morehouse-Cowles. This award will be presented at the FSCT Annual Meeting in Chicago.

DON L. MAZZONE
Chair

Membership

The Membership Committee is aware of possible changes in the recruitment and admission of new members into the Federation so we are waiting on new guidelines before starting a new membership drive. While we wait for the Board to issue a definitive election process, we have concentrated on ideas of how to reduce the loss of members each year.

We hope to have a collection of ideas that we can present to the Federation Staff and publish a paper to all Societies. Some of the ideas that have come from the committee: (1) Each Society try to get on the same computer format so that, instead of sending in a membership list, a floppy disc containing the information would be sent to FSCT Headquarters. There would be less work for them and less possibility for errors, (2) We ask the various organizations that hold symposiums, meetings, or seminars for a copy of their attendee list so we can recruit potential members. We have started this with a list from the Waterborne Symposium in New Orleans. Horace Philipp is separating names from this to forward to the various Societies.

I spoke with Tori Graves, and I would like to make a mailing to our entire membership appealing for their help recruiting at least one new member in the coming year. The mailing would contain a letter from me requesting their help, a membership application, and a list of Society membership chairs.

We are compiling other ideas and hope to add them to any that might come out of Spring Week.

JEFF SHUBERT
Chair

Professional Development

The committee composition changed in 1995 as a result of term expirations imposed by "term limitations" to include Fritz Walker (Air Products, Philadelphia Society) replacing Roger Woodhull; Gail Pollano (Zeneca Resins, New England Society) filling a vacancy on the PDC caused by the death of Fred Schwab in late 1994; and Bernadette Corujo (Zeneca Resins, Philadelphia Society) replacing Carl Knauss. The PDC graciously acknowledges the work of the "retiring" Committee members.

The Professional Development Committee's (PDC) mission statement 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 1996: POLYMER CHEMISTRY FOR THE COATINGS FORMULATOR—is a newly created seminar intended for engineers, chemists, technicians, and technical service individuals involved in the coatings, inks, and adhesives arenas. The seminar will indoctrinate the attendee to basic polymer types utilized in the coatings industry, describing polymer make-up, reasons for selecting particular chemistries, and ways to achieve desired properties through resin selection. The attendee will also receive a broad overview of various testing methods used to determine film properties, e.g., thermal and mechanical test methods and hardness testing. 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 overview.

The Committee will also organize a session for the Annual Meeting in Chicago that will be similar in nature to the Polymer Chemistry for the Coatings Formulator and offered as a "tutorial" in a two-day program.

"COMPUTER APPLICATIONS IN COATINGS"—is also a newly developed course that was successfully beta-tested at the Annual Meeting in St. Louis last year. The course will include a general overview of the topic and presentations on various software packages including: Design of Experiments; Solvent Selection; and Formulation.

The courses defined above have been organized as a result of needs defined by the membership through a survey of the FSCT. In order to keep a "pulse" on the FSCT membership's changing job requirements, the PDC is also participating in developing a method to accurately define the FSCT's membership professional development needs. The media through which the needs are defined may be in the form of telephone solicitations, surveys, or Internet queries. In conjunction with providing a definition of professional development needs, the PDC is also examining the possibility of providing a "News Group" on the Internet.

ROSE A. RYNTZ
Chair

PDC Accomplishments for 1995

Goal	Proposed Rev*	Proposed Exp	Actual Rev*	Actual Exp
Mission Statement	Done			
Strategy Planning for FSCT August 30-31, 1995, Blue Bell, PA	Done			
Formulating for the Clean Air Act				
March 21-22, 1995, Cleveland	15K	11K	14,175K	7,765K
November 6-7, 1995, Denver	15K	11K		
Polymer Chemistry for the Coatings Formulator				
June 20-21, 1995, Chicago	15K	11K	29,365K	14,738K
Annual Meeting Session	Done			
Computer Applications in the Coatings Industry Plan to run twice at AM in St. Louis				
Total	45K	33K		

*Rev (all dollar amounts)

PDC Goals for 1996

Goal	Proposed Rev*	Proposed Exp	Actual Rev*	Actual Exp
Strategy Planning for Seminar Development	6K			
Submit plan to Executive Committee				
Internet "News Group" Implementation				
Polymer Chemistry for the Coatings Formulator	15K	11K		
Computer Applications in the Coatings Industry	15K	11K		
Annual Meeting Session Polymer Chemistry for the Coatings Formulator				
Total	30K	28K		

*Rev (all dollar amounts)

Note: The travel budget for the PDC should be increased to allow for airline reimbursement of at least one PDC member to act as moderator for each seminar.

Technical Advisory

The Technical Advisory Committee met on Friday, February 16, 1996, in Boston, MA, to discuss plans for the upcoming joint meeting with the Societies Technical Committee Chairs. The meeting was set for August 8 and 9 in Pittsburgh, PA. A presentation will be provided by Herb Johnston of Battelle on the Focus Industry Technology Transfer project (FITT), which "provides an opportunity for an industry trade organization or professional society to collaborate with the scientific and engineering experts of the federal laboratories." A tour will be given of the Bayer research facilities including plastic extrusion and compact disc coatings laboratories. Other activities will be a review of the new Speakers Award and APCJ/AF Voss Award judging forms and an evening reception.

The Technical Advisory Committee also drafted letters thanking individuals who gave presentations at the Paint Industries' Show in St. Louis and Societies that submitted papers for the APCJ/AF Voss Awards competition. The letters listed judges' comments so the feedback could be used for submissions to the JCT or for future entries.

Finally, a one-day symposium for the 1997 International Technology Conference was outlined. "Wood as a Coatings Substrate" will cover both natural and man-made wood products, the chemistry and deterioration of wood, and coatings systems for wood. The proposal will be submitted to the Joint Coatings/Forest Products Committee to gain their cooperation in the development of the program.

FREIDUN ANWARI
Chair

The next meeting of the FSCT Board of Directors will take place on Tuesday, October 22, 1996, at 9:00 am, at the Chicago Hilton & Towers, in Chicago, IL.

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Regulatory Update August 1996

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

Environmental Protection Agency
June 25, 1996 - 61 FR 32729
National Volatile Organic Compounds Emission Standards for Architectural Coatings
Action: Proposed rule

The Environmental Protection Agency (EPA) has published their long-anticipated proposed standards to reduce volatile organic compound (VOC) emissions from architectural coatings, as required under Section 183(e) of the Clean Air Act Amendments. The proposal would establish VOC content levels for 55 individual architectural coating categories, which are expected to take effect on April 1, 1997. The regulation is applicable to architectural coatings, with several exemptions, manufactured or imported for sale or distribution in the United States after that date. It is the culmination of several years of intensive discussions involving EPA and a broad array of interested parties.

The proposal offers companies several compliance options for meeting the regulatory requirements. Companies would be allowed to continue manufacturing higher VOC content paint by paying an "exceedance fee" on the excess VOCs. A low volume exemption would be established. And, under a variance provision, manufacturers would be able to apply for an extended compliance time if economic hardship would result from timely compliance.

EPA has specifically requested public comment in two areas: the anticipated costs associated with reformulation, and the coatings performance. Comments on the proposal must be submitted in duplicate to Air and Radiation Docket and Information Center (6102), Attention: Docket no. A-92-18, EPA, 401 M Street, S.W., Washington, D.C. 20460. Electronic copies may submitted by e-mail to: a-and-r-docket@epamail.epa.gov as an ASCII file. All comments must be received by August 30, 1996.

Electronic copies of the proposed rule are available on EPA's Technology Transfer Network bulletin board system, under the heading Clean Air Act Amendments, at (919) 541-5742. For additional information, contact Ellen Ducey, EPA, (919) 541-5408.

Environmental Protection Agency
June 20, 1996 - 61 FR 31668
Accidental Release Prevention Requirements: Risk Management Programs Under Clean Air Act Section 112(r)(7)
Action: Final rule

The EPA has promulgated regulations to prevent accidental releases of regulated substances and reduce the severity of those that do occur. The rules are applicable to all stationary sources with processes that contain more than a threshold quantity of a regulated substance, including industrial organics, paints, adhesives, sealants, and resins.

Processes will be divided into three categories based on the (1) potential for offsite consequences associated with a worst-case accidental release; (2) accident history; or (3) compliance with the prevention requirements under the Occupational Safety and Health Administration's Process Safety Management Standard. Processes that have no potential impact on the public in the case of an accidental release will have minimal requirements. For other processes, sources will implement a risk management program that includes more detailed requirements for hazard assessment, prevention, and emergency response.

The plans will be submitted to a central point specified by the EPA and will be available to state and local governments and the public. The regulations, which went into effect August 19, 1996, are intended to encourage sources to reduce the probability of accidental releases of substances that have the potential to cause harm to public and the environment.

EPA has issued several guidance documents (61 FR 31733) which include model risk management plans (RMP) to assist stationary sources in the development of risk management programs. The document "RMP Offsite Consequence Analysis Guidance" is designed to help sources comply with offsite consequence requirements without specific expertise or access to computer-based modeling tools. "Risk Management Plan Data Elements" details the type of information that would be submitted by each source as its risk management plan, including data on worst case and alternative releases for toxics.

To obtain copies of these documents, please fax requests to the Emergency Planning and Community Right-to-Know (EPCRA) Information Hotline at (703) 412-3333. Electronic copies are available through EPA's Technology Transfer Network bulletin board system, (919) 541-5742, or World Wide Web, http://www.epa.gov.swercepp/.

For additional information on "RMP Offsite Consequence Analysis Guidance," contact Craig Matthiessen, EPA, (202) 260-9781.

For information on "Risk Management Plan Data Elements," contact Dr. Lyse Helsing, EPA, (202) 260-6128. General information is also available by calling the EPCRA Hotline at (800) 535-0202.

For specific information on this rule, contact the EPCRA Hotline at (800) 424-9346 or Craig Mattheissen, EPA, (202) 260-8600.

Environmental Protection Agency
June 12, 1996 - 61 FR 29719
National Ambient Air Quality Standards for Ozone and Particulate Matter
Notice: Advanced notice of proposed rulemaking

The EPA has issued an advanced notice of proposed rulemaking indicating the agency's intention to combine the timing on whether to retain or amend the current national ambient air quality standards (NAAQS) for both ozone and particulate matter. A proposal on this topic will be published by November 29, 1996; a final rule is scheduled for mid-1997. EPA has decided to combine consideration of ozone and particulate matter standards because the agency has determined that the two pollutants share a number of common characteristics, including similar health affects associated with exposure to them. Among the key issues addressed by the agency are new alternative averaging times, forms and levels of the ozone standard, and amendments to the current requirements for particulate matter.

Electronic copies of this notice are available on EPA's Technology Transfer Network bulletin board system, (919) 541-5742. For further information on the notice, contact Dr. David McKee, EPA, (919) 541-5288. For more information on the particulate matter NAAQS, contact Dr. Jane Caldwell, EPA, (919) 541-0328. And for additional information on the integrated implementation strategy development process, contact Denise Gerth, EPA, (919) 541-5550.

Department of Transportation
Research and Special Programs Administration
June 14, 1996 - 61 FR 30175
Direct Final Rule Procedure; Petitions for Rulemaking
Action: Final rule

The Research and Special Programs Administration (RSPA) has announced the implementation of a new and more efficient procedure for adopting non-controversial rules. This "direct final rule" procedure involves issuing a final regulation providing notice and an opportunity to comment, which states that the rule will go into effect on a specified date without further publication of the text if the RSPA does not receive any significant adverse comments. If no adverse comments are received, RSPA will publish a subsequent notice in the *Federal Register* to confirm the effective date of the rulemaking. If adverse comments are received, the agency will withdraw the direct final rule before it goes into effect.

For additional information, call Nancy Machado, RSPA, (202) 366-4400.

Environmental Protection Agency
June 20, 1996 - 61 FR 31435
National Emission Standards for Hazardous Air Pollutants for Source Categories: Organic Hazardous Air Pollutants from the Synthetic Organic Chemical Manufacturing Industry and Other Processes Subject to the Negotiated Regulation for Equipment Leaks; Clarification
Action: Final rule: amendments

On April 15, 1995, the EPA proposed amendments to certain portions of the "National Emission Standards for Hazardous Air Pollutants From the Synthetic Organic Chemical Manufacturing Industry and Other Processes Subject to the Negotiated Regulation for Equipment Leaks" (known as the HON). This action announces EPA's final decisions on those proposals.

The rule has been revised to remove glycerol tri-(polyoxypropylene)ether, polyethylene glycol, and polypropylene glycol from the list of chemical production processes regulated under the HON. The production of these compounds will be regulated by the national emission standards for hazardous air pollutants. The equipment leak requirements are also being modified to clarify the intent of certain provisions, to correct oversights, and to simplify the demonstration of compliance with the requirements. The amendments were effective June 20, 1996.

For additional information, contact Dr. Janet S. Meyer, EPA, (919) 541-5254.

Department of Transportation
Research and Special Programs Administration
June 26, 1996 - 61 FR 33216
Performance-Oriented Packaging Standards; Final Transitional Provisions
Notice: Notice of proposed rulemaking (NPRM)

The RSPA has proposed incorporating a number of revisions to the classification of certain hazardous materials which are poisonous by inhalation and to provisions for the manufacture, use and reuse of hazardous materials packaging into the Hazardous Materials Regulations. The amendments are mainly in the areas of hazard classification, performance-oriented packaging, intermediate bulk containers, and portable tanks.

Among other things, the rule would (1) clarify requirements concerning the use of cushioning material in packaging in the event of a hazardous materials leak; (2) set up testing of certain liquids with a flash point of 65° or above; (3) specify equivalency calculations for the thickness of stainless drums; and (4) indicate requirements for labeling combustible liquids with placards.

For additional information, contact RSPA's Beth Romo, (202) 366-8553, or Bill Gramer, (202) 366-4545.

Environmental Protection Agency
June 18, 1996 - 61 FR 30814
National Emission Standards for Hazardous Air Pollutants (NESHAP) for Shipbuilding and Ship Repair (Surface Coatings) Operations
Action: Direct final rule

The EPA has issued an extension to its NESHAP for Shipbuilding and Ship Repair Operations, originally published on December 15, 1995. The rule requires existing and new major sources to control emissions using the maximum achievable control technology to limit hazardous air pollutants. Under this action, the June 13, 1996 deadline for submittal of an implementation plan has been extended to December 16, 1996; the compliance date has been extended from December 16, 1996 to December 16, 1997. This extension has been granted because EPA has determined that insufficient time was provided for facilities to comply with the requirements.

The direct final rule will go into effect August 19, 1996 unless

significant, adverse comments are received. For additional information, contact Mohamed Serageldin, EPA, (919) 541-2379.

Department of Transportation
Research and Special Programs Administration
June 26, 1996 - 61 FR 33250
Crashworthiness Protection Requirements for Tank Cars; Detection and Repair of Cracks, Pits, Corrosion, Lining Flaws, Thermal Protection Flaws and other Defects of Tank Car Tanks
Action: Final rule; corrections and response to petitions for reconsideration.

The RSPA has issued a final rule which revises certain requirements in the Hazardous Materials Regulations to improve the crashworthiness of tank cars and to increase the probability of detecting critical tank car defects. Among other things, it allows an analysis using independent mathematical or computer modeling procedures to verify compliance with the thermal protection standard for certain tank cars. Requirements for thermal protection and head-puncture resistance are also revised, along with various minor technical changes.

The regulation went into effect July 1, 1996. For additional information, contact James Rader, RSPA, (202) 366-0510, or Thomas Phemister, Federal Railroad Administration, (202) 366-0635.

Environmental Protection Agency
June 27, 1996 - 61 FR 33588
Addition of Facilities in Certain Industry Sectors; Toxic Chemical Release Reporting; Community Right-to-Know
Action: Proposed rule

Under this proposal, EPA would add seven groups to the list of industries subject to the reporting requirements of section 313 of the Emergency Planning and Community Right-to-Know Act (EPCRA). EPA believes that the addition of these industry groups will significantly add to the public's right-to-know about releases and other waste management activities of toxic chemicals. The industries added to the list include chemicals and allied products-wholesale, standard industrial code 5169. Reporting will be required for the first full year following publication of the final rule.

Comments on this proposal must be received by August 26 and should be sent in triplicate to OPPT Docket Clerk, TSCA Document Receipt Office (7407), Office of Pollution Prevention and Toxics, EPA, Room E-G099, 401 M Street, S.W., Washington, D.C. 20460. Comments may also be submitted on disks in either ASCII or WordPerfect 5.1 format. Electronic copies will also be accepted by sending e-mail to oppt.ncic@epamail.epa.gov as an ASCII file. Please include the docket number OPPTS-400104 on all submissions.

For specific information on the proposal, contact EPA's Tim Crawford, (202) 260-1715, or Brian Symmes (202) 260-9121. For additional information on EPCRA section 313, contact the EPCRA Hotline, (800) 535-0202. drums; and (4) indicate requirements for labeling combustible liquids with placards.

For more information, contact RSPA's Beth Romo, (202) 366-8553, or Bill Gramer, (202) 366-4545.

Environmental Protection Agency
July 1, 1996 - 61 FR 34252
Criteria for Classification of Solid Waste Disposal Facilities and Practices; Identification and Listing of Hazardous Waste; Requirements for Authorization of State Hazardous Waste Programs
Action: Final rule

The Environmental Protection Agency (EPA) has promulgated revisions to the existing criteria for solid waste disposal facilities and practices. The revisions establish that only those non-municipal non-hazardous waste disposal units that meet specific standards may receive conditionally exempt small quantity generator (CESQG) hazardous waste. The rule also establishes requirements relating to location restrictions, groundwater monitoring and corrective action. The regulation is applicable to certain industrial manufacturing plants who dispose of CESQG hazardous waste in non-municipal non-hazardous waste disposal units.

Electronic copies can be obtained over the Internet through the EPA Public Access Server@ gopher.epa.gov. For additional information, call Paul Cassidy, EPA, (703) 308-7281.

Air Quality Amendments Introduced—On May 10, Representative Stephen Stockman (R-TX) introduced a bill which will amend several environmental laws, including the Clean Air Act. Among other things, the proposal would repeal the EPA's authority to require enhanced monitoring and submission of compliance certification, require EPA to provide a cost-benefit analysis for emissions standards for hazardous air pollutants, and make information privileged resulting from voluntary environmental self-audits. The measure has been jointly referred to the House Committees on Commerce and Ways and Means.

Regulatory Review Goes Into Effect—The provisions of the Small Business Regulatory Enforcement Fairness Act (SBREFA), signed by the President in March, went into effect on June 28. Among other things, the law requires federal agencies to evaluate all proposed rulemakings for their potential economic effect on small businesses. In addition, agencies must submit an explanation of major regulations, including a cost-benefit analysis, to Congress, which then has 60 days to review the rulemaking before it goes into effect. During the remainder of the current session, the House Subcommittee on National Economic Growth, Natural Resources, and Regulatory Affairs will be given the responsibility of reviewing federal regulations. A new joint House-Senate regulatory oversight committee may be formed during the next session of Congress to perform this task.

In a related issue, several House Democrats have expressed their concern in a letter to White House Chief of Staff Leon Panetta that EPA's proposed rulemaking to limit VOC emissions from architectural coatings was published prematurely to avoid having to comply with SBREFA economic requirements. EPA staff has indicated that the regulation had been in development for several years, was already overdue for release and that the publication timing was not a deliberate effort to avoid compliance.

States Proposed Legislation and Regulations

ALASKA

Air Quality (Proposed Regulation)—A proposed rule of the Alaska Department of Environmental Conservation (DEC) would increase fees to pay for the air quality operating permit program until it receives federal approval. Contact Robert Hughes, DEC, (907) 465-5100.

Solid Waste (Regulation)—The Alaska DEC adopted a final rule (17 AKAJ 72; 4/22/96) which requires persons who install, test, or remove underground storage tanks to be certified by the state. The regulation will go into effect 30 days after filing. Contact Jim Hayden, DEC, (907) 465-5133.

ARIZONA

Air Quality (Proposed Regulation)—The Arizona Department of Environmental Quality (DEQ) has issued a proposal (2 AZAR 3140; 6/14/96) which would add several substances, including acetone, to the list of compounds that are exempted from consideration as volatile organic compounds (VOCs) to conform to federal standards. Contact Martha Seaman, DEQ, (602) 207-2222.

A final rule (2 AZAR 3031; 5/31/96) adopted by the DEQ incorporates by reference federal air quality requirements for new source performance standards and national emission standards for hazardous air pollutants. The rule was effective May 9. Contact Martha Seaman, DEQ, (602) 207-2222.

CALIFORNIA

Notice—The South Coast Air Quality Management District (SCAQMD) has postponed the compliance date for its Rule 1136 from July 1, 1996. As written, the rule imposes stringent VOC emission limits for wood furniture coatings. The amendments approved by the South Coast's governing board establish two sets of VOC limits. An interim table, effective July 1, 1997, requires manufacturers to be halfway to their compliance goal. A second table of limits will go into effect July 1, 2005. The revisions also offer facilities who already use lower-VOC water-based coatings several compliance options, including increased flexibility in emission averaging.

Air Quality (Proposed Regulation)—The California Air Resources Board (CARB) has proposed a regulation which would amend requirements for preparing site-specific air toxics emission inventory plans by exempting low-risk facilities from reporting requirements; streamlining certain reporting procedures; and amending evaluation criteria. Contact Richard Bode, CARB, (916) 322-3807.

Hazardous Materials Transportation (Regulation)—A final regulation of the California Office of Emergency Services (OES) would amend requirements for the reporting of hazardous material releases. The rule, effective April 30, modifies the information to be included on the comprehensive hazardous material inventory reporting form and specifies certain reporting requirements. Contact Tracey Vardas, OES, (916) 262-1750.

Hazardous Waste—CA S. 1706 (Wright) authorizes the issuance of variances from the requirements regulating the management of hazardous waste if it is determined that the waste is eligible. The Assembly Appropriations Committee released the bill with a favorable report on July 10.

Packaging—CA S. 1155 (Maddy) repeals the Rigid Plastic Container Law promoting the use of recycled materials in packaging. On July 8, the legislation was amended on the Senate floor to exclude only food, water, and cosmetics packaging from the law.

Toxic Substances—Proposition 65—The California Office of Environmental Health Hazard Assessment (OEHHA) intends to add nine chemicals to the list of substances known to cause cancer or reproductive toxicity, as required by Proposition 65. Contact Carmen Milanes, OEHHA, (916) 445-6900.

COLORADO

Air Quality (Regulation)—A regulation (19 COR 2; 5/10/96) adopted by the Colorado Air Quality Control Commission (AQCC) revises air pollution emission notice reporting requirements by adding exemptions and by clarifying the authority to collect fees for fugitive emissions. The rule went into effect May 30. Contact AQCC, (303) 692-2000.

A proposal (19 COR 4; 5/10/96) issued by the Colorado AQCC would adopt by reference federal maximum achievable control technology (MACT) standards for aerospace manufacturing, hazardous organic national emission standards for hazardous air pollutants, shipbuilding and repair operations, and wood furniture manufacturing facilities. Contact AQCC, (303) 692-3100.

Hazardous Materials Transportation (Proposed Regulation)—A proposal issued by the Colorado Department of Public Safety would update existing requirements for the routing and permitting of vehicles transporting hazardous materials. Contact State Patrol, (303) 239-4500.

DELAWARE

Lead—DE S. 448 (Blevins) permits the promulgation of regulations for the training and certification of individuals engaged in lead-based paint activities and of lead-based paint hazard control training programs. It also allows the establishment of lead-based paint hazard work practice standards. On June 27, the bill passed the House and was sent to the governor.

Spray Paint Restrictions—DE H. 689 (Brady) prohibits the delivery of permanent colored marking devices and aerosol containers of paint to a person who is younger than 18 years of age. The bill failed to pass the House on June 30.

DISTRICT OF COLUMBIA

Solid Waste (Regulation)—The Washington, D.C. Department of Consumer and Regulatory Affairs (DCRA) adopted a regulation governing underground storage tanks which (1) details procedures for registration, reporting, and recordkeeping; (2) establishes new tank performance standards and criteria for upgrading existing tanks; (3) outlines requirements for tank operation, maintenance, and closure; and (4) requires owners to

report any releases. The rule was effective May 24. Contact Angelo Tompros, DCRA, (202) 645-6080.

FLORIDA

Air Quality (Regulation)—A final regulation (22 FLAR 3704; 6/14/96) issued by the Florida Department of Environmental Protection (DEP) adopts by reference federal new source performance standards and national emission standards for hazardous air pollutants. The rule went into effect June 25. Contact Beth Hardin, DEP, (904) 488-0114.

The Florida DEP adopted a final rule concerning operating permits for sources of air pollution which (1) changes the date of permit application submissions for area sources; (2) specifies that reports on all deviations from permit conditions must be submitted semi-annually; and (3) removes requirements for excess emissions due to startup, shutdown, or malfunction. The regulation was effective June 25. Contact Beth Hardin, DEP, (904) 488-0114.

GEORGIA

Lead (Proposed Regulation)—A proposed rule of the Georgia Department of Natural Resources (DNR) would establish procedures for a state program for the accreditation of lead-based paint activity training programs and would implement requirements for certifying persons engaged in such activities. The proposal would not require mandatory lead-based paint abatement. Contact John Taylor, DNR, (404) 362-2692.

HAWAII

Hazardous Materials Transportation—HI H. 3577 (Souki) relates to the transportation of hazardous materials and waste. The governor signed the legislation on June 12.

ILLINOIS

Occupational Safety and Health (Regulation)—A final regulation (20 ILR 7419; 5/24/96) adopted by the Illinois Department of Labor (DOL) incorporates by reference federal Occupational Safety and Health Administration (OSHA) requirements for fall protection, hazard communications, and permit-required confined spaces. The rule went into effect May 10. Contact Lenore Killam, DOL, (217) 782-9386.

INDIANA

Air Quality (Proposed Regulation)—The Indiana Department of Environmental Management (DEM) has introduced proposals (19 INR 2596; 6/1/96) which would adopt by reference the federal national emission standard for hazardous air pollutants for wood furniture manufacturing operations and for aerospace manufacturing and rework facilities. Contact Larry Fedor, DEM, (317) 232-8223.

Water Quality (Proposed Regulation)—A proposed regulation (19 INR 2605; 6/1/96) of the Indiana DEM dealing with water quality would eliminate fees for land application, unit process additions, vehicle licenses, wastewater certification, and wastewater management permits and renewals. Contact Nancy King, DEM, (317) 232-7694.

IOWA

Hazardous Materials Transportation (Regulation)—A final regulation (18 IAAB 1848; 5/22/96) of the Iowa Department of Transportation (DOT) incorporates federal standards for commercial carriers transporting certain hazardous materials. Among other things, the rule amends cargo tank requirements; conforms hazardous materials transportation to international standards; modifies equipment specifications; and establishes criteria for intermodal carriers with a cargo weight of more than 10,000 pounds. The rule went into effect June 26. Contact DOT, (515) 239-1639.

Air Quality (Regulation)—A rule adopted by the Iowa Environmental Protection Commission (EPC) defers the requirement to obtain a Title V operating permit for all sources that are not major sources. These sources are exempted from paying permit fees until they are required to apply for an operating permit. The regulation was effective July 24. Contact Catherine Fitzsimmons, EPC, 900 East Grand Avenue, Des Moines, IA 50319.

KENTUCKY

Lead (Proposed Regulation)—The Kentucky Cabinet for Human Resources (CHR) proposed a regulation which would ban lead-containing paint and similar surface coatings and other consumer products on which lead-containing paints are used. Contact William Moore, CHR, (502) 564-7900.

LOUISIANA

Air Quality (Notice)—The Louisiana Department of Environmental Quality (DEQ) has published a memorandum of understanding (22 LAR 405; 5/20/96) on the implementation and enforcement of state and federal fugitive emission control programs for industrial sources. Under the guidelines, facilities must implement the most stringent consolidated program. Contact Bliss Higgins, DEQ, (504) 765-0114.

Community Right-to-Know (Proposed Regulation)—A proposed regulation (22 LAR 381; 5/20/96) of the Louisiana DEQ would adopt procedures for off-site transportation-related emergency incidents; for the removal of abandoned containers; for creating emergency response storage facilities; and for reporting and recordkeeping requirements. This proposal replaces an earlier rulemaking on the same subject. Contact Patsy Deaville, DEQ, (504) 765-0399.

Lead (Proposed Regulation)—A proposal (22 LAR 385; 5/20/96) issued by the Louisiana Department of Health and Hospitals (DHH) would amend current regulations concerning lead poisoning to conform with state law, federal housing requirements, and industry standards. Contact DHH, (504) 826-2347.

MARYLAND

Lead (Proposed Regulation)—Proposed regulations (22 MDR 824, 829; 5/24/96) of the Maryland Department of the Environment (DOE) would establish requirements and procedures for lead paint abatement activities, with a special emphasis on risk reduction in rental housing, and would establish requirements for the temporary or permanent relocation of an individual with an elevated blood lead level equal to or greater than 25 micrograms per

deciliter. Contact Deanna Miles-Brown, DOE, (410) 631-3173.

MASSACHUSETTS

Market Share Liability—MA H. 2205 (Jehlen) authorizes the use of market share liability in civil actions brought against producers or manufacturers of lead constituents used in paint. The legislation has been referred for further study.

MICHIGAN

Occupational Safety and Health—MI H. 5861 (Green) revises reporting requirements to the state of fatalities and catastrophes to conform with changes to federal OSHA standards. Introduced on May 8, the bill was sent to the House Committee on Human Resources and Labor.

Solid Waste—MI S. 941 (McManus) provides for solid waste permit and license application fees. The bill was signed by the governor on July 1.

MISSOURI

Air Quality (Proposed Regulation)—A proposed rule (21 MOR 1238; 5/15/96) of the Missouri Department of Natural Resources (DNR) would modify current require-ments for air pollution sampling methods by incorporating by reference recent federal guidelines on capture efficiency methods for VOC emission control systems. Contact Roger Randolph, DNR, (314) 751-4817.

A final regulation (21 MOR 1285; 5/15/96) of the Missouri (DNR incorporates by reference standards under the Clean Air Act and other EPA requirements for air quality, as well as updating provisions for compliance with Title V operating permit program criteria. The rule goes into effect 30 days after publication in the Code of State Regulations. Contact DNR, (314) 751-7840.

The Missouri DNR proposed a regulation (21 MOR 1360; 6/3/96) which would set up emission control technology performance criteria and work practices in order to ensure that sources that emit or have the potential to emit hazardous air pollutants will achieve specific emission standards. Contact Jim Kavanaugh, DNR, (573) 751-4817.

MONTANA

Hazardous Waste (Regulation)—A final regulation (1996 MTAR 1382; 5/23/96) of the Montana Department of Environmental Quality (DEQ) incorporates federal standards for hazardous waste management and amends current state requirements in order to ensure that the state has primary authority to administer state provisions in place of comparable federal standards. The rule went into effect May 24. Contact Mark Stahly, DEQ, (406) 444-3742.

NEW HAMPSHIRE

Air Quality—NH S. 600 (Rodeschin) allows the state to issue facility-wide operating permits to non-major stationary sources covering all regulated emissions. It also clarifies the authority of the state to issue a single permit to a facility that covers all regulated emissions. The governor signed the bill on June 10.

NEW MEXICO

Air Quality (Proposed Regulation)—A proposed regulation introduced by the New Mexico Environmental Improvement Board (EIB) would establish standards for new stationary source emissions and would amend the regulations pertaining to the state implementation plan. Contact Cliff Hawley, EIB, PO Box 26110, 1190 St. Francis Drive, Santa Fe, NM, 87502.

NEW YORK

Air Quality—NY A. 10818 (Committee on Rules) clarifies that fugitive emissions are included in determining whether a source of hazardous air pollutants is subject to Title V permits, and allows the listing and delisting of hazardous pollutants. The bill was released from the Assembly Committee on Rules on July 1.

NY S. 7355 (Marcellino), among other things, (1) clarifies that fugitive emissions are included in determining whether a source of hazardous air pollutants is subject to Title V permits; (2) permits the state to list and de-list hazardous pollutants; and (3) and allows the state to take longer than three years to issue Title V permits. The bill, which passed the Senate on June 14, is under consideration by the Assembly Committee on Environmental Conservation.

NY S. 7356 (Marcellino and Maziarz) authorizes the issuance of integrated facility permits upon the request of the applicant to cover multiple sources of emissions. On June 12, the legislation was approved by the Senate and sent to the Assembly Committee on Environmental Conservation.

Flammable Paint—NY A. 8711 (Wright) prohibits the use of non-water-based or flammable paint in any public or private dwelling unit. The bill was sent to the Assembly Rules Committee on July 11; however, the measure is considered dead for this year due to the adjournment of the state legislature on July 13.

Graffiti—NY A. 9099 (Katz) clarifies that a court has the power to require any individual placed on probation to participate in a graffiti removal program as a condition of probation. The governor signed the legislation on June 18.

Laminatives—NY A. 8617 (Weisenberg) requires the use of shatter-resistant laminated glass windows and doors in the construction and reconstruction of public buildings. The bill passed the Assembly on June 20 and was sent to the Senate Committee on Rules.

Lead—NY S. 1262 (Volker) establishes a lead abatement licensing and certification program. On June 13, the bill passed the Senate and was referred to the Assembly Committee on Health.

OHIO

Water Quality (notice)—The Ohio Environmental Protection Agency (EPA) has announced the rescission of several regulations dealing with water quality issues, including rules that outlined procedures for (1) monitoring ambient ground water quality; (2) reviewing ground water sampling and analysis plans; and (3) analyzing ground water quality assessment plans. Contact Tim Krichbaum, Ohio EPA, (614) 644-2752.

OKLAHOMA

Air Quality (Proposed Regulation)—A proposed rule of the Oklahoma Department of Environmental Quality (DEQ) would

amend the definitions of "major source" and "regulated pollutant" and would modify criteria for insignificant activities, permit content and public review in order to bring state air quality requirements into compliance with federal operating permit program. Contact Joyce Sheedy, DEQ, (405) 271-5220.

A final regulation (13 OKR 1919; 6/3/96) adopted by the Oklahoma DEQ extends the time a new minor source can operate before filing for an operating permit, lengthens the duration of minor source operating permits, and specifies general air quality permitting information. The rule was effective July 1. Contact Kay York, DEQ, (405) 271-8140.

The Oklahoma DEQ adopted a final regulation which establishes a schedule for the phased submittal of operating permit applications that is based on the facility's standard industrial classification code. The rule went into effect July 1. Contact Scott Thomas, DEQ, (405) 271-5220

The Oklahoma DEQ has adopted a regulation which lowers the annual operating fee from the current level of $15.65 per ton of regulated pollutant as a one-time only event for 1996, effective July 1. Contact Scott Thomas, DEQ, (405) 271-5220.

Community Right-to-Know (Regulation)—An emergency rule adopted by the Oklahoma DEQ incorporates federal emergency planning and community right-to-know standards. The regulation went into effect May 3, 1996 and will expire July 14, 1997. Contact Monty Elder, DEQ, (405) 271-8062.

Lead (Proposed Regulation)—A proposal issued by the Oklahoma DEQ would implement a limited lead-based paint certification program, including procedures and requirements for the certification of individuals who have received training for inspecting and performing lead-based paint activities. Contact Toni Payne, DEQ, (405) 271-5220

General Permitting (Regulation)—The Oklahoma DEQ has adopted final regulations, implementing the Uniform Environmental Permitting Act which (1) classifies permit applications in specific categories; (2) establishes tiered permitting procedures for air quality, solid and hazardous waste management, and water quality; and (3) updates permit review procedures. The rule went into effect July 1. Contact Kay York, DEQ, (405) 271-8140.

PENNSYLVANIA

Air Quality (Notice)—The Pennsylvania Department of Environmental Protection (DEP) has published revisions to the Continuous Source Monitoring Manual, which is available to the public (26 PAB 2361; 5/18/96). The manual includes information on design specifications, reporting requirements, performance test procedures, and criteria for obtaining approval of continuous source emission monitoring systems. Contact Joseph Nazarro, DEP, (717) 783-9247.

RHODE ISLAND

Air Quality (Proposed Regulation)—The Rhode Island Department of Environmental Management (DEP) proposed a regulation which would amend air pollution control requirements by adding emission caps for 13 different stationary sources, thus relieving those sources from obtaining operating permits. Contact Douglas McVay, DEM, (401) 277-2808.

Spray Paint Restrictions—RI S. 2837 (Palazzo) bans the sale of "portable" cans of spray paint. The bill passed the Senate on June 13; it is now under consideration by the House Committee on Corporations.

SOUTH CAROLINA

Air Quality (Proposed Regulation)—The South Carolina Department of Health and Environmental Control (DHEC) intends to introduce a proposal (20 SCSR 28; 5/24/96) governing toxic air pollution control standards. The proposal would address issues such as whether facilities may submit only emissions data, rather than perform modeling, and whether certain chemicals can be removed from the list of toxic air pollutants. Contact Barbara Lewis, DHEC, (803) 734-4554.

Environmental Audits—SC H. 3624 (Sharpe) defines environmental audits and creates a privilege with regard to the contents of these reports. On June 4, the governor signed the bill.

Hazardous Waste (Regulation)—A final regulation (20 SCSR 75; 5/24/96) adopted by the South Carolina Department of Health and Environmental Control (DHEC) incorporates by reference new federal universal waste requirements, phase II land disposal restrictions, and treatment criteria for newly identified wastes prior to disposal. The rule became effective May 24. Contact John Litton, DHEC, (803) 896-4174.

TENNESSEE

Air Quality (Proposed Regulation)—A proposed regulation of the Tennessee Department of Environment and Conservation (DEC) would require all construction and operating permits for specified air contaminants to include new source performance standards and national emission standards for hazardous air pollutants. Contact Malcolm Butler, DEC, (615) 532-0600.

The Tennessee DEC proposed a regulation (22 TNAR 34; 6/14/96) which would increase the threshold of applicability of VOC emissions per year from 25 tons to 100 or more for wood furniture finishing operations in certain counties. Contact Malcolm Butler, DEC, (615) 532-0600.

A final regulation of the Tennessee DEC adds several chemicals, including acetone, to the list of compounds that have been determined to have negligible photochemical reactivity. The rule will go into effect August 14. Contact Malcolm Butler, DEC, (615) 532-0600.

Water Quality (Proposed Regulation)—A proposal (22 TNAR 3; 5/15/96) concerning water quality issued by the Tennessee DEC would adopt federal standards for national pollutant discharge elimination system general permits, specify procedures for issuing permits and licenses, and outline recordkeeping and reporting requirements. Contact Thomas Roehm, DEC, (615) 532-0625.

TEXAS

Air Quality (Regulation)—A final regulation (21 TXR 4790; 5/28/96) of the Texas Natural Resource Conservation Commission (NRCC) regarding the standard exemption list for operating

permits for modification or new construction. The rule, which went into effect June 7, adds exemptions to the list and revises limits on the use of these exemptions. Contact NRCC, (512) 239-1966.

VIRGINIA

Lead (Regulation)—An emergency rule issued by the Virginia Department of Labor and Industry (DLI) requires certified lead contractors to notify the state 20 days before beginning a lead abatement project with a value of $2,000 or more. The regulation went into effect June 26, 1996 and will expire on June 25, 1997. Contact Bonnie Robinson, DLI, (804) 371-2631.

The Virginia DLI intends to adopt regulations concerning lead project permits, fees, and lead abatement certification. The rule would allow the state to monitor lead contractors' compliance with requirements for the safe disposal of lead paint waste and would establish procedures for paying lead permit fees. Contact Clarence Wheeler, DLI, (804) 786-0574.

Water Quality (Regulation)—A final rule (12 VAR 2651; 6/24/96) of the Virginia Water Control Board (WCB) establishes procedures for the issuance of pollutant discharge elimination system and pollution abatement permits. The regulation went into effect July 24. Contact Richard Ayers, DEQ, (804) 698-4075.

WASHINGTON

Air Quality (Regulation)—The Southwest Air Pollution Control Authority (SWAPCA) adopted a final rule which, among other things, limits VOC emissions from architectural coatings, consumer products, automotive refinishing, and spray paints and requires the use of higher efficiency spray guns in refinishing operations. The regulation became effective May 25. Contact Jennifer Brown, SWAPCA, (360) 574-3058.

WISCONSIN

Air Quality (Regulation)—A regulation (485 WIAR 35; 5/31/96) adopted by the Wisconsin Department of Natural Resources (DNR) removes acetone from the definition of VOC; amends the eligibility requirements for variances from reasonably available control technology standards; and updates air pollution control requirements. Sections of the rule went into effect July 1; the remainder are effective August 1. Contact Robert Park, DNR, (608) 266-1054.

Air Quality (Proposed Regulation)—A proposed regulation (485 WIAR 30; 5/31/96) of the Wisconsin DNR would establish a state version of the national emission standards for hazardous air pollutants. Contact Roger Fritz, DNR, (608) 266-1201.

Lead (Regulation)—An emergency regulation adopted by the Wisconsin Department of Health and Social Services (DHSS) establishes criteria for awarding grants to fund educational programs about the dangers of lead poisoning; and funds lead poisoning or screening and any follow-up care for children under the age of six. The rule became effective July 1. Contact Bill Otto, Bureau of Public Health, (608) 266-9337.

NPCA Renews Support for EPA's Proposed National AIM VOC Rule

The Environmental Protection Agency (EPA) has published their long-anticipated proposed standards to reduce volatile organic compound (VOC) emissions from architectural and industrial maintenance (AIM) coatings. EPA's proposed rule would set a VOC content level for each of the 55 categories of architectural coatings. In response to the new legislation, the National Paint and Coatings Association (NPCA), Washington, D.C., has renewed its support for the proposed national rule.

The proposed rule is the culmination of several years of intensive discussions and negotiations involving EPA and a broad array of affected and interested parties. NPCA believes the proposed national rule is a practical and achievable standard that will result in significant VOC reductions nationwide.

According to NPCA President Andy Doyle, "With certain refinements, EPA's proposed rule is fundamentally consistent with industry's suggested format. The rule calls for only one table of standards, providing crucial national uniformity and predictability for our industry. The EPA AIM VOC rule will help avoid a prospective compliance nightmare of conflicting state rules across the country."

NPCA intends to offer comments to EPA in key areas where it believes the rule can be improved. For example, NPCA will recommend the strengthening of an expedited variance procedure which companies can use to demonstrate economic and technical hardship with compliance for a particular product line. In addition, NPCA has requested that the U.S. EPA hold a public hearing concerning the recently proposed national standards.

EPA has developed the proposed rule under authority of Section 183(e) of the Clean Air Act Amendments of 1990 (CAAA), which requires VOC limits for consumer and commercial products, including AIM coatings.

The AIM category is estimated to represent about two percent of the nation's overall VOC emissions inventory. The proposed rule is expected to reduce AIM VOC emissions by 25% from a 1990 baseline, which already represents substantial VOC reductions over the past decades due to industry reformulations and the introduction of an increasing inventory of water-based products.

"NPCA has always maintained that a reasonable national rule that recognizes economic and technological considerations is the best approach for regulating architectural and industrial maintenance coatings. We believe the EPA rule strikes a fair balance between environmental gains and the need to maintain the economic viability of our industry," said Mr. Doyle.

Most states with ozone attainment areas are depending on EPA's national rule to assist them in meeting their CAAA-mandated goals for VOC reduction. States in nonattainment areas who fail to develop plans for reducing ozone by 15% in 1996, and three percent per year thereafter, can lose federal highway funding and suffer other sanctions.

Rohm and Haas Receives Presidential Green Chemistry Challenge Award

Rohm & Haas Co., Philadelphia, PA, was presented with the Presidential Green Chemistry Challenge Award at a recent awards ceremony in Washington, D.C. Rohm & Haas was recognized for its development of Sea-Nine® 211 marine antifoulant, which uses isothiazolone chemistry as a more environmentally acceptable ingredient in marine paints, compared to many currently used biocides.

The Green Chemistry Challenge Award was established by an alliance of the chemical industry and the Clinton Administration to recognize and promote fundamental breakthroughs in chemistry that accomplish pollution prevention through source reduction and are useful to industry. Other award recipients include Dow Chemical, Monsanto Co., and Donlar Corp. Texas A&M University was also honored with an award for work by an academic institution.

Company Vice President Charles M. Tatum accepted the award on behalf of Rohm & Haas. "We are honored to be among the first recipients of the Green Chemistry Challenge Award," said Dr. Tatum. "Such recognition encourages the chemical industry to seek more environmentally benign alternatives to current chemical products. That is consistent with our own operating philosophy, and is of benefit to our customers and our environment," Dr. Tatum said.

According to John Harrington, Rohm and Haas Global Commercial Manager for Marine Markets, the new antifoulant has achieved acceptance and is being used in marine paints in the Asia-Pacific region, and is just beginning to achieve usage in Europe. Commercial ship-building and repair are not large industries in the United States; however, several U.S. makers of marine paints have applied to the EPA to register formulations containing Sea-Nine antifoulant.

In March of this year, Rohm & Haas announced the start-up of its new manufacturing facility in Bayport, TX, dedicated exclusively to the production of the company's isothiazolone biocides and antifoulant products.

Rohm and Haas Co. was among the first recipients of the Presidential Green Chemistry Challenge Award, presented in Washington, D.C. Pictured at the award ceremony in the National Academy of Sciences Building were (left to right) Rohm and Haas Vice Presidents Howard C. Levy and Dr. Charles M. Tatum, and award-presenter Dr. Lynn R. Goldman, Assistant Adminstrator, U.S. EPA.

Mistrial Declared in NDPA Antitrust Suit Against 800-Operators

A jury was unable to reach a verdict in the antitrust trial involving nine 800-operators who claimed conspiracy between the National Decorating Products Association (NDPA), St. Louis, MO, and F. Schumacher & Co. A mistrial was declared after six weeks of testimony and 10 days of jury deliberation in Reading, PA, federal district court.

The jury had been asked by the nine plaintiffs to find that the association had conspired with its members and F. Schumacher & Co. to put the 800-number operators out of business in violation of the Sherman Antitrust Act. During the trial, which began on May 3, the plaintiffs had attempted to establish that NDPA had orchestrated a campaign threatening wallcovering suppliers with a boycott of their products unless the suppliers took action against or ceased doing business with 800-number dealers.

The suit was filed in 1990 as a result of marketing policies that Schumacher adopted to restrict and then eliminate sale of its products to 800-number dealers. The plaintiffs contended that these policies were a result of a conspiracy involving the New York-based wallcovering manufacturer and the St. Louis-based trade association. The case was originally dismissed in a 1992 summary judgment, a decision that was affirmed upon appeal.

However, in an unusual move, the U.S. Court of Appeals granted a rehearing of the appeal and reversed its prior decision. The U.S. Supreme Court declined to hear the separate appeals of NDPA and Schumacher from that order, returning the case to federal district court in Reading for trial. The plaintiffs sought damages and fees in excess of $350 million.

The case required a unanimous verdict from the 11-member panel.

Kerr-McGee Corp. to Relocate Oil and Gas Business Unit

Kerr-McGee Corp., Oklahoma City, OK, will relocate its oil and gas Exploration and Production business unit to Houston, TX. The move will include the unit's senior management and headquarters personnel and is expected to be completed by August 1997.

The company's corporate offices, staff units, and chemical and coal headquarters will remain based in Oklahoma City. Presently 220 employees now located in Oklahoma City with the Exploration and Production business unit will be affected by the move.

This relocation is a continuation of the restructuring program that Kerr-McGee previously announced.

Ranbar Announces Acquisition of TriSpec

Ranbar Electrical Materials, Inc., Manor, PA, has acquired Triangle Specialty Resins Inc. TriSpec's product focus is one and two-component epoxies, polyurethanes, and specialty polymers for the electrical/electronic industries.

No change is expected in the products of TriSpec or its relationship with existing customers. The TriSpec products will be manufactured at Ranbar's Manor plant.

SCM Chemicals to Increase Chloride-Process TiO_2 Operations at Kemerton, Australia Facilities

Plans have been revealed by SCM Chemicals, Baltimore, MD, to expand the chloride-process TiO_2 operations at Kemerton near Bunbury, Western Australia, by 111,000 tons per annum to a total annual capacity of 190,000 tons.

The expansion project, which is anticipated to cost approximately $470 million, will involve the building of a second 111,000 tpa chloride-process TiO_2 production facility, adjacent to the present 79,000 tpa capacity plant in the Kemerton Industrial Park. The project is scheduled to be completed by January 1999.

Kemira and Ishihara Suspend Plans for TiO_2 Joint Venture

Kemira Pigments Oy, Helsinki, Finland, and Ishihara Sangyo Kaisha Ltd., Osaka, Japan, have suspended discussions on the proposed joint venture for the production of titanium dioxide pigments in Singapore.

Final agreements for the 75,000 tons per annum plant project were expected to be signed by the end of June; however, the parties were unable to reach final agreement on some of the crucial points of the joint venture.

Ishihara is expected to proceed with the project to build a 75,000 tpa titanium dioxide pigments plant in Singapore.

Morehouse-COWLES Acquired by Epworth Mfg. Co.

Epworth Manufacturing Co., South Haven, MI, has acquired Morehouse-COWLES, Inc., Fullerton, CA. Morehouse-COWLES, Inc., previously a wholly owned subsidiary of Summa Industries, a public company, will operate as a privately held concern hereafter.

Morehouse-COWLES manufactures particle reduction and viscous mixing and blending equipment serving the paint, ink, adhesive, coatings, pharmaceutical, food and chemical industries. Similarly, Epworth manufactures grinding and dispersion equipment, serving primarily the same industries as Morehouse-COWLES.

No significant operation changes are planned.

Deeks & Co. To Represent Cargill

Deeks and Co., Cincinnati, OH, and Louisville, KY, will represent Cargill for their linseed, soya, and sunflower oils and Dilulin® reactive diluent. Deeks & Co. will be responsible for the sales and distribution of these products for Cargill in central and southern Ohio and Indiana, all of Kentucky, and western West Virginia.

The VanDeMark Group to Expand Phosgene Production Facilities

The VanDeMark Group, Lockport, NY, will conduct a five million dollar expansion of its phosgene derivative production facilities.

Construction of the expansion, which will start August 1996, includes a multipurpose phosgene derivative production facility, a 3,000 square foot addition to an existing research and development lab, a 13,000 square foot warehouse, and a major upgrading of the company's emission control system.

The four phases of expansion are scheduled for completion by the end of 1997.

ASTM to Conduct Training Course to Focus On "Paint Volatile Organic Compounds"

The American Society for Testing and Materials (ASTM), West Conshohocken, PA, will present "Paint Volatile Organic Compounds," a two-day technical and professional training course, on November 6-7, 1996 at Reichhold Chemicals Inc., in Los Angeles, CA.

This course will focus on obtaining precise, meaningful VOC data from laboratory tests on paints and related coatings. It also includes laboratory demonstrations on the use of gas chromatography, the Karl Fischer Titration Method, paint density, and other test methods needed to determine the VOC of coatings.

In addition to a discussion on the latest VOC technologies and changes in VOC measurements (e.g., multi-component paints and VOC aerosols, etc.), the basic principles of the ASTM test methods used to measure VOC in the U.S. Environmental Protection Agency's New Source Performance Standard will be covered.

This course is designed for chemists and others who use EPA tests to determine if paints or coatings meet VOC requirements. Individuals from the paint industry, government regulatory bodies, commercial laboratories, and paint users can also benefit from the course.

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

For more information, contact Kristina Falkenstein, ASTM, 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959.

Schedule for Macbeth's Color Seminar Released

Macbeth Division of Kollmorgen Instruments Corp., New Windsor, NY, has released the 1996 Fall/Winter schedule for "Fundamentals of Color" seminar. This two-day seminar will introduce the basic principles of color science and is designed for anyone involved in color specification, evaluation, measurement, and quality control.

The seminar consists of both lectures and practical demonstrations on color communication and specification, visual color evaluation, color measurement instrumentation, and the general principles for managing color in business today. An informal workshop, scheduled on the second afternoon, gives attendees the opportunity to experiment with equipment for visual color evaluation, color measurement, color quality control, and color formulation.

The location and dates of the seminar are as follows: Oct. 1-2, Detroit, MI; Oct. 15-16, Memphis, TN; Oct. 29-30, Toronto, Ontario; Nov. 6-7, City of Industry, CA; Nov. 19-20, Kenna, LA; and Dec. 3-4, Mahwah, NJ.

The course fee is $395 and includes reference materials, workbook, and lunch each day.

Additional seminar information may be obtained from Wanda F. Smith, Macbeth, 405 Little Britain Rd., New Windsor, NY 12553-6148.

"Environmentally Compliant Coatings Course"

Sponsored by
North Dakota State University
Department of Polymers & Coatings

Crowne Plaza Resort, Hilton Head Island, SC
January 21-24, 1997

North Dakota State University's Department of Polymers and Coatings is offering a four-day intensive course on "Environmentally Compliant Coatings" for individuals who have experience in coatings research, but want to learn about recent developments on water-reducible, latex, high-solids, powder coatings, radiation curing, corrosion, and modern analysis of coatings.

The course will be taught at the research level with emphasis on the underlying physical, organic, and polymer chemistry. Theoretical considerations will be related to practical problems, and new approaches will be suggested.

Information concerning registration and accommodations can be obtained from Debbie Shasky, Program Coordinator, (tel: 701-231-7633; fax: 701-231-8439; e-mail: nupoly@plains.nodak.edu), and information concerning the program content from Prof. Marek W. Urban, Chair of the Polymers and Coatings Department and Short Course Director.

"Coatings Science Course"

Sponsored by
North Dakota State University
Department of Polymers & Coatings

NDSU Campus, Fargo, ND
Course Date: June 2-13, 1997

North Dakota State University's Department of Polymers and Coatings is offering a two-week intensive summer coatings science course for all individuals interested in enhancing their current level of knowledge in coatings and paints, or to those who seek broader perspective, understanding, and fundamentals of coatings science.

The course will be offered from June 2-13, 1997. Registration is limited to 40 participants. Information concerning registration and accommodations can be obtained from the Program Coordinator, Debbbie Shasky, Program Coordinator, (tel: 701-231-7633; fax: 701-231-8439; e-mail: nupoly@plains.nodak.edu), and information concerning the program content from Prof. Marek W. Urban, Chair of the Polymers and Coatings Department and Short Course Director.

American Vacuum Society's 43rd Symposium Scheduled for Oct. 14-18, in Philadelphia, PA

The American Vacuum Society (AVS), New York, NY, will conduct its 43rd National Symposium on October 14-18, 1996 at the Pennsylvania Convention Center, Philadelphia, PA.

The one-week symposium will cover films, microelectronics, nanostructures, processing, surfaces, vacuum, and related technologies.

In addition to programs from the Society's eight technical divisions, the annual symposium will include the following:

- parallel sessions on applied surface science, electronic materials and processing, nanometer-scale science and technology, plasma science and technology, surface science, thin films, vacuum metallurgy, and vacuum technology;
- three topical conferences on flat panel displays, magnetic surfaces, interfaces, and nanostructures, and microelectromechanical systems;
- technical sessions on biomaterial interfaces and manufacturing science and technology addressing the many application areas of these developing technologies;
- more than 40 short courses on applied vacuum technology; surface analysis and materials characterization; and the processing and characterization of materials, thin films, and coatings.
- an equipment exhibition featuring 160 exhibitors displaying the latest in vacuum technology, equipment, and services and will include a display of historic thin-film equipment.

For more information, contact AVS, 120 Wall St., 32nd Fl., New York, NY 10005.

Changing Technology Focus Of SPI's Midwest Conference

One of the most important issues facing the plastics industry—how to use today's changing technology to create an effective business strategy for the future—will be discussed at The Society of the Plastics Industry (SPI) Inc.'s 27th Annual Midwest Section Conference. Slated for September 5-7, the conference will be held at the Grand Geneva Resort and Spa, Lake Geneva, WI.

Under the theme, "Changing Technologies: Developing Strategies for the Future," the conference will focus on using technology to improve products, manufacturing processes, marketing and build a workforce capable of meeting tomorrow's technological challenges. The Keynote Address will be delivered by Jean Heuschen, of GE Plastics.

In addition, conference breakout sessions will cover six different technical applications that influence the plastics industry including: the Internet; process mapping; creating a technically skilled workforce; the use of robotics and return on investments; new hot-runner technology; and an overview of new materials technology and how they perform.

To obtain additional information, contact SPI, 1275 K St., N.W., Ste. 400, Washington, D.C. 20005.

BYK-Gardner Releases Upcoming Seminar Schedule

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

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

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

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

There is no fee to attend the seminars. Contact BYK-Gardner USA, 2435 Linden Lane, Silver Spring, MD 20910 for additional information.

70th Anniversary Conference on Colour Materials Slated for October 22-24, 1997, in Tokyo, Japan

The Japan Society of Colour Materials is sponsoring the 70th Anniversary Conference on Colour Materials on October 22-24, 1997, at Arcadia Ichigaya (Shigaku Kaikan), Chiyoda-ku, Tokyo, Japan. Titled "New Developments in Colour Material Science and Technology," the program will cover all aspects of pigments, coatings, printing inks, resins, functional materials, and relating products, together with their testings and equipments.

Scientific and technological activities will be comprised of plenary lectures, oral and poster sessions, and a technical forum.

For more information, contact Shuichi Hamada, Japan Society of Color Materials, Kitamura Bldg., 5F, 9-12, 2-chome, Iwamoto-cho, Chiyoda-ku, Tokyo 101 Japan.

NACE Presents Conference on Corrosion in the Oil Industry

NACE International, Houston, TX, will conduct a conference on "Corrosion in the Oil Refining Industry" on September 26-27. This conference will be held in conjunction with NACE Fall Committee Week, September 22-27 at the JW Marriott Hotel, in Houston, TX.

This conference is designed for refinery inspector, corrosion engineer, process engineer, and metallurgist and addresses various problem areas of corrosion in the oil refinery.

Topics to be discussed during the conference include material selection, failure analysis, corrosion monitoring, corrosion mechanisms, and corrosion control techniques, as well as inspection.

The technical program is designed as a forum for providing basic information on corrosion and materials problems specific to the refining industry.

For more information, contact NACE Membership Services, P.O. Box 218340, Houston, TX 77218-8340; (713) 492-0535.

BGSU and ITW DeVilbiss Cosponsor Spray Finishing Workshop

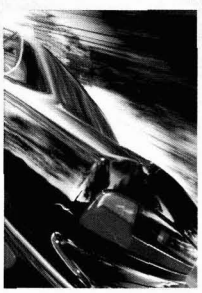
Bowling Green State University, Bowling Green, OH, and ITW DeVilbiss, Toledo, OH, will conduct a "Spray Finishing Technology Workshop" on October 23-25, at the ITW DeVilbiss Training Center.

The workshop will emphasize spray finishing associated with industrial, contractor, and maintenance applications, as well as automotive refinishing. Spray system and equipment selection, operation, maintenance, surface and material preparation will also be discussed.

For more information, contact Richard A. Kruppa, College of Technology, Bowling Green State University, Bowling Green, OH 43403-0301.

Application Equipment for High Quality Appearance Powder Coatings, Especially for Automotive Clear Topcoats

Kenzo Yanagida, Mitsuyoshi Kumata, and Masashiro Yamamoto—Nihon Parkerizing Co., Ltd.*



Recently developed fine powder can provide a quality appearance as good as that obtained with solvent-based coatings. However, if such a fine powder is applied as it is, several problems occur due to the inherent cohesiveness of powder. The purpose of this study is to overcome these problems, to develop the optimum powder coating system to apply fine powder, and to realize the commercial application of the coating system for automotive body topcoats.

INTRODUCTION

Powder coatings applied by electrostatic spray are superior in terms of reduction of pollution, utilization of resources, productivity, and so on because no organic solvent is necessary in application. Therefore, they have been widely adopted in many industrial processes. Especially from the ecological point of view, many European countries and the United States have recently taken a hard line in the regulation of VOCs,[1-4] which has encouraged the shift to powder coatings in the industrial finishing field. This trend is apparent in the fact that for the past several years the production of powder coatings in Europe and the U.S. has been growing more than 10% each year over the previous year.

This trend reflects recent aggressive and serious considerations of moving to powder coatings by the automotive industry, which is one of the most typical industries that require high quality decorative finishes. In the U.S. for example, Low-Emissions Paint Consortium (LEPC)[5-8] or Big 3 has been jointly developing new technologies for clear topcoat on automotive bodies and is expected to start the pilot line as early as February 1996.

However, there are many technological problems left unsolved in the practical application of powder coatings for decorative use such as automotive body coating. Above all, clear topcoat, which is the final finish on automotive bodies, requires a very high quality appearance that cannot be achieved by conventional powder coating technologies. In terms of functional performances, such as weatherability and anti-chipping, powder film is as good as or superior to solvent type liquid film, because those functional performances depend on physical properties of the coating. However, in terms of appearance, conventional powder coatings and powder application technologies have not been successful in obtaining a high quality appearance finish as good as that by solvent-based coatings when a comparison of appearance is done between a powder coated film and a solvent-based coated film of the same thickness. It appears that in order to realize powder coating of automotive bodies, the improvement of image clarity is especially important. Recently a powder coating[9] whose major characteristics is its smaller particle size has been developed and a considerable advance in image clarity has been achieved with this powder. However, fine powder involves several problems in application, including:

—unstable powder feed due to the decreased fluidization capability of powder;

—poor appearance due to the spitting made of agglomerated powder particles formed during fluidization process and flakes of powder build on powder feed system formed during powder transportation process; and

—poor transfer efficiency due to aerodynamical effect from the light weight of smaller powder particles.

In addition, there is a problem characteristic to coating of automotive bodies. Powder clear topcoat is not a coating on an electro-conductive substrate (automotive body itself) but a coating on an insulated film (basecoat) that exists between clear topcoat and the automotive body (see *Table* 1). The use of corona type spray guns for the coating of insulated film results in the following

*13-27 2-Chrome, Shinonome, Koto-Ku, Tokyo, Japan 135.

Table 1—Typical Film Composition and Coating Method of Metallic Finish Car

Layer	Resin	Thickness	Coating Method	
		(μm)	Current	Next Generation
Clear topcoat	Acrylic	30-45	Solvent	Powder (R&D target)
Metallic base	Acrylic	10-20	Solvent or Waterborne	Waterborne
Primer surfacer	Polyester	30-45	Solvent	Powder
Undercoat	Epoxy	15-30	E-Coat	E-Coat

problems because the surface potential of automotive body, having an insulated film on it, is increased by the accumulated charge from free ions and charged powder particles: orange peel caused by electric repulsion (back-ionization)[10] and poor transfer efficiency.

The purpose of our research was to develop a new powder coating system that can apply finer powder coatings which conventional powder coating systems have failed to apply successfully, and to put the new system to practical use for clear topcoat of automotive bodies.[11,12] This paper describes the achievements that have been made to overcome the previously mentioned problems. Virtually all the equipment described is manufactured by Nihon Parkerizing Co., Ltd.

EXPERIMENTAL

Evaluation of Stability of New Powder Feed System

Figure 1 shows the schematic diagram of the powder feed system developed for fine powder coatings. The cylindrical powder hopper has a fluid-bed and 30 liter capacity. An agitator is equipped in the hopper, and the speed of revolution is controlled between 10 to 100 rpm. The temperature and the humidity of the fluidizing air is controlled at 10 to 30°C (86°F) and less than 30% respectively by the air conditioner. Fluidized powder and fluidizing air (powder/air mixture) is pumped out by the injector and then transported to the spray gun via powder hose. The amount of transported powder (hereinafter "powder feed rate") is automatically sensed by the sensor installed between the powder hopper and the injector, and the sensed feed rate is compared to the feed rate set at the feed rate controller to maintain at a constant value (the set value ± 2.5%). The powder feed rate

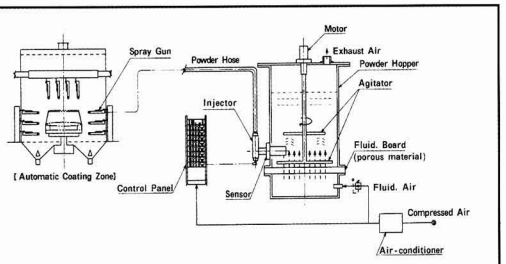


Figure 1—Schematic diagram of developed powder feed system.

sensor used for this experiment is of capacitance type,[11] and the electrostatic equipment is a one-gun unit equipped with an automatic and real-time feedback control and monitoring system of powder feed rate. The feed rate is controlled at any value between 50 to 230 g/min, and the gun impressed voltage between 0 to 100 kV (negative).

Using the experimental system, the sensor output value was measured for 10 cycles, each cycle consisting of 15 sec of powder spraying (pumping) and 10 sec of pause. The sensor output value was compared to the powder feed rate set at the feed rate controller. The measurement conditions and the powder used are shown in *Tables* 2 and 3, respectively. To evaluate the stability of powder feed rate with this feed system, powder was sprayed continuously for 24 hr, and every two hours the actual feed rate (grams per min) was measured with a powder bag put to the gun tip to collect actual powder output from the gun for one minute spray.

Measurement of Transfer Efficiency

The transfer efficiency (in this paper "transfer efficiency" means "first pass transfer efficiency") with the electrostatic equipment was measured as shown in *Figure* 2. The powder feed system used was the one shown in *Figure* 1. The parts transportation system used the overhead conveyor whose transportation speed is controllable between 1 to 6.5 meters (or 3 to 20 ft) per minute. The part used is a square (600 mm × 600 mm, 1 mm thick) coated steel panel that has an average 10 microns (0.4 mils) cationic electro-dipped film and average 40 microns (1.6 mils) polyester film. The following optional systems were used to increase transfer efficiency.

Table 2—Standard Condition of Powder Fluidization

Temperature of fluidizing air	15°C
Humidity of fluidizing air	under 30%
Revolution speed of agitator	20 rpm
Powder hose	I.D. 12 mm x 5 m

Table 3—Specifications of Powder Coatings for Experiment

Resin	Color	Particle Size	
		D50 (μm)	SD (μm)
Sample A ..... Acrylic	Clear	10.5	9.2
Sample B ..... Polyester	Gray	34.3	16.1

D50: Average size (weight average) as the 50th percentile point of the distribution.
SD: Distribution width as a standard deviation of the distribution.

Pre-Charge System: *Figure* 3 shows the principles of a pre-charge system.[12] The surface of the part covered with an insulated undercoat is, prior to the powder spraying, corona charged by the corona discharge device as shown in *Figure* 3(1) to the opposite polarity (positive polarity in this study) to the one applied for the powder spray gun. Then, in the process of powder spraying shown in *Figure* 3(2), most of the positive ions deposited on the surface of the part by corona discharge device and the negative ions that are generated by the powder spray gun are coupled and neutralized. The negative ions generated by the spray gun are partly deposited on powder particles and partly on the part (free ions). Thus, the increase of surface potential of the part is suppressed, resulting in not only improved transfer efficiency but also in reduced electric repulsion (back-ionization).

In the experiment, the corona discharge device was installed in the upper course of parts transportation and powder spray gun in the down course (*Figure* 4). The applicable voltage with the corona discharge device, or pre-charge system, is between 0 to 60 kV (positive).

Free Ion Reducing System: As shown in *Figure* 5, there are pin electrodes incorporated in the ring (henceforth "free ion trap") attached to the gun body for the purpose of reducing free ions existing in the powder coating field (between gun the corona pin and the part). The free ion trap is kept at ground potential and almost all of the free ions generated around corona pin are trapped (captured) by this free ion trap to suppress the increase of the surface potential of the part. As mentioned previously, the "pre-charge system" improved transfer efficiency, and reduced electric repulsion is expected to be the effect of this system.

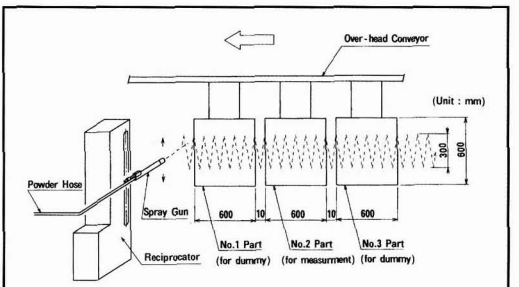


Figure 2—Schematic diagram of measuring facility for transfer efficiency.

Electric Field Reinforcing System: As *Figure* 6 shows, there are ring electrodes installed in front of the spray gun ("external electrodes") with which the electric field generated between pin electrode of spray gun and the part can be reinforced. These external electrodes face the surface of the part, or undercoat film, and are connected to a DC high voltage source whose polarity is the same as that for the spray gun. The high voltage supplied to external electrodes is controlled between 0 to 60 kV (negative). This system reinforces, by the external inductive electric field, the electric field intensity adjacent to the part that has been already generated by the corona discharge, reinforcing the adhesion power of charged powder particles by Coulomb's force to improve transfer efficiency.

Now the measurement method of transfer efficiency must be briefly explained. Three pieces of parts were hung on hooks as shown in *Figure* 2 and conveyed to the

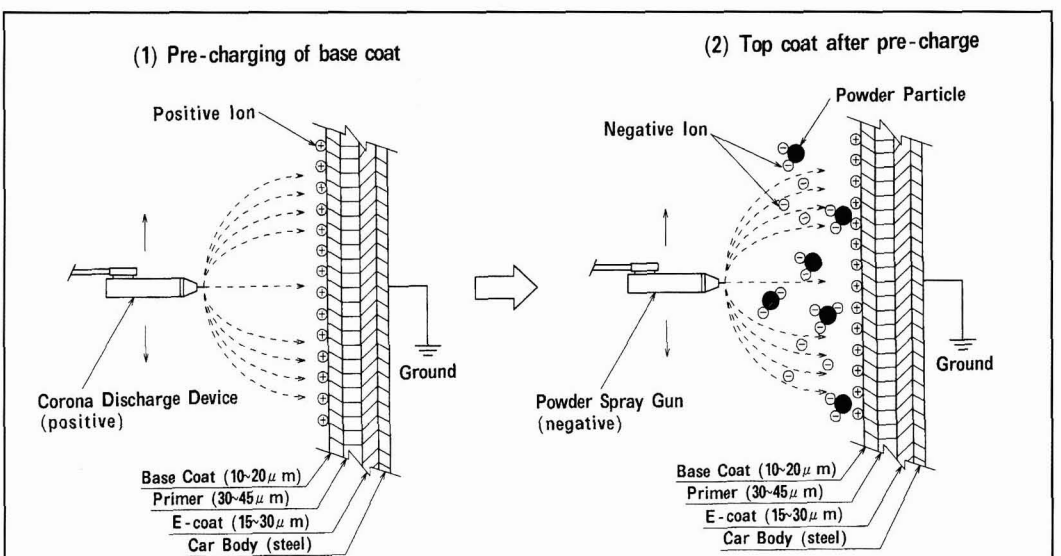


Figure 3—Schematic diagram of pre-charge process. (1) is performed before topcoating process, and (2) is performed after pre-charge process.

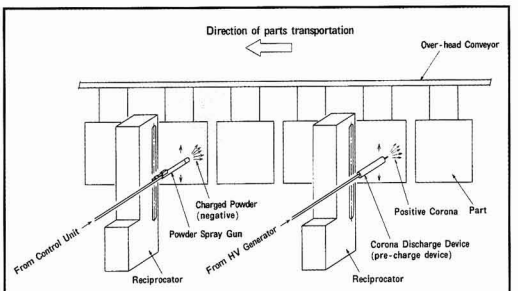


Figure 4—Schematic diagram of experimental facility equipped with pre-charge system.

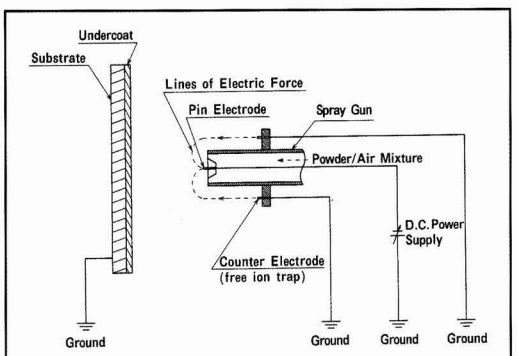


Figure 5—Cross-section of spray gun equipped with free ion trap.

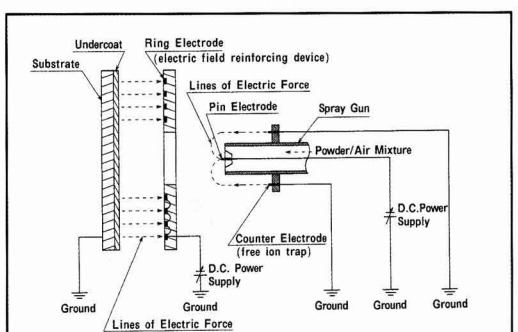


Figure 6—Cross-section of spray gun equipped with free ion trap and electric field reinforcing system.

front of the spray gun installed on a reciprocator by the conveyor to the direction of the arrow in the figure. The gun was reciprocated up and down, and the parts were powder coated under the conditions shown in *Table* 4. After powder spraying, the middle part was unloaded. The weight of powder particles deposited on the part was taken by an electronic scale. The transfer efficiency η is calculated in accordance with the following formula.[13]

$$\eta = \frac{Wp \times CV}{Lp \times FR} \ (\%)$$

where Wp = weight of powder particles deposited on the part (grams)
CV = conveyor speed (m/min)
Lp = horizontal length of the part (m)
FR = powder feed rate (g/min)

Evaluation of Appearance

The appearance of the powder coated surface is apt to be seriously damaged by spits remaining as spit marks after baking. Spitting on the coated surface is caused by agglomerated powder particles and flakes of powder particles built on powder hose inner wall and powder channel inside spray gun. This phenomenon is more conspicuous with finer powder. In order to cope with this problem, a new gun nozzle (shown in *Figure* 7, "nozzle A") was developed which is capable of dispersing agglomerated powder particles and preventing powder particles from building on spray gun. Nozzle A disperses fine powder particles that are agglomerated during powder fluidization process and powder transportation process at the gun nozzle tip, the final stage of powder transportation, and is expected to spray powder particles in a well dispersed condition.

In the experiment, the appearance evaluation was performed in terms of spits on the surface of the middle part under the same coating conditions as shown in *Figure* 2 and *Table* 4 that were used for the transfer efficiency evaluation. For the evaluation, the number of spits (before baking) on the coated surface whose diameter are more than 0.4 mm (400 μm, or approximately 16 mils) were counted with human eyes. For the comparison purpose, other nozzles besides nozzle A—such as nozzle B (swirl nozzle whose outer head diameter is 30 mm) and nozzle C (fan nozzle)—were tested.

RESULTS AND DISCUSSION

Effect of New Powder Feed System

An attempt was made to measure the responsivity of the powder feed system without agitator and air conditioner using powder sample A,[9] which is an acrylic resin based powder whose average particle size is 10 μm (or 0.4 mils) manufactured by Nippon Paint. This attempt was unsuccessful because the powder was hardly fluidized in the hopper, and the sensor was clogged just after the start of pumping. A well fluidized condition in the hopper is not obtained in the case of a hard-to-fluidize pow-

der like powder sample A, because channeling occurs in the hopper and powder particles and air cannot be well mixed in the hopper (*Figure* 8). The reason for the poor fluidization of fine powder is considered to be attributed to the agglomeration among powder particles. Generally speaking, the more the specific area of powder particles is, the more the agglomeration of powder particles is accelerated due to the following reasons: (1) agglomeration by electrostatic force among powder particles; (2) agglomeration by the softening of the surface of powder particles under higher temperatures; and (3) agglomeration by the absorbed moisture on the surface of powder particles under high humidity.

Then the responsivity of the powder feed system was determined using a normal industrial powder coating, sample B, polyester resin based powder whose average particle size is 35 μm (1.4 mils). The experimental conditions were the same as that for powder sample A and the powder feed system was used. As *Figure* 8 shows, powder particles were well fluidized by the compressed air supplied to the fluid-bed through a fluidizer. The experiment results are shown in *Figure* 10: the responsivity of the new powder feed rate control system to the remote signal to control powder feed rate.

Powder sample A was studied using the new powder feed system shown in *Figure* 1. A fluidization as good as that with powder sample B was obtained. *Figure* 9 shows the responsivity of the new powder feed system with powder sample A to the remote signal of powder feed rate. In both *Figures* 9 and 10, sensor output has an excellent responsivity to the set value (powder feed rate). It has been confirmed that a satisfactory fluidization condition and constant powder feed is possible even with hard-to-fluidize powders such as the finer powder coating mentioned earlier when the new powder feed system equipped with an agitator and an air conditioner for fluidizing air is available.

Figure 11 shows measurements of powder feed rate consistency for 24 hr continuous spraying of powder sample A under the same test configuration used for the previous experiment. The actual powder output at 100 g/min and at 150 g/min settings are so constant that the guaranteed accuracy of ± 2.5% of set value with the powder feed rate control system is accomplished.

In final analysis, a fluidization condition as excellent as that with normal industrial powder can be obtained

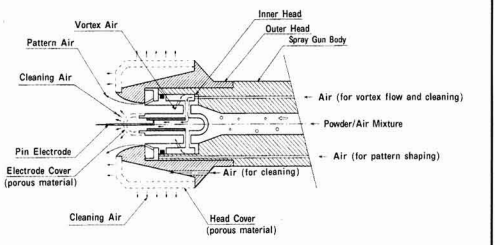


Figure 7—Cross-section of developed gun nozzle.

Table 4—Typical Spraying Parameters

Reciprocation stroke	0.3 m
Reciprocation velocity	15 m/min
Conveyor speed	2.0 m/min
Gun impressed voltage	-80 kV
Distance between gun and substrate	200 mm/150 mm
Powder feed rate	80 g/min
Powder	Sample A (cf. *Table* 3)
Size of substrate	600 mm x 600 mm

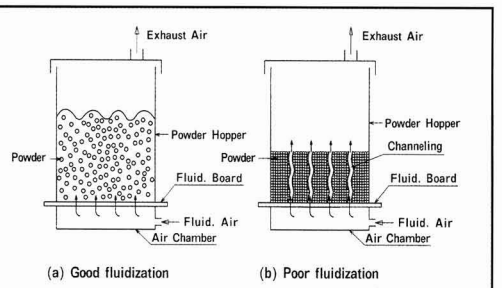


Figure 8—Comparison of fluidizing conditions by normal fluid-bed type hopper. (a) Fluidization of normal powder (av. particle size; 35 μm). (b) Fluidization of fine powder (av. particle size; 10 μm).

Table 5—Comparison in Transfer Efficiency and Electrical Repulsion between Former and New Developed Coating Systems

Condition	Hooper	Vpc[a]	I.T.[b]	Vex[c]	Transfer Efficiency (%)		Electrical Repulsion	
		(kV)	—	(kV)	d^d=200 mm	d^d=150 mm	T^e=50μm	T^e=100 μm
1	Developed	Not used	Not used	Not used	68.2	72.2	No	Yes
2	Developed	Not used	Used	Not used	75.2	81.0	No	No
3	Developed	Not used	Used	-20	78.2	—	No	No
4	Developed	+50	Used	-20	80.1	—	No	No
5	Developed	+50	Not used	Not used	72.1	—	No	No
6	Normal	Not used	Not used	Not used	60.3	—	No	Yes

Nozzle: A type (developed).
Powder: A type (10 μm)
Distance between Gun and Ion-Trap: 150 mm
Gun impressed voltage: -80 kV

(a) V_{pc}: Voltage impressed to pre-charge system.
(b) I.T.: Free ion trapping device.
(c) V_{ex}: Voltage impressed to external electric field reinforcing system.
(d) d: Distance between gun and substrate.
(e) T: Thickness of coating film.

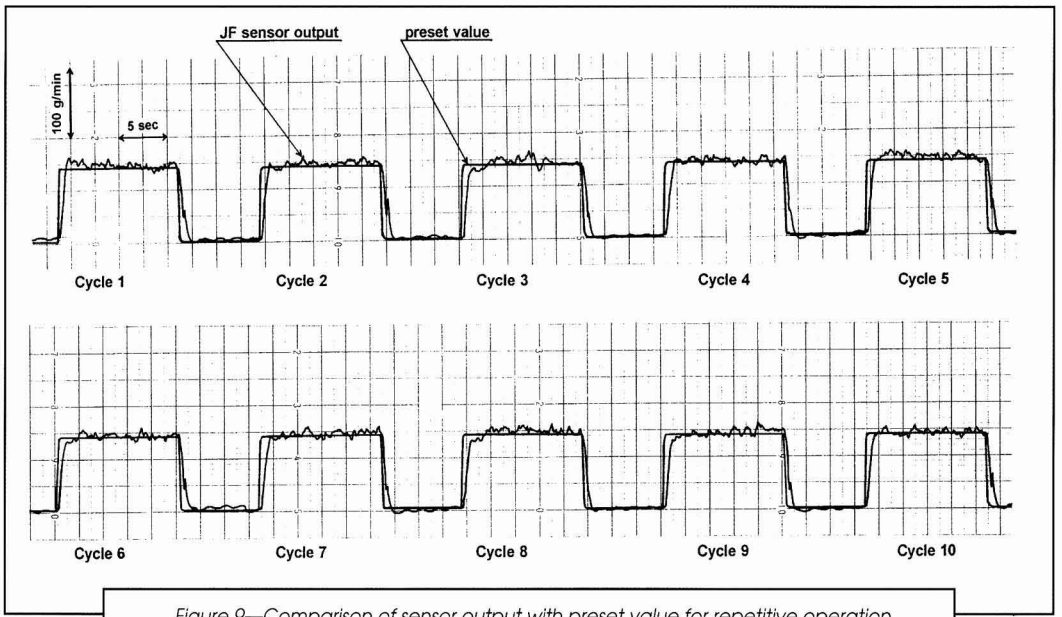


Figure 9—Comparison of sensor output with preset value for repetitive operation of fine powder feed.

even with a powder as fine as to 10 μm (0.4 mils) by the addition of an agitator to the hopper and by the selection of an adequate temperature and moisture of the fluidizing air. Furthermore, it has also been confirmed that the combination of the fluid-bed type powder hopper equipped with an agitator and a powder feed rate control system consisting of a capacitance type powder feed rate sensor and a feed back control function enables a constant powder feed.

Effect of New Powder Coating System Equipped with Pre-Charge System

With metallic finish and pearl finish automobiles, clear topcoats are applied on insulated basecoats. The application of electrostatic powder spray guns of corona charge type increases the surface potential of automotive body covered with basecoat by free ions and electric charge of charged powder particles, resulting in discharge among deposited powder particles on the body surface, or back-ionization, which would turn into orange peel, one of the critical flaws in the appearance of the surface. In addition, the increase of surface potential reduces electric field strength between spray gun and the part (automotive body), resulting in poor transfer efficiency.

Table 6—Number of Spittings by Type of Nozzle

Condition	Nozzle	Hooper	Numer of Spits (> 0.4 mm)
1	A	Normal	2-4
2	A	Developed	Non
3	B	Normal	>>10
4	B	Developed	<10
5	C	Normal	>10
6	C	Developed	<10

Nozzle A: Newly developed.
Nozzle B: Swirl (30 mm I.D.)
Nozzle C: Fan

The pre-charge system was evaluated to confirm the effect to suppress the increase of surface potential of the part. The surface of the part covered with insulated undercoat is, prior to a powder spraying, corona charged to the opposite polarity (positive polarity in this paper) to the one applied for the powder spray guns. On the surface of the part insulated by undercoats, this pre-charge system generates an inductive electric field with which negatively charged powder particles are attracted to the part surface.

The pre-charge experiment was performed as shown in *Figure* 3(1), and after pre-charge a powder spraying was done under the coating conditions stipulated in *Table* 4. The pre-charge conditions were pre-charge voltage set at +50 kV, and the distance between pre-charge electrode and the part set at 200 mm (8 in.) in order to control the surface potential of the part between +100 to 400 V. The film thickness of clearcoat was targeted at 50 (2 mils) and 100 μm (4 mils).

The results of the experiment for evaluating pre-charge effect are shown in *Table* 5 and *Figure* 12. With the test under condition 1, where there was no pre-charge applied, a back-ionization was observed at or around the clearcoat film thickness of 100 μm (8 mils), while under condition 5, where pre-charge was applied, there was no back-ionization observed. In terms of transfer efficiency, condition 5 achieved higher efficiency by approximately four points than condition 1. It is considered that pre-charge had an effect to offset a considerable part of the positive ions deposited on the surface by the pre-charge

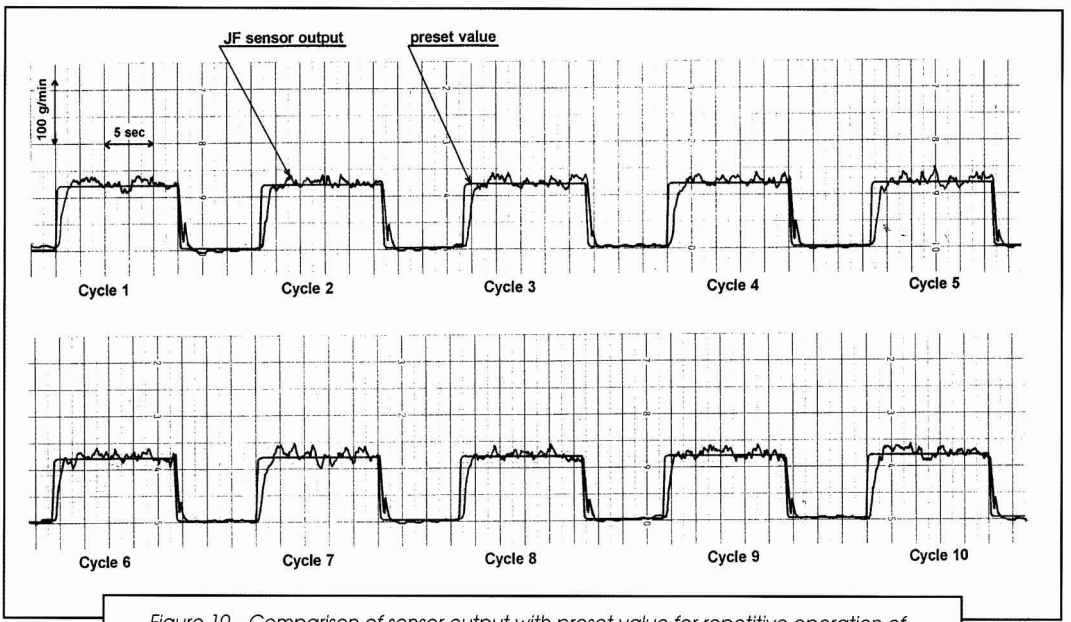


Figure 10—Comparison of sensor output with preset value for repetitive operation of normal powder feed.

system with the negative ions coming from the charged powder particles and free ions.

As explained earlier, it has been confirmed that the pre-charge system suppresses back-ionization and increases transfer efficiency.

Effect of New Powder Coating System Equipped with Free Ion Trap

The free ion trap was developed for the same purpose of suppressing the increase of surface potential as the previously mentioned pre-charge system. The effect of mounting the trap on the spray gun was evaluated. As shown in *Figure* 5, there are pin electrodes incorporated in the ring attached to the gun body for the purpose of reducing free ions existing in the powder coating field (between gun corona pin and the part). The free ion trap is kept at ground potential and almost all of the free ions generated around the corona pin are trapped (captured) by this free ion trap to suppress the increase of the surface potential of the part.

The experiment was performed using the system shown in *Figure* 5 under the conditions stipulated in *Table* 4. The coating conditions were the distance between corona pin electrode and counter electrodes for ion trap set at 150 mm (6 in.); the number of counter electrodes being 4; and the clearcoat film thickness targeted at 50 μm (2 mils) and 100 μm (4 mils).

The results of the experiment for evaluating free ion trap effect are shown in *Table* 5 and *Figure* 12. Under test condition 1, where free ion trap was not applied, a back-ionization was observed at or around the clearcoat film thickness of 100 μm (8 mils), while under condition 2, where free ion trap was applied, there was no back-ionization observed. In terms of transfer efficiency, condition 2 achieved higher efficiency by approximately seven points than condition 1. It is considered that free ion trap captured most of free ions generated by the corona discharge at nozzle pin and considerably reduced the excessive charge that reached the surface of the part.

As explained earlier, it has been confirmed that free ion trap system suppresses back-ionization (orange peel) and increases transfer efficiency.

Effect of New Powder Coating System Equipped with External Electric Field Reinforcing System

When an electrostatic powder coating is applied to electro-conductive surface or part, there is an electric field generated between the spray gun and grounded parts dependent on the voltage impressed on the nozzle pin. Coulomb's force[14] (F) working on charged powder particles is in proportion to electric field strength (E) and the charge to the mass (q) as shown in the following formula.

$$F \propto qE$$

This means that if q is the same, transfer efficiency is in direct proportion to E. Free ion trap has a great effect in improving transfer efficiency and minimizing back-ionization by suppressing the increase of the surface potential of the part whose surface is coated with insulate materials. However, the electric field strength between the part and the corona pin of the gun nozzle is weakened because the electric field generated by the corona discharge around the pin electrode of the gun nozzle is apt to focus on the electrodes of free ion trap.

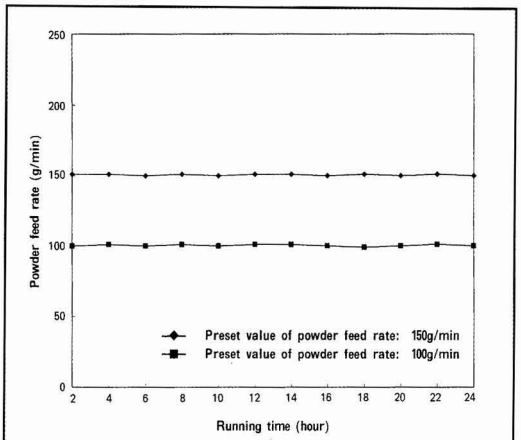


Figure 11—Fluctuation of powder feed rate with running time.

In order to increase the electric field strength adjacent to the part, an additional external electrode is used to form another electric field between the spray gun and the part as shown in *Figure* 6. In the experiment, the gun impressed voltage was set at (–) 80 kV and the voltage impressed on the external electrodes was set at (–) 20 kV. The distance between external electrodes and the part was set at 100 mm (4 in.), and that between spray gun and the part 200 mm (8 in.). Other spraying conditions are shown in *Table* 4.

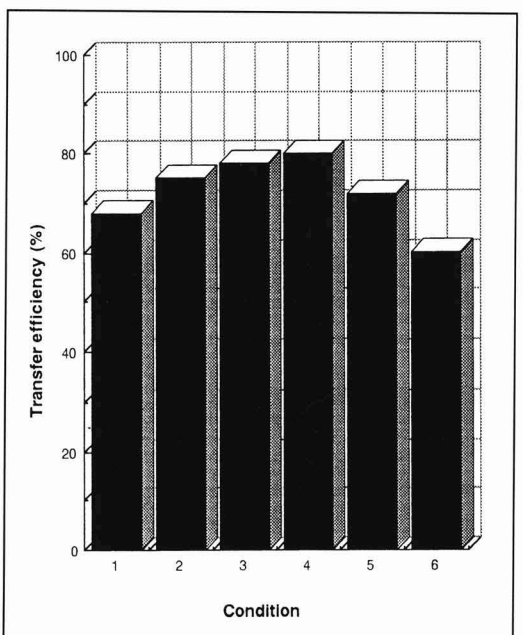


Figure 12—Comparison to transfer efficiency in each condition.

The results of the experiment for evaluating the effect of external electric field reinforcing system are shown in *Table* 5 and *Figure* 12. The transfer efficiency with the spraying where external electrodes were applied (condition 3) was higher by three points than the spraying without external electrodes. As in the system setup shown in *Figure* 6, the transfer efficiency of the spraying with pre-charge at (+) 50 kV was approximately 80% (condition 4), which is higher by two points compared to the spraying without pre-charge.

As explained previously, by the combination of the three developments—pre-charge system, free ion trap, and electric field reinforcing system—not only the orange peel due to back-ionization was minimized but also a remarkable improvement was achieved in transfer efficiency. For reference, the transfer efficiency without the three developments was 60 to 68%, while that with all the three developments was more than 80% (*Table* 5). As for the improvement in appearance of the finish, the quality finish as high as or higher than that with liquid coating was obtained in terms of distinctness of image (DOI) and surface roughness (Ra) using powder sample A whose average particles size is 10 μm (D50) and under a spraying condition where back-ionization is minimized. *Figure* 13 shows that DOI with powder sample-A whose average particle size is 10 μm (D50) is more than 80% by NSIC.[15,16] Suga Image Clarity (Nippon Paint) measurement while in *Figure* 14, Ra=0.08 μm, was achieved with the powder whose D50 is 10 μm. For *Figure* 13 (NSIC) and *Figure* 14 (Ra), refer to the paper written by J.C. Kenny, T. Uneo, and K. Tsutsui.[9]

Effect of New Spray Nozzle on Dispersion of Agglomerated Particles

Table 6 shows a comparison among three types of nozzles: nozzles A, B, and C in terms of spitting. The combination of nozzle A and the fluid-bed type powder hopper equipped with an agitator (= condition 2) did not produce a spitting whose diameter is larger than 0.4 mm (1/64 in.), which is a maximum size that will not turn into a spit mark after baking. On the other hand, both nozzle B and nozzle C, both of which are commercially available, produced several spits in case these nozzles were used in combination with the powder feed system shown in *Figure* 1, and tens of spits in case these nozzles were used in combination with a commercially available powder feed system.

Table 6 shows that although nozzle B and nozzle C were, from the experiment, effective in reducing the number of spits with an excellent fluidizing condition obtained by the adoption of the newly developed powder feed system as shown in *Figure* 1, some spits still exist. These spits are believed to come from the agglomerated powder particles produced during transportation process (from injector through powder hose to gun nozzle). If the agglomerated powder particles formed in transportation can be broken and dispersed at the nozzle tip that is the final stage of powder transportation, spit marks after baking will be prevented. The result under condition 2, where a newly developed nozzle A having the structure and functions as shown in *Figure* 7 was

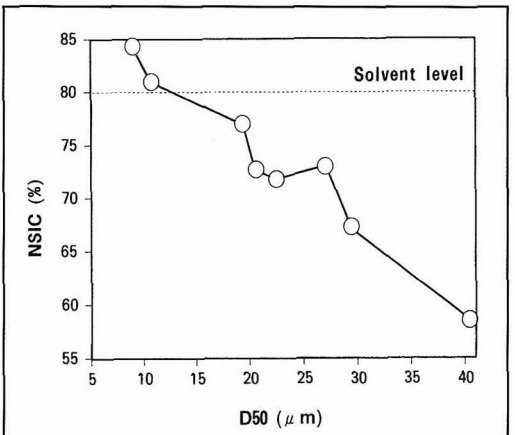


Figure 13—Powder coating average particle size effect on image clarity. (film thickness: 80 μm).

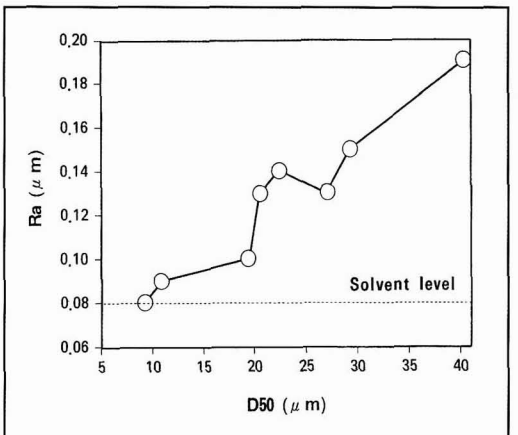


Figure 14—Powder coating average particle size effect on surface roughness. (film thickness: 80 μm).

applied, has proved the effect to disperse agglomerated particles.

SUMMARY

In this study, a trial was made for putting into practical use the electrostatic powder coating system best suited to the clear topcoat of automotive bodies with finer powder coating, which had been considered to be almost impossible.

The results of our research to solve several technological problems in applying fine powder coatings are as follows:

(1) A constant feeding of fine powder accurate to ±2.5% of the set feed was realized by the re-design of a powder feed system such as controlling the temperature and moisture of fluidizing air, adoption of agitator, and the automatic feedback control of powder feed rate.

(2) On the gun nozzle, spitting was successfully minimized by putting a device to break and disperse agglomerated powder particles.

(3) A transfer efficiency higher than 80% (12 to 20 points higher than that with conventional systems) was realized by increasing charging efficiency of powder sprayed out of gun nozzle, minimizing free ions, and establishing an external field reinforcing system.

(4) Orange peel by back-ionization was successfully suppressed by minimizing free ions.

These results mean that the requirements for coating costs and finish appearance have been cleared in the field of clear topcoats of automotive bodies that is one of the most difficult applications in electrostatic powder coating.

The challenge left is to research and develop the practical applications of the new system for automotive body plants in commercial production, such as the optimized coating conditions and re-designing the whole coating system including powder receiving system and powder recovery system. Currently a trial has been made at a pilot line scaled for production line.

Finally, it should be mentioned that the new electrostatic powder coating system is applicable for auto primer

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surfacers as well as for clear topcoats, although this has not been covered in this paper.

ACKNOWLEDGMENT

From the very start of this study, great help and much advice have been provided from Dr. Koichi Tsutsui, Director, R&D Department, Powder Coatings Division, Nippon Paint Co., Ltd. (partner of the joint R&D) in terms of supplying us with fine powder coatings for clear topcoat and test pieces, and the evaluations (spitting and image clarity) of appearance of coated samples. Also Mr. Takao Amasaki and Mr. Shannon Libke from Nippon Paint Co., Ltd. have been a great help in the area of measurement and evaluation of coated sample appearance.

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* 1995 Constituent Society Paper *

Rheology Modifiers for Low VOC Bake Coatings

New York Society for Coatings Technology Technical Committee—
Sheila Westerveld*, Rudy Berndlmaier, Richard Swenson, Daniel Weadock, Henry R. Stoner, Janis W. Anderson, Ashok Khokhani, and Jim McGrath

The Technical Committee of the New York Society for Coatings Technology investigated commercially available additives for their influence on the rheology of low volatile organic compounds (VOC) coatings. These rheology modifiers are important because coatings manufacturers must change their formulations in order to comply with government VOC regulations. The committee solicited samples of rheology modifiers from 15 commercial manufacturers. They were tested in both water and solvent-based low VOC coating systems.

The committee received rheology modifiers from 14 generic types. Standard bake enamels using these rheology modifiers were prepared in water and solvent-based systems. The paints were considered for degree of sag, pigment suspension, sprayability, and specular gloss. Sprayability was evaluated and compared with three methods of viscosity determination for possible trend developments and predictions.

INTRODUCTION

As was highlighted in *Chemical and Engineering News*,[1] both federal and state governments are applying severe restrictions on volatile organic compounds (VOCs) as they apply to paint and coatings. These environmental constraints put on the amount of volatile emissions permitted has led to the development of newer resin systems. These resins have lower solvent content and lower viscosities at higher solids. One of the ways of controlling the VOCs in both water and solvent-based resin systems is by reducing the molecular weight and thereby controlling their viscosities. This had led to a problem called thermal sag resistance. Thermal sag is one of the major problems in low VOC baking enamels. These coatings, when cured at elevated temperatures, tend to sag if not formulated correctly. For this reason, rheological additives for both solvent and water-based coating systems are of great concern in formulating to meet more stringent environmental standards.

One of the formulating techniques to improve thermal sag resistance is the addition of rheology modifiers. Rheology is defined as the science of flow and deformation.[2] Therefore, rheology modifiers for coatings are additives that affect the flow and deformation of coatings. Rheology modifiers are organic, inorganic, or both. Based on the type of rheology modifier, the thickening mechanism would differ greatly. Thickening can occur by swelling particles in the liquid phase, network formation by particles, and/or by hydrogen bonding.[2] Rheology modifiers for baking enamels cause coatings to be either pseudoplastic or thixotropic. Pseudoplastic materials have a viscosity that is inversely proportional to the shear rate and independent of time of shear, whereas, thixotropic materials have a viscosity that is also inversely proportional to the shear rate but is dependent on the time of shear. The shear rate dependency of pseudoplastic and thixotropic materials is shear thinning. Shear thinning is the reduction in viscosity of a coating at increasing shear rates. A shear thinning coating prevents sag by having large viscosities at the low shear rates of sag (<1.0 sec^{-1}) while allowing flow through a spray gun by having low viscosities at high shear rates (>1000 sec^{-1}).[3] Rheology modifiers, however, do more than just produce shear thinning, they affect flow through a spray gun, atomization, application characteristics, uniformity of coating, leveling, cure, gloss of finish, etc.

As a result of the problems mentioned previously, a number of rheology modifier suppliers are addressing these issues. They have identified the causes of these problems and defined the requirements of ideal rheology modifiers to correct these problems. Suppliers were interviewed to determine the efficacy of these generic types of rheology modifiers and to learn the direction in which their development is progressing.

Presented at the 73rd Annual Meeting of the Federation of Societies for Coatings Technology, on October 9, 1995, in St. Louis, MO.

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Table 1—Formulas Produced to Illustrate the Need for a Thermal Anti-Sag Additive

Formula #1—Low VOC Water-Based Gloss White Baking Enamel

	LBS	GALS
Kelsol 4097-WG4-55	114.7	12.5
2-Butoxy ethanol	7.1	0.9
R-900 TiO_2	226.0	6.5
Hi speed disperse to 7 Hegman		
Letdown		
Add slowly while mixing each of the next items:		
Kelsol 4097-WG-4-55	267.5	29.1
Cymel 303	70.9	7.1
Water	366.0	43.9
	1052.2	100.0

Physical Properties

PVC %	18.8
Pigment/binder ratio	0.8/1.0
% solids by weight	48.2
% solids by volume	34.4
Viscosity @25°C, #2 Zahn	105 sec
WPG	10.52
pH	8.5 ± 0.3
VOC excluding water, lbs/gal	1.52
g/L	182.5

Formula #2—High-Solids Gloss White Acrylic Baking Enamels

	LBS	GALS
Joncryl 500	193.4	22.6
R-900 TiO_2	338.4	9.7
Butanol	38.7	5.7
Hi speed disperse to 7 Hegman		
Letdown		
Joncryl 500	174.2	20.4
Cymel 303	125.8	12.6
MIBK	188.6	28.4
Blocked PTSA acid (25%)	4.9	0.6
	1064.0	100.0

Physical Properties

PVC %	17.3
Pigment/binder ratio	0.8/1.0
% solids by weight	72.4
% solids by volume	56.1
Viscosity @25°C, #2 Zahn	23 sec
WPG	10.68
VOC excluding water, lbs/gal	2.95
g/L	353.5

EXPERIMENTAL PROCEDURE

A letter was sent to six resin manufacturers requesting their participation in our study. The requirements of the resin sample were:

(1) It is a commercially available product;

(2) A starting point formula for a gloss white bake enamel is submitted with the sample;

(3) The VOC of the finished paint at application must not be greater than 3.0 lbs/gal (minus water);

(4) The bake schedule for full cure should be 30 min at 350°F (177°C); and

(5) No additives should be included in the formula, with the exception of an acid catalyst for cure.

From the formulas submitted, the group narrowed down the selection to two resin systems. One formula each was selected for a solvent-based and one for a water-based bake system. These two formulas (see *Table* 1) were produced to illustrate the need for a thermal anti-sag additive.

A copy of the final formulas and testing protocol was sent to various additive companies, with a request for the submission of the best product for each formula. Both formulas would be tested in the following manner:

(1) The paints will be baked at 350°F (177°C) for 30 min;

(2) The substrate will be 3.5 × 6 smooth steel Q-panels;

(3) The coating will be sprayed to produce 1.5 mils dry film thickness;

(4) The coated panels will be evaluated using an anti-sag meter before baking; and

(5) The panels will be analyzed for sag resistance and gloss after baking.

One additive per formula was accepted. The additive companies were asked to provide the recommended use level as well as the proper addition sequence within the formula. The submission should provide that:

(1) The resulting coating should not sag when baked;

(2) The resulting coating should retain its high gloss finish after curing;

(3) A single additive (as opposed to a combination) should be submitted for each coating;

(4) Guidelines for the proper level, point of addition, and incorporation technique be provided; and

(5) The additive be classified by its generic type.

A total of 11 additives were received for the water-based formula (three water swelling clays (smectites), two synthetic silicas, an attapulgite, an associative thickener, a titanate, a polyester, a polyacrylate, and a cationic oligomer) and for the solvent-based formula 12 additives were received (two synthetic silicas, two organo sulfonates, an attapulgite, a polyurea, a titanate, a polyolefin, a hydrogenated castor oil derivative, an organo clay, a polyamide, and a cationic oligomer).

Formulation Method

The starting point formulas were chosen for their ease of manufacture as well as their need for a rheology modifier to prevent sag. For both formulas, a high-speed dispersion of the titanium dioxide pigment with the resin was made followed by a letdown phase. In an attempt to be fair to all suppliers, we asked them to formulate using their additives and to optimize the coating performance of the selected formulas. Additives were submitted for the grinding phase as well as post additions. The incorporation of each additive was followed exactly as recommended by the supplier. Re-

fer to *Table* 2 for generic type, percent additive, and order of addition.

Physical Testing Method

Once the paint samples were made, they were stored for approximately two months at room temperature in eight-ounce glass jars and then checked for settling. The degree of settling was based on the amount of separation, the amount of material that had accumulated on the bottom, as well as the ease of reincorporation. In order to determine the rating and description of paint condition, ASTM D 869-85 (reapproved 1993) "Standard Test Method of Evaluating Degree of Settling of Paint" was followed.[4] Further determinations relating to the ease of reincorporation of the pigment were made by noting whether the samples were easily hand mixed or if they required mechanical agitation.

The paint samples were tested for viscosity by three different test methods: Brookfield, Zahn cup, and ICI cone/plate (*Table* 3). The samples were then subjected to various wet and dry film tests. Each sample was tested for sag resistance using a multinotch applicator following the Method A procedure described under ASTM D 4400[5] before and after the bake cycle. Two anti-sag meters were used. The first had a clearance range of 1 to 6 mils (25 to 150 µm) and the second had a clearance range of 3 to 12 mils (75 to 300 µm). Pre- and post-bake sag results were recorded in *Table* 4. The samples were sprayed on smooth steel 0.01 in. Q-panels. Each spray application was timed (5.1-7.5 sec) to compare dry film thickness as a function of spray time. Duplicate panels were sprayed, however, one panel was kept vertical and the other horizontal during the 15 min flash off and 30 min bake at 350°F (177°C). The horizontal panels were evaluated for gloss using a 60° gloss meter, hardness with a Tukon hardness tester, and general physical appearance without the interference of sagging. The vertical panels were used only to evaluate sag.

RESULTS

Incorporation

The solvent-based coating additives were easier to incorporate into the formula than the water-based formulas. This was due to the amount of foam generated in the mixing of the water-based coatings. No defoamer was used to eliminate the possibility of interference with the effectiveness of the rheology additive. In general, the additives that were added in the grind phase were more difficult to incorporate than those added during the letdown phase. The synthetic silicas were the most difficult to incorporate in the water-based formula and gave poor finishes. The recommendation to make a pre-gel of the attapulgite and smectite additives made the incorporation in water much easier.

Some recommendations did not produce viable paints. The viscosity increase was excessive and some gelling occurred. Therefore, some formulas required making a pre-gel of the additive or reducing the concentration in

Table 2—Additives Used

Water-Based Sample	Generic Type	% Additive by Total Weight of Formula	Type of Addition PRE Dispersion or POST Dispersion	Dilution % Water
1-1	Attapulgite	0.29	pre	4
1-2	Smectite	0.50	pre	4
1-3	Associative thickener	1.36	post	3
1-4	Synthetic silica	0.80	pre	31
1-5	Titanate	0.12	post	4
1-6	Synthetic silica	1.96	pre	6
1-7	Polyester	0.40	pre	10
1-8	Smectite	1.11	post	12
1-9	Polyacrylate	0.50	post	10
1-10	Blank	0.00	—	0
1-11	Smectite	0.38	post	6
1-12	Cationic oligomer	0.99	post	4

Solvent-Based Sample	Generic Type	% Additive by Total Weight of Formula	Type of Addition PRE Dispersion or POST Dispersion
2-1	Attapulgite	0.26	pre
2-2	Polyurea	0.30	post
2-3	Synthetic silica	0.80	pre
2-4	Titanate	0.18	post
2-5	Polyolefin	4.76	pre
2-6	Synthetic silica	1.48	pre
2-7	Castor derivative	0.99	pre
2-8	Organo clay	0.28	pre
2-9	Organo sulfonate	0.46	post
2-10	Blank	0.00	—
2-11	Polyamide	0.50	post
2-12	Organo sulfonate	2.01	post
2-13	Cationic oligomer	0.99	post

Table 3—Paint Samples Tested for Viscosity by Three Different Test Methods: Brookfield, Zahn Cup, and ICI Cone/Plate

Water-Based Sample	Generic Type	Initial @ 72°F Zahn #3/dft sec	mils	Diluted @ 72°F Zahn #2/dft sec	mils	Diluted Cone/Plate (cps)	Diluted Brookfield #3 Spindle 10 rpm	Diluted Brookfield #3 Spindle 100 rpm	Shear Thinning Index 10rpm/100 rpm
1-1	Attapulgite	156	0.7	110	1.7	176	700	600	1.2
1-2	Smectite	114*	1.2	95	1.6	216	700	605	1.5
1-3	Associative thickener	120	0.9	107	1.6	256	800	735	1.1
1-4	Synthetic silica	175*	0	40	1.4	124	300	230	1.3
1-5	Titanate	120	1.0	57	2.0	160	550	470	1.2
1-6	Synthetic silica	79*	0.8	87	1.6	168	2100	905	2.3
1-7	Polyester	150	1.3	33	1.6	92	150	140	1.1
1-8	Smectite	85*	0.8	69	1.5	128	450	300	1.5
1-9	Polyacrylate	53*	0.9	150	1.7	200	1400	915	1.5
1-10	Blank	122	1.6	—	—	131	400	395	1.0
1-11	Smectite	119	1.2	95	1.6	208	600	535	1.1
1-12	Cationic oligomer	101	0.8	100	1.5	184	350	345	1.0

*Note: These paints wre too non-Newtonian for this test as early break in fluid flow occurred before cup was half emptied.

Solvent-Based Sample	Generic Type	@72°F sec	mils	Cone/Plate (cps)	Brookfield #3 Spindle 10 rpm	Brookfield #3 Spindle 100 rpm	Shear Thinning Index 10 rpm/100 rpm
2-1	Attapulgite	21	2.9	72	50	80	0.6†
2-2	Polyurea	24	3.0	72	100	85	1.2
2-3	Synthetic silica	26	3.8	84	350	130	2.7
2-4	Titanate	23	3.6	72	50	80	0.6†
2-5	Polyolefin	52	3.4	88	2100	455	4.6
2-6	Synthetic silica	72	3.3	120	1600	495	3.2
2-7	Castor derivative	35	2.9	96	4500	880	5.1
2-8	Organo clay	27	4.0	80	100	105	1.0
2-9	Organo sulfonate	29	3.7	76	300	125	2.4
2-10	Blank	23	3.6	72	50	80	0.6†
2-11	Polyamide	27	3.8	76	1000	265	3.8
2-12	Organo sulfonate	27	2.7	88	750	220	3.4
2-13	Cationic oligomer	55	3.0	88	700	230	3.0

†Note: These numbers indicate dilatency which does not actually exist. This is due to the inaccuracy of using the #3 spindle at these low viscosities. The #2 spindle could not be used because of the size of the sample.

order to be included in the study. This is noted as a reminder that starting point formula recommendations often require adaption to obtain the optimum performance.

Sprayability

There were obvious differences in application performances of the coating sprayed. Sprayability is a subjective description given by an applicator regarding the coating being sprayed. The concern of the applicator is to obtain his desired finish when applying the coating and may adjust the coating by dilution or adjust his gun settings to obtain this finish. The quality of this finish is dependent on spray velocity, atomization, flow on substrate, etc. The most common measure specified between coating manufacturer and applicator is either Zahn 2 or Ford #4 cup measurements. ASTM D 1200-88 indicates efflux cup is limited to Newtonian or near Newtonian liquids.[6] To ascertain if this measure is accurate, we evaluated sprayability based on atomization and coverage.[7] We have also included the uniformity of finish in our results.

Video taping the spraying of all the paint samples under the same conditions gave us a visual demonstration of sprayability as shown in *Figures* 1 and 2. As can be seen in these video frames, (2-8) shows best sprayability followed by (2-6) and (1-10); (1-4) had very poor sprayability. In each case the nozzle is level with the top edge of the panel and at the same stage of the spray. Note the resulting coverage. Also, most importantly, note the differences in the atomization of the spray. This variation in sprayability also correlated with the dry film thicknesses obtained on the panels. As seen in *Figure* 1, the water-based coatings had poorer sprayability resulting in thinner films. As we needed to evaluate sag resistance, we set up the criterion of a minimum 1.5 dry film thickness, where necessary coatings were diluted with water to obtain at least 1.5 mils dry film thickness.

Variation was also seen in the dry film thickness of the solvent-based coatings as a result of the effect of the rheology modifiers. No attempt was made to equalize dry film thickness by dilution as these coatings gave ample film build and dilution would unnecessarily increase the VOC. However, the rheology modifiers that give high dry film thickness had the best sprayability.

The time for each sprayout was determined exactly using the video. The time of a sprayout varied from 5.1 to 7.5 sec. Theoretical dry film thicknesses were calculated for a six-second spray period using the video and counting the frames of actual spray time per sample. The

comparisons of the theoretical dry film thicknesses gave similar results as the actual dry film thicknesses and, therefore, not used in any of the graphs.

Viscosity

As explained earlier, the water-based samples containing the rheological modifier did not produce 1.5 mils dry film thickness during the allotted spray period. Dilution was required to reduce the resistance to flow. The samples were diluted incrementally until a six-second spray out produced 1.5 mils dry film thickness. Zahn cup viscosity was measured before and after the final dilution. As shown in *Table* 3, the Zahn viscosity of a given water-based coating decreased significantly upon dilution with the notable exceptions of those coatings having shear thinning indexes of ≥1.5. As noted in ASTM D 1200-88,[6] efflux cup measurement is for Newtonian or near-Newtonian coatings. When comparing one rheological additive to another, the Zahn measurement is a poor measure of sprayability because the additives produce non-Newtonian fluids. However, most paint sprayers rely on the Zahn cup to determine sprayability, but, as shown in *Graph* 1, there is no correlation between Zahn and dry film thickness. Coatings (2-12) and (2-8) had the thinnest and thickest dry films respectively, yet both coatings had the same Zahn viscosity.

The Brookfield is an instrument that is better suited to measure viscosity for non-Newtonian coatings. With the Brookfield, the shear thinning index can be determined which gives a reliable measurement of the degree of Newtonian and non-Newtonian behavior for a narrow range of shear rates.[8] A value of 1.0 is considered Newtonian and as values increase above 1.3 are said to exhibit shear thinning non-Newtonian behavior. Unfortunately, as shown in *Graph* 2, there is little correlation between shear thinning index and dry film thickness for both coating systems. This can be explained because the Brookfield shear rates, typically 1-100 sec^{-1}, are much lower than the shear rates that occur when spraying which are >1000 sec^{-1}.

The ICI cone/plate viscometer was used to determine viscosity because it provides information about the flow properties of the material under application conditions: brushing, spraying, electrostatic disk, or roll coating.[9] A linear regression was performed to compare ICI viscosity with dry film thickness. As shown in *Graph* 3, the trend for the solvent-based samples is opposite the trend for the water-based samples. Neither trend provides conclusively that the ICI viscosity is a good measurement of sprayability. Even though the solvent-based samples showed a trend of higher ICI viscosity representing poor sprayability, there were notable exceptions. The sample with the highest ICI viscosity (2-6), a synthetic silica, gave a higher film thickness than expected, the samples (2-1), an attapulgite, and (2-2), a polyurea, had the lowest viscosities and had the thinnest films.

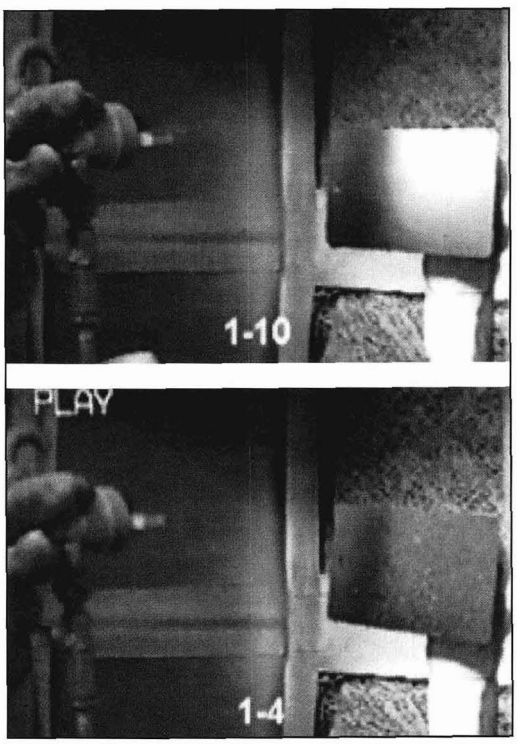


Figure 1—Water-based samples during actual spray.

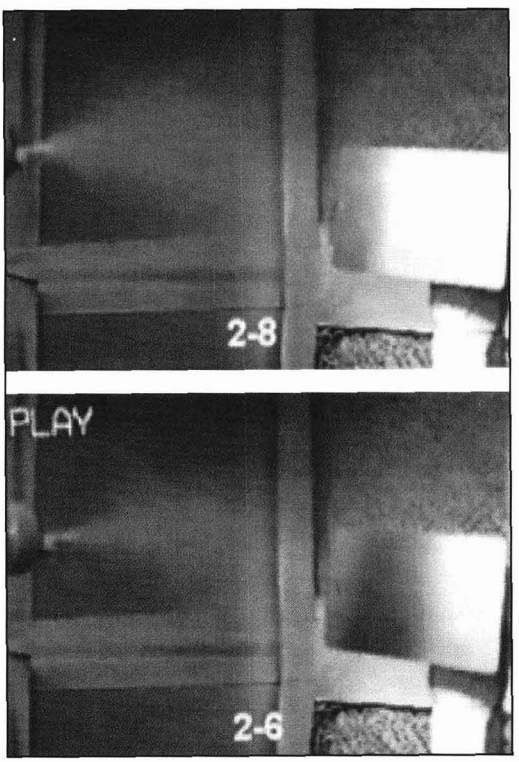
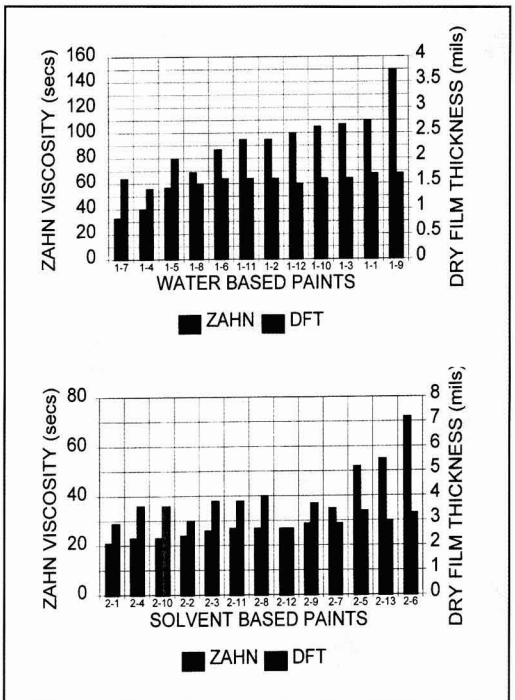
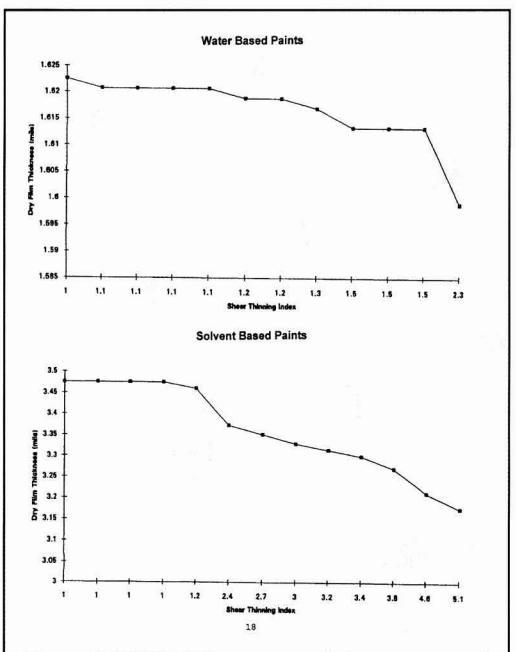


Figure 2—Solvent-based samples during actual spray.



Graph 1—Zahn vs. dry film thickness.



Graph 2—Shear thinning index vs. dry film thickness.

The graph shows an opposite trend, however, with respect to the water-based samples. The smectite samples (1-8), sprayed so that the panel is full of specs and not a uniform film, which demonstrates that the coating was not fully atomized and had difficulty coming out of the gun, yet, the polyester (1-7) had lowest ICI viscosity and produced a thin film. These graphs indicate that the ICI cone/plate viscometer is not a reliable instrument for determining sprayability.

Since this study did not find a simple but reliable viscosity method that accurately predicted sprayability, the only way to determine sprayability is to spray the sample and measure the dry film thickness. It is not clear why no reliable correlation was obtained. Possible reasons why viscosity measurements did not give a reliable measure of sprayability are:

(1) Changes in particle size and shapes in paint due to the incorporation of the additive. Configuration of particles can affect the flow of paint through the orifice.

(2) Changes in the extension (dynamic uniaxial extention)[10] of paint due to the incorporation of the additive. Extensional viscosity is not well measured with these instruments and extension does affect the flow through small orifices.

(3) Bulk and surface viscoelasticity which influence the atomization of the paint.[7]

(4) Surface tension.[11]

Settling

Table 4 lists the settling properties of each formula according to a rating number. These numbers relate to ASTM D 869-85 (reapproved 1993) "Standard Test Method for Evaluating Degree of Settling of Paint."[4]

In general, the water-based samples settled much less than the solvent-based samples. Where settling did occur, the sediment was soft and for the most part easy to reincorporate.

The major difference between the two paint systems was the increased hardness of the sediment in the solvent-based system. Here the sediment was much harder and more difficult to reincorporate. In several instances, strong mechanical shaking was required to reincorporate the sediment completely.

Sagging

Based on the results in *Table* 4, the Leneta sag ratings of the water-based coatings at ambient temperature and under bake conditions were generally better than the solvent-based coatings. No differences between room temperature and thermal sag resistance were noted in the water-based formulas, including the blank with no rheological modifier. The greatest anti-sag rating obtained was, for example, (1-6), a synthetic silica. Although sample (1-9), a polyacrylate, showed little tendency to sag, the paint flocculated and lacked stability. It was confirmed that this type of polyacrylate is not usually a good choice for pigmented coatings. This polyacrylate is not one of the types currently used in coatings. As seen in *Graph* 4, there is a relationship be-

Table 4—Pre- and Post-Bake Sag Results

Water-Based Sample	Generic Type	Tukon Hardness Knoops	Gloss 60° Mean	Leneta Sag Tester Room Temp	Leneta Sag Tester After Baked @ 350°F for 30 min	Settling % Separation	Settling Rating*
1-1	Attapulgite	17	90	4-5	4-5	5%	8 vs
1-2	Smectite	20	81	4	4	5%	8 s
1-3	Associative thickener	17	90	5	4 1/2-5	15%	8 vs
1-4	Synthetic silica	<1	78	5	5	10%	8 s
1-5	Titanate	15	89	4	4	10%	6 m
1-6	Synthetic silica	17	81	12	12	10%	8 vs
1-7	Polyester	16	91	4	4	20%	8 vs
1-8	Smectite	20	66	3-5	4-6	0%	8 vs
1-9	Polyacrylate	17	53	10	10	60%	0 h
1-10	Blank	17	88	7	7	10%	6 m
1-11	Smectite	14	88	5	5	25%	8 vs
1-12	Cationic oligomer	15	84	3-5	4-5	0%	10 vs

Solvent-Based Sample	Generic Type	Tukon Hardness Knoops	Gloss 60° Mean	Leneta Sag Tester Room Temp	Leneta Sag Tester After Baked @ 350°F for 30 min	Settling % Separation	Settling Rating*
2-1	Attapulgite	10	93	1	1	5%	0 h
2-2	Polyurea	15	93	3	2	10%	8 s
2-3	Synthetic silica	15	84	5	5	40%	8 s
2-4	Titanate	15	98	1	1	5%	0 h
2-5	Polyolefin	17	47	12	12	5%	8 s
2-6	Synthetic silica	17	67	12	12	5%	8 s
2-7	Castor derivative	11	86	12	1	5%	6 m
2-8	Organo clay	9	83	2	2	35%	6 m
2-9	Organo sulfonate	10	72	3	3	15%	8 s
2-10	Blank	13	91	1 1/5	1 1/2	5%	0 h
2-11	Polymide	15	87	7	5	50%	8 s
2-12	Organo sulfonate	15	83	9	9	20%	8 s
2-13	Cationic oligomer	14	77	5	5	30%	8 s

*Key: vs = very soft, s = soft, m = moderate, h = hard; See Standard Test Method for written rating description of condition in the paint (10 = No change from original; 0 = very firm cake not restorable to a uniform suspension by manual stirring...)
*ASTM D869-85 (reapproved 1993)

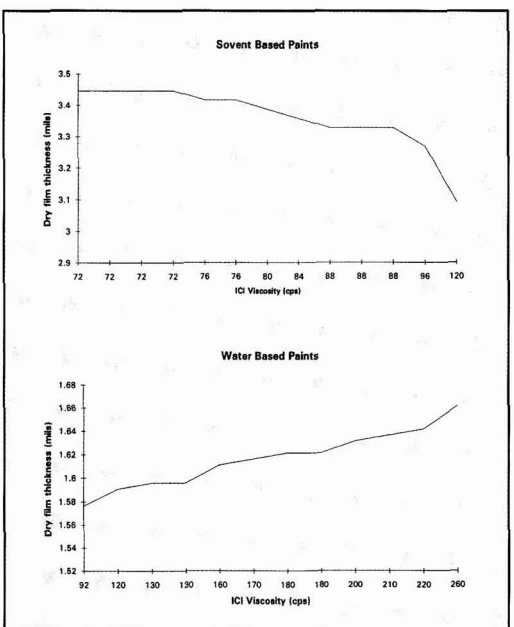
tween the room temperature sag and the shear thinning index. The higher the shear thinning index, the greater the low shear thickening properties of the coating which produces better anti-sag results.

The solvent-based coatings had a much greater tendency to sag but several rheology modifiers gave high Leneta anti-sag ratings. These were: (2-5), a polyolefin; (2-6), a synthetic silica; and (2-12), an organo sulfonate. Unfortunately, the organo sulfonate delaminated from the panel as a single sheet on storage. Another sample, (2-7), a hydrogenated castor derivative, gave a striking example of thermal sag. The Leneta reading at ambient temperature was 12 mils and then the panel had a thermal sag of 1 mil after baking. Again, the samples with the best anti-sag properties had the largest Brookfield shear thinning index. This trend can be seen in *Graph* 5.

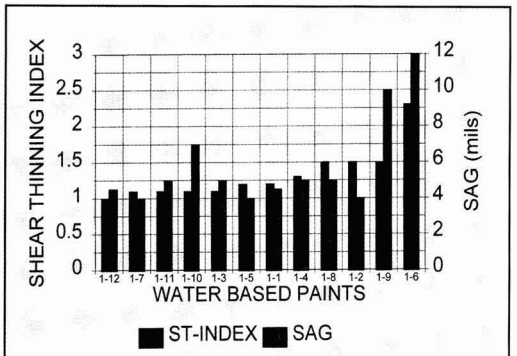
Gloss

All the additives with the exception of the associative thickener for the water-based system and the castor derivative for the solvent-based system, reduced the gloss as the amount of additive increased.

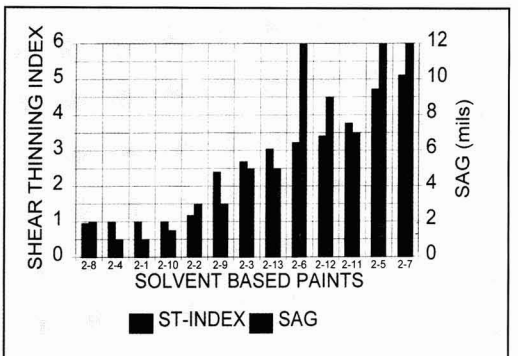
The solvent-based samples that had the best anti-sag properties (2-5 and 2-6) also had the lowest gloss reading. The low gloss readings could be due to the high concentration of rheology modifier in each. Sample (2-5)



Graph 3—ICI viscosity vs. dry film thickness.



Graph 4—Shear thinning index vs. sag.



Graph 5—Shear thinning index vs. sag.

has almost five percent by weight additive in the coating. Some of the solvent-based formulas, including the blank, had wrinkled films which may have affected the gloss.

Where the rheology modifier did not detract from the gloss, the solvent-based system tended to have higher gloss than the water-based system. However, sample (1-6) which demonstrated the best sag resistance also had a high gloss of 81%.

Hardness

There was not a distinguishable difference between water-based samples with the exception of sample (1-4), one of the synthetic silicas in this study. This sample had a Tukon hardness of < 1 and the panels blocked. The water-based system generally cured harder than the solvent-based system.

The solvent-based coatings showed only a slight difference between samples with respect to hardness with the exceptions of (2-1), an attapulgite; (207), a castor oil derivative; (2-8), an organo clay; and (2-9), an organic sulfonate.

CONCLUSIONS

Water-Based Formula

If gloss is of major importance, then (1-8), a smectite; (1-9), a polyacrylate; and (1-4), one of the two synthetic silicas would not be good choices for rheological modifiers in this formula. All other additives did not detract significantly or improve the gloss over that of the control. The polyacrylate, (1-9), flocculated on standing. This paint is not stable and is not recommended for this formula. This type of polyacrylate is not usually used for coatings because it has a tendency to flocculate pigment. Sample (1-4), the silica, also had a problem with blocking. It could be attributed to the high oil absorption of the silica pigment which may have absorbed the acid catalyst. More work would have to be done to be absolutely certain that this was the reason for the insufficient cure.

The most effective rheology modifier for anti-sag in water-based coating was (1-6), a synthetic silica. Although it was the best choice for this formula, it had an impact on some of the other physical properties. It reduced the sprayability, requiring a six-percent dilution with water to attain the same dry film thickness as the control. Since the silica was used at the highest amount of additive concentration (1.96% total weight of formula), as expected, the gloss was notably reduced from 88 to 81%. It may be possible to increase the gloss by preparing a ladder study to find the optimal level of silica for good gloss and still retain the performance as a rheology modifier.

The other modifier water-based coatings in this evaluation diluted to give the same sprayability had similar anti-sag properties. The coatings containing oversized particles on the sprayout panels may not have been fully incorporated. These particles could have adversely affected sprayability. These were the smectite samples which are more difficult to incorporate.

Solvent-Based Formula

The coating with no addition of rheology modifier wrinkled while baking and was one of the worst for anti-sag. Almost all other formulas had some degree of wrinkle, but most were not as pronounced as the control. This wrinkling was due to the volatility of an amine blocking agent used in the acid catalyst. The volatile amines can cause early crosslinking of the surface of the coating prior to complete cure of the coating.

The coatings with the best combined properties of sag resistance and gloss are rated in the following order:

(1) (2-11), a polyamide;

(2) (2-3), a synthetic silica; and

(3) (2-13), a cationic oligomer.

All three had the same thermal sag resistance, a Leneta reading of 5 mils. The polyamide had the highest gloss of the three, followed by the silica and then the cationic oligomer. However, it should be noted that some specks appear on the coating with the synthetic silica which probably indicates incomplete incorporation. This would indicate that this material is also hard to incorporate.

Another synthetic silica, (2-6), gave 12 mils anti-sag but had a great reduction of gloss (93 to 67%) and caused orange peel and pinholes. At this level, this modifier would not be recommended because of the adverse effect on gloss. However, ladder studies may determine an optimal level that may achieve good sag resistance with a minimal effect on gloss.

Sample (2-5) also had 12 mils anti-sag and a significant reduction in gloss (93 of 47%). This polyolefin containing coating gave a spatter finish and the high concentration of rheology modifier (4.76%) probably accounted for the spattering effect.

One of the organo sulfonates, (2-9), gave 3 mils anti-sag and reduced the gloss to 72% and also introduced orange peel. The other organo sulfonate containing sample, (2-12), delaminated from the steel panel over a period of about a month. There was total adhesion failure.

The castor oil derivative, (2-7), had excellent room temperature sag resistance but failed the test on baking. This is because curing did not occur before the dissolution of the rheology modifier.[3]

In summary, sprayability is not a property that can be measured with traditional viscosity instruments such as the Zahn cup, the Brookfield, or the ICI cone/plate viscometers. When very controlled time of spray can be regulated, timed dry film thickness can be used as a measure of sprayability. For example, when using automatic spray equipment, sprayability is readily measured by dry film thickness results.

It is common for rheology modifiers to decrease the gloss of a coating. The final gloss is dependent on the concentration of the additive in the formula.

The water-based recommended additive that gives the best combination of gloss and thermal anti-sag is (1-6), a synthetic silica.

The solvent-based recommended additive that gives the best combination of gloss and thermal anti-sag is (2-11), a polyamide, followed by (2-3), a synthetic silica and then (2-13), a cationic oligomer.

Optimization

It is certain that further optimization is required as some of the rheological modifiers gave poor anti-sag performance while keeping the desired physical appearance, other additives gave poor finishes but were acceptable for their anti-sag properties and the rest fell somewhere in between. In fairness to the additive suppliers, this committee is extending the opportunity to the additive suppliers to participate in a further study of their rheological modifiers. The additive companies will supply the finished paint so that optimization of the rheological modifier will have been established.

ACKNOWLEDGMENTS

The authors want to give special thanks to Standard Coating Corp. for making the test coatings, Standard Coating Corp. and King Industries for allowing the authors the use of their facilities for the laboratory work needed to complete this paper, and thanks to the following companies for submitting samples for use in this study: BYK-Chemie; Cabot Corp.; Degussa Corp.; Engelhard Corp.; BFGoodrich Co.; Henkel Corp.; S.C. Johnson Polymer; Kenrich Petrochemicals, Inc.; King Industries, Inc.; Lubrizol; Reichhold Chemicals, Inc.; Poly-Resyn Corp.; Rheox, Inc.; Rohm and Haas Co.; Southern Clay; Standard Coating; Troy Chemical Corp.; R.T. Vanderbilt Co.; and United Catalysts (Sud-Chemie).

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Performance Optimization of 100% Solids, UV-Cure Inks and Wood Fillers Using Aluminum Trihydroxide (ATH) Filler

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This paper employs differential photocalorimetry, color, gloss, and physical test measures to characterize the effects of aluminum trihydrate (ATH) loading (from 13 to 56% by weight) on the ultra-violet (UV) transparency, enthalpy of cure, and cure kinetics of pigmented and unpigmented UV-cure inks and wood fillers. The thixotropic properties and relatively low opacity of ATH allows the use of significant loading levels without whitening pigmented inks or opacifying clear wood fillers. This work demonstrates how increased loadings of ATH, a UV transparent filler, can be employed to increase fully-cured coating thicknesses of UV-cure coatings for a given cure irradiance, and increase cure kinetics (rate of cure) for a given coating thickness, while also offering substantial cost savings by replacing more expensive components.

INTRODUCTION

Regulatory issues and public concerns over air quality issues increasingly continue to drive coatings manufacturing and application processes to lower VOC emissions. UV-cure coating technologies are one of the most promising options for lowering or even eliminating organic emissions by enabling the use of 100% solids coatings. Several practical hurdles limit the widespread application of this technology, however. These limitations include: (1) difficulty effecting through-cure at thicker coating weights; (2) having to run at slower line speeds; (3) finding UV-transparent fillers; and (4) the relatively high cost for UV-cure resins and photoinitiators. In addition, the characteristics of many of the ingredients necessary for the formulation of UV-cure coatings make it difficult to acquire U.S. Food and Drug Administration (FDA) approval for food contact applications.

While research efforts into new, more innocuous, lower cost UV-cure resins will undoubtedly contribute to increased penetration and expansion of UV-cure coatings technologies into new and existing markets, many desired applications and end-use properties can be deliberately engineered into the coating formulation by the use of appropriate fillers or extenders. Additionally, raw materials cost savings can often be realized by replacing some of the more expensive resin components with relatively inexpensive fillers.

In UV-curable polymer applications, however, most inorganic fillers and pigments actually hinder curing reactions by their inherent UV absorbance properties, which can serve to reduce or limit the effective penetration depth of the UV radiation by near-surface "screening" of the coating. Cure efficiency or effective crosslink density can also be compromised if the filler is capable of acting as a free radical scavenger, effectively quenching polymerization at all depths of the coating film. These same filler properties can also lead to yellowing or polymer degradation at the filler surface upon sustained exposure to UV light. One of the most ubiquitously employed inorganic fillers, TiO_2, can both absorb UV light and quench certain free radical reactions.[1]

The practical number of useful fillers for UV-cure polymer applications is limited by both general and specific application requirements. General UV-cure application requirements would include high UV transparency and chemical inertness while abrasion resistance, fire retardance, wettability, or visible transparency would be desirable end-use attributes. An ideal filler, by these metrics, is one that is low cost, meets all the previously mentioned general requirements, imparts no undesirable qualities to the coating, and has "tun-

Presented at the 73rd Annual Meeting of the Federation of Societies for Coatings Technology, on October 9, 1995, in St. Louis, MO.
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Table 1—Red UV-Cure Screen Printing Ink Formulations

	Control	0.25 ATH Filled	1.0 ATH Filled
Ebecryl 6700	46.0	40.3	37.3
TMPTA	2.7	2.4	2.2
TRPGDA	13.0	11.3	10.4
NVP (NaOH stab.)	5.0	4.4	4.1
Pennco 9R110	25.4	22.3	20.6
Quantacure ITX	1.4	1.2	1.1
Quantacure EDP	4.6	4.1	3.8
FC-430	0.5	0.4	0.4
Defoamer	0.4	0.4	0.4
Cab-O-Sil M-5	1.0	—	—
0.25 ATH	—	13.2	—
1.0 ATH	—	—	19.7
Total	100	100	100
Grind	7+	7+	7
Brookfield Visc #4, 1 rpm	46,200	43,200	43,800
Brookfield Visc #4, 10 rpm	12,700	11,760	14,280

where:
Ebecryl 6700=acrylated aromatic urethane supplied by UCB Radcure, Inc.
TMPTA=Trimethylol propane triacrylate supplied by UCB Radcure, Inc.
TRPGDA=Tripropylene glycol diacrylate supplied by UCB Radcure, Inc.
NVP=N-vinyl-2 pyrrolidone produced by ISP Corp. and BASF Corp.
Pennco 9R110=a dispersion of 20% red pigment in 80% TMPTA, supplied by Penn Color, Inc.
Quantacure®ITX=photoinitiator supplied by Biddle Sawyer Corp.
Quantacure®EDP=photoinitiator supplied by Biddle Sawyer Corp.
FC-430=fluorocarbon surfactant supplied by 3M Co.
Cab-O-Sil M-5=fumed silica supplied by Cabot Corp.
0.25 ATH=Spacerite®S-11, supplied by Alcoa Industrial Chemicals, Inc.
1.0 ATH=Spacerite®S-11, supplied by Alcoa Industrial Chemicals, Inc.

able" features that can be optimized for a variety of end-use requirements.

Unlike other inorganic fillers, aluminum trihydroxide (ATH) is completely transparent to UV light, so it cannot interfere with the efficiency of UV-curing via absorption mechanisms.[2-4] Owing to this UV transparency, ATH does not compete with photoinitiators for UV light nor does it behave as a UV initiated catalyst inducing unwanted side reactions in polymer films. Previous investigations of filled UV-cure polymers unambiguously show that ATH loadings increase UV transparency relative to unfilled resins, for given film thicknesses.[2-4]

Table 2—UV-Cure High Speed Wood Filler Formulations

	Control	7.5 ATH Filled	8.0 ATH Filled
Ebecryl 3700-20R	26.8	20.9	21.2
TMPTA	18.7	14.6	14.9
TRPGDA	8.0	6.3	6.4
Irgacure 651	2.1	1.7	1.7
$CaCO_3$	22.2	—	—
Clay	22.2	—	—
7.5 ATH	—	56.5	—
8.0 ATH	—	—	55.8
Total	100	100	100
Grind	3.5	4+	4+
Brookfield Visc #4, 5 rpm	26,800	27,360	25,080
Brookfield Visc #4, 20 rpm	15,930	21,330	19,440

where:
Ebecryl 3700-20R=a TMPTA dilution of acrylated epoxy resin supplied by UCB Radcure, Inc.
Irgacure®651=photoinitiator supplied by Ciba Corp.
$CaCO_3$ and clay were supplied by Anglo-American Clays Corp.
7.5 ATH=Spacerite®S-23, supplied by Alcoa Industrial Chemicals, Inc.
8.0 ATH=Spacerite®S-EMH, supplied by Alcoa Industrial Chemicals, Inc.

The use of ATH as a filler for UV-cure coatings offers several unique opportunities regarding the limitations listed. ATH is commonly employed as a polymer filler owing to a number of inherent properties, including: fire retardance,[5] smoke suppression,[6] controlled opacity,[2,3] dielectric properties,[7,8] and arc and track resistance.[7,8] Specialized end-use coatings applications requiring these properties include circuit boards, electrical insulators, business machines, and appliances.

This paper employs differential photocalorimetry, appearance, and physical test measures to comparatively characterize the effects of ATH loading on the viscosity, color, gloss, enthalpy of cure, and cure kinetics of pigmented and unpigmented UV-cure inks and wood fillers. This work will demonstrate how increased loadings of ATH can be employed to control resin viscosity, increase fully cured coating thickness, and increase cure kinetics (rate of cure) for a given coating thickness, while also reducing raw materials costs by replacing more expensive components.

EXPERIMENTAL

Preparation and Curing of UV-Cured Films

Ink and wood filler resin formulations were prepared based on products from UCB Radcure as outlined, together with grind and viscosity data, in *Tables* 1 and 2. These resins were prepared in the presence and absence of precipitated ATH fillers from Alcoa* (98% $Al(OH)_3$ minimum, gibbsite, r = 2.42 g/cm^3, refractive index = 1.57) at loading levels ranging from 13 to 56% by weight. Filler loading levels were determined by matching the viscosity of the control samples (see *Tables* 1 and 2). It is important to note that the use of ATH as the primary filler eliminated the need for fumed silica (thixotrope) in the ink resin formulations. The precipitated ATH fillers used in this study are henceforth referred to as 0.25 ATH (0.25 μm median particle diameter), 1.0 ATH (1.0 μm median particle diameter), 7.5 ATH (7.5 μm median particle diameter), and 8.0 ATH (8.0 μm median particle diameter). All fillers were used as is, i.e., none of the fillers were dried prior to use. The ATH fillers were dispersed in the resins using a Cowles blade disperser at medium speed for 15 min.

Ink samples prepared for comparative color and appearance measures were screened onto white, high-gloss, clay-filled paper using 270 mesh screens. These films were cured in a single pass using a single Aetek 300 W/in. Hg lamp at a conveyor belt speed of 100 feet per min, under normal air atmosphere.

Wood filler samples were prepared as drawdowns of approximately 1 mil on sanded, 1/4 in., unfilled particle board. All wood filler samples were cured using 1 Aetek 200 W/in. Hg lamp at a line speed of 120 feet per min, under normal air atmosphere. Each filler sample was

*Alcoa Spacrite® S-11 (0.25 μ), S-3 (1.0 μ), S023 (7.5 μ), and S-EMH (8.0 μ).

sanded after curing and topcoated with a black, high-gloss lacquer for comparative gloss measurements. Wood filler drawdowns were also prepared at 1.5 mils on glass to evaluate thru-cure and overall toughness. Hoffman scratch testing on these 1.5 mil films were all 500 grams. These films all exhibited excellent toughness, sandability, and thru-cure.

Color and Gloss Measures

All color measures (L,A,B values) were performed using a Pacific Scientific TCM (The Color Machine), version 1.31. All gloss measures were performed using a BYK-Gardner micro tri-gloss meter. All reported values are the averages of three independent measures of different regions of the samples.

Differential Photocalorimetry

All differential photocalorimetry (DPC) measures were performed using a TA Instruments 930 DPC. A standard high pressure mercury arc lamp with an output of 6 mW/cm^2 was used to irradiate 15-50 mg quantities (as specified in text) of the inks and wood fillers for 0.1 min in open, flat bottom aluminum pans while using an empty pan as a reference. In all DPC data shown, the lamp shutter was opened (the first time) at one minute (x-axis). The heat of reaction was measured as a function of time at 30°C under atmospheric conditions. Baseline corrections and subsequent peak integrations for the enthalpy of cure were determined with the TA software. Latent cure was evaluated by repeating 0.1 min UV exposures at five-minute intervals. Cure rates were calculated by modeling the initial slopes observed upon UV irradiation of the samples. It is important to note that, for all filled systems reported here, cure enthalpies and rates are normalized to sample resin weight, as opposed to total sample weight, to allow for unbiased comparisons of the effects of filler loadings on resin cure efficiency.

UV-Visible Spectroscopy

A dual beam Hitachi U-3110 UV-VIS (ultra-violet/visible) spectrophotometer equipped with a $BaSO_4$ coated integrating sphere (Hitachi model 150-0902) was used to measure the diffuse reflectance (% R_d) for neat ATH, clay, and calcium carbonate powders. All data calculations were performed with Spectra-Calc software from Galactic Industries. All spectra were acquired from 250 to 800 nm at a scan rate of 60 nm/min, with a Spectralon™ (Labsphere) secondary standard in the reference port of the sphere. The sample spectra were ratioed to a background spectrum that was run with Spectralon standards placed in both the sample and reference ports.

RESULTS AND DISCUSSION

Red UV-Cure Screen Printing Ink

The UV-cure screen printing ink formulations are listed in *Table* 1. Basically, the starting (control) formulation

Table 3—Color and Delta E Readings for Red UV-Cure Screen Printing Inks

	L	A	B	Delta E
Control filled	33.33	64.39	48.19	0.00
0.25 ATH filled (13.2%)	34.20	65.23	47.59	1.35
1.0 ATH filled (19.7%)	34.19	64.93	48.45	1.05

Table 4—Gloss Readings from Red, UV-Cured Screen Printing Inks

Sample	20° Gloss	60° Gloss
Control (unfilled)	57.3	90.4
0.25 ATH filled (13.2%)	42.1	87.1
1.0 ATH filled (19.7%)	70.7	95.6

Table 5—Cure Enthalpies and Cure Rates (normalized to resin weight) Observed for Red UV-Cure Inks under 0.1 min Exposures as a Function of Sample Weight

	50mg Samples		15 mg Samples	
	$\Delta H_{(W/g)}$	Rate $_{(W/g/m)}$	$\Delta H_{(W/g)}$	Rate $_{(W/g/m)}$
Control (unfilled)	3.1	0.65	9.9	8.2
0.25 ATH filled (13.2%)	3.3	0.72	13.3	12.9
1.0 ATH filled (19.7%)	4.5	1.30	14.9	12.0

Table 6—Gloss Readings from Black Lacquer Topcoated, Filled Particle Board

Sample/Gloss Direction	20°	60°	85°
Control			
side/side	16.83	64.97	75.53
top/bottom	13.50	60.23	69.27
7.5 ATH filled			
side/side	28.17	74.10	85.97
top/bottom	26.53	70.33	81.33
8.0 ATH filled			
side/side	26.80	63.77	74.50
top/bottom	25.07	65.30	78.30

Table 7—Cure Enthalpies and Cure Rates (normalized to resin weight) Observed for UV-Cure Wood Fillers under 0.1 min Exposures as a Function of Sample Weight

	50 mg Samples		15 mg Samples	
	$\Delta H_{(W/g)}$	Rate $_{(W/g/m)}$	$\Delta H_{(W/g)}$	Rate $_{(W/g/m)}$
Control	67.1	19.5	186.3	175
$CaCO_3$/Clay filled (44.4%)				
7.5 ATH filled (56.5%)	160.3	61.0	231.6	187
8.0 ATH filled (55.8%)	136.0	63.5	237.4	238

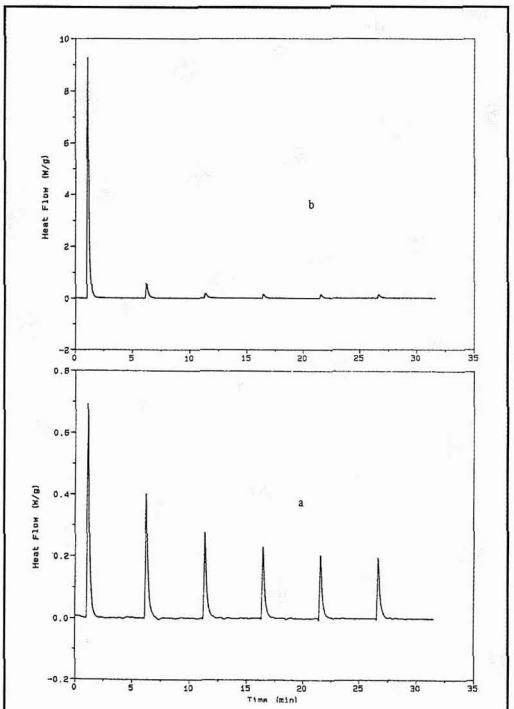

Figure 1—0.1 min exposure DPC data (repeated at 5-min intervals) for neat 15 mg samples of (a) red screening ink, and (b) wood filler.

(without fumed silica) was diluted with ATH until the resin viscosity approximated that of the control sample. It is interesting to note that, owing to the thixotropic behavior and low oil absorption of ATH, relatively high loadings (13-20%) could be achieved while also precluding the need for fumed silica additions. Similar formulation viscosities were observed at both 1 and 10 rpm.

The effect of resin dilution by ATH on color was evaluated using comparative color measures, as shown in *Table* 3. Owing to the relatively low opacity observed with ATH fillers, the color values are negligibly affected by filler loading, giving delta E values of 1.35 and 1.05 for the 0.25 ATH (13.2%) and 1.0 ATH (19.7%) filled formulations, respectively. The lack of whitening observed upon filler loading shows that ATH effectively serves as an inert spacer for the red lake pigment used in the ink formulation. Comparative gloss measures for these samples are listed in *Table* 4. Gloss (particularly 60°) is relatively unaffected by filler loading. In the authors' opinions, this is due, at least in part, to the wettability of ATH and the blocky shape of precipitated ATH, as opposed to ground fillers, which are often angular or platy. The 1.0 ATH filled sample actually appears to improve gloss, which is not surprising, given the increased dimensional stability imparted by filler loadings, but the variations observed (±5%) approach the experimental error of the measure, precluding unambiguous interpretation.

DPC-based enthalpies of cure (ΔH) and cure rates are listed in *Table* 5. All samples, whether 15 or 50 mg (± 2 mg), completely covered the bottom of the sampling pans and were approximately 8 mils or ≥ 30 mils thick, respectively. UV exposure times of 0.1 min were employed to allow for appreciable cure without completely curing the coatings. Latent (residual) cure was verified by performing repeat exposures at five-minute intervals, as shown in *Figure* 1a, for a 15 mg ink sample. The latent cure observed for these ink formulations is significant, owing to "screening effects" arising from the intense near surface UV absorbance (both before and after cure) of the resin system and pigment employed. The data reported in *Table* 5 is normalized to resin weight, as opposed to sample weight, to allow for unbiased comparisons of resin cure since the filler, being chemically inert and transparent to UV light, does not undergo any chemical reactions upon UV exposure.

As shown by the enthalpy and cure rate data in *Table* 5, both the 50 and 15 mg ink samples exhibit increased extents of cure upon loading with ATH, reaching nearly 50% for the 1.0 ATH (19.7%) filled ink formulation. This effect (increasing cure with ATH loading) appears most pronounced for the 15 mg samples, owing to insulating and radiative (away from the instrument) heat losses often encountered with DPC measurements on thick films of strongly absorbing coating formulations. These effects also account for the "apparent" decrease in observed cure (J/g) or cure rate (W/g/m) at higher sample weight (i.e., 50 vs 15 mg). The transparent "spacing" effect of ATH, as mentioned regarding the color data, allows for increases in cure depth and rates of cure in the screening inks by extending UV penetration into the ink film, as well as by allowing for an increased UV flux for a given penetration depth.

UV-Cure High Speed Wood Filler

The UV-cure wood filler formulations are listed in *Table* 2. As with the screening ink, all formulations are based on a common resin system and ATH loading

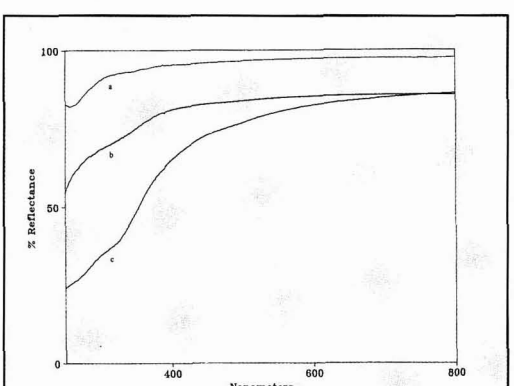

Figure 2—Diffuse reflectance UV-V is curves for neat, packed powders of (a) ATH, (b) calcium carbonate, and (c) clay.

levels were determined by matching the viscosity of the control wood filler formulation. The high loading levels employed were achievable, at least in part, due to the low oil absorption (on an ml oil/ml solids basis) of 7.5 ATH (0.77) and 8.0 ATH (0.61) relative to a 50/50 mix of $CaCO_3$ and clay (0.96). The control wood filler sample is filled (44.4%) with $CaCO_3$ and clay, as these are currently considered "standard" fillers for this application.

Sandability was qualitatively evaluated using drawdowns of approximately 1 mil of filler on sanded 1/4 in. particleboard. This subjective evaluation was performed using 320 grit wet/dry paper to comparatively evaluate the filler ability to be easily sanded on commercial production lines. In all cases sandability was judged to be equivalent.

Comparative gloss readings, shown in *Table* 6, were also measured on the particleboard filled samples after sanding and topcoating with a black high gloss lacquer. As with the ink samples discussed previously, all gloss measures of the ATH loaded wood fillers compare favorably with, if not offering a slight improvement over, the control formulation.

Cure enthalpies and cure rates (normalized to resin weight) measured for 0.1 min UV exposures of the wood filler formulations (listed in *Table* 2) are shown in *Table* 7 for 15 and 50 ± 2 mg samples. Dramatic increases in degree of cure and cure rate are clearly evident for both the 15 and 50 mg samples of the ATH loaded wood fillers, relative to the control. It is interesting to note that larger increases in enthalpy of cure (≥ 100% or 2×) are observed for the 50 mg samples relative to the 15 mg samples (25% increase for ATH filled systems). This observation is due to increased effective UV penetration depth in the wood fillers relative to the red screen inks, both neat and ATH loaded, owing to:

- increased UV transmittance of the wood filler resin system relative to the inks;
- the lack of red lake pigment in the wood filler formulations;
- the replacement of $CaCO_3$ and clay (both UV absorbing fillers) by ATH (which is UV transparent); and
- the high loading levels (up to 56.5%) employed for the wood fillers.

These listed factors also suggest that reduced latent ethalpies of cure (residual cure) should be observed for the wood filler formulations, particularly for the lower weight (15 mg) samples. This is clearly evident in *Figure* 1b, which shows that the residual cure (DPC heat flow) observed in the wood formulation following a 0.1 min UV exposure is but a fraction of that evidenced by the red screen ink, shown in *Figure* 1a.

The effective UV penetration depth of the red screen ink is thin compared to the thickness of a 15 mg sample (7-8 mil) while the effective penetration depth for the ATH loaded wood filler formulations significantly exceeds the thickness of the 15 mg samples, evidencing itself as larger enthalpies of cure (normalized to resin weight) for 50 mg samples. The effect of filler type on UV transparency is graphically illustrated in *Figure* 2, which shows comparative diffuse reflectance UV-Vis spectra for neat ATH, calcium carbonate ($CaCO_3$), and clay. The highest reflectance (least absorbance) is observed for ATH. This data clearly suggests that UV (250-400 nm) penetration into the coatings (inks or wood fillers) can be increased as a direct function of ATH loading, which supplants highly UV absorbing materials (either resin or other fillers). From a production coating perspective, the observed increase in heat of cure (ΔH) for screening inks and wood fillers, with increased ATH loading translates into:

- increased thru-cure, for a given line speed;
- obtaining the same degree of cure at increased line speeds;
- possible reductions in photoinitiator levels; and/or
- raw materials cost savings, by replacing more expensive components.

As an example to emphasize this latter point, the ATH loaded screen ink and wood filler formulations presented here allowed for raw materials cost savings of 5-10% over the control formulations.

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ACKNOWLEDGEMENTS

We wish to thank Bill Radak, of R&D Coatings, Inc., for his help in preparing the UV-cured polymers for this study. We also wish to thank Linda Gaydosik and Paul Schwartz, of Alcoa, for expert technical assistance in performing the DPC and UV-Vis measures discussed in this work. Finally, we thank the Alcoa Industrial Chemicals Division for supporting this research.

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Electrochemical Impedance Spectroscopy Evaluation of Various Aluminum Pretreatments Painted with Epoxy Primer

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Panels of aerospace aluminum (Al) alloys 2024 (UNS A92024) and 7075 (UNS A97075) were coated with four pretreatments (thin-film sulfuric-acid [H_2SO_4] anodization, chromic-acid anodization, and two commercial silica-based gels). Some of these panels were painted with chromated epoxy primer (MIL-P-23377D). All panels were subjected to several months of monitoring by electrochemical impedance spectroscopy (EIS) at open-circuit potential. Several panels were also subjected to EIS measurements made at various applied potentials. Equivalent circuit simulations indicate that a model like that proposed by van Westing, et al., which includes four time-constants (coating, pore, double-layer, and pretreatments) fits the data well. The epoxy primer is shown to be a highly porous, non-barrier coating.

INTRODUCTION

The problem of modeling electrochemical impedance data for polymer-coated metals has been investigated for some time. Mansfield (*Figure* 1) provided a nested dual-time constant model for the corrosion behavior of a generic coated metal.[1] This model includes an RC time constant for the polymer coating, and a second for the polymer-metal interface, i.e., the area at the polymer-coating interface where corrosion occurs. Kendig, et al.,[2] introduced a triple-time-constant model (*Figure* 2), which accounts for non-uniform defects and pores within the coating, for epoxy coating on steel. To explain diffusion of charge carriers across the paint-metal interface, van Westing et al.,[3] proposed a quadruple-time-constant equivalent circuit (*Figure* 3) for epoxy paint on steel. A complicated, nested quintuple-time-constant model (*Figure* 4) for coated aluminum beverage cans in chloride (Cl^-) solution recently was described by Grandle and Taylor.[4] Especially with regard to the more complex equivalent circuits (*Figures* 2-4), physical interpretation of the various time constants may vary from researcher to researcher. Therefore, while many reports may describe identical circuits to analyze electrochemical impedance data, the imputed meaning to the circuit elements is often quite different.

To narrow down the extraordinary variety of equivalent circuits available, a comparison was undertaken to investigate the electrochemical impedance behavior of an epoxy primer applied to several pretreatments over two aerospace aluminum (Al) alloys. Four pretreatments were chosen: chromic-acid anodization, thin-film sulfuric-acid (H_2SO_4) anodization, and two commercial siloxane gels deposited from tetraethoxysilane sols.

EXPERIMENTAL PROCEDURE

Two Al alloys were employed as substrates: Al 2024 (UNS A92024) and 7075 (UNS A97075). As mentioned previously, four types of pretreatment were used in this study: chromic-acid anodization, two weights of thin-film H_2SO_4 anodization, and two sol-gel coatings. Details of the method of anodization are described elsewhere.[5] The two sol-gel silica-based coatings[6] were applied only to Al alloy 2024 by Lord Corporation.[7] One sol-gel coating, the "original" formulation, was based solely on tetraethoxysilane monomers in an alcohol solution. The other, the "modified" formulation, also contained aminosilanes, supposedly added to enhance adhesion of the pretreatment to an adhesive epoxy paint system. For clarity, *Table* 1 shows the various pretreatments and the alloys to which they were applied.

Some of the pretreated panels were painted with an epoxy polyamide primer (MIL-P-23377D, Type 1). Painted panels were allowed to cure at ambient condi-

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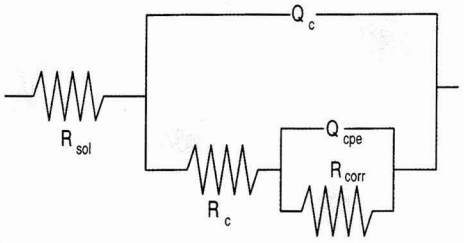

Figure 1—Equivalent circuit for generic metal with polymeric coating.

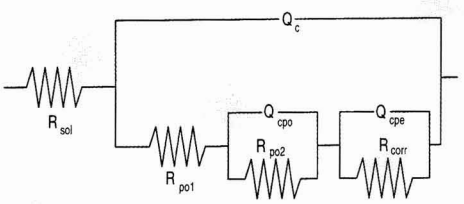

Figure 2—Kendig et al.'s, equivalent circuit used to explain epoxy-coated steel.

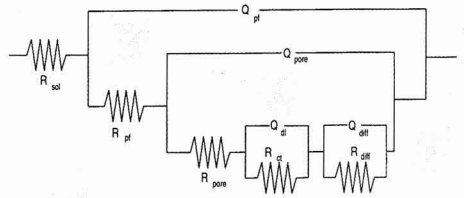

Figure 3—van Westing et al.'s, equivalent circuit used to explain epoxy-coated steel.

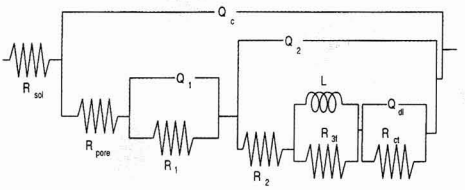

Figure 4—Equivalent circuit to model coated Al beverage cans in Cl^- solution.

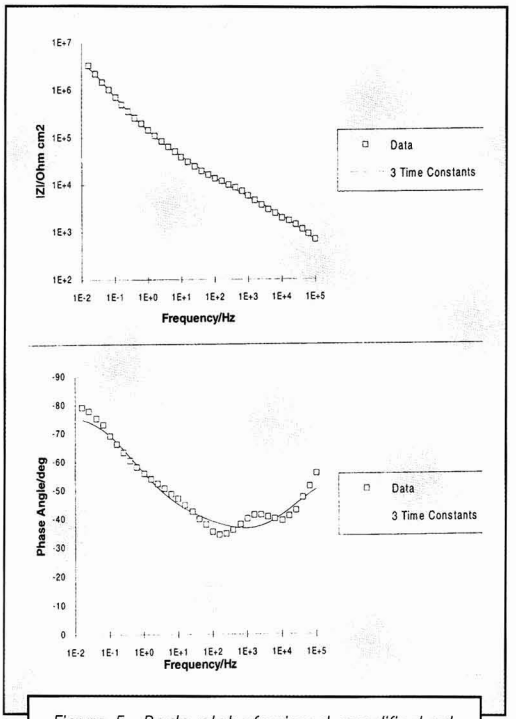

Figure 5—Bode plot of primed, modified sol-gel pretreatment on Al 2024 after two days under NaCl(aq), fit to the equivalent circuit in Figure 2. ($\chi^2 = 4.65 \times 10^{-3}$).

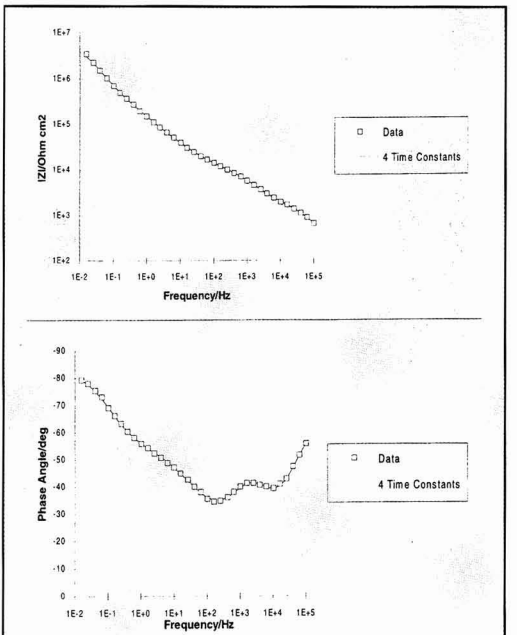

Figure 6— Bode plot of primed, modified sol-gel pretreatment on Al 2024 after two days under NaCl(aq), fit to the equivalent circuit in Figure 3. ($\chi^2 = 7.25 \times 10^{-5}$).

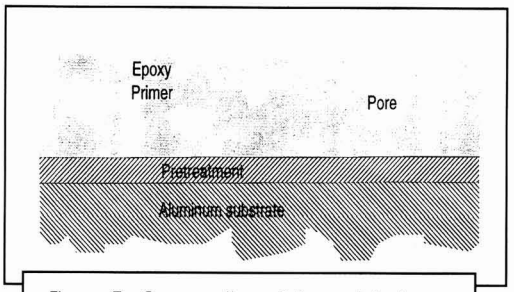

Figure 7—Cross-section of the painted, pretreated surface.

tions for at least 14 days prior to use. Thicknesses of the applied paint were measured by collecting 10 to 12 readings from an eddy-current thickness gauge (Permascope) and averaging. Reported uncertainties are standard deviations. *Table* 2 shows the measured thicknesses of the painted panels.

Both bare and painted panels were placed in borosilicate cells (sample area exposed to electrolyte = 7.5 cm^2) which were filled with 30 ml of 3.5% aqueous sodium chloride [NaCl(aq)]. Cells were periodically monitored at open-circuit potential by electrochemical impedance spectroscopy (EIS) for several months. The apparatus used to perform EIS scans was an IBM PS/2-controlled potentiostat (Princeton Applied Research 273A) and frequency-response analyzer (Schlumberger SI1255), at a frequency range of 0.01 Hz to 100 kHz and applied amplitude of 5 mV. Polarized EIS scans of the painted sol-gel panels were performed at 154 days under NaCl electrolyte. EIS scans were also taken of the painted sol-gel panels after several hours of immersion in distilled water (after several months under NaCl electrolyte). Analysis of the data was performed using Boukamp's Equivcrt software[8] (version 4.51) for complex non-linear-least-squares fitting of electrochemical impedance data.

RESULTS AND DISCUSSION

Equivalent Circuit Used

Initially, a two time-constant-model (*Figure* 1) was tried to fit EIS data, but did not work. Thus a three-time-constant model (*Figure* 2), as proposed by Kendig, et al., for steel coupons coated with epoxy paint, was tried as a hypothetical equivalent circuit for the painted Al systems. Kendig, et al.'s equivalent circuit includes the standard solution resistance R_{sol}, a coating capacitance Q_c(in this paper, all capacitors will be represented as constant-phase elements Q with associated exponents n), a coating resistance R_{pol}, a corrosion resistance R_{cor} across the paint-substrate interface with associated double-layer capacitance Q_{cpe}. In addition, a time constant to model inhomogeneous pore and interfacial defects in the coating was incorporated: a resistance R_{po2} and impedance Q_{cpo}. Unfortunately, this equivalent circuit also proved to be inadequate to fit many of the EIS scans, as shown in

Table 1—Pretreatments and Al Alloys Used

Pretreatment/Alloy	2024	7075
Thin-film H_2SO_4 anodization, high weight (800-900 mg ft^{-2})	x	x
Thin-film H_2SO_4 anodization, low weight (400-500 mg ft^{-2})	x	x
Chromic-acid anodization	x	x
Siloxane sol-gel[a]	x	
Modified siloxane sol-gel[a]	x	

(a) Applied to panels by Lord Corp. The modified sol-gel contains aminosilanes to improve epoxy-substrate adhesion.

Table 2—Epoxy Primer Thicknesses as Measured by Permascope. Uncertainties are Standard Deviations of Ten or More Readings

	Primer Thickness/μm	
Pretreament/Alloy	Al 2024	Al 7075
Thin-film H_2SO_4 anodization, low weight	35.8 ± 6.1	25.9 ± 1.3
Thin-film H_2SO_4 anodization, high weight	37.8 ± 3.3	34.5 ± 2.6
Chromic-acid anodization	22. ± 1.	19. ± 2.
Siloxane sol-gel	7.4 ± 0.8	
Modified siloxane sol-gel	7.4 ± 0.8	

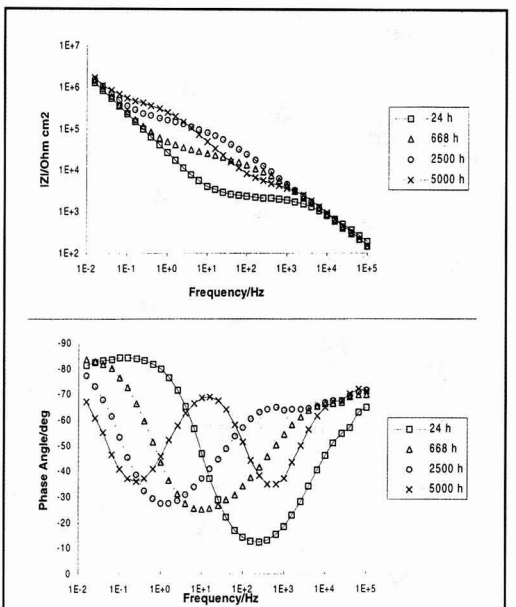

Figure 8—Bode plot of primed low-thickness thin-film H_2SO_4 anodization on Al 7075.

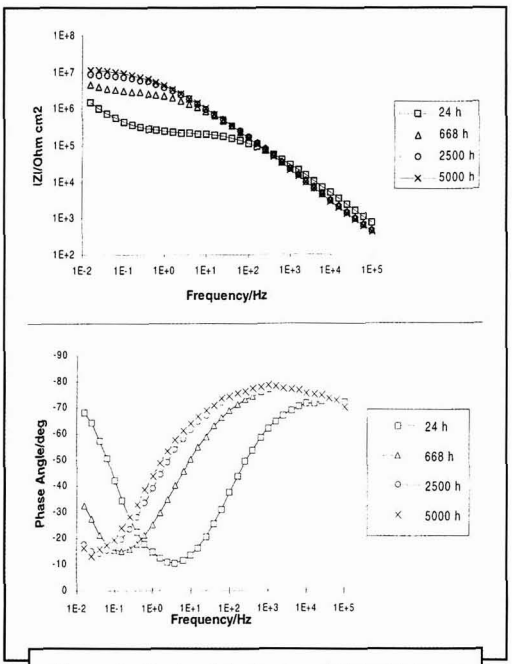

Figure 9—Bode plot of primed high-thickness thin-film H_2SO_4 anodization on Al 7075.

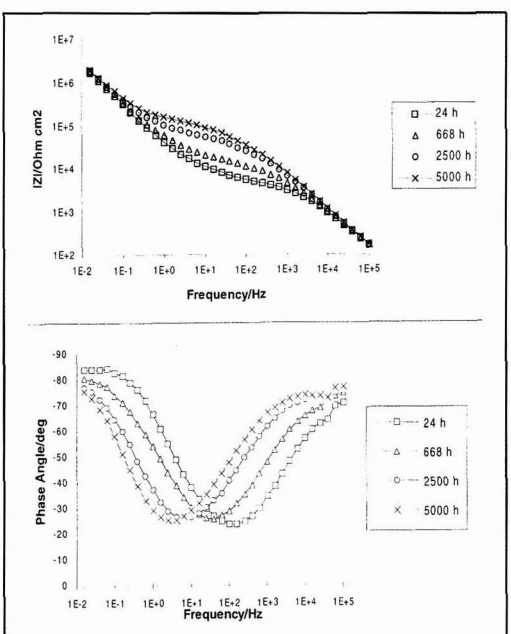

Figure 10—Bode plot of primed chromic-acid anodization on Al 7075.

Figure 5. Attempts to fit the impedance scans to the equivalent circuits shown in *Figures* 1 and 2 were made, including different times under electrolyte immersion, and all four pretreatments, but to no avail. Despite a low χ^2 ($\chi^2 = 4.65 \times 10^{-3}$), the several inflections clearly visible in the phase-angle plot (*Figure* 5, bottom) could never be simulated.

Accordingly, a four-time-constant equivalent circuit, similar to that employed by van Westing, et al. (see *Figure* 3), was required to explain the electrochemical results found in this experiment. All pretreatments fitted remarkably well to this equivalent circuit; substantial improvement, including the value for χ^2, was seen even for those Bode plots which had fewer than four obvious inflections. *Figure* 6, which uses the same data as *Figure* 5, but is modeled instead by the four-time-constant circuit, provides a comparison of the three- versus four-time-constant circuits.

In this model, the interpretation of which differs slightly from van Westing et al., the standard solution resistance R_{sol}, a coating capacitance Q_{pf}, and a coating resistance R_{pf} are represented. Also included is a time constant to represent the high porosity of this primer, R_{pore} with Q_{pore}, plus the time constants to model the double-layer capacitance between pretreatment and paint Q_{dl}, with associated charge-transfer resistance R_{ct} (there is a capacitance and resistance associated with the area of the [pigment-containing] polymer-pretreatment interface), and the pretreatment itself, R_{diff} and Q_{diff}. A sketch of the physical model of the surface is shown in *Figure* 7. The exact nature of the pores in the organic primer is not clear: the pores could be macroscopic flaws created during the application or curing process, as was seen in our case, or they could be microscope defects and tortuosity associated with amorphous polymer tangles, or even flaws due to poor attachment of pigment particles to the resin.

Sample Bode plots of the various primed pretreatments at particular times are shown in *Figures* 8 through 11. Because there were similarities among EIS data from the pretreatment/alloy systems, not all systems studied are presented. Low-thickness thin-film H_2SO_4 on Al 2024 was similar to high-thickness thin-film H_2SO_4 anodization on Al 7075 (*Figure* 9), high-thickness thin-film H_2SO_4 on Al 2024 was similar to low-thickness thin-film H_2SO_4 on Al 7075 (*Figure* 8), chromic-acid anodized Al 2024 was similar to chromic-acid anodized Al 7075 (*Figure* 10), and aminosilane-containing sol-gel was similar to the original formulation of sol-gel (*Figure* 11).

A series of plots of the various equivalent circuit parameters changing with time are shown in *Figures* 12 through 16. All of the thin-film H_2SO_4-anodized panels exhibit an increase of R_{ct} over time and a simultaneous drop in Q_{dl}, indicating an initially high but gradually slowing reaction rate across the paint-pretreatment interface, with a build-up of corrosion products. The chromic-acid anodized panels show an early, rapid increase of R_{ct} (to $> 10^9\ \Omega \cdot cm^2$), presumably from corrosion inhibition by chromate, and then a decline to measurable levels at later times.

The sol-gel pretreatments (*Figures* 15 and 16) show markedly different evolution with time. Both sol-gels

Table 3—Correlation between Painted, Pretreated Panels' Appearance and Dielectric Constant

Al Alloy, Pretreatment	Initial Qpf/nF·cm^{-2}	Paint thickness/μm	Calculated primer ε	Appearance after 210 d
2024, H_2SO_4, high[a,b]	1.7	37.8 ± 3.3	72 ± 7	Pinholes; 1 or 2 blisters
7075, H_2SO_4, low[a,b]	0.96	25.9 ± 1.3	28 ± 2	Some blisters
7075, H_2SO_4, high[a,b]	0.28	34.5 ± 2.6	11 ± 1	3 or 4 blisters
2024, H_2SO_4, low[a,b]	0.33	35.8 ± 6.1	14 ± 2	Nothing
7075, chromic-acid[b]	0.57	19. ± 2	12 ± 2	Nothing
2024, chromic-acid[b]	0.74	22. ± 1	18 ± 1	Nothing
2024, modified sol-gel	1.1	7.4 ± 0.8	9.2 ± 1.0	Numerous tiny blisters
2024, sol-gel	0.87	7.4 ± 0.8	7.3 ± 0.8	4 tiny blisters

(a) Low indicates low coating weight, and high indicates high coating weight.
(b) Anodized samples were measured after 24 hr of contact with NaCl electrolyte.

reveal water uptake in the coating via an increase in Q_{pf}. The original formulation could not be fitted with merely four time constants; instead, a convenient circuit was constructed by dividing the double-layer time constant into two (RQ) subcircuits in series. The true physical nature of this modification is not clear at present. The circuit used is merely a convenient modification to create an adequate fit, as measured by χ^2. Further work must be done to determine what the "real" equivalent circuit might be, although one may suspect that various reactions are occurring at the interface between the paint and pretreatment, improving the adhesion of the paint. In support of this argument is the lack of such a complex double-layer time constant on the modified sol-gel pretreatment, and the concurrently high blister rate observed under salt-spray testing. On the original sol-gel formulation, n_{dif} ~ 0.93 (a slightly rough surface pre-

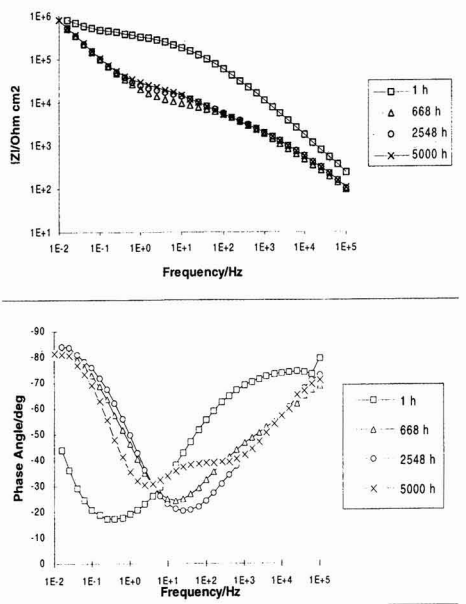

Figure 11—Bode plot of primed sol-gel original formula on Al 2024.

Table 4—Comparison of Bare and Painted Pretreatment Initial Qs

Alloy, Pretreatment	Painted Q_{dif}/μF·cm^{-2}	Bare Q/μF·cm^{-2}
7075, H_2SO_4, low	0.834 ± 0.013	0.955 ± 0.007
7075, H_2SO_4, high	0.689 ± 0.014	0.996 ± 0.005
2024, H_2SO_4, low	0.712 ± 0.037	0.971 ± 0.011
2034, H^2SO_4, high	0.936 ± 0.012	0.993 ± 0.006
7075, chromic-acid	0.607 ± 0.025	1.37 ± 0.01
2024, chromic-acid	0.790 ± 0.032	1.56 ± 0.01
2024, sol-gel	2.18 ± 0.57	2.67 ± 0.02
2024, modif. sol-gel	3.41 ± 1.06	3.49 ± 0.40

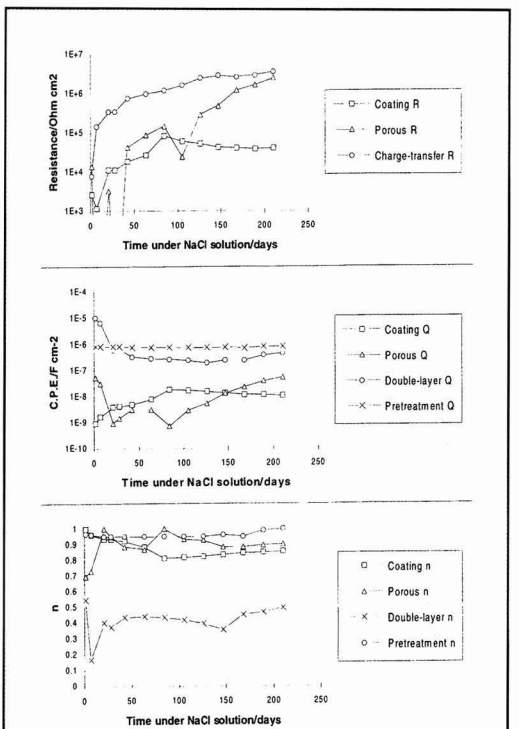

Figure 12—Evolution of circuit parameters with time for primed, low-weight H_2SO_4 anodization on Al 7075: (top) resistances, (middle) cpe's, (bottom) cpe exponents.

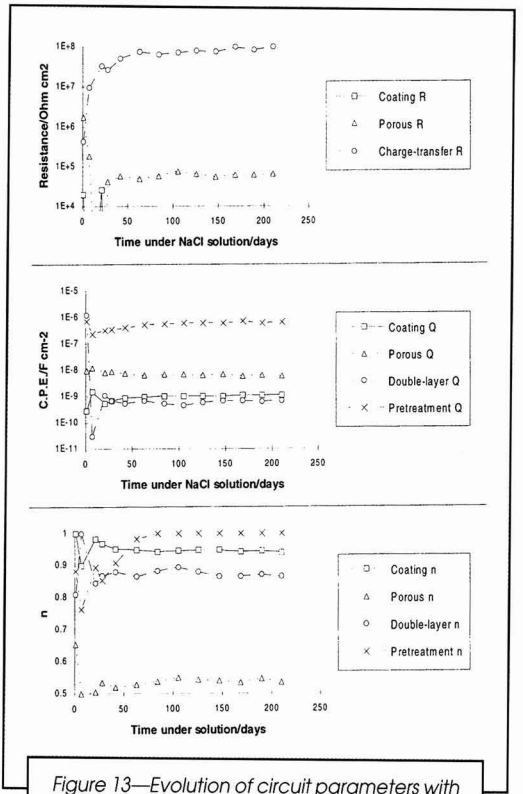

Figure 13—Evolution of circuit parameters with time for primed, high-weight H_2SO_4 anodization on Al 7075: (top) resistances, (middle) cpe's, (bottom) cpe exponents.

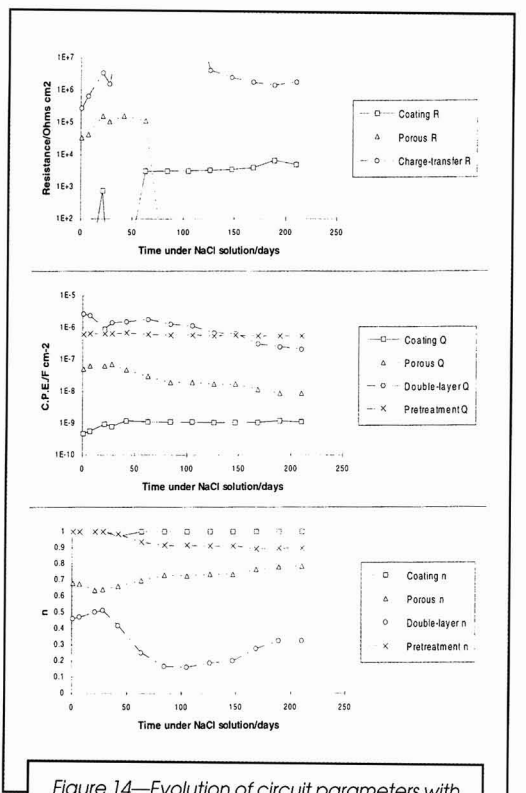

Figure 14—Evolution of circuit parameters with time for primed, chromic-acid anodization on Al 7075: (top) resistances, (middle) cpe's, (bottom) cpe exponents.

treatment), while the modified sol-gel $n_{diff} = 1.0$, indicating a lack of roughening (and thus poor adhesion).

In general, the sol-gel systems appear to have more stable values for the circuit components over time. Thus we may conclude that corrosion of the underlying Al is a relatively unimportant process, probably because of the inert nature of the sol-gel pretreatment. In contrast, the anodized samples exhibit more highly variable circuit components, whether actively inhibited (chromic-acid anodized) or not (thin-film H_2SO_4 anodized), thus corrosion is a more important consideration for the time evolution of these Al surfaces.

Dielectric Constant and Barrier Properties of the Primer

Water uptake by the primer is evident from the increase of Q_{pf} with time for all anodized panels. Assuming that Q_{pf} is sufficiently close to a perfect capacitor C_{pf} (this assumption seems to be satisfied, for all fits indicate $n_{pf} > 0.8$), and using the relation between dielectric constant e and primer thickness d_{pf},

$$C_{pf} = \frac{\varepsilon_0 \varepsilon}{d_{pf}} \quad (1)$$

where ε_0 = the vacuum permittivity, a general correlation was found between flaws in the paint and the measured initial primer ε, as shown in *Table* 3. Two different effects of immersion in NaCl(aq) were observed under 40× magnification: (1) large blisters and pinholes visible to the unaided eye; and (2) tiny blisters, observable only under the microscope. The more serious flaws were the large blisters and pinholes. In large numbers, these increased ε by a factor of 2 to 5. Of little influence were the tiny blisters, which even in large amounts did not change ε.

The more pronounced the flaws and defects existing within the primer, the higher the measured dielectric constant will be (e.g., low coating weight thin-film H_2SO_4 anodized 7075 and high coating weight thin-film H_2SO_4 anodized 2024). The ultimate tendency for the most porous paint films will be towards the dielectric constant of water ($\varepsilon = 79$),[9] because these films will absorb water the most rapidly, while the least porous films will have a low initial dielectric constant, nearer to that of epoxy resins ($\varepsilon \approx 3.6$).[10] This suggests that EIS may be a way of determining the overall relative quality of an applied epoxy paint film, by measuring ε within an hour of assembling an electrochemical cell.

The overall resistance R_{pf} of the epoxy primer is an indicator of the general permeability of the primer. As shown in *Figures* 13-16, $R_{pf} < 10^5\ \Omega\ cm^2$, and was often

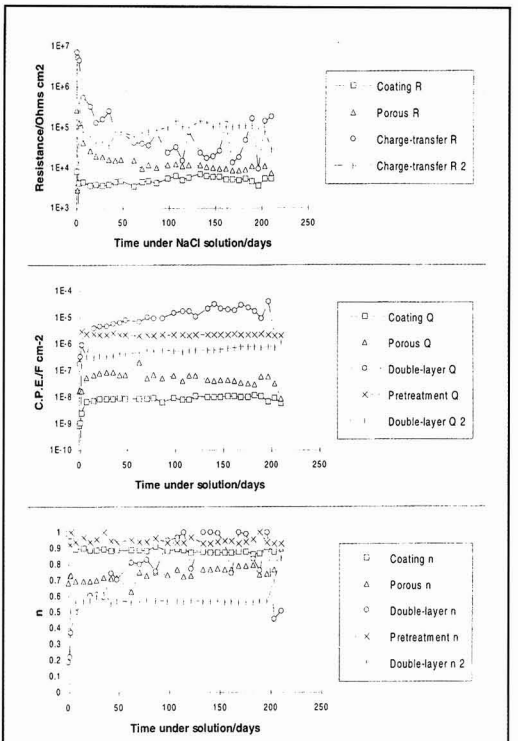

Figure 15—Evolution of circuit parameters with time for primed, original sol-gel formula on Al 2024: (top) resistances, (middle) cpe's, (bottom) cpe exponents.

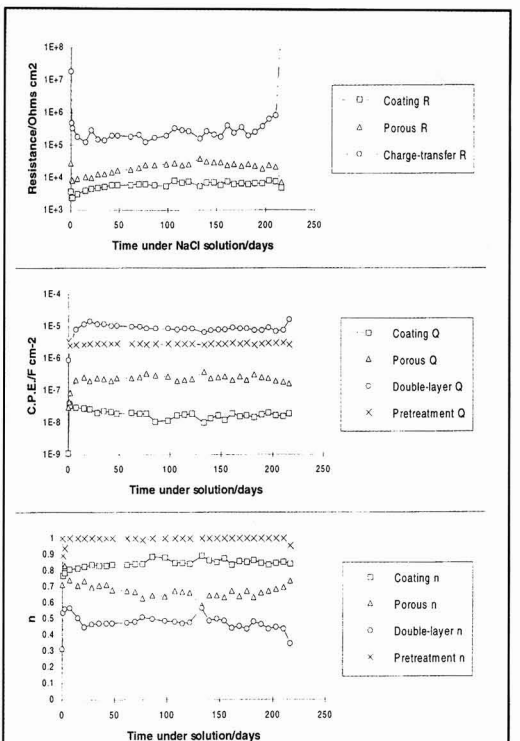

Figure 16—Evolution of circuit parameters with time for primed, modified sol-gel formula on Al 2024: (top) resistances, (middle) cpe's, (bottom) cpe exponents.

observed to be 10^3-10^4 Ω cm^2, thus indicating poor barrier properties for the primer.

Dielectric Properties of the Underlying Pretreatment

In all cases the values for the pretreatment capacitance Q_{diff} were similar for bare and painted panels, lending support to the four-time-constant equivalent circuit. In the case of the thin-film H_2SO_4 anodized pretreatment, which is generally regarded as a bilayer structure (thick porous layer overlying a thin barrier layer),[11] the only detectable part of the pretreatment on the primed panels was the thin barrier layer, i.e., at lower frequencies. The sol-gel pretreatments are made up of a single homogenous layer, and thus are modeled by a single RQ time constant.[12] *Table* 4 shows the initial measured Q_{diff} for all panels. R_{diff} values are not provided, for few useful values could be obtained: measurements at frequencies significantly lower than 0.01 Hz would have to be obtained. All calculated R_{diff} values, however, were found to be much greater than 10^7 Ω·cm^2.

In all cases the painted pretreatment capacitance is slightly less than the bare capacitance. This may be ascribed to less water absorption by the pretreatment covered by primer, than by bare pretreatment exposed directly to electrolyte. The significantly lower Q values for the sol-gel pretreatments are due to their relative thinness, on the order of 0.2-0.3 μm, while the anodized pretreatments are roughly 100 times higher.

Measurements Under Distilled Water

After 147 days under NaCl(aq), the solution was removed from the painted original sol-gel panel, and distilled water was used as the electrolytic solution instead. The sample was scanned twice, after 90 min and 180 min under distilled water, after which the water again was replaced by fresh NaCl(aq), and standard EIS measurements were continued periodically, as before, for the long term. After 216 days under NaCl(aq), the solution was removed from the modified sol-gel sample, and 1:10 diluted NaCl(aq) was used instead. The solution was scanned at 90 and 180 min, after which the diluted NaCl(aq) was replaced by distilled water. EIS scans were again taken at 90 and 180 min.

Changes within the coatings over the course of 180 min in these solutions are shown in *Figures* 17 and 18. The original sol-gel formula exhibited little change in double-layer capacitance Q_{dl} and charge-transfer resistance R_{ct} when distilled water was substituted for NaCl(aq). The sol-gel modified by addition of

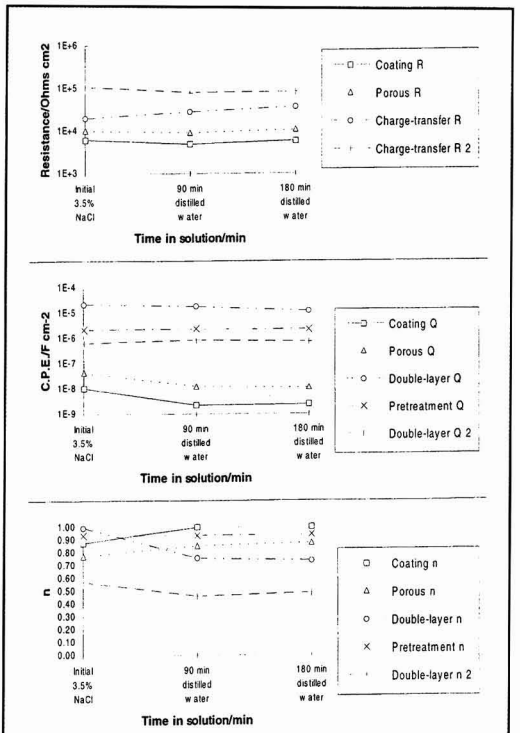

Figure 17—Change in circuit parameters vs time under various solutions, after 147 days under 3.5% NaCl (epoxy primer over original sol-gel formula); (top) resistances, (middle) cpe's; (bottom) cpe exponents.

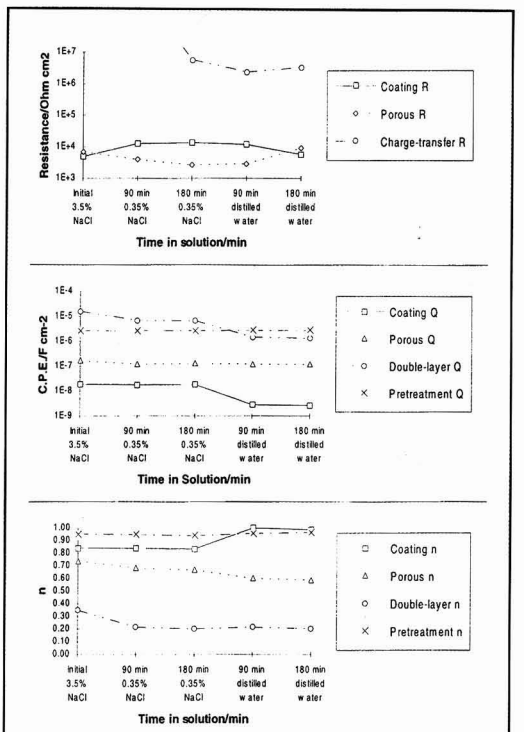

Figure 18—Change in circuit parameters vs time under various solutions, after 216 days under 3.5% NaCl (epoxy primer over modified sol-gel formula); (top) resistances, (middle) cpe's; (bottom) cpe exponents.

aminosilanes, however, showed a marked decrease of Q_{dl} and R_{ct} under water. To explain this, the following hypothesis is proposed. The siloxane coating absorbs or reacts with ions from the primer, thus causing a measurable, low R_{ct} between the primer and pretreatment. In the modified sol-gel, positively charged aminosilanes attract negatively charged Cl^- ions, forming a large Q_{dl} (nearly 10 times the Q_{dl} of the standard sol-gel formula), while simultaneously blocking adsorption or reaction of ions. Addition of water washes away the Cl^- ions from the aminosilanes, thus reducing Q_{dl}. This also allows ions to react or absorb with the siloxanes, reducing R_{ct}.

Polarization Measurements

With this equivalent circuit, most changes with polarization ought to come from the exchange of ions and material between the coating and surrounding electrolyte. Little, if any, change should be manifest in the deepest layers of the coating system, namely, the pre-

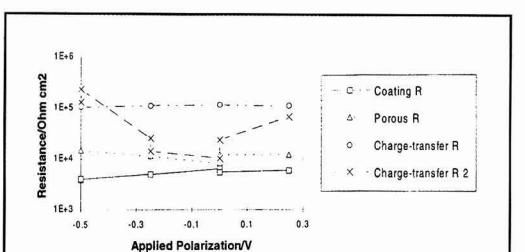

Figure 19—Equivalent-circuit resistances from EIS results of primed original sol-gel on Al 2024 after 154 days under NaCl electrolyte.

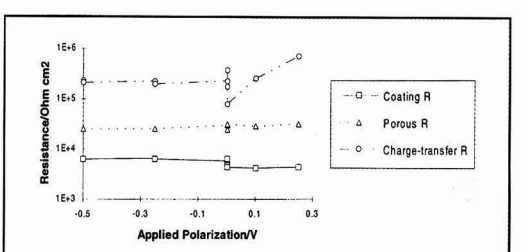

Figure 20—Equivalent-circuit resistances from EIS results of primed modified sol-gel on Al 2024 after 154 days under NaCl electrolyte.

treatment and its time constant. Both types of sol-gel systems exhibited similar calculated resistance values. No significant effects of applied voltage were evident for either type of sol-gel pretreatment with applied epoxy primer (*Figures* 19 and 20), except for the resistance designated "Charge-transfer R 2" (*Figure* 19), which reaches a minimum at about 0V applied to the sample, and is higher as the magnitude of the applied voltage increases. As stated previously, the added time-constant for the original sol-gel formula is of unknown origin. From these data it seems to be related to ion-transfer between electrolyte and coating system, as well as adhesion of primer to pretreatment (by inspection of the surface after immersion in the EIS cell, and from independent salt-spray results not given here).

CONCLUSION

The EIS data from an aluminum surface, pretreated and painted with epoxy primer, can be modeled quite well with a four-time-constant equivalent circuit similar to that proposed by van Westing et al., to explain epoxy-coated steel. The interpretation of this circuit provided herein, however, differs from van Westing et al.'s: (1) one-time-constant for the polymer coating; (2) one-time-constant for the porosity of the polymer coating; (3) one-time-constant for reactions between the polymer coating and the pretreatment; and (4) one-time-constant to be caused by the pretreatment itself. Support for this model comes from EIS data taken over an extended period of time, data taken after varying the electrolyte concentration, and data acquired while applying various potentials. The epoxy primer used was found to be quite permeable, and a very poor barrier to ion exchange.

ACKNOWLEDGMENTS

The author would like to thank Mr. William Green, Mr. Donald Hirst, Mr. Frank Pepe (all of the Naval Air Warfare Center, Aircraft Division, Warminister, PA), and Dr. Kevin Kovaleski (Lehigh University) for technical assistance. Special thanks are due to Mr. Stephen Spadafora (Naval Air Warfare Center) and Dr. Richard Granata (Lehigh University) for general comments concerning this work, and especially to Dr. Herbert Stark (Lehigh University) for many discussions concerning acquisition and analysis of EIS data, as well as comments during final preparation of this report. This work was funded by a grant from the Office of Naval Research (contract N00014-90-J-1229).

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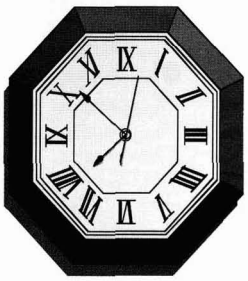
How Much  Do You Spend in Training?

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High-Solids Coatings Using Benzylanilinium Sulfonates-II α,α-Dimethylbenzylpyridinium ρ-Toluenesulfonate, an Effective Blocked Sulfonic Acid

S. Nakano and T. Morimoto—Nippon Paint Co., Ltd.*
T. Endo—Tokyo Institute of Technology†

*α,α-Dimethylbenzylpyridinium ρ-toluenesulfonate (**1**), a new class of blocked sulfonic acids, was synthesized in good yield and some properties of **1** were compared with those of N-(ρ-methoxybenzyl)-N,N-dimethylanilinium ρ-toluenesulfonate (**2**), an effective blocked sulfonic acid.*

*^{1}H-NMR analysis showed that **1** and **2** were able to release the corresponding amine blocked ρ-toluenesulfonic acid during the reaction with H_2O and that the unblocking temperatures were 80 °C and 75 °C, respectively. Consequently, each aqueous solution turned acidic from neutral around 80 °C.*

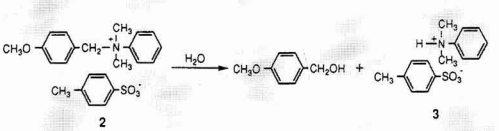
*Furthermore, the hydrolysis properties of **1** and **2** were estimated by measuring the rate of hydrolysis for **1** and **2**. It was found that the **1** activation energy (Ea) was higher than the **2** Ea during hydrolysis. Consequently, **1** showed better thermal latency than **2**.*

INTRODUCTION

Environmental pollution has become a serious problem worldwide. Many chemists in the coatings industry are trying to reduce VOC by developing higher-solids coatings. It is well known that the combination of hexamethoxymethylmelamine (HMMM) and polymers containing OH moieties are useful for high-solids coatings. However, under certain conditions, the curability of coating solutions including HMMM is not sufficient to produce cured films. Acid catalysts[1] such as ρ-toluenesulfonic acid (ρ-TSA) are often used to accelerate the crosslinking reaction for the HMMM coating solutions. Since free sulfonic acids reduce storage stability, amine blocked sulfonic acids[2] are widely used as latent acid catalysts. However, even such "latent" catalysts accelerate the crosslinking reaction over a wide temperature range and it has been difficult to get good storage stability. Consequently, several classes of latent catalysts have been reported.[3-9]

We have already reported[10] that benzylanilinium sulfonates (**2**) turned acidic from neutral around 80°C by the reaction with nucleophiles such as H_2O releasing sulfonic acid (**3**) (*Scheme* 1), a catalyst for the crosslinking reaction between melamine resins and polymers. Furthermore, we demonstrated that **2** is able to produce one-pot HMMM coating solutions showing better storage stability and curability than amine blocked ρ-toluenesulfonic acid. Consequently, the approach to the ideal profile for latent acid catalysts (*Figure* 1) leads to the ideal one-pot HMMM coatings showing acceptable curability and storage stability.

However, the **2** stability against nucleophiles such as H_2O was not acceptable. It was postulated that **2** would be substituted by H_2O to produce sulfonic acid (*Scheme* 1), since the N,N-dimethylanilinium moiety would act as a good leaving group. Ideal latent acid catalysts for thermosetting coatings should not be decomposed under any conditions other than heating at the corresponding temperature. Therefore, it would not be expected that **2** can act as an ideal latent acid catalyst under certain conditions.



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Scheme 1

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†Research Laboratory of Resources Utilization, 4259 Nagatsuta, Midori-ku, Yokohama 226, Japan.

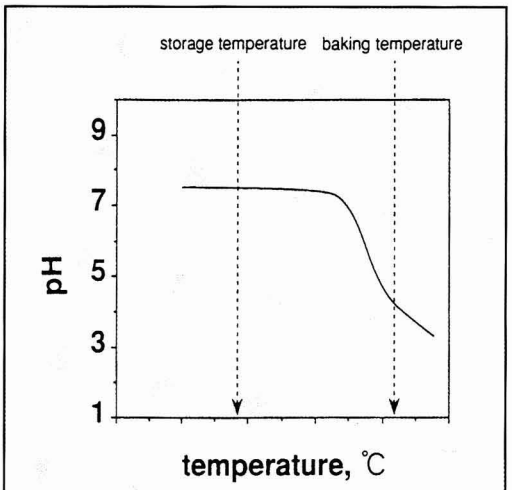


Figure 1—Ideal profile for latent acid catalysts.

It is well accepted that nucleophilic substitution may be prevented by a steric effect. Therefore, benzylammonium salts, substituted at the α-position of the benzyl group, are expected to show good resistance to nucleophilic substitution. We developed the α,α-dimethylbenzylpyridinium SbF_6 salt and found that this salt was able to release pyridinium SbF_6, an initiator for cationic polymerization, at elevated temperatures.[11] From these results, α,α-dimethylbenzylpyridinium ρ-toluenesulfonate[12] (**1**) would also release sulfonic acid (**4**) at elevated temperatures (*Scheme* 2). In other words, **1** is expected to be an ideal latent acid catalyst showing sufficient stability against nucleophiles because of its steric effect around the α-carbon.

In this paper, we describe the hydrolysis properties of **1** compared with **2** to estimate the stability of the **1** coating solutions including nucleophiles. The unblocking reaction is also described to estimate how **1** can act in HMMM coating solutions. Also, the effect of **1** on the crosslinking reaction for the HMMM coating solutions is discussed. Furthermore, the storage stability of the **1** coating solution was evaluated compared with that of the **2** coating solution.

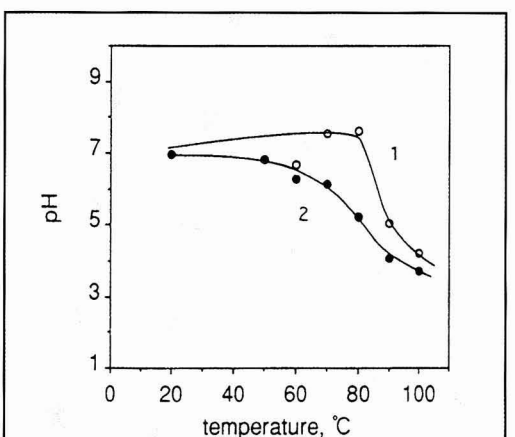


Figure 2—Effect of temperatures on pH of a 1 wt% aqueous solution of each catalyst.

EXPERIMENTAL

Synthesis of Pyridinium SbF_6 (5)

Into a four-necked flask equipped with a stirrer and a reflux condenser were placed 1.16g (0.01 mol) of pyridinium chloride, 2.75 g (0.01 mol) of $KSbF_6$, and 20 g of methanol. The mixture was stirred at 20°C for one hour. After the reaction mixture was filtered off, the methanol was removed under vacuum to obtain **5** as a white powder in 97% yield.

Synthesis of α,α-Dimethylbenzylpyridinium SbF_6 (1)

Into a four-necked flask equipped with a stirrer and a reflux condenser were placed 1.36 g (0.01 mol) of α,α-dimethylbenzyl alcohol (**6**), 3.16 g (0.01 mol) of **5**, 2 g of molecular sieves and 20 g of nitromethane. The mixture was stirred and maintained at 70°C for 7.2 hr. After the molecular sieves were filtered off, the nitromethane was removed under vacuum. The residue was washed with ether and water to obtain crude α,α-dimethylbenzylpyridinium SbF_6 (**7**). **7** was recrystallized from methanol to afford a white powder in 68% yield.

7 (4.52g, 0.01 mol), potassium ρ-toluenesulfonate (2.1 g, 0.01 mol) and methanol (100 g) were placed in a four-necked flask fitted with a stirrer and a reflux condenser. The mixture was maintained at 20°C and stirred for one hour. After the methanol was removed under vacuum, isopropanol was added to the residue and **1** was recrystallized from isopropanol after the insoluble parts were filtered off to afford a white powder in 63% yield.

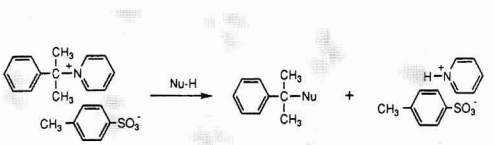
Coating solution **2** was synthesized by the same method previously reported.[10]

Measurement of pH of the Aqueous Solutions

One gram of each catalyst was dissolved in 100 g of water and the aqueous solutions heated for 10 min at specific temperatures. The pH of these aqueous solutions was then measured at 20°C using a pH meter.

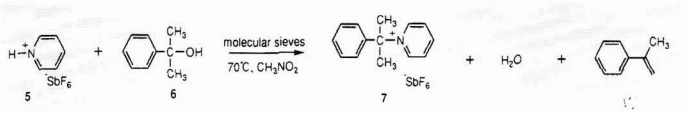
Estimation of Rate of Hydrolysis

One gram of each catalyst was dissolved in 100 g of water and the solution was stored at 60°, 70°, 80°, or



Scheme 2

90°C for six hours. Samples were taken every hour from every solution and were analyzed using HPLC (solvent; a 7:3 v/v mixture of methanol and water, reference substance; anisole). To calculate the numerical value k, the time when the % conversion reach 20 was obtained.



5 6 7

Scheme 3

Estimation of Unblocking Temperatures

Each catalyst (0.03 mmol) was dissolved in dimethylsulfoxide-d_6 and 2 mmol of deuterium oxide was added. After mixing, the solution was heated for 10 min in an oil bath after which the ^{1}H-NMR spectrum of the solution was measured. The conversion of **1** was calculated from the ratio of **1** to α-methylstyrene and α,α-dimethylbenzyl alcohol. The conversion of **2** was calculated from the ratio of protons at the α-position of **2** to the protons on the methyl groups of **3**. Unblocking temperatures of each catalyst were defined as the temperature at which five percent of that catalyst was converted to **3**, when it was heated for 10 min.

Synthesis of the Acrylic Polyol

The synthesis of a polymer containing OH moieties was carried out in a round-bottomed flask equipped with a mechanical stirrer, a reflux condenser, a dropping funnel, and a thermometer. Xylene (390 g) was heated to 130°C and stirred. To this, a mixture of styrene (120 g), 2-hydroxyethylmethacrylate (139.2 g), iso-butylmethacrylate (30.6 g), iso-butylacrylate (168 g), and n-butylmethacrylate (142.2 g) was added dropwise at 130°C over two hours, with t-butylperoctoate as the radical initiator. The temperature was maintained at 130°C for a further two hours.

Mn; 6400, Mw/Mn; 2.36, estimated by GPC, polystyrene standard, OHV; 99 KOHmg/g, solid %, 61.

Formulation of Clear Coating Solutions

Two grams of each catalyst were dissolved in five grams of the methanol. HMMM (60 g) and the acrylic polyol solution (230 g) were then added to obtain clear coating solutions.

Evaluation of Crosslinking Reaction

Each clear coating solution was applied to steel panels and baked for 20 min at fixed temperatures to obtain cured films. The gel fractions of the cured films were evaluated in acetone using a Soxhlet extractor. Curing temperatures were defined as the temperature which the gel fraction was 95% of the film weight.

Evaluation of Storage Stability

The previously mentioned clear coating solutions were diluted with xylene to a viscosity of 30 sec at 20°C using a #4 Ford cup. After the coating solutions were stored at 60°C, the viscosity of each diluted coating solution was checked at 20°C using a #4 Ford cup.

RESULTS AND DISCUSSION

Synthesis of Benzylpyridinium Salts (1)

α,α-Dimethylbenzylpyridinium SbF_6 is synthesized[11] by the reaction of α,α-dimethylbenzyl alcohol and pyridinium SbF_6 in good yield (*Scheme* 3). Therefore, this reaction was applied to the synthesis of **1**. However, **1** was not obtained by the reaction of α,α-dimethylbenzyl alcohol with pyridinium ρ-toluenesulfonate. It would be considered that pyridinium ρ-toluenesulfonate cannot strongly interact with α,α-dimethylbenzyl alcohol because of its weaker acidity compared to pyridinium SbF_6. **1** was synthesized according to *Schemes* 3-5.

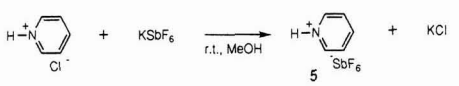
Pyridinium SbF_6 (**5**) was synthesized by the reaction of pyridinium chloride with $KSbF_6$ in methanol (*Scheme* 4). The reaction proceeded quantitatively, since KCL was precipitated in the solution.

The **1** was synthesized by the reaction of α,α-dimethylbenzyl alcohol (**6**) with **5** according to *Scheme* 4, followed by the exchange of SbF_6^- to a tosylate anion (*Scheme* 5). The dehydration reaction of α,α-dimethylbenzyl alcohol (*Scheme* 3) proceeded homogeneously, since pyridinium SbF_6 (**5**) was soluble in CH_3NO_2 at ambient temperatures. LC analysis showed that α-methylstyrene was also formed during the reaction. As shown in *Table* 1, **7** was obtained in the moderate yield, when molecular sieves were added to the reaction mixture. It would be considered that molecular sieves acted as a dehydration agent during the reaction and, therefore, the reaction in *Scheme* 3 proceeded.

The reaction in *Scheme* 5 proceeded quantitatively, since $KSbF_6$ was precipitated in the solution. Therefore, **1** was obtained in good yield (*Table* 2).

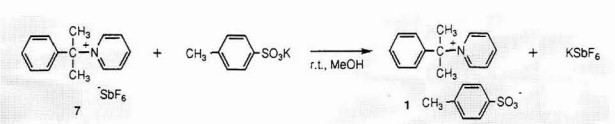
Synthesis of Benzylanilinium Sulfonates (2)

2 was synthesized by the reaction of ρ-methoxybenzyl chloride with N,N-dimethylaniline in acetonitrile accord-



5

Scheme 4



7 1

Scheme 5

Table 1—Synthesis of α,α-Dimethylbenzyl Pyridinium SbF_6 (7) by the Reaction of α,α-Dimethylbenzyl Alcohol (6) with Pyridinium SbF_6 (5) at 70°C for 7.2 hr in Nitromethane (20g)

5	6	Molecular Sieves	Yield, %	
mmol	mmol	g	7	α-methylstyrene
10	10	0	7	32
10	10	2	68	32

Table 2—Properties of Catalysts

Catalysts	Yield, %	m.p., °C
1	63	149.8 - 150.1
2	92	130.6 - 131.9

ing to *Scheme* 6 and the chloride anion was exchanged with a tosylate anion by reacting sodium p-toluenesulfonate in methanol (*Scheme* 7). The identification data is summarized in *Table* 2.

Temperature Dependency of pH for Aqueous Solution Containing Catalysts

Figure 2 shows the effect of temperature on the pH of 1 wt% aqueous solutions containing **1** or **2**. The pH of each solution was measured at 20°C after they were heated at specific temperatures for 10 min. Both aqueous solutions were neutral at room temperature and became acidic around 80°C. These results indicate that catalysts react with H_2O, a nucleophile having active hydrogen, releasing sulfonic acid (**3** or **4**) around 80°C. The **1** aqueous solution became acidic more rapidly compared with the **2** aqueous solution. Nucleophilic substitution of H_2O to **1** would be interrupted below 80°C due to the steric hindrance of the α-methyl groups in **1**. On the other hand, **2** would be slowly hydrolized at temperatures greater than 50°C.

The reaction of catalysts with polymer OH moieties should proceed according to the same mechanism, as OH groups would act as nucleophiles. Consequently, it can be expected that these catalysts will accelerate the crosslinking reaction of HMMM coating solutions by releasing acids.

Stability of Catalysts in Aqueous Solution

A 1 wt% aqueous solution (2.7×10^{-4} M for the **1** solution, 2.4×10^{-4} M for the **2** solution) of each catalyst was formulated and they were stored at 40°C. *Figure* 3 shows the pH change of these solutions. As shown in *Figure* 3, the pH of the **2** aqueous solution reached **4** (1×10^{-4} M for the $[H^+]$), after storage for 48 hr. However, the **1** aqueous solution maintained a pH of around 5.5 (3.2×10^{-6} M for the $[H^+]$) for 10 days. These pH implied that 42% of **2** was hydrolyzed and that one percent was hydrolyzed, if the corresponding amine blocked p-TSA (**3** or **4**) could perfectly dissociate in the aqueous solution. *Figure* 4 shows the hydrolysis degree of each catalyst, which was calculated using the $[H^+]$ based on pH. It is clear that **1** is very stable in water, although **2** decomposes completely in 168 hr. The α-methyl groups in **1** would prevent the nucleophilic attack of H_2O to the α-carbon due to their steric hindrance. This effect of the α-methyl groups in **1** could lead to a catalyst not influenced by any components in coating solutions other than heating. These results imply that the **1** could be applied to the waterborne system.

Rate of Hydrolysis of Catalysts

One gram of each catalyst was dissolved in 100 g of water and the aqueous solutions were stored at specific temperatures for six hours. The conversion of each initiator was evaluated by HPLC. *Table* 3 shows the conversion and the rate of hydrolysis for each catalyst. It is clear that **1** is more stable than **2** in water over a wide temperature range and that the Ea of **1** was higher than the Ea of **2**.

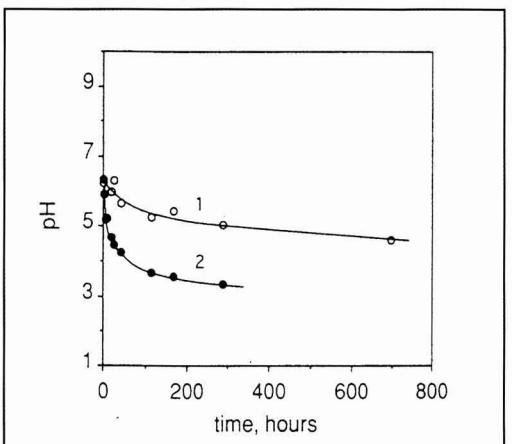


Figure 3—pH change of a 1 wt% aqueous solution of each catalyst at 40°C.

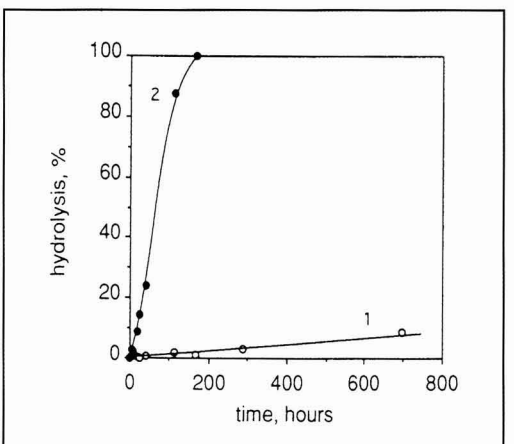
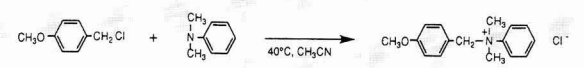
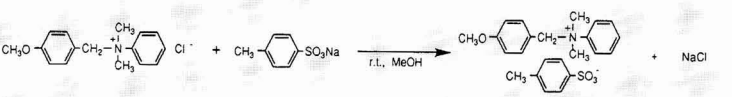


Figure 4—Stability of each catalyst in a 1 wt% aqueous solution at 40°C.

Figure 5 shows the Arrhenius plots of each catalyst. Each plot showed a good linear relationship over this temperature range. It was estimated from these plots that the **1** hydrolysis rate (ln k = 2.9) would approach that of **2** (ln k = 2.3) at 120°C ($2.54 \times 10^{-3}K^{-1}$), although the **1** hydrolysis rate (ln k = 5.8) was slower than **2** (ln k = –3.4) at 60°C ($3.00 \times 10^{-3}K^{-1}$). Therefore, it is expected that **1** would show greater thermal latency than **2** as a latent acid catalyst.



Scheme 6



2

Scheme 7

Unblocking Reaction of Catalysts

The unblocking reaction of **1** was carried out by the reaction of D_2O using ^{1}H-NMR to estimate how **1** is unblocked in the coating solutions including nucleophiles such as polyols. Each sample, consisting of a catalyst, D_2O and DMSO-d_6, was heated at specific temperatures for 10 min.

The **1** solution ^{1}H-NMR spectra showed some new signals at temperatures greater than 80°C. Signals observed at 2.3, 7.1, and 7.5 ppm (for tosylate anion) and 8.0, 8.6, and 8.9 (for pyridinium cation) demonstrated that pyridine blocked ρ-TSA (**4**) is released from **1** in the solution and signals observed at 2.1, 5.1, 5.4, 7.2-7.3, and 7.4-7.5 ppm showed that α-methylstyrene was also formed during the reaction. Furthermore, α,α-dimethylbenzyl alcohol was observed at 1.4 and 7.3-7.4 ppm. Therefore, **1** would be unblocked at a temperature greater than 80°C according to *Scheme* 8.

Table 4 shows the yield of compounds released from **1** during the reaction. As shown in *Table* 4, α-methylstyrene was preferentially formed rather than α,α-dimethylbenzyl alcohol over these temperatures. **1** could be unblocked via an S_N1 mechanism, followed by the decomposition of the α,α-dimethylbenzyl cations by an E1 mechanism (*Scheme* 9) rather than via the nucleophilic substitution of H_2O molecules. **2** released N,N-dimethylaniline blocked ρ-TSA (**3**) and ρ-methoxylbenzyl alcohol under the same conditions (*Scheme* 10), as shown in *Table* 5.

Table 6 shows the conversion of each catalyst to the corresponding amine blocked ρ-TSA at 120°C. *Table* 6 clearly shows that both **1** and **2** were almost unblocked to the corresponding amine blocked ρ-TSA at 120°C within 15 min. Therefore, these catalysts would be perfectly decomposed to sulfonic acid during the baking process of the coating solutions within 15 min.

Unblocking Temperatures

We have already reported[10] that the curing temperatures of coating solutions, consisting of polyols, melamine resins and **2**, vary depending on the **2** unblocking temperatures and that the **2** unblocking temperatures are estimated by the reaction of **2** with D_2O. The **1** unblocking temperature was estimated by a similar method.

Table 3—% Conversions and Rates of Hydrolysis of Catalysts at Several Temperatures

Catalysts	Temperature, °C	Time, hours	Conversion ,%	Rate of Hydrolysis, ln k
1	60	1	0	–5.759
		2	0	
		3	0	
		4	0	
		5	2.9	
		6	1.9	
	70	1	0	–4.356
		2	0.1	
		3	1.3	
		4	2.1	
		5	6.2	
		6	23.8	
	80	1	4	–2.560
		2	14.3	
		3	21.3	
		4	22.5	
		5	26.2	
		6	26.5	
	90	1	21.0	–1.446
		2	34.5	
		3	47.2	
		4	57.1	
		5	65.4	
		6	72.0	
2	60	1	1.5	–3.433
		2	4.4	
		3	9.6	
		4	9.2	
		5	12.9	
		6	17.6	
	70	1	17.7	–2.157
		2	20.6	
		3	28.5	
		4	41.4	
		5	45.3	
		6	51.5	
	80	1	30.9	–0.995
		2	55.0	
		3	70.2	
		4	79.5	
		5	90.7	
		6	93.1	
	90	1	64.3	0.030
		2	93.1	
		3	97.9	
		4	100	
		5	100	
		6	100	

Table 4—Effect of Temperature on Unblocking Reaction of 1

Temperature, °C	Yield, %		
	α-methylstyrene	4	6
70	0	0	Trace
80	0	0	Trace
90	12	16	4
100	25	36	11
120	75	96	21

4: pyridine blocked p-TSA.
6: α,α-dimethylbenzyl alcohol.

Table 5—Effect of Temperature on Unblocking Reaction of 2

Temperature, °C	Yield, %	
	p-methoxybenzyl alcohol	3
60	0	0
70	3	3
80	8	8
90	24	24
100	54	54
120	100	100

3: N,N-dimethylaniline blocked p-TSA

Table 6—Comparison of Conversion of Catalysts at 120°C

	Conversion, %	
Time, minutes	1	2
5	82	93
10	95	100
20	100	100

Table 7—Unblocking Temperatures of Catalysts

Catalysts	Unblocking Temperatures, °C
1	80
2	75

Table 8—Properties of Coating Solutions

Catalysts	Appearance	Solids, %	Curing Temperatures[a], °C
1	Clear	55.0	125
2	Clear	55.7	125

(a) Curing temperature is defined as the temperature at which 95% of the gel fraction is obtained.

As shown in *Table* 7, **1** showed nearly the same unblocking temperature compared with **2**, although the **1** hydrolysis rate was slower than that of **2**. These data indicated that **1** was unblocked to the α,α-dimethylbenzyl cation by a S_N1 mechanism and then the cation released H^+ by an E1 mechanism.

Properties of Coating Solutions

1 and **2** were dissolved in methanol whereupon HMMM and the acrylic polyol were added to the solution to obtain coating solutions for this study. Both **1** and **2** were completely soluble in these coating solutions when added at 1 wt% catalyst per solids and all coating solutions were clear.

These solutions were diluted with xylene to a viscosity of 30 sec at 20°C using a #4 Ford cup. Each diluted coating solution remained clear. The % solids of each coating solution was 55.0% (for the **1** coating solution) and 55.7 (for the **2** coating solution), as summarized in *Table* 8. These values are expected to be higher if the polymer molecular weight is lowered.

Crosslinking Reaction of Coating Solutions

Each coating solution was baked for 20 min at specific temperatures to evaluate the catalytic activity of each catalyst. The cured films obtained were clear and did not turn yellow.

The crosslinking reaction proceeded smoothly and a gel fraction of over 95% was obtained as shown in *Figure* 6, although no gel fraction was obtained below 80°C under these conditions. It can be considered that both **1** and **2** released sulfonic acid at 80-90°C. The crosslinking profile of the **1** coating solution showed a closer approximation to the ideal profile for one-pot coatings because the **1** coating solution showed lower curability below 90°C and the same curability above 100°C.

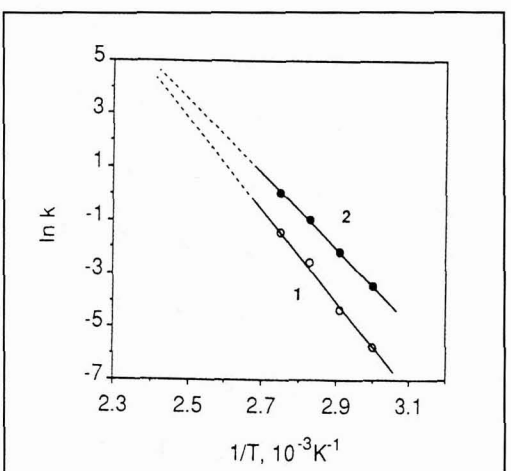
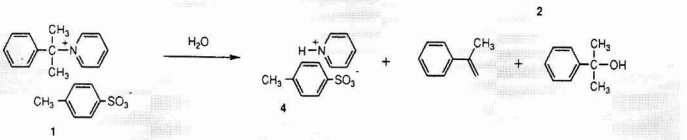
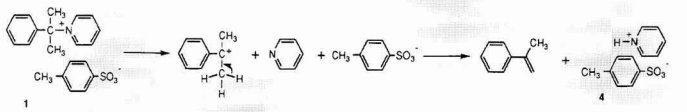


Figure 5—Arrhenius plots for the hydrolysis of catalysts.

Curing temperatures, at which the gel fraction reached 95%, are summarized in *Table* 8. **1** showed the same curing temperature compared with **2**, as expected from the unblocking temperatures and hydrolysis rates. It is postulated that **1** would show nearly the same hydrolysis rate to that of **2** around 125°C (*Figure* 5). Furthermore, sulfonic acid (**3**), released from **1** might show the higher acidity than **4**, as pyridine (bp 115°C), which has a boiling point lower than N,N-dimethylaniline (bp 193°C), evaporated off. These effects would lower the **1** curing temperature.



Scheme 8



Scheme 9

Storage Stability of Coating Solutions

Storage stability of each coating solution was checked at 60° or 80°C after dilution with xylene to a viscosity of 30 sec at 20°C using a #4 Ford cup. It is well known that mono-functional alcohols with low molecular weights significantly inhibit the increase in viscosity,[13] therefore, the amount of methanol added to each coating solution was carefully controlled as shown in the experimental section.

Figure 7 shows the viscosity change of the clear coating solutions at 60° or 80°C. As expected, the **1** coating solution showed better storage stability than that of the **2** coating solution, although the **1** coating solution was cured at the same temperature compared to the **2** coating solution. These results imply that **1** acted as better latent thermal acid catalysts in the crosslinking reaction between the melamine resins and acrylic polyols.

As summarized in *Table* 3, **2** hydrolized faster than **1** below 90°C because of the nucleophilic attack by H_2O molecules and the **2** unblocking reactions in the coating solutions could proceed by the same mechanism in an aqueous solution. Consequently, the viscosity of the **2** coating solution increased, as **2** would release **3** slowly due to the nucleophilic attack of the polymer OH groups in the coating solutions. On the other hand, **1** would release sulfonic acid (**3**) by a S_N1 mechanism at elevated temperatures due to the effect of α-methyl groups and the reaction would proceed unimolecularly. Furthermore, the α-methyl groups of **1** would interrupt the nuclephilic attack of the polymer OH groups in the coating solutions. These effects of the α-methyl group would bring greater thermal latency to **1**.

SUMMARY

It was found that 1-(α,α-dimethylbenzyl)-pyridinium-ρ-toluenesulfonate (**1**) released pyridine-blocked ρ-toluenesulfonic acid which in turn catalyzed the crosslinking reaction between melamine resins and polymers containing OH moieties. **1** better approached an ideal latent acid catalyst than N-(ρ-methoxybenzyl)-N,N-dimethylanilinium ρ-toluenesulfonates (**2**) due to its remarkable stability against external stimulation such as nucleophilic attack.

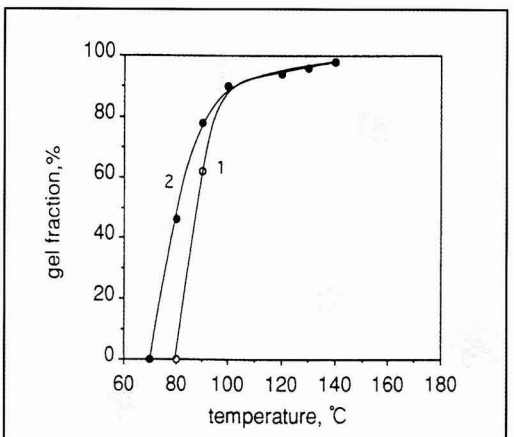


*Figure 6—Crosslinking reaction of coating solutions containing **1** or **2**.*

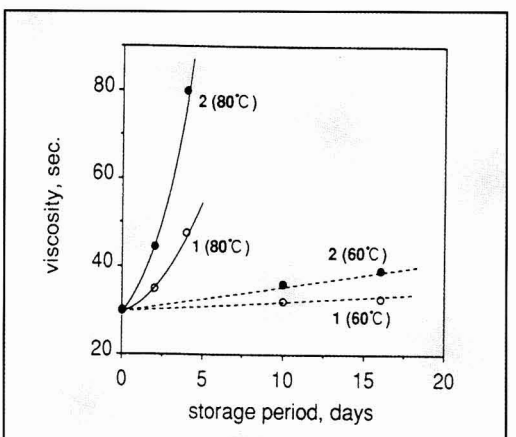


*Figure 7—Storage stability of coating solutions containing **1** or **2** at several temperatures.*

Clear coating solutions, consisting of **1**, HMMM and an acrylic polyol, showed the same curability and better storage stability compared with those of clear coating solutions containing **2** as the acid catalyst.

Consequently, it would be concluded that **1** provides superior one-pot, high-solids coatings which would help to reduce VOC when formulated with melamine resins and polymers containing OH moieites.

ACKNOWLEDGMENT

The authors especially thank Mr. K. Oguni for his fundamental work in the synthesis of 1-(α,α-dimethylbenzyl)-pyridinium ρ-toluenesulfonate and to Mr. P. Chronis for his work on the hydrolysis rate of the benzylammonium salts.

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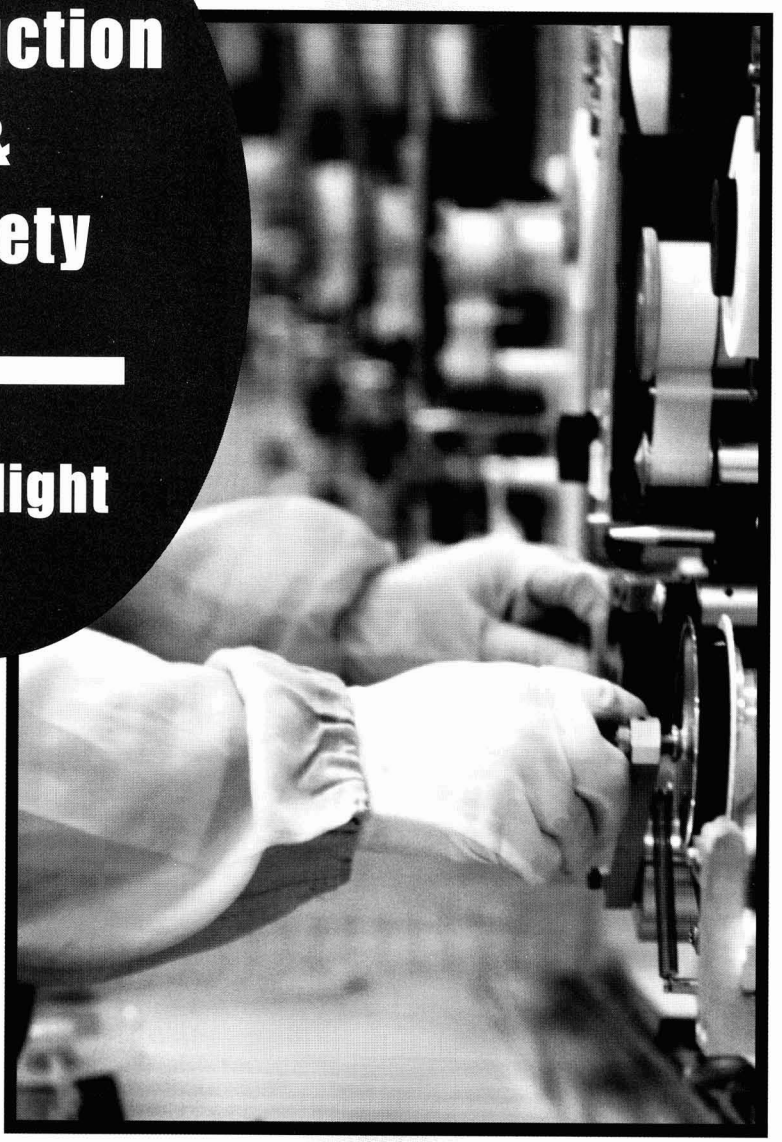
Production & Safety Spotlight



What is a Spotlight?

The JCT 'Spotlight' focuses on a critical area of the coatings industry. Insights into trends, opportunities, and challenges that impact this area will be provided in targeted articles and interviews.

Providing a valuable reference tool, the Spotlight also highlights the companies and products that supply essential services, materials, or equipment to the industry. The company and product guides included in the Spotlight were compiled by individual companies' responses to a mail survey.

The inclusion of companies and products in this guide should not be construed as an endorsement by the JCT or the Federation of Societies for Coatings Technology. JCT makes every effort to ensure that the informations is accurate, but is not responsible for errors or omissions.

Names appearing in bold indicate advertisers in this issue.

Future '96 Spotlights

September ---------- Resins
December ---------- Lab Apparatus & Equipment

To participate in future Spotlights, contact JCT, 492 Norristown Rd., Blue Bell, PA 19422; (610) 940-0777.

Production & Safety—One Approach

*Protecting employee and consumer health and safety, as well as the environment, have always been important to the coatings industry. To accomplish this, the industry has concentrated on developing safe work practices; manufacturing products that can be used and disposed of safely; and supporting employees, customers, and the communities in which they operate. This Spotlight focuses on one approach taken to address these concerns—the National Paint & Coatings Association's Coatings Care™ program**

INTRODUCTION

As technology in the paint and coatings industry has advanced, so have customers' demands for safe, reliable, and environmentally sound products. Industry has met those demands time and time again through a wide variety of durable and highly visible products. Manufacturers are constantly exploring technologies that take into account the need for environmental protection, yet still offer safety with high product performance.

As the coatings industry advances, it also diversifies. Once new technologies and product applications become available, industry must adapt and respond quickly in order to keep pace and satisfy growing customer demands. Automotive coatings, architectural coatings, wood furniture finishes, and aerospace coatings are just some applications that are being addressed by a coatings industry composed of multinational organizations, as well as smaller organizations that focus on a specific product or specialty coatings line.

Regardless of size or product specialty, every company in the paint and coatings industry must learn to make its technological advances compatible with ever-growing health, safety, and environmental requirements.

NPCA discussed this idea at length to try to determine a method to help member companies integrate health, safety, and environmental requirements into every aspect of their businesses. The integration would be second nature, something companies would know they were achieving without even thinking about it. How could NPCA make this an easy transition for its members?

NPCA answered this question with the Coatings Care™ program. Coatings Care™ was developed as a progressive health, safety, and environmental initiative, enabling companies to follow a common, effective management approach for their health, safety, and environmental programs. Participation in NPCA's Coatings Care™ program provides the opportunity for all company employees to follow established, consistent practices and published policies, and for management to plan for and provide sufficient resources for program effectiveness.

Diverse and sometimes conflicting requirements for worker, customer, and environmental safety may cause companies to create numerous and overlapping management strategies. NPCA hopes to eliminate these inconsistencies with Coatings Care™, by simplifying regulatory compliance and integrating ongoing established health, safety, and environmental activities into a company's everyday planning procedures and operations.

NPCA has already completed an implementation plan for Coatings Care™, outlining the association's responsibilities for explaining the program to members and how they can implement it. NPCA had dedicated 1996 as a time for program promotion and membership education. Member implementation is scheduled to begin in the spring of 1997.

Coatings Care™ was also approved by the International Paint and Printing Ink Council and will be used by all of the international trade associations representing the paint and printing ink industries. This will allow multi-national companies to apply the same health, safety, and environmental management practices to their global operations.

In addition, Coatings Care™ has been designed to be supportive and complementary to the Chemical Manufacturer Association's Responsible Care™ program. Companies that have made a commitment to Responsible Care™ have already met all the goals of Coatings Care™ participation.

PARTICIPATION

Participation in Coatings Care™ is voluntary. But, because the program offers expanded resources, improved communications, and the opportunity for heightened industry performance in health, safety, and environmental measures, NPCA believes participation in Coatings Care™ is vital to an organization's future.

Policy Statement

In an effort to protect worker and community health and safety, as well as the environment, Coatings Care™ will:

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

* Information for the Spotlight is reprinted from the June 1996 issue of *Coatings*, published by National Paint & Coatings Association, 1500 Rhode Island Ave. N.W., Washington, D.C. 2005.

Because the benefits of Coatings Care™ are numerous, participation will be something companies want, rather than need, to achieve. The program offers the means and opportunities to:

- more effectively use organizational and management resources for compliance with health, safety, and environmental regulations;
- integrate consideration of health, safety, and environmental resource information in organizational planning and operations;
- enhance participation and direction of association activities;
- access health, safety, and environmental management practices and resources being used or considered on an international basis;
- expand participation in developing health, safety, and environmental standards which will govern the industry;
- operate with a uniform health, safety, and environmental policy statement;
- adhere to management practices identified or developed by industry associations;
- develop community outreach efforts to support public involvement; and
- identify and evaluate areas for improvement.

Implementation of Coatings Care™ will require a firm commitment from top management to successfully carry out the specified management practices. Coatings Care™ participation reflects the coatings industry's commitment to foster individual and collective programs that promote sound health, safety, and environmental practices.

NPCA member companies are all currently operating health, safety, and environmental programs, and obviously it will take time to integrate existing efforts with the management practices in Coating Care™. Recognizing this, NPCA has developed a progression implementation schedule. Transportation and distribution management codes will be introduced in 1997, manufacturing management in 1998, product stewardship in 1999, and community responsibility in 2000. With each introduction, membership support publications are planned. In fact, revisions of NPCA's *Shipping Guide for the Paint and Coatings Industry* to reflect adoption to the Coatings Care™ program are expected to be complete by early 1997 to coincide with the introduction of the transportation and distribution codes. These implementation dates are not set in stone—any company that wishes to incorporate certain management practices earlier than the given date is certainly welcome to do so, and NPCA will lend any assistance it can.

Additional information on Coatings Care™ is available by contacting NPCA at 1500 Rhode Island Ave., N.W., Washington, D.C. 2005; (202) 462-6272.

Code of Management Practices

These are four critical areas of health, safety, and environmental responsibility which Coatings Care™ addresses with codes of management practices:

Manufacturing

Occupational safety and health
Operations (process safety)
Environmental management (pollution prevention/waste management)

Transportation and Distribution

Training
Risk management
Carrier performance
Distributors
Emergency response

Product Stewardship

Product development
Health, safety, and environmental education and information
Product safety (product use)

Community Responsibility

Emergency response
Employee education and training
Community liaison

PRODUCTION & SAFETY SPOTLIGHT: supplier listing

Paul O. Abbe, Inc.
139 Center Ave.
Little Falls, NJ 07424
Phone: (201) 256-4242
FAX: (201) 464-0041
Barry Fuller, Sales Eng.
- Blenders
- Grinding/Milling
- Grinding Media
- Mixing and Dispersing

Alsop Engineering Co.
P.O. Box 3449
Kingston, NY 12402
Phone: (914) 338-0466
Greg Haver, Sales Eng.;
Herb Reeve, Prod. Mgr, Mixers
- Agitators
- Containers
- Filtering/Straining
- Pumping/Metering

American Lewa, Inc.
132 Hopping Brook Rd.
Holliston, MA 01746
Phone: (508) 429-7403
FAX: (508) 429-8615
Ken McQuesten, Sales Mgr.; Don Deveaux, Applications Mgr.
- Pumping/Metering

Anker Labelers USA, Inc.
705 Live Oak St., Ste. E
Tarpen Springs, FL 34689
Phone: (813) 937-0233
FAX: (813) 942-6361
Paul Aschenbrock, Exec. Vice President/GM
- Filling/Packaging/Labeling

The Aro Corp.
One Aro Center
Bryan, OH 43506
Phone: (419) 636-4242
FAX: (419) 633-1748
Larry L. White, Diaphragm Pumps Prod. Mgr.;
Lyle W. Shoup, Piston Pump Prod. Mgr.
- Agitators
- Ink Production Equipment
- Pumping/Metering

AZO Inc.
4445 Malone Rd.
Memphis, TN 38118
Phone: (901) 794-9480
FAX: (901) 794-9934
Gary Clarke, Components Sales Mgr.
- Material Handling & Conveyors
- Filtering/Straining

Bowers Process Equipment, Inc.
904 Downie St.
P.O. Box 339
Stratford, Ont., N5A 6T3
Canada
Phone: (800) 567-3223
FAX: (519) 272-0911
Wilf Schalm, Sales Mgr.
- Agitators
- Blenders
- Disperser Blades
- Dispersers
- Filling/Packaging/Labeling
- Ink Production Equipment

Buhler Inc.
1100 Xenium Ln.
Minneapolis, MN 55441-9497
Phone: (612) 545-1401
FAX: (612) 540-9246
- Agitators
- Blending Tanks
- Dispersers
- Material Handling & Conveyors
- Grinding/Milling
- Grinding Media
- Ink Production Equipment
- Instrumentation and Control
- Mixing and Dispersing
- Ram Dischargers
- Safety/Fire Protection

BYK-Gardner USA
2435 Linden Ln.
Silver Springs, MD 20910
Phone: (301) 495-7150
FAX: (301) 585-4067
Bob Hortel, Regional Sales Mgr.;
Mark Taylor, Regional Sales Mgr.
- Instrumentation and Control

Conn and Company
11 S. Marion St.
Warren, PA 16365
Phone: (814) 723-7980
FAX: (814) 723-8502
Richard C. Freeman, Owner
- Agitators
- Blenders
- Disperser Blades
- Dispersers
- Ink Production Equipment
- Mixing and Dispersing

J. De Vree & Co. N.V.
Toekomstlaan 10
Merksem, Belgium B 2170
Phone: 0032 3 645 7690
FAX: 0032 3 646 4815
- Filling/Packaging/Labeling

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Irvington, NJ 07111
Phone: (201) 372-1500
FAX: (201) 372-8311
- Cleaning
- Containers
- Dispensing
- Distillation

Eiger Machinery, Inc.
888 E. Belvidere Rd., Unit #214
Grayslake, IL 60030
Phone: (847) 548-0044
FAX: (847) 548-0099
Dave L. Peterson, Vice President;
Lisa Kinater, Sales Rep.;
Robert Kadcliff, Sales Rep.
- Dispersers
- Grinding/Milling
- Grinding Media
- Mixing and Dispersing

Eirich Machines, Inc.
4033 Ryan Rd.
Gurnee, IL 60031
Phone: (847) 336-2444
FAX: (847) 336-0914
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- Dispersers
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- Grinding Media
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South Haven, MI 49090
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FAX: (616) 637-3421
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- Disperser Blades
- Dispersers
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- Ink Production Equipment
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Filter Specialists, Inc.
P.O. Box 735
Michigan City, IN 46361
Phone: (219) 879-3307
FAX: (219) 877-0632
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Doug Fitzgerald, Int'l. Sales Mgr.
- Filtering/Straining

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FAX: (514) 354-6948
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FAX: (608) 241-4448
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Oldsmar, FL 34677
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Clarendon Hills, IL 60514-0198
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FAX: (630) 325-7045
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Dispensing
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Christ Zoga, Exec. Vice President;
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7592 N.E. Industrial Dr.
Macon, GA 31206
Phone: (912) 784-9040
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Bill Hodgins, New Markets Devel. Mgr.;
Nancy Attaway, Customer Service
Containers

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Portage, MI 49081-0188
Phone: (616) 323-1313
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Al DeKock; Steve Crouch
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Charles Ross & Son Co.
710 Old Willets Path
Hauppauge, NY 11788
Phone: (516) 234-0500
FAX: (516) 234-0691
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Ram Dischargers

Serfilco, Ltd.
1777 Shermer Rd.
Northbroook, IL 60062
Phone: (847) 559-1777
FAX: (847) 559-1995
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Sigma Equipment Corp.
39 Westmoreland Ave.
White Plains, NY 10606
Phone: (914) 682-1820
FAX: (914) 682-0599
Edward D'Errico, General Mgr.
Grinding/Milling

Snyder Industries
4700 Fremont
Lincoln, NE 68502
Phone: (402) 467-5221
FAX: (402) 467-6493
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Spencer Machine & Tool Inc.
6205 Gheens Mill Rd.
Jeffersonville, IN 47130
Phone: (812) 282-6300
FAX: (812) 282-7272
Brad Spencer, Sales Mgr.
Filtering/Straining

Terriss-Consolidated Industries
807 Summerfield Ave.
Asbury Park, NJ 07712
Phone: (908) 988-0909
FAX: (908) 502-0526
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Instrumentation and Control
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U.S. Stoneware
700 E. Clark St.
East Palestine, OH 44413
Phone: (330) 426-4500
FAX: (330) 426-1859
Paula Jurjavcic, Sales Supervisor
Grinding/Milling
Grinding Media
Pumping/Metering

Vero Dispersion Machines, Inc.
3120 58th Ave., #124
Vero Beach, FL 32966
Phone: (561) 978-0265
FAX: (561) 778-9833
John Allen, President;
Alan Taylor, Technical Dir.
Grinding/Milling

Versa-Matic Pump
6017 Enterprise Dr.
Export, PA 15632-8969
Phone: (412) 327-7867
FAX: (412) 327-4300
Patricia L. Stone, Mgr. Marketing Communications
Pumping/Metering

Vorti-Siv Div.
MM Industries, Inc.
36135 Salem Grange Rd.
P.O. Box 720
Salem, OH 44460
Phone: (330) 332-4958
FAX: (330) 332-1543
Vic Maroscher, Vice President
Filtering/Straining

Watlow Electric Manufacturing
12001 Lackland Rd.
St. Louis, MO 63146
Phone: (314) 878-7820
FAX: (314) 878-2369
Kevin Sikkink; Steve Lubahn
Infrared Curing Equipment
Instrumentation and Control

Western Equipment Co.
14 Crow Canyon Ct., #200
San Ramon, CA 94583
Phone: (510) 820-8883
FAX; (510) 820-9188
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Blending Tanks
Disperser Blades
Dispersers
Distillation
Filling/Packaging/Labeling
Material Handling & Conveyors
Filtering/Straining
Grinding/Milling
Grinding Media
Ink Production Equipment
Instrumentation and Control
Mixing and Dispersing
Safety/Fire Protection
Compressors

Wilden Pump & Engineering
22069 Van Buren
Grand Terrace, CA 92313-5651
Phone: (909) 422-1730
FAX: (909) 783-3440
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Wyssmont Co.
P.O. Box 1397
Ft. Lee, NJ 07024
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Ovens

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Conn and Company
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S.E. Firestone Assoc., Inc.
Glen Mills, Inc.
Hockmeyer Equipment
Hoover Precision Products, Inc.
IKA Works, Inc.
Indco, Inc.
Kady International
Lightnin
Littleford Day Inc.
MixMor of PA, Inc.
Morse Mfg. Co., Inc.
Myers Engineering, Inc.
Patterson Process Equipment Div.
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ProQuip, Inc.
Charles Ross and Son Co.
Serfilco, Ltd.
Terriss-Consolidated Industries
Western Equipment Co.

Blenders

Paul O. Abbe, Inc.
Conn and Company
Eirich Machines, Inc.
Paul N. Gardner Co., Inc.
Jetco, Inc.
Western Equipment Co.

Conical

Bowers Process Equipment, Inc.
International Reserve Equipment Corp.
Littleford Day Inc.
Patterson Process Equipment Div.
Charles Ross and Son Co.

Cylinder

Bowers Process Equipment, Inc.
Glen Mills, Inc.
International Reserve Equipment Corp.
Kady International
Littleford Day Inc.
Patterson Process Equipment Div.
Charles Ross and Son Co.

Blending Tanks

Bowers Process Equipment Inc.
Buhler Inc.
Eirich Machines, Inc.
S.E. Firestone Assoc., Inc.
Hockmeyer Equipment
Kady International
Patterson Process Equipment Div.
Terriss-Consolidated Industries
Western Equipment Co.

Cleaning

Disti-Kleen, Inc.

Containers

Bags

Snyder Industries

Cans and Pail Closers

Disti-Kleen, Inc.
Paul N. Gardner Co., Inc.

Containers

Cans

Disti-Kleen, Inc.

Plastic

Snyder Industries

Stainless Steel

Indco, Inc.
Kady International
Charles Ross and Son Co.
Terriss-Consolidated Industries

Drums

Fiber

Longview Fibre Co.

Steel

Indco, Inc.
Terriss-Consolidated Industries

Tanks

Fiberglass

S.E. Firestone Assoc., Inc.

Metal

Alsop Engineering Co.
Disti-Kleen, Inc.
S.E. Firestone Assoc., Inc.
Terriss-Consolidated Industries
Western Equipment Co.

Plastic

S.E. Firestone Assoc., Inc.
Snyder Industries

Portable

Bowers Process Equipment Inc.
S.E. Firestone Assoc., Inc.
Longview Fibre Co.
Snyder Industries
Western Equipment Co.

Process

Bowers Process Equipment Inc.
Charles Ross and Son Co.
Snyder Industries
Western Equipment Co.

Shipping

Bowers Process Equipment Inc.
Longview Fibre Co.
Snyder Industries
Western Equipment Co.

Storage

Bowers Process Equipment Inc.
Disti-Kleen, Inc.
S.E. Firestone Assoc., Inc.
International Reserve Equipment Corp.
Longview Fibre Co.
Charles Ross and Son Co.
Snyder Industries
Western Equipment Co.

Tote

Bowers Process Equipment Inc.
Disti-Kleen, Inc.
S.E. Firestone Assoc., Inc.
Longview Fibre Co.
Snyder Industries

Misc. Containers

Disti-Kleen, Inc.
Rexan Mulox Inc.

Dispensing

Colorant

Disti-Kleen, Inc.
S.E. Firestone Assoc., Inc.
Precision Dispensing

Computerized

Disti-Kleen, Inc.
S.E. Firestone Assoc., Inc.
Precision Dispensing

Disperser Blades

Bowers Process Equipment Inc.
Conn and Company
Epworth Mfg. Co., Inc.
S.E. Firestone Assoc., Inc.
Paul N. Gardner Co., Inc.
Hockmeyer Equipment
Indco, Inc.
Myers Engineering, Inc.
Premier Mill Corp.
Western Equipment Co.

Dispersers

Bowers Process Equipment Inc.
Buhler Inc.
Conn and Company
Eiger Machinery Inc.
Eirich Machines, Inc.
Epworth Mfg. Co., Inc.
S.E. Firestone Assoc., Inc.
Paul N. Gardner Co., Inc.
Hockmeyer Equipment
IKA Works, Inc.
Indco, Inc.
Littleford Day Inc.
Myers Engineering, Inc.

Netzsch Incorporated
Premier Mill Corp.
Charles Ross and Son Co.
Western Equipment Co.

Distillation

Disti-Kleen, Inc.
S.E. Firestone Assoc., Inc.
Littleford Day Inc.
Western Equipment Co.

Filling/Packaging/Labeling

Can Casing Machines

J. De Vree & Co., N.V.
Western Equipment Co.

Depalletizers

Priority One Packaging Machinery
Western Equipment Co.

Fillers

Bowers Process Equipment Inc.
J. De Vree & Co., N.V.
S.E. Firestone Assoc., Inc.
Ideal Manufacturing & Sales Corp.
Western Equipment Co.

Label Machines

Anker Labelers USA Inc.
J. De Vree & Co., N.V.
New Way Packaging Machinery Inc.
Priority One Packaging Machinery
Western Equipment Co.

Lid Openers

Paul N. Gardner Co., Inc.

Lid Punch Closures

Jetco, Inc.

Palletizers

S.E. Firestone Assoc., Inc.
Priority One Packaging Machinery
Western Equipment Co.

Misc. Filling/Packaging/Labeling

J. De Vree & Co., N.V.
S.E. Firestone Assoc., Inc.
New Way Packaging Machinery, Inc.
Western Equipment Co.

Drum Conveyors

Eirich Machines, Inc.
Priority One Packaging Machinery

Feeders

AZO Inc.
Eirich Machines, Inc.
Wyssmont Co., Inc.

Mechanical Conveyors

Buhler Inc.
Eirich Machines Inc.
Priority One Packaging Machinery
Western Equipment Co.

Pallet Conveyors

Priority One Packaging Machinery

Pallet Dispensers

Priority One Packaging Machinery

Pneumatic Conveyors

AZO Inc.
Buhler Inc.
Eirich Machines, Inc.

Tubular Conveyors

Eirich Machines, Inc.

Misc. Material Handling & Storage Equipment

Buhler Inc.
Morse Mfg. Co., Inc.
Priority One Packaging Machinery

Film Applicators

S.E. Firestone Assoc., Inc.
Paul N. Gardner Co., Inc.
Geneq, Inc.
Industry Tech

Filtering/Straining

Filter Presses

Alsop Engineering Co.
International Reserve Equipment Corp.
Netzsch Incorporated
Serfilco, Ltd.

Filter/Pressure Vessels

Chemical

Filter Specialists, Inc.
Parker Hannifin Corp.
Vorti-Siv Div., MM Industries, Inc.

Cloths

Filter Specialists, Inc.

Compressed Air

Serfilco, Ltd.

Liquid

Alsop Engineering Co.
Filter Specialists, Inc.
Parker Hannifin Corp.
Ronningen-Petter
Serfilco, Ltd.
Vorti-Siv Div., MM Industries, Inc.

Oil

Filter Specialists, Inc.
Parker Hannifin Corp.
Serfilco, Ltd.

Paint

Filter Specialists, Inc.
Parker Hannifin Corp.
Ronningen-Petter
Vorti-Siv Div., MM Industries, Inc.

Solvent

Filter Specialists, Inc.
Littleford Day Inc.
Parker Hannifin Corp.
Ronningen-Petter
Serfilco, Ltd.
Vorti-Siv Div., MM Industries, Inc.

Filtering Bags/Strainers

Filter Specialists, Inc.
Paul N. Gardner Co., Inc.
Parker Hannifin Corp.
Ronningen-Petter
Serfilco, Ltd.

Filtering Cartridges

Alsop Engineering Co.
Filter Specialists, Inc.
Parker Hannifin Corp.
Serfilco, Ltd.

Screening Machines

S.E. Firestone Assoc., Inc.
International Reserve Equipment Corp.
Vorti-Siv Div., MM Industries, Inc.

Straining Equipment

S.E. Firestone Assoc., Inc.
Filter Specialists, Inc.
Ronningen-Petter
Spencer Machine & Tool Co., Inc.
Vorti-Siv Div., MM Industries, Inc.
Western Equipment Co.

Misc. Filtering/Straining

Filter Specialists, Inc.
S.E. Firestone Assoc., Inc.
Jetco, Inc.
Parker Hannifin Corp.
Vorti-Siv Div., MM Industries, Inc.

Grinding/Milling

Attrition

Eiger Machinery Inc.
Epworth Mfg. Co., Inc.
S.E. Firestone Assoc., Inc.
Glen Mills, Inc.
Kady International
Netzsch Incorporated
Western Equipment Co.
Wyssmont Co., Inc.

PRODUCTION & SAFETY SPOTLIGHT: product listing

Ball

Paul O. Abbe, Inc.
Eiger Machinery Inc.
Eirich Machines, Inc.
Epworth Mfg. Co., Inc.
S.E. Firestone Assoc., Inc.
Paul N. Gardner Co., Inc.
Geneq, Inc.
Glen Mills, Inc.
Hoover Precision Products, Inc.
International Reserve Equipment Corp.
Patterson Process Equipment Div.
U.S. Stoneware
Western Equipment Co.

Bead

Buhler Inc.
Eiger Machinery Inc.
Eirich Machines, Inc.
Epworth Mfg. Co., Inc.
S.E. Firestone Assoc., Inc.
Glen Mills, Inc.
Hockmeyer Equipment
Netzsch Incorporated
Premier Mill Corp.
Charles Ross and Son Co.
U.S. Stoneware
Vero Dispersion Machines, Inc.
Western Equipment Co.

Colloid

Epworth Mfg. Co., Inc.
Glen Mills, Inc.
Premier Mill Corp.
Charles Ross and Son Co.

Horizontal

Buhler Inc.
Eiger Machinery Inc.
Eirich Machines, Inc.
Epworth Mfg. Co., Inc.
S.E. Firestone Assoc., Inc.
Glen Mills, Inc.
IKA Works, Inc.
Netzsch Incorporated
Patterson Process Equipment Div.
Premier Mill Corp.
Charles Ross and Son Co.
Sigma Equipment Inc.
Vero Dispersion Machines, Inc.
Western Equipment Co.
Wyssmont Co., Inc.

Impact

Epworth Mfg. Co., Inc.
Glen Mills, Inc.
International Reserve Equipment Corp.
Kady International
Prater Industries, Inc.
Wyssmont Co., Inc.

Jar & Jar Rolling Machines

Paul O. Abbe, Inc.
Epworth Mfg. Co., Inc.
S.E. Firestone Assoc., Inc.
Paul N. Gardner Co., Inc.
Geneq, Inc.
Glen Mills, Inc.
U.S. Stoneware
Western Equipment Co.

Laboratory

Paul O. Abbe, Inc.
Eiger Machinery Inc.
Eirich Machines, Inc.
Epworth Mfg. Co., Inc.
S.E. Firestone Assoc., Inc.
Paul N. Gardner Co., Inc.
Geneq, Inc.
Glen Mills, Inc.
Hoover Precision Products, Inc.
Kady International
Netzsch Incorporated
Premier Mill Corp.
Charles Ross and Son Co.
U.S. Stoneware
Western Equipment Co.

Pebble Mills & Linings

Paul O. Abbe, Inc.
Eirich Machines, Inc.
Epworth Mfg. Co., Inc.
S.E. Firestone Assoc., Inc.
Paul N. Gardner Co., Inc.
Geneq, Inc.
Glen Mills, Inc.
Patterson Process Equipment Div.
Western Equipment Co.

Peg

Epworth Mfg. Co., Inc.
S.E. Firestone Assoc., Inc.
Netzsch Incorporated
Vero Dispersion Machines, Inc.

Resonance

Epworth Mfg. Co., Inc.

Roller

Buhler Inc.
Epworth Mfg. Co., Inc.
S.E. Firestone Assoc., Inc.
Paul N. Gardner Co., Inc.
Geneq, Inc.
Indco, Inc.
International Reserve Equipment Corp.
Marchant Industries, Inc.
Netzsch Incorporated
Charles Ross and Son Co.
U.S. Stoneware
Western Equipment Co.
Wyssmont Co., Inc.

Sand

Eirich Machines, Inc.
Epworth Mfg. Co., Inc.
Glen Mills, Inc.
Netzsch Incorporated
Charles Ross and Son Co.
Western Equipment Co.

Shot

Buhler Inc.
Epworth Mfg. Co., Inc.
S.E. Firestone Assoc., Inc.
Netzsch Incorporated
Charles Ross and Son Co.

Small Media

Buhler Inc.
Eiger Machinery Inc.
Eirich Machines Inc.
Epworth Mfg. Co., Inc.
S.E. Firestone Assoc., Inc.
Glen Mills, Inc.
Hockmeyer Equipment
Hoover Precision Products, Inc.
Netzsch Incorporated
Premier Mill Corp.
Charles Ross and Son Co.
Sigma Equipment Inc.
U.S. Stoneware
Western Equipment Co.

Vertical

Buhler Inc.
Eirich Machines, Inc.
Epworth Mfg. Co., Inc.
S.E. Firestone Assoc., Inc.
IKA Works, Inc.
International Reserve Equipment Corp.
Netzsch Incorporated
Western Equipment Co.

Misc. Grinding/Milling

Buhler Inc.
Eiger Machinery Inc.
Eirich Machines, Inc.
Epworth Mfg. Co., Inc.
S.E. Firestone Assoc., Inc.
Geneq, Inc.
Glen Mills, Inc.
Hoover Precision Products, Inc.
International Reserve Equipment Corp.
Kady International
Netzsch Incorporated
Patterson Process Equipment Div.
Premier Mill Corp.
Charles Ross and Son Co.
U.S. Stoneware
Vero Dispersion Machines, Inc.
Western Equipment Co.
Wyssmont Co., Inc.

Grinding Media

Paul O. Abbe, Inc.
Buhler Inc.
Eiger Machinery Inc.
Eirich Machines, Inc.
Epworth Mfg. Co., Inc.
S.E. Firestone Assoc., Inc.
Paul N. Gardner Co., Inc.
Geneq, Inc.
Glen Mills, Inc.
Hockmeyer Equipment
Netzsch Incorporated
Premier Mill Corp.
Western Equipment Co.

Watlow Electric Manufacturing

Ink Production Equipment

Ink Mills

Buhler Inc.
Epworth Mfg. Co., Inc.
Hockmeyer Equipment
Kady International
Littleford Day Inc.
Marchant Industries, Inc.,
Patterson Process Equipment Div.
Premier Mill Corp.
Charles Ross and Son Co.
Western Equipment Co.

Ink Mixers

Bowers Process Equipment Inc.
Buhler Inc.
Conn and Company
IKA Works, Inc.
Indco, Inc.
Kady International
Myers Engineering, Inc.
Patterson Process Equipment Div.
Premier Mill Corp.
Charles Ross and Son Co.
Western Equipment Co.

Ink Pumps

The Aro Corp.
Netzsch Incorporated

Ink Tubs

Buhler Inc.
Western Equipment Co.

Misc. Ink Equipment

Buhler Inc.
Kady International

Instrumentation and Control

Control Systems

Buhler Inc.
Eirich Machines, Inc.
Precision Dispensing
Priority One Packaging Machinery

Flowmeters

Geneq, Inc.
Liquid Controls Corp.
Serfilco, Ltd.
Western Equipment Co.

Heat Exchangers

International Reserve Equipment Corp.

Level Controls/Sensors

Geneq, Inc.
Serfilco, Ltd.

Liquid Depth Indicators

Geneq, Inc.

Liquid Level Indicators

Geneq, Inc.
Serfilco, Ltd.

Specific Gravity Measuring Devices

Geneq, Inc.
Terriss-Consolidated Industries

Temperature Controls

Watlow Electric Manufacturing

Misc. Instrumentation & Control

BYK-Gardner USA
Industry Tech

Mixing and Dispersing

Conn and Company
Epworth Mfg. Co., Inc.
MixMore of PA, Inc.

Change Can

Buhler Inc.
Glen Mills, Inc.
Jetco, Inc.
Morse Mfg. Co., Inc.
Myers Engineering, Inc.
Premier Mill Corp.
Charles Ross and Son Co.

Drum

S.E. Firestone Assoc., Inc.
Lightnin
Morse Mfg. Co., Inc.
Myers Engineering, Inc.
Premier Mill Corp.
Charles Ross and Son Co.
Western Equipment Co.

Homogenizers

S.E. Firestone Assoc., Inc.
Geneq, Inc.
Glen Mills, Inc.
IKA Works, Inc.
Kady International
Lightnin
Myers Engineering, Inc.
Charles Ross and Son Co.

Horizontal Paddle-Type

Hockmeyer Equipment
International Reserve Equipment Corp.
Littleford Day Inc.
Prater Industries, Inc.
Charles Ross and Son Co.

Kneaders

IKA Works, Inc.
Littleford Day Inc.
Charles Ross and Son Co.

Pipe Line

Lightnin
Premier Mill Corp.
Charles Ross and Son Co.

Rotary Batch Mixers & Blenders

Eiger Machinery Inc.
Eirich Machines, Inc.
Kady International
Lightnin
Littleford Day Inc.
Charles Ross and Son Co.

Rotar Blade

S.E. Firestone Assoc., Inc.
IKA Works, Inc.
Kady International
Lightnin
Charles Ross and Son Co.

Spiral Blade

Hockmeyer Equipment
Lightnin
Charles Ross and Son Co.

Thinning & Tinting Tanks

S.E. Firestone Assoc., Inc.
Lightnin
Myers Engineering, Inc.
ProQuip, Inc.
Charles Ross and Son Co.

Ultrasonic Energy Dispersers

Glen Mills, Inc.

Misc. Mixing & Dispersing

Buhler Inc.
BYK-Gardner USA
Eiger Machinery Inc.
Eirich Machines, Inc.
S.E. Firestone Assoc., Inc.
Paul N. Gardner Co., Inc.
Glen Mills, Inc.
Hockmeyer Equipment
IKA Works, Inc.
Kady International
Lightnin
Morse Mfg. Co., Inc.
Myers Engineering, Inc.
Premier Mill Corp.
ProQuip, Inc.
Charles Ross and Son Co.
Western Equipment Co.

Ovens

Paul N. Gardner Co., Inc.
Geneq, Inc.
Wyssmont Co., Inc.

Pumping/Metering

Fittings

Alsop Engineering Co.
Terriss-Consolidated Industries

Gaskets

Alsop Engineering Co.
Terriss-Consolidated Industries

PRODUCTION & SAFETY SPOTLIGHT: product listing

Meters

Serfilco, Ltd.
Terriss-Consolidated Industries

Meters-pH

Paul N. Gardner Co., Inc.
Geneq, Inc.
Serfilco, Ltd.
Terriss-Consolidated Industries

Pumps

Air Powered

The Aro Corp.
Grover Mfg. Corp.
ITT A-C Pump
Serfilco, Ltd.
U.S. Stoneware
Versa-Matic Pump Co.
Wilden Pump & Engineering

Carboydrum

Morse Mfg. Co., Inc.
Serfilco, Ltd.

Centrifugal

Alsop Engineering Co.
ITT A-C Pump
Serfilco, Ltd.
Terriss-Consolidated Industries

Diaphragm

Alsop Engineering Co.
American Lewa, Inc.
The Aro Corp.
Grover Mfg. Corp.
ITT A-C Pump
Serfilco, Ltd.
Versa-Matic Pump Co.
Wilden Pump & Engineering

Hand

The Aro Corp.
Serfilco, Ltd.

High Pressure

American Lewa, Inc.
The Aro Corp.
Grover Mfg. Corp.
ITT A-C Pump
Wilden Pump & Engineering

Metering

American Lewa, Inc.
Serfilco, Ltd.
Wilden Pump & Engineering

Positive Displacement Rotary

Alsop Engineering Co.
Glen Mills, Inc.
ITT A-C Pump
Netzsch Incorporated
Terriss-Consolidated Industries

Proportional

American Lewa, Inc.

Reciprocating

American Lewa, Inc.
The Aro Corp.
Grover Mfg. Corp.
ITT A-C Pump
Wilden Pump & Engineering

Vacuum

Paul N. Gardner Co., Inc.
U.S. Stoneware

Valves

Terriss-Consolidated Industries

Misc. Pumping/Metering

American Lewa, Inc.

Ram Dischargers

S.E. Firestone Assoc., Inc.
Myers Engineering, Inc.
Charles Ross and Son Co.

Reactor and Recovery Systems

Buhler Inc.
IKA Works, Inc.
International Reserve Equipment Corp.
Littleford Day Inc.
Patterson Process Equipment Div.

Safety/Fire Protection

Dust Removal

Buhler Inc.

Fume Removal Systems

Wetern Equipment Co.

Safety Containers

Paul N. Gardner Co., Inc.
Western Equipment Co.

Tinting

Jetco, Inc.

Compressors

Western Equipment Co.

B. Currie

Nacan Products Ltd., Brampton, Ontario, has appointed **Bill Currie** to the position of Business Director, Resins and Specialty Chemicals. In this capacity, Mr. Currie will manage all sales and marketing, and technical service activities. He is a member of the Toronto Society.

Carol Winslow Rapp has joined the staff of Dar-Tech, Inc., Cleveland, OH, as Sales Representative for the Kentucky/Southern Indiana Region. Ms. Rapp will represent BYK-Chemie, Micro Powders, PPG LoVel Silicas, CVC Epoxy Resins, and Lonza. She is a member of the Louisville Society.

Witco Corp., Greenwich, CT, has elected **E. Gary Cook**, to the position of Chairman, Chief Executive Officer, and President.

Netzsch Incorporated, Exton, PA, has named **James B. Beede** to Vice President of its Grinding and Dispersion Division. Previously, Mr. Beede served as General Manager, Latin American Operations, with Potters Industries.

Gordon H. Jones, Sales Manager, Western Region, was named UCB Chemicals/Radcure's, Smyrna, GA, "Salesperson of the Year for 1995." Mr. Jones is a member of the Los Angeles Society.

Also, **Michael J. Idacavage** has joined the company as the Technical Manager of UCB's Radcure Business Unit. Dr. Idacavage will be responsible for all aspects of Radcure's technical activities in North America.

Daniel B. Kerr has joined the staff of Engelhard Corp., Iselin, NJ, as Account Executive, Universal Colorants, in the company's Pigments and Additives Group. Mr. Kerr will develop and implement the sales strategy for universal colorant dispersions for retail point-of-sale tinting of architectural coatings.

The M.F. Cachat Co., Cleveland, OH, has appointed **Clifford G. Rumsey** to the company's sales team. Mr. Rumsey will provide speciality chemicals technical sales and service for customers in central and western Ohio.

Lonza Inc., Fair Lawn, NJ, has appointed **Allen Deraney** to the position of Vice President, Materials Management. Mr. Deraney will be responsible for raw material sourcing, contract management, supplier negotiations, and business team support.

Gary Kubera has assumed the position of Vice President of Corporate Development for McWhorter Technologies Inc., Carpentersville, IL.

Also, **Kevin Brolsma** has been named Vice President of Powder Coating Resin. In his new position, Mr. Brolsma will be responsible for the Powder Business.

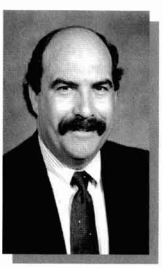
Hüls America Inc., Somerset, NJ, has promoted **David Kallal** to Area Manager of the Midwest region for the company's Colorants and Biocides division. In addition to managing key accounts in the Ohio region, Mr. Kallal will now oversee all sales activities in the midwestern area from Ohio and Western Pennsylvania through Kansas. He is a member of the CDIC Society.

David A. Danner was appointed Technical Service Chemist for the company's Coatings Additives. In this capacity, Mr. Danner will provide technical assistance to customers in the selection and use of additives. He is member of the Western New York Society.

In other news, **Robert J. Morlino** has accepted the position of Group Vice President, Colorants and Biocides Division. In this position, Mr. Morlino will assume global responsibility for the company's colorants.

Elsewhere, **Thomas E. Maggio**, Executive Vice President for the company's Colorants and Biocides Business, has retired. Dr. Maggio has served Hüls America Inc. and its predecessor companies for 30 years.

D. Kallal



D.A. Danner

R.J. Morlino

T.E. Maggio

K.A. Oliver

Rhône-Poulenc, Cranbury, NJ, has added **Kelly A. Oliver** to the staff of their North American Coatings and Construction Materials business as an Architectural Coatings Scientist. Ms. Oliver will be responsible for formulating the company's additives into architectural coatings and providing technical service to customers in the areas of defoamers, dispersants, thickeners, water repellents, and latexes.

Walt Jennings, Cofounder of J&W Scientific, Folsom, CA, was presented the M.J.E. Golay Award. Professor Jennings received the award at the 1996 International Symposium on Capillary Chromatography in Riva del Garda, Italy. The Award is sponsored by Perkin-Elmer.

DuPont, Wilmington, DE, has bestowed the honor of Distinguished Scientist, the highest level accorded to DuPont scientists, upon **Ying-Kao Lee**. Dr. Lee, the fourth person in the company's history to achieve this special recognition, was acknowledged for his numerous technological achievements in the development of new automotive paints and coatings.

Fusion UV Curing, Gaithersburg, MD, has appointed **Mark Mitry** to the position of Manager, Applications and Process. Mr. Mitry's responsibilities will include oversight of the Fusion UV Curing Application Labs in the United States, Europe, and Asia.

In addition, **Simon Whittle** was named Chemist, Applications and Process. Mr. Whittle will be responsible for lab testing, customer visits, and coordination with vendors and raw materials suppliers.

The Inter-Society Color Council (ISCC), Reston, VA, elected the following officers: President—**Ellen C. Carter**, Consultant; President-Elect—**Michael H. Brill**, of David Sarnoff Research Center; Treasurer—**Hugh S. Fairman**, Consultant; and Secretary—**Danny C. Rich**, of Datacolor International.

Helen Epps, of University of Georgia; **James Keiser**, of E.I. DuPont; and **Jack Ladson**, of BYK-Gardner, were elected Directors, with their term expiring 1999.

In other news, **Michael H. Brill** was presented with ISCC's 1996 Macbeth Award. The Award recognizes an individual for one or more recent outstanding contributions in the field of color.

L. Cooper

Leonora Cooper has accepted the position of Technical Marketing Specialist for S.P. Morell and Co., Armonk, NY. Ms. Cooper's 10 years of chemical industry experience includes technical service and application development and sales and marketing.

Ashland Chemical Co., Dublin, OH, has announced several management personnel changes in its specialty chemicals businesses. **Gary A. Cappeline** was named Group Vice President.

James A. Duquin has been promoted to Group Vice President. Mr. Duquin is responsible for Composite Polymers, Foundry Products, Specialty Polymers & Adhesives, and Electronic Chemicals divisions.

Walter M. Tarpley has been promoted to Vice President and General Manager of the Industrial Chemicals & Solvents (IC&S) Division.

The National Board of Registration for Nuclear Safety Related Coating Engineers and Specialists, Leola, PA, has announced the certification of **John Montle**, NCS149, and **Bala Viswanath**, NCS 155.

Mr. Montle is Vice President of Technology with Carboline Co., St. Louis, MO and Mr. Viswanath is a Coating Specialist with Pacific Gas and Electric.

Michael J. Kenny has been appointed President, North American Operations of Laporte Inc., Charlotte, NC. Mr. Kenny will manage the following North American Operations: Plastic Compounds; Adhesives, Sealants, and Coatings; Water Technology; Timber; and Absorbents.

The Society of Manufacturing Engineers (SME), Dearborn, MI, has named the following as Philip R. Marsilius Outstanding Young Manufacturing Engineers for 1996: **David O. Craig**, of IBM Corp.; **Andrei Csipkes**, of Lucent Technologies; **Edward C. De Meter**, of Pennsylvania State University; **Winston Ervelles**, GMI Engineering & Management Institute; **Richard J. Furness**, of Ford Motor Co.; **Andrew J. Hazelton**, of Nikon Research Corporation of America; **Thomas R. Kurfess**, of Georgia Institute of Technology; **Roland J. Menassa**, of General Motors Corp., **James J. Pellegrini**, of Johnson & Johnson Interventional Systems Co.; **Kay (Prueser) Starkey**, of Harnischfeger Corp.; and **Albert J. Wavering**, of National Institute of Standards Technology.

Obituaries

H.J. Poth

Harry J. Poth, Past-President of the CDIC Society, died on July 1, 1996. He was 70 years old.

Mr. Poth's career in the industry encompassed 30 years at Dean & Barry Paint Co. In addition, Mr. Poth was employed by both Burke-Hall, Memphis, TN, and Bruning Paint Co., Baltimore, MD.

An active member of the Federation, Mr. Poth served as FSCT Treasurer in 1978. He has also served as Chairman of the Bylaws, Program, and Public Relations Committees. Other FSCT activities included serving on the Council, Board of Directors, Executive Committee, and Board of Directors of PRI. Mr. Poth was a member of the Gallows Birds.

As a member of the CDIC Society, Mr. Poth was the CDIC Council Representative for six years and served on the Board of Directors for three years. While Secretary of the Society, Mr. Poth received the Trigg Award.

Mr. Poth is survived by his wife, Ruth; two sons, Charles and Gregory; and two grandchildren.

Clarence F. Silleck, a member of the New York Society, passed away on March 30, 1996.

Dr. Silleck graduated from the Polytechnic University, Brooklyn, NY, in 1936. He retired from C.J. Osborn Chemical Inc. as Vice President in 1976.

In addition to being a member of the Federation, Dr. Silleck held memberships with the American Association for the Advancement of Science and the American Chemical Society. He was also a Fellow of the American Institute of Chemists and the New York Academy of Science.

Books/ Publications

Performance Additives

AlliedSignal Inc. has published a table of properties of polyethylenes, micronized polyolefins, copolymers, and specialty additives that includes acid numbers, melting points, density, and viscosity. These polyethylenes, polyolefins, and specialty additives are reportedly used to improve the performance of coatings, inks, and adhesives as well as in textile finishing, cosmetics, and other specialty applications.

Circle No. 30 on Reader Service Card

Grind Aids

The new brochure, "The Benefits of Surfynol Grind Aids in Waterborne Traffic Paints," which contains property and performance data tables, discusses Surfynol CT-136 and CT-161 grind aids in model waterborne traffic paint formulations. Incorporation of these products reportedly allows traffic paint formulators to upgrade performance properties (drying time, water resistance) without increasing water sensitivity or hindering viscosity stability. CT-136 and CT-161 grind aids are acetylene-based pigment surface wetting additives.

Circle No. 31 on Reader Service Card

Fumed Metallic Oxides

Degussa Corporation has recently published a study on the uses of fumed metallic oxides in water-based paints and coatings. The report, "Enhancing Performance of Water-Based Coatings with Fumed Metallic Oxides," evaluates the effects of fumed metallic oxides in air-dried modified epoxy and vinylidene chloride copolymer. This report concludes that fumed metallic oxides allow the formulator to be flexible in designing adhesives or coatings for applications.

Circle No. 32 on Reader Service Card

Transfer Hoses

The Slautterback Corp. introduces a new brochure for its electrically heated transfer hoses. These transfer hoses are designed to transfer gas samplings, liquid foods, and other materials. This brochure offers a description of hose technical characteristics, specifications, and an ordering guide to assist in the proper hose selection for a specific application.

Circle No. 33 on Reader Service Card

Silane and Silicone Chemistry

A brochure published by Hüls America Inc. gives the reader an overview of the commercial production capabilities and support services of their silanes and silicones. Some products in the silane line includes coupling agents and adhesion promoters, waterproofing agents, and synthetic reagents. The silicones include vinyl-terminated fluids, platinum catalysts, and organofunctional monomers and copolymers.

Circle No. 34 on Reader Service Card

Grinding Media

Epworth Manufacturing Co., Inc., introduces a color brochure to showcase their line of grinding media. This brochure provides details on ferrous and non-ferrous grinding media that are small or large. It also provides guidelines for selecting large and small media, including charts with information on media type, size and shape, wear rating, and viscosity.

Circle No. 35 on Reader Service Card

Emergency Response Guidebook

Labelmaster introduces the *1996 Emergency Response Guidebook (North American)* in a spiral-bound book and a 3.5" diskette format. This edition of the *Guidebook* was jointly developed by Canadian, United States, and Mexican departments and includes a dangerous goods list developed by the United Nations. The diskette is Windows™ compatible, and the book lists hazardous materials alphabetically and by UN code.

Circle No. 36 on Reader Service Card

Environmental Auditing Book

Environmental Resources Management Group announces the release of *Environmental Audits, 7th Edition*. This publication provides an overview of environmental auditing, including legal issues and staff development, and covers the procedures used to define, assess, and improve an existing environmental auditing program. *Environmental Audits* is said to reflect recent developments in the environmental auditing field: the EPA's new audit policy, the impact of ISO 14000, new management systems, and new approaches to report writing.

Circle No. 37 on Reader Service Card

Emissions Reporting Guide

MDI Polymeric MDI Emissions Reporting Guidelines for the Polyurethane Industry, from the Polyurethane Div. of the Society of the Plastics Industry, reportedly aids in the identification of release sources from storage, processing, transfer, use and disposal of chemicals, and MDI and PMDI emissions. This guide is designed to help polyurethane manufacturers and processors fill out the EPA emissions form and to provide information on routine and accidental releases into the environment.

Circle No. 38 on Reader Service Card

Equipment

Electric Truck Oven

The Grieve Corporation introduces an electric truck oven to handle flammable solvents. This truck oven has guide tracks for loading and unloading and it has a 60-minute timer with digital temperature control. This unit contains a manual reset temperature controller, an exhauster for venting, and a 10-minute purge timer to process flammable solvents.

Circle No. 39 on Reader Service Card

Pail Liners

A line of polyethylene pail liners for mixing and storing flammable and non-flammable products is available from New England Plastics Corp. The ValuLiner Pail Pals offer three styles for the consumer: rigid high-density, flexible low-density, and antistatic polyethylene. These pail liners are 15 mil thick and have a contoured lip that fits over the top of the pail. Pail Pals fit standard metal and plastic pails and are disposable.

Circle No. 40 on Reader Service Card

Performance Nozzle

Church & Dwight Co., Inc., introduces a nozzle for use with ARMEX™ blast media. Design breakthroughs reportedly reduce dust emissions to levels previously achieved by wet head nozzles. This performance nozzle incorporates a pistol grip to aid in blast stream control.

Circle No. 41 on Reader Service Card

Desk Lamp

Macbeth Div. of Kollmorgen Instruments Corp. introduces a daylight desk lamp, Sol-Source™. Sol-Source is a compact desk lamp which uses a tungsten halogen light and a proprietary filter to simulate daylight. This desk lamp is available with 7500, 6500, or 5000K illumination.

Circle No. 42 on Reader Service Card

Spray Gun

ITW Ransburg announces the REA 9000A, an air spray or HVLP spray gun, that can be retrofitted into existing systems. This spray gun is field repairable with air driven parts and is reportedly durable enough to withstand the toughest production environments.

Circle No. 43 on Reader Service Card

Process Controller

A single-loop process controller for universal processing applications, packaged in field-mounted housing, has been introduced by Wahl Instruments, Inc. The WC310 may be mounted on a wall or pipe and it has control and input-output capabilities as a standard for rapid configuration, which is user-defined through a keyboard.

Circle No. 44 on Reader Service Card

Disposable Filter Funnel

Whatman Inc. announces a new disposable filter funnel that can be used for trichloroacetic acid (TCA) precipitation, purification, and counting procedures. The filter and the sample retained on it can be removed from the funnel for processing, analysis, or storage without risking contamination that may happen during cleaning. The filters are available in different grades for a range of applications.

Circle No. 45 on Reader Service Card

Pipe Fittings

The Fibercast Co. introduces a fiberglass reinforced vinyl ester pipe fitting called Centrimates™. Centrimates are designed with long radii and corrosion barriers to give low flow impedance. These pipe fittings are pressure rated up to 150 PSI, temperature rated up to 200°F, and come in five shapes and stock sizes.

Circle No. 46 on Reader Service Card

Temperature Logger

This miniature logger from Onset Computer Corporation is a stainless steel probe that measures temperatures from -20° to 70°C (-4° to 158°F) and comes with a factory-replaceable battery. Data can be offloaded by connecting the logger to a PC or Mac and transferred to a spreadsheet.

Circle No. 47 on Reader Service Card

Coil Mixer

Thomas Scientific introduces a rotating coil stirrer. The Turbomixer™ is designed with fluid motion to reduce dead spots and settling. This rotating coil stirrer reportedly reduces cycle times by 50% by using low power overhead mixers instead of paddle type stirrers. The rotating coil is a pump and a mixer and is viscous up to 40,000 cPs.

Circle No. 48 on Reader Service Card

Small Media Milling System

Union Process, Inc., introduces a ceramic-lined small media milling machine. The DM-2 is a smaller version of the Deltamill designed for metal-free grinding and dispersing applications with an alumina grinding chamber, a choice of zirconium oxide discs or sialon, and a ceramic rotating media separator. The DM-2 reportedly has the capability for throughput up to 15 gallons per hour and includes a variable frequency drive (VFD).

Circle No. 49 on Reader Service Card

Latex Filler

New from Sherwin-Williams is a one-component, VOC-complying acrylic latex filler developed to fill and hide imperfections on foam plastics, metals, and interior wood. This latex filler reportedly is fast air drying and offers good sanding properties. Kem Aqua® 65P has no flash point or critical recoat time, a VOC content of less than 1.2 lb/gal, and is lead- and chromate-free.

Circle No. 50 on Reader Service Card

Control Software

HS 40 is a Windows™-based program designed for the operation of Perkin-Elmer's headspace sampler from a PC. This control software can view all headspace parameters of a method on a single page to maintain control. HS 40 has the capability to allow users to assign vial number ranges, print the sequences and methods, and read out available hardware options.

Circle No. 51 on Reader Service Card

Frame Grabber

Data Translation introduces a digital-only PCI capture board. The DT3157 MACH frame grabber is designed for digital cameras and reportedly allows users to take advantage of the flexibility and real-time benefits that digital video and PCI Bus offer. The DT3157 frame grabber is supported by a Windows® architecture that isolates application code from the hardware-specific commands.

Circle No. 52 on Reader Service Card

Technical Papers on CD-ROM

More than 40 technical papers from the Corrosion/96 Annual Conference are available on CD-ROM from NACE International. The topics include materials selection, coatings, cathodic protection, and industry-specific applications and are indexed by author, title, number, and topic. This CD-ROM is compatible with Windows™, UNIX, and Macintosh systems.

Circle No. 53 on Reader Service Card

Non-HAP Solvents

Shell Chemical Co. introduces a line of solvents that can reportedly be used as replacements for n-hexane, toluene, and xylene in many applications. Cypar™ Solvents are non-hazardous air pollutants that are made from a hydrotreating process. They exhibit low odor and contain less than .2% aromatics.

Circle No. 54 on Reader Service Card

Neutralizing Acid Waste

Unlike conventional alkalis, magnesium hydroxide is a non-corrosive that automatically buffers at a pH of 9.0 so downstream life will not be jeopardized. The Dow Chemical Company discusses the chemistry and provides comparisons when using magnesium hydroxide to neutralize the acid in waste streams.

Circle No. 55 on Reader Service Card

Foam Surfactant

Barlox 12*i*, a multi-functional surfactant, produces minimal stable foam. This foam surfactant from Lonza Inc. is an alternative to alkyl phenol ethoxylates that has detergency and coupling along with surface tension reduction. Barlox 12*i* is developed to offer foam control at lower temperatures for energy efficiency.

Circle No. 56 on Reader Service Card

FEDERATION MEETINGS

For information on FSCT meetings, contact Federation of Societies for Coatings Technology, 492 Norristown Rd., Blue Bell, PA 19422 (610) 940-0777, FAX: (610) 940-0292.

1996

(Oct. 22-24)—International Coatings Technology Conference. Chicago Hilton and Towers and McCormick Place North, Chicago, IL.

(Oct. 23-25)—International Coatings Expo (Formerly Annual Meeting and Paint Industries' Show). McCormick Place North, Chicago, IL.

1997

(Nov. 3-5)—International Coatings Technology Conference and Expo (Formerly Annual Meeting and Paint Industries' Show). Georgia World Congress Center, Atlanta, GA.

SPECIAL SOCIETY MEETINGS

1997

(Feb. 5-7)—24th Annual International 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 F. Thames, Co-Organizers, WBHS&PC Symposium, Dept. of Polymer Science, USM, Box 10076, Hattiesburg, MS 39406-0076).

(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).

(May 8-10)—50th Annual Spring Symposium. Sponsored by the Pacific Northwest Society. Panamerican Hotel, Vancouver, British Columbia.

(May 12-14)—Southern Society Annual Meeting. King and Prince Beach and Golf Resort, St. Simons Island, GA. (Eve Irvine, J.M. Huber Corp., One Huber Rd., Macon, GA 31298; (912) 750-5433).

OTHER ORGANIZATIONS

1996—North America

(Sept. 4-11)—Manufacturing '96 Conference. Sponsored by the Society of Manufacturing Engineers (SME). McCormick Place, Chicago, IL. (SME, One SME Drive, P.O. Box 930, Dearborn, MI 48121-0930).

(Sept. 8-12)—1996 EOS/ESD Symposium. Sponsored by the ESD Association. Lake Buena Vista, FL. (ESD Association, 7902 Turin Rd., Ste. 4, Rome, NY 13440).

(Sept. 9-12)—Safety in Ammonia Plants and Related Facilities. Sponsored by American Institute of Chemical Engineers. Westin at Copley Place, Boston, MA. (AIChE*xpress* Service Center, 345 E. 47th St., New York, NY 10017-2395).

(Sept. 9-13)—"The Basic Composition of Coatings." Short Course sponsored by University of Missouri-Rolla (UMR), Rolla, MO. (UMR Coatings Institute, 1870 Miner Circle, Rolla, MO 65409).

(Sept. 10)—Rheology Seminar. Sponsored by Brookfield Engineering Laboratories, Inc. New Jersey. (Barbara Cunningham, Brookfield Engineering Laboratories, Inc., Dept. NR-119, 240 Cushing St., Stoughton, MA 02072).

(Sept. 12)—Rheology Seminar. Sponsored by Brookfield Engineering Laboratories, Inc. Cincinnati, OH. (Barbara Cunningham, Brookfield Engineering Laboratories, Inc., Dept. NR-119, 240 Cushing St., Stoughton, MA 02072).

(Sept. 16-17)—Engineering & Construction Contracting Conference. Sponsored by American Institute of Chemical Engineers. Walt Disney World Swan Hotel, Orlando, FL. (AIChE*xpress* Service Center, 345 E. 47th St., New York, NY 10017-2395).

(Sept. 16-19)—Can Technology Conference & Exposition. Sponsored by the Society of Manufacturing Engineers (SME). Hyatt Rosemont, Rosemont, IL. (SME, One SME Drive, P.O. Box 930, Dearborn, MI 48121).

(Sept. 17-19)—Powder Coating '96. Conference and Exhibition sponsored by The Powder Coating Institute. Indiana Convention Center, Indianapolis, IN. (Goyer Management, P.O. Box 54464, Cincinnati, OH 45254-0464).

(Sept. 17-20)—BatchMaster 3.5 Modules Training Course. Sponsored by BatchMaster Software Corp. Irvine, CA. (Wendy Curfman, BatchMaster Software Corp., 1500 Pacific Coast Hwy., Ste. E, Seal Beach, CA 90740).

(Sept. 22-25)—1996 Manufacturers and Suppliers Workshop and Exposition. Sponsored by The American Ceramic Society. Adam's Mark Hotel, Charlotte, NC. (The American Ceramic Society, 735 Ceramic Place, Westerville, OH 43081-8720).

(Sept. 23-25)—"Particle Size Analysis." Training course sponsored by Horiba Instruments, Irvine, CA. (Geneen Spence, Horiba Instruments, 17671 Armstrong Ave., Irvine, CA 92714).

(Sept. 23-27)—"Introduction to Paint Formulation." Short Course sponsored by University of Missouri-Rolla (UMR), Rolla, MO. (UMR Coatings Institute, 1870 Miner Circle, Rolla, MO 65409).

(Sept. 30-Oct.1)—Florida Plastics Summit. Sponsored by The Society of the Plastics Industry (SPI), Inc. Clarion Plaza Hotel, Orlando, FL. (SPI, 1275 K St., N.W., Ste. 400, Washington, D.C. 20005).

(Oct. 1)—Rheology Seminar. Sponsored by Brookfield Engineering Laboratories, Inc. San Francisco, CA. (Barbara Cunningham, Brookfield Engineering Laboratories, Inc., Dept. NR-119, 240 Cushing St., Stoughton, MA 02072).

(Oct. 3)—Rheology Seminar. Sponsored by Brookfield Engineering Laboratories, Inc. Denver, CO. (Barbara Cunningham, Brookfield Engineering Laboratories, Inc., Dept. NR-119, 240 Cushing St., Stoughton, MA 02072).

(Oct. 2-3)—Fifth Annual Advanced Radiation (UV/EB) Curing Marketing/Technology Seminar. Sponsored by Armbruster Associates, Inc. Marriott Hotel, Newark Airport, Newark, NJ. (David C. Armbruster, Armbruster Associates, Inc., 43 Stockton Rd., Summit, NJ 07901).

(Oct. 7-9)—"Basic Coatings for Sales, Marketing, and General Personnel." Short Course sponsored by University of Missouri-Rolla (UMR), Rolla, MO. (UMR Coatings Institute, 1870 Miner Circle, Rolla, MO 65409).

(Oct. 8-11)—International Process Safety Managment Conference & Workshop. Sponsored by American Institute of Chemical Engineers. Airport Marriott Orlando, Orlando, FL. (AIChE*xpress* Service Center, 345 E. 47th St., New York, NY 10017-2395).

(Oct. 8-11)—"Response Surface Methods for Process Optimization." Sponsored by Stat-Ease Inc. Minneapolis, MN. (Rich Burnham, Stat-Ease Inc., Hennepin Square, Ste. 191, 2021 E. Hennepin Ave., Minneapolis, MN 55413-2723).

(Oct. 14-17)—15th International Congress on the Applications of Lasers and Electro-Optics. Sponsored by the Laser Institute of America. Radisson Plaza Hotel at Town Center, Southfield, MI. (Daryl Flynn, Laser Institute of America, 12424 Research Pkwy., Ste. 125, Orlando, FL 32826).

(Oct. 14-18)—43rd National Symposium of the American Vacuum Society. Pennsylvania Convention Center, Philadelphia, PA. (American Vacuum Society, 120 Wall St., 32nd Flr., New York, NY 10005).

(Oct. 16-18)—"Ceramic and Glass Solutions for New and Improved Products." Course cosponsored by The New York State College of Ceramics at Alfred University and the New York State Center for Advanced Ceramic Technology. Alfred University, Alfred, NY. (Marlene Wightman, New York State College of Ceramics, Alfred University, Alfred, NY 14802).

(Oct. 16-19)—Joint Fall Meeting of the Basic Science, Nuclear, and Environmental Technology and Cements Division. Sponsored by The American Ceramic Society. San Antonio, TX. (The American Ceramic Society, 735 Ceramic Place, Westerville, OH 43081-8720).

(Oct. 20-23)—"Polyurethanes Expo '96." Technical Conference & Exposition sponsored by The Society of the Plastics Industry, Inc., (SPI). Bally's Las Vegas Casino and Hotel, Las Vegas, NV. (SPI, Polyurethane Division, 355 Lexington Ave., New York, NY 10017).

(Oct. 23-25)—109th Annual Meeting of the National Paint and Coatings Association (NPCA). Palmer House (Hilton), Chicago, IL. (Cheryl Matthews, NPCA, 1500 Rhode Island Ave., N.W., Washington, D.C. 20005-5597).

(Oct. 23-25)—"Spray Finishing Technology Workshop." Sponsored by Bowling Green State University (BGSU) and ITW DeVilbiss. ITW DeVilbiss Training Center, Maumee (Toledo), OH. (Richard A. Kruppa, College of Technology, BGSU, Bowling Green, OH 43403).

(Oct. 24-25)—"Set-Up Reduction—How to Apply Innovative Just-In-Time Techniques to Shrink Lot Sizes, Slash Lead Times, and Maximize Competitiveness." Sponsored by The Saddle Island Institute. University Park Hotel, Salt Lake City, UT. (Betsy Tyson, The Saddle Island Institute, 100 State St., Boston, MA 02109).

(Oct. 27-Nov. 1)—84th Congress & Exposition. Sponsored by the National Safety Council. Orange County Convention Center, Orlando, FL. (Michael J. Taylor, National Safety Council, 1121 Spring Lake Dr., Itasca, IL 60143-3201).

(Oct. 28-29)—"Set-Up Reduction—How to Apply Innovative Just-In-Time Techniques to Shrink Lot Sizes, Slash Lead Times, and Maximize Competitiveness." Sponsored by The Saddle Island Institute. Radisson Plaza Hotel at Kalamazoo Center, Kalamazoo, MI. (Betsy Tyson, The Saddle Island Institute, 100 State St., Boston, MA 02109).

(Oct. 28-30)—"The Fundamentals of Corrosion and Its Control." Sponsored by LaQue Corrosion Services. Holiday Inn SunSpree Resort, Wrightsville Beach, NC. (S. Darden, LaQue Corrosion Services, P.O. Box 656, Wrightsville Beach, NC 28480).

(Oct. 29-31)—Fabtech West Conference & Exposition. Sponsored by the Society of Manufacturing Engineers (SME). San Jose Convention Center, San Jose, CA. (SME, One SME Drive, P.O. Box 930, Dearborn, MI 48121-0930).

(Nov. 1-3)—"Fall Decor '96: Paint and Decorating Show." Sponsored by the National Decorating Products Association (NDPA). Minneapolis Convention Center, Minneapolis, MN. (Teri Flotron, NDPA, 1050 N. Lindbergh Blvd., St. Louis, MO 63132-2994).

(Nov. 3-6)—1996 International Conference. Sponsored by the Adhesive and Sealant Council, Inc. Fairmont Atop Nob Hill, San Francisco, CA. (Kathy Oates Domenick, Director, Education and Training, The Adhesive and Sealant Council, Inc., 1627 K St., N.W., Ste. 1000, Washington, D.C. 20006).

(Nov. 4-6)—"Particle Size Analysis." Training course sponsored by Horiba Instruments, Irvine, CA. (Geneen Spence, Horiba Instruments, 17671 Armstrong Ave., Irvine, CA 92714).

(Nov. 6-7)—"Paint Volatile Organic Compounds (VOCs)." Training course sponsored by the American Society for Testing and Materials (ASTM). Los Angeles, CA. (Kristina Falkenstein, ASTM, 100 Barr Harbor Dr., West Conshohocken, PA 19428-2959).

(Nov. 6-8)—ARMA Executive Committee Meeting and Board of Directors Meeting. Sponsored by Asphalt Roofing Manufacturers Association (ARMA). Tucson, AZ. (ARMA, 6000 Executive Blvd., Ste. 201, Rockville, MD 20852-3803).

(Nov. 10-13)—"Organic Coatings Science and Technology." Sponsored by the State University of New York, Institute of Materials Science and the Division of Polymeric Materials: Science and Engineering of the American Chemical Society (ACS). Westin Resort, Hilton Head Island, SC. (Angelos V. Patsis, Institute of Materials Science, State University of New York, New Paltz, NY 12561).

(Nov. 10-15)—Annual Meeting of the American Institute of Chemical Engineers. Sponsored by American Institute of Chemical Engineers. Palmer House Hilton, Chicago, IL. (AIChE*xpress* Service Center, 345 E. 47th St., New York, NY 10017-2395).

(Nov. 12-14)—Autofact Conference & Exposition. Sponsored by the Society of Manufacturing Engineers (SME). Cobo Center, Detroit, MI. (SME, One SME Drive, P.O. Box 930, Dearborn, MI 48121-0930).

(Nov. 17-21)—SSPC '96. 1996 International Conference and Exhibition. Charlotte, NC. (Dee Boyle, SSPC, 40 24th St., 6th Floor, Pittsburgh, PA 15222-4643).

(Nov. 19-22)—"The Fourth Color Imaging Conference: Color Science, Systems, and Applications." Sponsored by the Society for Imaging Science & Technology (IS&T) and the Society for Information Display (SID). The Radisson Resort, Scottsdale, AZ. (IS&T, 7003 Kilworth Lane, Springfield, VA 22151; or SID, 1526 Brookhollow Dr., Ste. 82, Santa Ana, CA 92705).

(Nov. 25-26)—Thomas Show. Sponsored by Thomas Scientific. Renaissance Harborplace Hotel, Baltimore, MD. (Thomas Scientific, 99 High Hill Rd. at I-295, Swedesboro, NJ 08085-0099).

1997—North America

(Jan. 21-24)—"Environmentally Compliant Coatings." Short course sponsored by North Dakota State University (NDSU). Crowne Plaza Resort, Hilton Head Island, SC. (Debbie Shasky, Program Coordinator, NDSU, Dept. of Polymers and Coatings, 54 Dunbar Hall, Fargo, ND 58105).

(Jan 28)—PCI Technical Subcommittee on Test Methods and ASTM D01.51 on Powder Coatings. Sponsored by the American Society for Testing and Materials (ASTM). Embassy Suites, Ft. Lauderdale, FL. (Jeffrey Hagerlin, O'Brien Powder Products, 9800 Genard Rd., Houston, TX 77041-7624).

(Feb. 14-15)—"Spring Decor '97: Paint & Decorating Show." Sponsored by the National Decorating Products Association (NDPA). Charlotte Convention Center, Charlotte, NC. (Teri Flotron, NDPA, 1050 N. Lindbergh Blvd., St. Louis, MO 63132-2994).

(Feb. 22-24)—"Interiors Decor Showcase '97." Sponsored by the National Decorating Products Association (NDPA). Toronto Congress Centre, Toronto, Ontario, Canada. (Teri Flotron, NDPA, 1050 N. Lindbergh Blvd., St. Louis, MO 63132-2994).

(Feb. 24-26)—"Basic Coatings for Sales, Marketing, and General Personnel." Short Course sponsored by University of Missouri-Rolla (UMR), St. Louis, MO. (UMR Coatings Institute, 1870 Miner Circle, Rolla, MO 65409).

(Mar. 1-2)—"Degradation and Stabilization of Polymers." Sponsored by the State University of New York. Hilton Head Island, SC. (Angelos V. Patsis, Institute of Materials Science, State University of New York, New Paltz, NY 12561).

(Mar. 2-5)—SSPC 1997 Compliance in Industrial Paint Conference. Sheraton Stamford Hotel, Stamford, CT. (Dee Boyle, SSPC, 40 24th St., 6th Floor, Pittsburgh, PA 15222-4643; (412) 281-2331).

(Mar. 10-12)—"Block and Graft Copolymer Blends." Sponsored by the State University of New York. Hilton Head Island, SC. (Angelos V. Patsis, Institute of Materials Science, State University of New York, New Paltz, NY 12561).

(Mar. 10-12)—"Introduction to Polymer Colloids/Emulsion Polymers." Sponsored by the State University of New York. Hilton Head Island, SC. (Angelos V. Patsis, Institute of Materials Science, State University of New York, New Paltz, NY 12561).

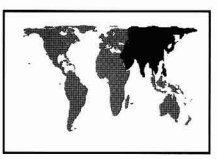
(Mar. 10-13)—"Pigment Dispersions." Sponsored by the State University of New York. Hilton Head Island, SC. (Angelos V. Patsis, Institute of Materials Science, State University of New York, New Paltz, NY 12561).

(Apr. 7-10)—12th Annual Advanced Composites Conference and Exposition. Sponsored by The Engineering Society (ESD) and SAE International. Westin Hotel, Renaissance Center, Detroit, MI. (Wael Berrached, ESD, 29355 Northwestern Hwy., Ste. 200, Southfield, MI 48034).

(Apr. 7-11)—"Basic Composition of Coatings." Short Course sponsored by University of Missouri-Rolla (UMR), Rolla, MO. (UMR Coatings Institute, 1870 Miner Circle, Rolla, MO 65409).

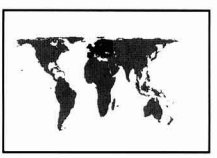
(Apr. 8-10)—Sixth Annual Advanced Coatings Technology Conference & Exposition. Sponsored by The Engineering Society (ESD) and SAE International. Westin Hotel, Renaissance Center, Detroit, MI. (Wael Berrached, ESD, 29355 Northwestern Hwy., Ste. 200, Southfield, MI 48034).

1997—Asia



(Oct. 22-24)—"New Developments in Colour Material Science and Technology." 70th Anniversary Conference on Colour Materials Tokyo sponsored by the Japan Society of Colour Material. Arcadia Ichigaya (Shigaku Kaikan), Tokyo, Japan. (Shuichi Hamada, Japan Society of Colour Material, Kitamura Bldg. 5F, 9-12, 2-chome, Iwamoto-cho, Chiyoda-ku, Tokyo 101, Japan).

1996—Europe



(Sept. 8-9)—"Inherently Conductive Polymers: An Emerging Technology." Sponsored by Advanced Polymer Courses. Hotel Sofitel, Brugge, Belgium. (Matt Aldissi, Advanced Polymer Courses, 536 Main ST., Unit #1, Falmouth, MA 02540).

(Sept. 15-20)—Fifth International Conference on Plasma Source Spectrometry. Sponsored by The Perkin-Elmer Corp. University of Durham, England. (Grenville Holland, Department of Geological Sciences, University of Durham, Science Laboratories, South Road, Durham City DH1 4RL, England).

(Sept. 18-20)—EUROCOAT '96. Congress/Exhibition sponsored by Union des Associations de Culture Méditerranéenne (UATCM). Congress Centre, Genova, Italy. (AITIVA/EUROCOAT '96. Dr. R. Ferretto c/o Boero Colori, Via Molassana, 60, I-16138 Genova, Italy).

(Sept. 18-20)—"Polypropylene '96." Sponsored by Maack Business Services. Zürich, Switzerland. (Maack Business Services, Moosacherstrasse 14, CH-8804 AU/Zürich, Switzerland).

(Oct. 7-9)—Central European Coatings Show. Exhibition and Conference sponsored by FMJ International. Katowice, Poland. (Jane Malcolm-Coe, FMJ International Publications Ltd., Queensway House, 2 Queensway, Redhill, Surrey RH1 1QS, England).

(Oct. 21-22)—"World Congress PET '96." Sponsored by Maack Business Services. Zürich, Switzerland. (Maack Business Services, Moosacherstrasse 14, CH-8804 AU/Zürich, Switzerland).

(Nov. 4-5)—The Sixth Annual Conference on Textile Coating and Laminating. Sponsored by the *Journal of Coated Fabrics*. Dusseldorf Hilton Hotel, Dusseldorf, Germany. (Programme Division: Technomic Publishing AG, Missionstrasse 44, Ch-4055 Basel, Switzerland).

(Nov. 11-13)—"Waterborne, High-Solids, & Radcure Technologies." Sponsored by Paint Research Association. Frankfurt, Germany. (Conference Secretary, Paint Research Association, 8 Waldegrave Rd., Teddington, Middlesex, TW11 8LD England).

(Nov. 12-14)—"Resins & Pigments." Exhibition and Conference sponsored by FMJ International. Frankfurt Messe, Frankfurt am Main, Germany. (Jane Malcolm-Coe, FMJ International Publications Ltd., Queensway House, 2 Queensway, Redhill, Surrey RH1 1QS, England).

(Nov. 26-27)—"Forum de la Connaissance 1996." Sponsored by the Association Française des Techniciens des Peintures, Vernis, Encres d'imprimerie, Colles et Adhésifs (AFTPVA). Auditorium de la Tour ELF, Paris-la-Défense, France. (AFTPVA, rue Etex, F-75018 Paris, France).

1997—Europe

(Apr. 14-19)—Hannover Fair '97. Industrial fair sponsored by Hannover Fairs USA, Inc. Hannover Fairgrounds, Hannover, Germany. (Andrea Anderson, Project Director, Hannover Fairs USA, Inc., 103 Carnegie Center, Princeton, NJ 08540).

(May 12-14)—"Epoxy Technologies for Ambient Cure Protective Coatings." Sponsored by Paint Research Association. Brussels, Belgium. (Conference Secretary, Paint Research Association, 8 Waldegrave Rd., Teddington, Middlesex, TW11 8LD England).

1998—Europe

(Jan 20-22)—Powder Coating Europe 98. Sponsored by Vincentz Verlag. Amsterdam Exhibition Centre, Amsterdam, The Netherlands. (Vincentz Verlag, Postfach 6247, D-30062 Hannover, Germany).

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Humbug from Hillman

Charles Beck has the dubious honor of being chosen as Humbug's "Philosopher of the Month" . . . a distinction which he may never be able to live down. What follows are Humbug's selections from among Charles' 38 points of Beckian philosophy.

Of Birth, Life and Death

—The two most exciting and unique times of life are birth, which we cannot remember, and death which we don't live to tell about.

—Life gets better as you go along. Where does life start? For most of us it was in the hospital. After surviving the trauma of birth, some big lug picks you up by your heels and gives you a healthy swat across your bare bottom, and you think "Life has to get better than this" . . . and it does.

Of Beans and Bean Counters

—When asked the secrets of his great wealth, the richest man in Babylon gave the following advice:

a. Avoid paying interest, for it buys you nothing.
b. Choose to be born to wealthy parents.

Of Old Age and Worse

—If you are over 60 and wake up in the morning, be thankful.

—If you are over 65 and wake up in the morning and nothing hurts, you're dead.

—When will people learn that the simple greeting, "How are you?" is not a request for a medical history?

For Peace of Mind

—Don't worry about it! A hundred years from now, it isn't going to make any difference anyway.

—I have been married 50 years, and in all that time, never considered divorce. Murder perhaps . . . .

Gone Fishin'

—Lord may I catch a fish so large that when I tell of it later, I will have no need to lie.

—Even a fish could stay out of trouble if it could learn to keep its mouth shut.

—Old fishermen never die, they just smell that way.

—When I get to heaven, there's one guy I am going to look up and that is Jonah. He has a better fish story than I have.

—A bad day at fishing beats a good day at work.

Humbug's philosophy—If it doesn't make someone smile, don't print it!

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Longtime contributor and loyal Humbugian, Owen Carpenter, inspired by a September 1987 (sic) list of church bulletins contributed by Howard Jerome, came up with these 1996 versions:

A Lenten bulletin of Saint Germaine Catholic Church of Oak Lawn, IL, printed a list of "actual quotes":

—Don't let worry kill you—let the church help.

—The ladies of the church have cast-off clothing of every kind and they may be seen in the church basement Friday.

—The rosebud on the altar this morning is to announce the birth of David Alan Belzer, the sin of Rev. and Mrs. Julius Belzer.

And from an Ann Landers column he selected:

—Remember in prayer the many who are sick of our church and community.

—Wednesday, the Ladies Liturgy Society will meet. Mrs. Jones will sing "Put Me in My Little Bed," accompanied by the pastor.

—At the evening service tonight, the sermon topic will be "What is Hell?" Come early and listen to our choir practice.

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Old reliable, Bob Athey, quotes a nameless lady who writes:

Old folks are worth a fortune: with silver in their hair, gold in their teeth, stones in their kidneys, lead in their feet and gas in their stomachs. I have become a lot more social with the passing years; some might even call me a frivolous old gal. I'm seeing five gentlemen every day.

As soon as I wake, Will Power helps me get out of bed. Then I go to see John. Then Charley Horse comes along, and when he is here he takes a lot of my time and attention. When he leaves, Arthur Ritis shows up and stays the rest of the day. (He doesn't like to stay in one place very long so he takes me from joint to joint). After such a busy day, I'm really tired and glad to go to bed—with Ben Gay. What a life!

P.S. The Preacher came by the other day. He said at my age I should be thinking about the hereafter. I told him I do—all the time. No matter where I am—in the parlor, upstairs, in the kitchen or down in the basement—I ask myself, "Now what am I here after?"

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—The greener grass on the other side is just as difficult to cut.

—The trouble with the younger generation is that so many of us do not belong to it any more.

—Many a golfer prefers a cart to a caddy because a cart can't count, criticize, or laugh.

—The Lion

—Herb Hillman, Humbug's Nest, P.O. Box 135, Whitingham, VT 05361.

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017	037	057	077	097	117	137	157	177	197	217	237	257	277	297
018	038	058	078	098	118	138	158	178	198	218	238	258	278	298
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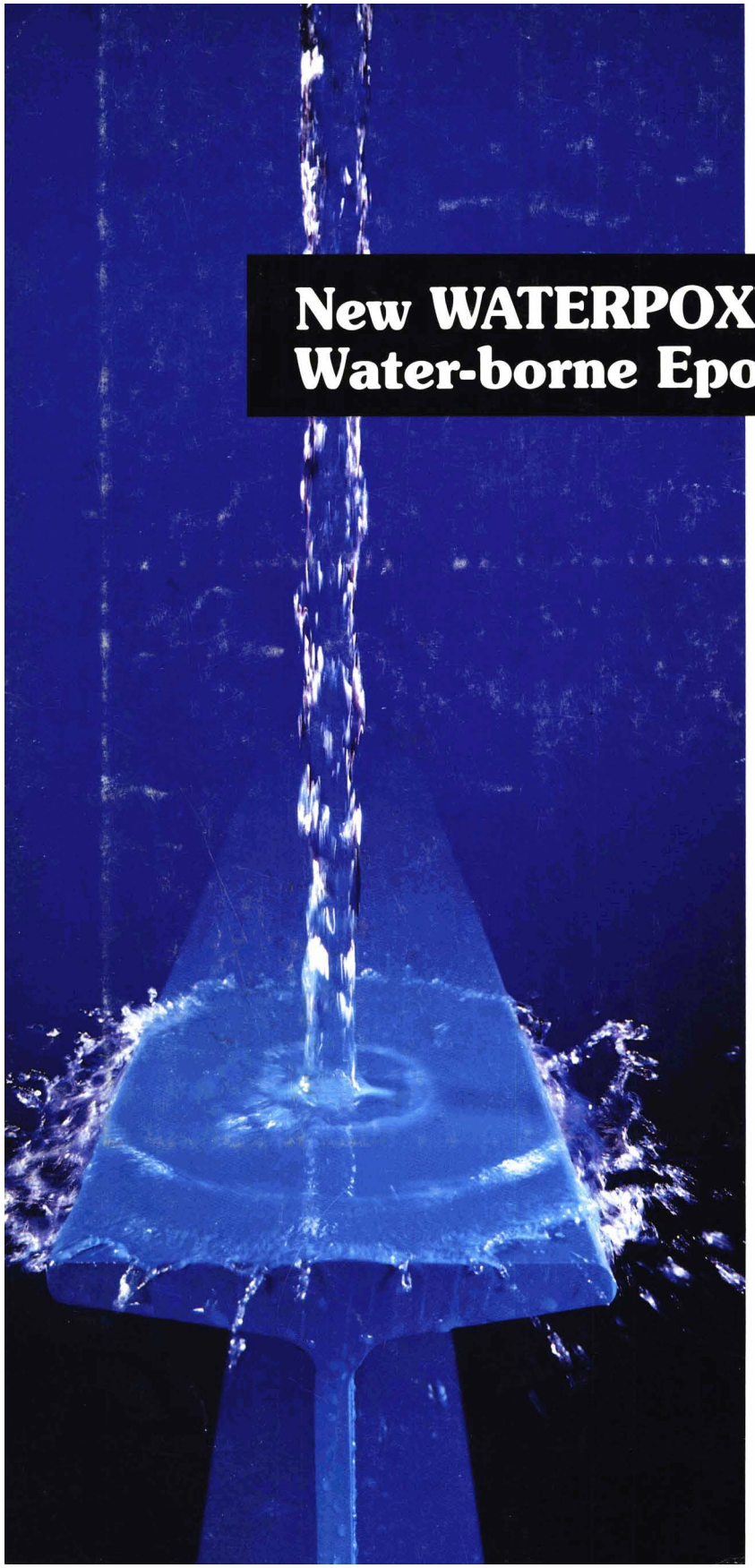

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