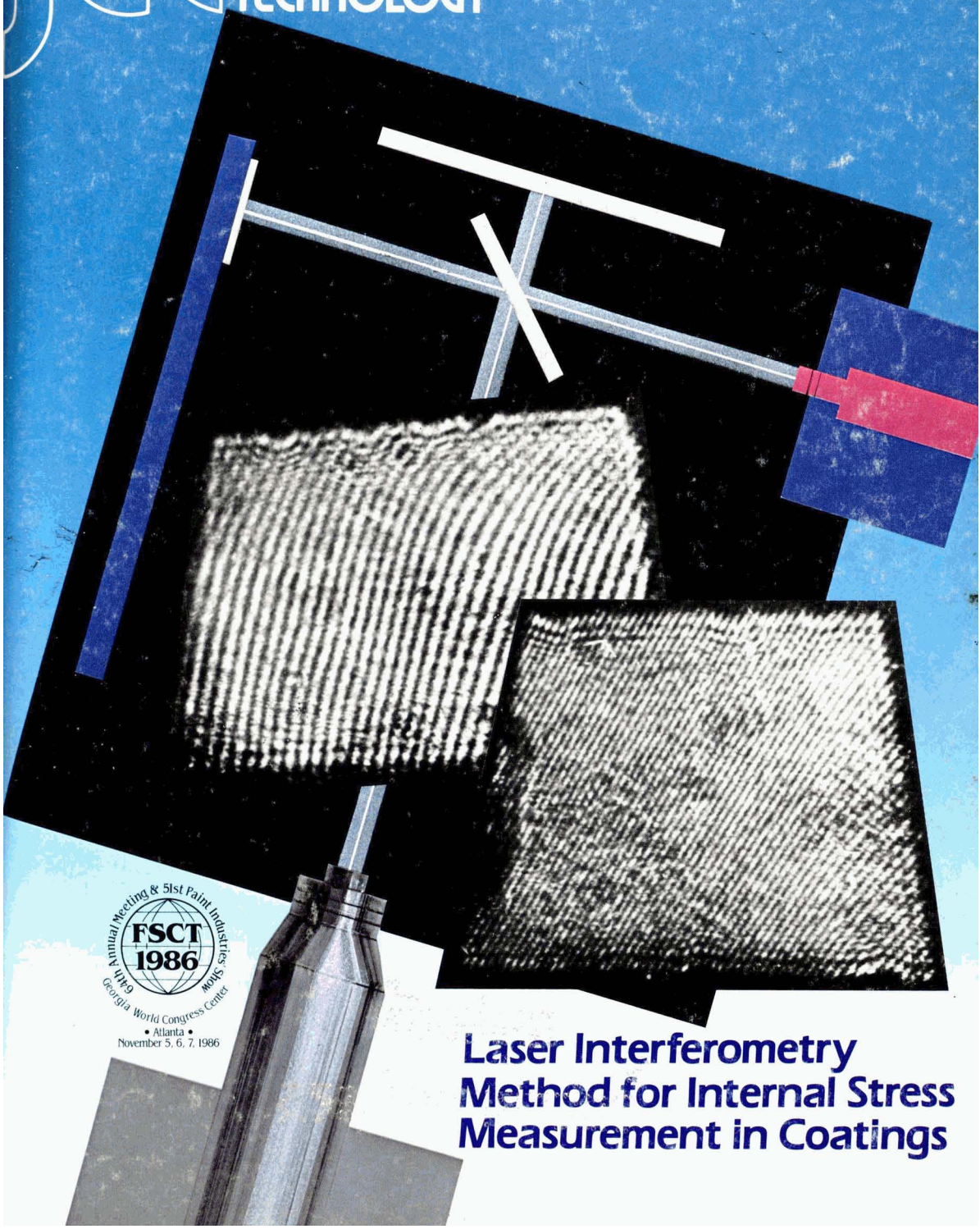
JCTAX 58 (735) 1-70 (1986)

JOURNAL OF COATINGS TECHNOLOGY

April 1986



Laser Interferometry Method for Internal Stress Measurement in Coatings

Complying with the OSHA Hazard Communications Standard means you must now fully inform your employees of the risks associated with their exposure to hazardous substances used in your operations. Wouldn't it be best if you could tell them that you're using one of the *least hazardous* biocides available as the in-can preservative in your paints, adhesives, latex emulsions, or other aqueous systems! Especially if it also assures you the same—or better—economy, effectiveness, and ease-of-use as the biocide you currently buy?

The best reason to use CALGON® Biocides may be their remarkably low hazards potential.

An Even Better One Is Their Superior Performance As In-Can Preservatives.

So now is the time to talk with us about the complete line of Calgon in-can preservatives. Let us help you select the Calgon biocide that gives you more of the cost-effective performance you want...with less of the risk to your employees, end-users, and the environment.

HIGHEST PERFORMANCE WITH LOWEST RISK

For maximum benefits, consider our TEKTAMER® products. Available as either aqueous dispersions or powder, these broad-spectrum biocides have the best toxicology profile of any biocide in the Calgon line.

- **HMIS RATING: 2-0-0**
- **No mercury, phenols, or heavy metals**
- **Doesn't contain nor generate formaldehyde**
- **EPA-registered and FDA-accepted**
- **No fish or wildlife warning required**
- **No detoxification needed for normal disposal**

MORE PROTECTION WITH LESS FORMALDEHYDE

If you plan to continue using—or switch to using—a formaldehyde-generator, first talk with us about Calgon's new BIOCHEK® 240. At use levels identical to the most commonly used brand, this *non-yellowing,* low-viscosity, water-clear, liquid Calgon biocide provides the same economical, effective performance...WITH *significantly less* free formaldehyde and *substantially* less generated formaldehyde.

- **HMIS RATING: 1-0-0**
- **Contains *four* times less free formaldehyde**
- **Generates *five* times less formaldehyde**
- **EPA registered**
- **No fish or wildlife warning required**
- **Doesn't irritate or sensitize the skin**
- **Non-corrosive**
- **No detoxification needed for normal disposal**

The advantages of BIOCHEK® 240 are especially important since proposed regulations to reduce permissible formaldehyde levels in the work place, and to extend OSHA Hazard Communications requirements to end-users, may be enacted.

LOOK AT OUR SAFETY AND PERFORMANCE DATA

In addition to their low hazards potential, Calgon biocides have already proven to be among the most cost-effective in-can preservatives available for paints, adhesives, latex emulsions, and other aqueous systems.

- **Rapid, long-lasting kill of broad spectrum of bacteria—including hard-to-control "wild strains"**
- **Added protection against fungi and yeast**
- **Compatible with other ingredients in end-use formulations**
- **Effective across broad pH range**
- **Protects at economically low dosages**

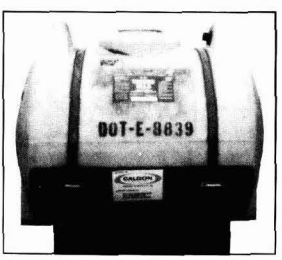
TEKTAMER® and BIOCHEK®, along with other biocides in our line, have been intensively evaluated by Calgon, at independent laboratories, and in plant operations..

We can provide you the data and support you need as you work to comply with the OSHA Hazard Communications Standard. Plus the technical service and laboratory support you need to evaluate use of our products in your formulations.

Let us show you exactly how Calgon preservatives compare—on safety and performance—with other available biocides. Write or telephone: Jim Farmerie, Marketing Manager, Specialty Chemicals Group, Calgon Corporation, P.O. Box 1346, Pittsburgh, PA 15230. (Telephone: 412/777-8000.)

A Safety/Performance Bonus

Calgon biocides are available in *returnable* liqui-bins that contain the equivalent of 5 drums. Let us show you how this can help you minimize the risks, costs, and problems associated with buying, storing, handling, and disposing of drums.



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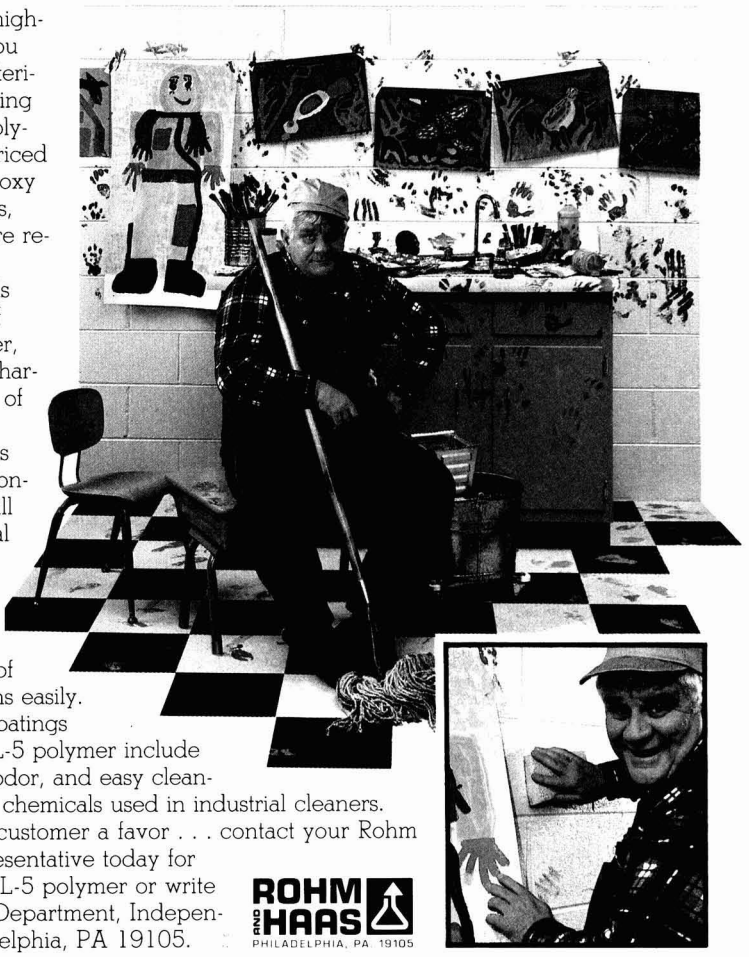
CALGON CORPORATION

SUBSIDIARY OF MERCK & CO., INC.

Bring your RMC down and his satisfaction up...

MAINCOTE TL-5 water-borne acrylic polymer is an economical approach to high-gloss, tile-like coatings. You realize significant raw materials savings when formulating with MAINCOTE TL-5 polymer because it is a low priced epoxy crosslinker, less epoxy is required in formulations, and expensive solvents are replaced with water.

Saving on raw materials costs is just one benefit of MAINCOTE TL-5 polymer, which has performance characteristics similar to those of two-component, solvent-borne epoxy wall coatings used in institutional environments. Your customers will like the easy stain removal properties offered by coatings based on MAINCOTE TL-5. And, they'll enjoy low maintenance costs as a result of the ability to remove stains easily.



Other advantages of coatings based on MAINCOTE TL-5 polymer include not only high gloss, low odor, and easy clean-up, but also resistance to chemicals used in industrial cleaners.

Do yourself and your customer a favor . . . contact your Rohm and Haas technical representative today for details on MAINCOTE TL-5 polymer or write our Marketing Services Department, Independence Mall West, Philadelphia, PA 19105.

ROHM AND HAAS
PHILADELPHIA, PA. 19105

with MAINCOTE® TL-5 polymer for tile-like wall coatings.

APRIL 1986

jct JOURNAL OF COATINGS TECHNOLOGY

VOLUME 58 NUMBER 735

THE JOURNAL OF COATINGS TECHNOLOGY (ISSN 0361-8773) is published monthly by the Federation of Societies for Coatings Technology, 1315 Walnut St., Philadelphia, PA 19107. Phone: (215) 545-1507.

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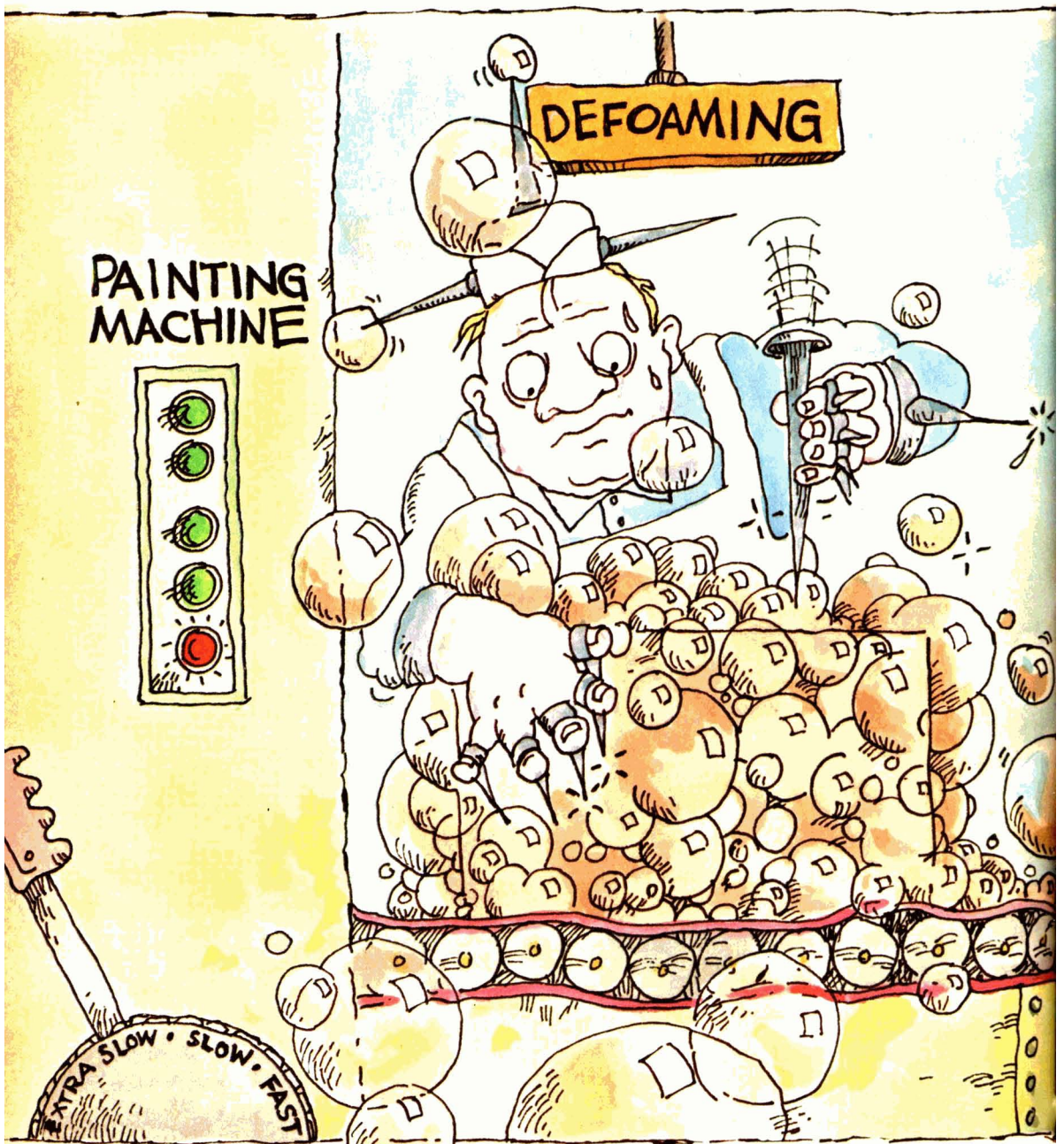
There are alternative

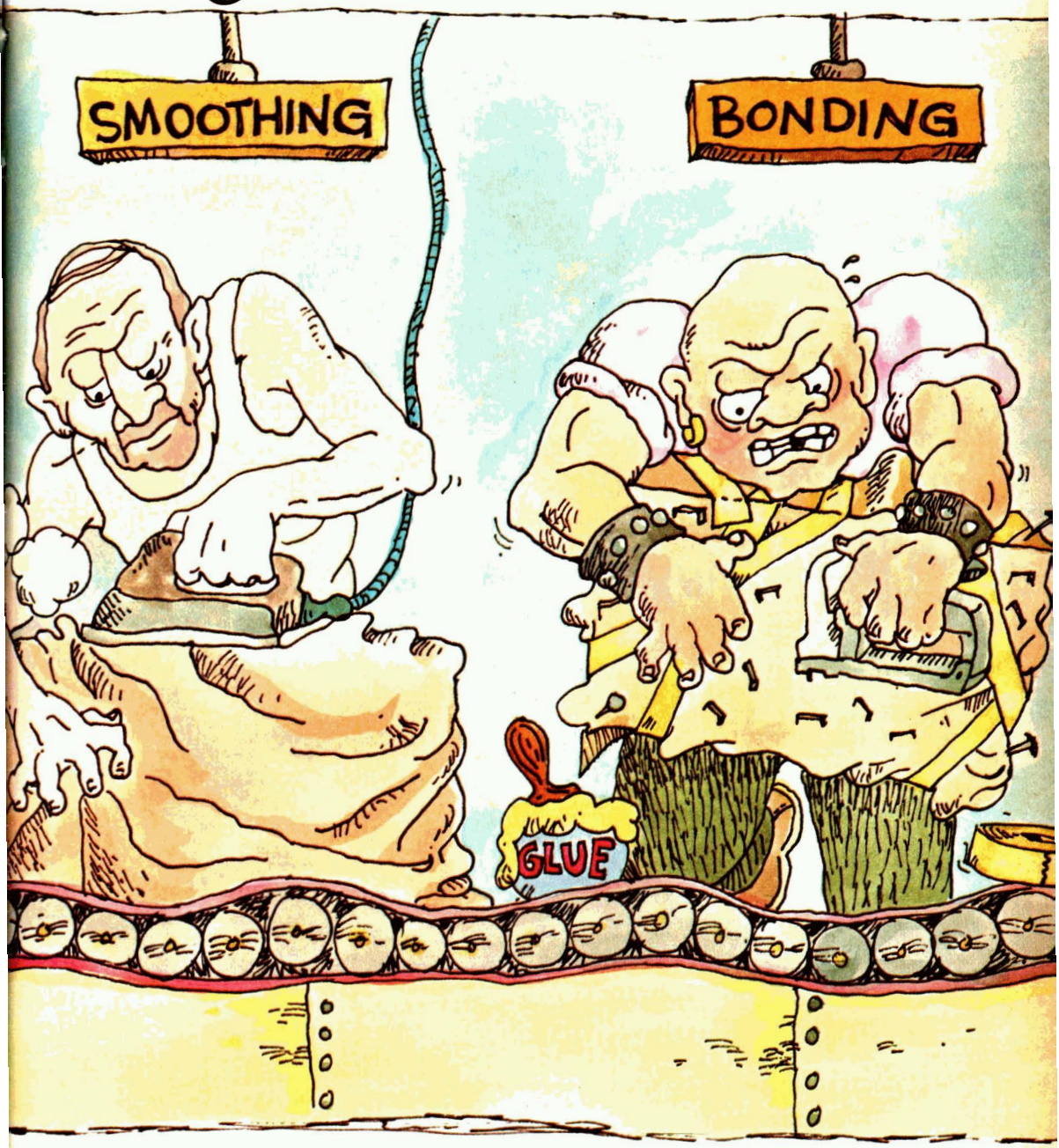


Instead, let Modaflow® flow aid handle these tough jobs:

Defoaming. Modaflow breaks up the air bubbles that cause troublesome foam and frothing when filling cans and drums. And less entrapped air means a superior coating surface.

Smoothing. Modaflow gives you outstanding flow-out for a surface that's virtually free of craters, pinholes, fisheyes and other worrisome imperfections.

to using Modaflow.®



Bonding. For excellent substrate bonding, better wet-out is what you need. And that's what Modaflow delivers.

Modaflow is available in two liquid forms and in powder. Modaflow is also regulated by the F.D.A. for use in many food contact applications.

For more information, a product sample and a list of distributors, write to Joanne Katzman, Dept. E1SG, Monsanto Chemical Company, 800 N. Lindbergh, St. Louis, MO 63167, or call 1-800-325-4330.

Remove a lot of worry.
Add a little Modaflow.

Monsanto

JOURNAL OF COATINGS TECHNOLOGY

1315 Walnut St., Phila., PA 19107

THE JOURNAL OF COATINGS TECHNOLOGY is published monthly by the Federation of Societies for Coatings Technology at 1315 Walnut St., Philadelphia, PA 19107. Phone: (215) 545-1507.

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	U.S. and Canada	Europe (Air Mail)	Other Countries
1 Year	$27.00	$ 50.00	$ 37.00
2 Years	$51.00	$ 97.00	$ 71.00
3 Years	$73.00	$142.00	$103.00

When available, single copies of back issues of the JOURNAL OF COATINGS TECHNOLOGY are priced as follows: $3.00 each for current calendar year issues; $4.00 each for all other issues.

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

A Guide for Authors is published in each January issue.

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

The Federation of Societies for Coatings Technology assumes no responsibility for the opinions expressed by authors in this publication.

Comment

And Now We Are 7,000

Federation membership has grown steadily over the years and we are very proud to announce that the goal of 7,000 in '86 has been attained. That's quite an achievement for the Federation—which began with 14 members back in the 20's. The 5,000 mark was reached in 1968.

And what is really remarkable is that there has never been a decline. However slight, the ranks inched upward yearly.

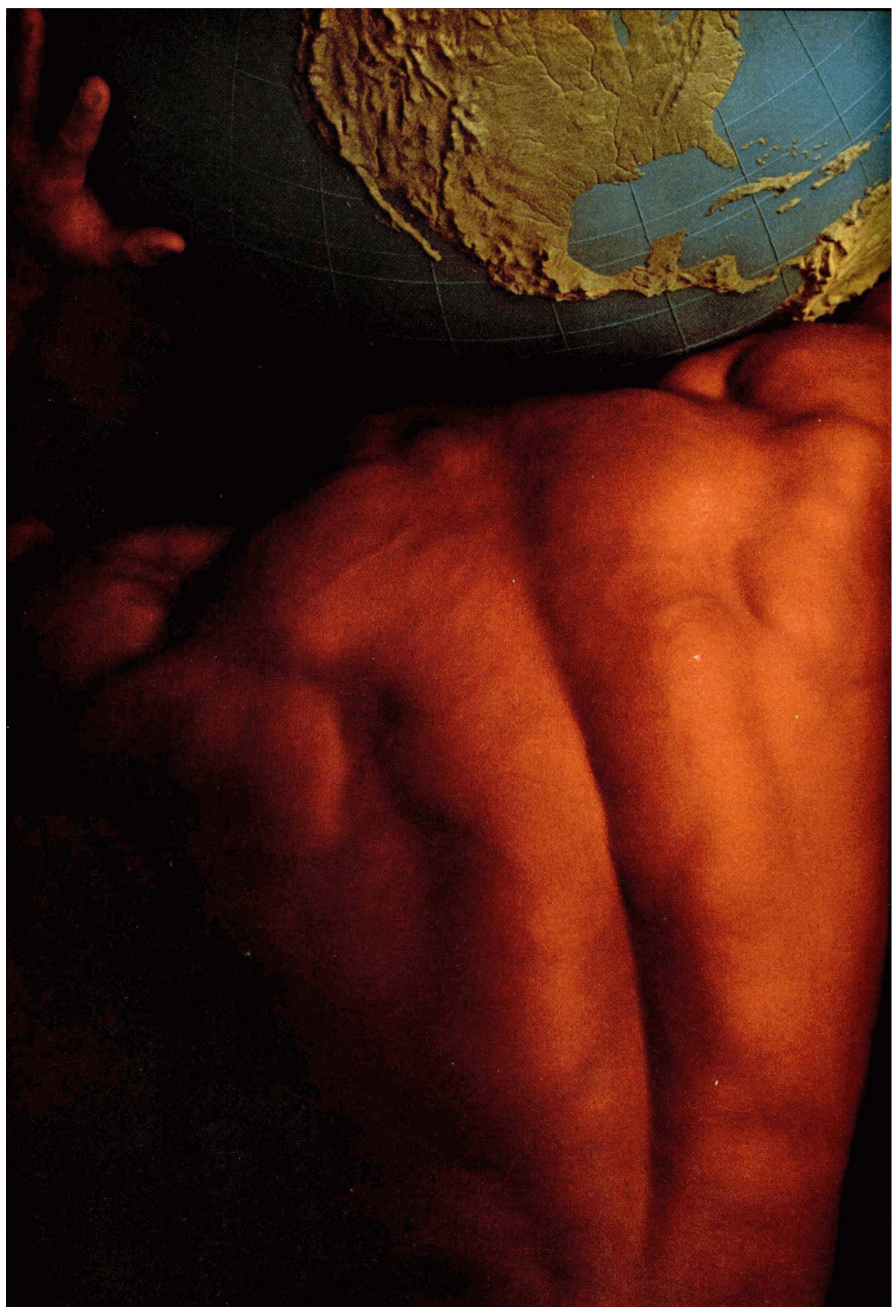
Most of the members fall into two major classes: Active (Paint People)—4,800 and Associate (Supplier People)—1,900. The remaining 400 members are Educators, Retirees, and Honoraries.

The Societies (there are 26) with more than 300 members are: Chicago—860; Los Angeles—600; New York—575; Southern—490; Toronto—440; Cleveland—360; and Detroit—350. The two Societies (Birmingham and Mexico) outside of the U.S. and Canada account for 330 members.

A separate membership category is Affiliate—for those qualified coatings industry personnel whose location of employment is not within the boundaries of any Society. There are about 40 such members now—from 18 other countries. This class of membership will surely increase as requests for "affiliation" are being received from around the globe.

As the world gets smaller, Federation membership will get bigger. At the historical rate of growth, there will be someone from every coatings-producing country among the 9,000 in 2000.

Frank J. Borrelle,
Executive Vice-President



THE BACKBONE OF COATINGS SOLVENTS JUST GOT STRONGER.

For over 50 years, Union Carbide's solvents have carried a lot of weight in the coatings industry. And now our broad line of these products has added new muscle.

With solvents like UCAR Ester EEP as an alternative to ethylene glycol monoethyl ether acetate. UCAR MAK for higher solids coatings. And UCAR PM and PM Acetate Solvents for a variety of industrial applications.

And new products are just one of our strong suits. Our long-term expertise in solvents technology, continuing R&D, sophisticated distribution network, and technical support systems are unmatched in the industry.

To find out more about what we have to offer, call your Union Carbide Sales Representative, contact one of our many distributors located throughout the nation, or write to us at Dept. K3442, Old Ridgebury Road, Danbury, CT 06817.

What we have to say just may put you on top of the world.

UNION CARBIDE

UCAR Solvents

Abstracts of Papers in This Issue

LASER INTERFEROMETRY METHOD FOR INTERNAL STRESS MEASUREMENT IN COATINGS—R.N. O'Brien and W. Michalik

Journal of Coatings Technology, 58, No. 735, 25 (Apr. 1986)

A novel method of measuring the internal strain developed in drying paint is presented. As usual the paint is applied to a metallic strip of known dimensions and modulus. The drying paint causes bending of the plate as stress develops in the paint. A small mirror attached to the end of the plate is one part of a modified Michelson laser interferometer. The number and spacing of the fringes in the mirror changes as the mirror moves to reduce the light path and change the angle of reflection. Great accuracy can be obtained by projecting the fringes for viewing at a distance, by using lengthy plates, by using plates with a lower modulus and thicker paint films. The apparatus is inexpensive and can be easily stored when not in use.

NATURAL SILICAS IN COATINGS—W.J. Polestak and T.D. Thompson

Journal of Coatings Technology, 58, No. 735, 31 (Apr. 1986)

Silica extender pigments obtained from natural sources have been used in various coating systems for some time. A brief review of the microcrystalline silicas available to the paint formulator is included for reference purposes. Cost reduction and sheen control are recognized as attributes of ground natural silica. Properties of the finer or micronized natural silicas, such as lower pigment abrasion and low oil absorption, are covered to indicate potential contributions to the traditional as well as new coating systems.

COLOR TOLERANCES IN AUTOMOTIVE PAINTS—H. Terstiege

Journal of Coatings Technology, 58, No. 735, 37 (Apr. 1986)

Existing color tolerances for non-metallic paints in the German automobile industry were investigated to achieve a compromise for tolerance fields in the chromaticity diagram. When paint is applied to a car on the production line or for touch-ups, color tolerances can be enlarged by a given factor. This concept involves the potential for measuring and controlling the color of the paint at the production line, which is now possible with new instrumentation.

SPECIFICATIONS AND CONFIDENCE LIMITS...ARE THEY RELATED?—E.L. Cairns

Journal of Coatings Technology, 58, No. 735, 43 (Apr. 1986)

The mathematical confidence limit is a useful tool to set achievable specifications. Statistics are calculated from a sampling of product history and describe the percentage of product which has fallen within various limits. Done properly, this method will serve to set reasonable specifications and provide information upon which gains in product uniformity can be made to the benefit of both supplier and purchaser.

Our special-purpose polymers make your formulating job easier.

General-purpose polymers require extra work by the formulator to overcome their limitations and come up with the exact properties and economics needed for a particular application.

Our "specials" do that additional work for you.

Polyvinyl offers the broadest line of special-purpose water-borne and solvent-based systems, each with the performance you need built right into the product itself.

These proven acrylic and urethane polymers are doing the job right now in such diverse applications as coatings, inks, adhesives, concrete sealers, furniture finishes and floor polishes.

With each polymer, our on-line data base can provide starting formulations to get you into production fast.

For more information, call (800) 225-0947 (in MA (617) 658-6600) or write Dept. GR2, 730 Main Street, Wilmington, MA 01887.

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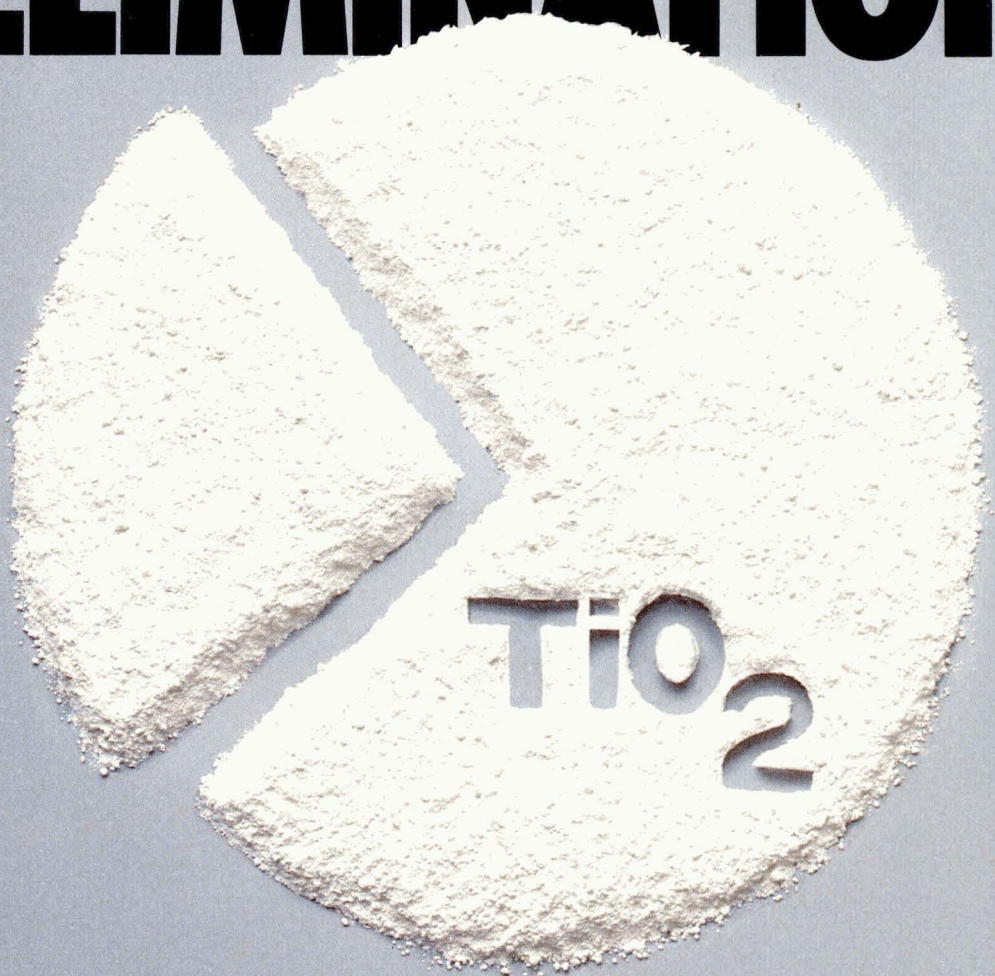
PROCESS OF ELIMINATION



New Ropaque® OP-62 cuts raw material costs.

Now there's a better way to beat the high cost of TiO_2 without sacrificing the performance or quality of your paints.

Introducing the revolutionary new opaque polymer, Ropaque OP-62.

Like its predecessor Ropaque OP-42, new Ropaque OP-62 provides all the benefits of your existing paint formulation, but at a lower raw material cost. And it does so without losing scrub and stain resistance or adhesion.

In addition, new Ropaque OP-62 provides up to 50% greater hiding efficiency than its earlier counterpart. That means you use even less TiO_2 in the formulation of your paints. And that reduction can save you an average 10-20¢ per gallon.

So if you're looking for ways to reduce the cost of raw materials in your paints, why not try the process of elimination. New Ropaque OP-62.

ELIMINATION OF PROCESS

New Ropaque® OP-62 is easy to formulate.

Until now, using an opaque polymer to supplement TiO_2 has been a time-consuming task.

But not anymore.

Introducing new easy-formulating Ropaque OP-62.

With Ropaque OP-62, there's no need to create and test a series of paints to convert each formulation. On the average, it takes just two steps to match the quality of your old formulation. It's that easy.

So try new Ropaque OP-62 in your next flat, sheen or semi-gloss paint. It's the opaque polymer to use for the elimination of process.

For more information, contact your Rohm and Haas technical representative. Or write our Marketing Services Department, Independence Mall West, Philadelphia, PA 19105.

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PHILADELPHIA, PA. 19105

Special Purpose Coatings To Be the Focus Of FSCT Seminar in Pittsburgh, May 13-14

"Special Purpose Coatings" is the subject of a one and one-half day seminar sponsored by the Federation on May 13-14 at the Sheraton Hotel at Station Square, Pittsburgh, PA.

Maintenance coatings systems formulated for definite end uses have become highly sophisticated and specialized. These coatings have been placed in the category of Special Purpose Coatings by the U.S. Bureau of Census, and as distinguished from architectural and industrial (OEM) coatings, have become the fastest growing group of all paints and coatings.

The seminar will explore the role of special purpose coatings, their importance, and what makes them different. Featured will be presentations by knowledgeable industry speakers on the application, inspection, performance, and generic composition of these products.

Program

Included in the program will be presentations on:

"Heavy Duty Maintenance Coatings Systems for Steel" (Types available, their properties and performance).

"The Maintenance of Bridges" (Application problems, types of coatings used and performance. The importance of bridge safety).

"Coatings Systems Specifications Development by the Steel Structures Painting Council" (Research & development).

"Traffic Marking Paints" (Types used, their application and performance properties).

"Marine Paint for Large Ships and Offshore Structures" (Types used, application procedures and performance properties).

"Aerosol Packaged Coatings" (Types available, their use and convenience).

"Automotive Refinish Coatings" (Present day auto refinishing systems, their performance properties).

"Fire Retardant Paints" (Where they are indicated, their application and importance).

"Inspection of the Finished Paint Job" (How to be certain that specifications have been followed).

"Special Coatings Systems for Meat and Food Packaging Plants, and Refineries and Petrochemical Plants" (To include other specialized maintenance requirements).

Speakers

Industry experts scheduled to speak include:

David R. Miller, Director of Coatings Operations, Redland-Prismo Corp., Canton, GA, will discuss the availability and performance of the many types of *Traffic Marking Paints*.

1986 Membership Directory Available from Federation

The 1986 Annual Membership Directory (Year Book) of the Federation of Societies for Coatings Technology (FSCT) is available.

Listed in the annual directory are the names, companies, addresses, and telephone numbers of the 7,000 Federation members by Society. The publication also provides an alphabetical index of members and includes informative details on Officers, the Board of Directors, Committee Members, and By-Laws.

The Year Book, included with membership in the Federation, is available to non-members for $20 per copy. To place orders, contact Ms. Meryl Cohen, Federation of Societies for Coatings Technology, 1315 Walnut St., Suite 832, Philadelphia, PA 19107, or call (215) 545-1506.

Bob Hill, Manager of Consumer Product Development, Rust-Oleum Corp., Evanston, IL, will speak on the use and convenience of *Aerosol Packaged Coatings*.

Dr. Bernard Appleman, Director of Steel Structures Painting Council, Pittsburgh, PA, will discuss coatings systems and *Specifications for Structural Steel Protection*.

An official of the Pennsylvania Dept. of Transportation, will discuss the problems of *Steel Bridge Maintenance and Safety*.

Kenneth Trimber, Vice-President, KTA Tator Associates, Pittsburgh, PA, will make a presentation on the mechanics of conducting an *Inspection of the Finished Paint Job*.

Bill Rains, Vice-President and Technical Director, Albi Div. of StanChem, Inc., E. Berlin, CT, will discuss the performance and use of *Fire Retardant Coatings*.

J. J. Bracco, Market Manager for Maintenance and Construction Coatings, Mobay Chemical Corp., Pittsburgh, PA, will discuss the features of *High-Performance Corrosion-Resistant Coating Systems*.

John White, Field Technical Manager, Devoe Marine Coatings Co., Div. of Grow Group, Inc., Louisville, KY, will speak on *Marine Coatings for Ships and Off-Shore Structures*.

Other industry experts will appear on the program to provide interesting and valuable information. Included will be three "Open Forum" sessions where speakers will answer questions from the audience.

Registration

To register, fill out accompanying form and return with payment to Federation of Societies for Coatings Technology, 1315 Walnut St., Suite 832, Philadelphia, PA 19107. Registration fee is $125 for FSCT members; $155 for non-members; after May 1, registration fee is $165 for everyone. (Payment must be in U.S. funds, payable in U.S. banks.)

Included in the registration fee is continental breakfast, luncheon, coffee breaks, and copies of talks, as well as bus transportation to airport at completion of seminar. *Please note reference to bus on registration form, and check appropriate box.*

Note: No refund for cancellations received after May 9.

Housing

Headquarters hotel is the Sheraton Hotel at Station Square, located at the doorstep of downtown Pittsburgh, overlooking the "Golden Triangle" area.

To obtain complete program information, contact Federation headquarters, 1315 Walnut St., Philadelphia, PA 19107; or telephone 215-545-1506.

SPECIAL PURPOSE COATINGS SEMINAR

REGISTRATION FORM

Registration fees: $125 (FSCT members); $155 (non-members)
$165 for everyone after May 1

Check must accompany registration form. Make checks payable to Federation of Societies for Coatings Technology. (Payment must be made in U.S. funds payable in U.S. banks.)

NICKNAME (For Registration Badge) _____

FULL NAME _____

JOB TITLE _____

COMPANY _____ PHONE _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

Name of Federation Society
Of Which You Are A Member _____

I will ☐ will not ☐ use the Federation bus to Greater Pittsburgh International Airport at conclusion of seminar.

No refund for cancelled registrations received after May 8.

Return form and check to: Federation of Societies for Coatings Technology
1315 Walnut Street, Suite 832
Philadelphia, PA 19107

IF YOU REQUIRE HOUSING AT THE SHERATON COMPLETE FORM BELOW

HOUSING FORM
Sheraton Hotel at Station Square

NAME _____

ADDRESS _____

CITY _____ STATE _____ ZIP _____

☐ Before 6 pm
Arrival Date _____ ☐ Late* Departure Date _____

Please reserve: Single _____ Room rate is $80 single and $90 double occupancy (per night)

Double/Twin _____

*Reservations will be held until 6:00 pm. If arrival is after 6:00 pm, hotel requires deposit for one night's lodging to guarantee availability. Make check payable to "Sheraton Hotel at Station Square."

Note: Reservations must be made no later than April 24 to guarantee availability and rates.

Return this form to: Federation of Societies for Coatings Technology
1315 Walnut Street, Suite 832, Philadelphia, PA 19107

Over 90% of Exhibit Space Reserved For Largest Paint Show in FSCT History

The Paint Industries' Show of the Federation of Societies for Coatings Technology will be held at the Georgia World Congress Center, Atlanta, GA, November 7-9, and will feature the products and services of the suppliers to the coatings industry. Currently, over 91% of available exhibit space is contracted and, with 6,000 industry personnel expected to attend, exhibit hours have been expanded to: 11:00 am – 5:30 pm, on Wednesday, November 5; 9:00 am – 5:30 pm, on Thursday, November 6; and 9:00 am – 3:00 pm, on Friday, November 7.

Technical Program

The 1986 Annual Meeting of the Federation will be held in conjunction with the Paint Industries' Show. The theme of the meeting, "Compliance and Quality: Recognizing the Opportunities," will focus on the emerging technologies (such as water-based, high-solids, and powder coatings) which are helping the industry meet regulatory requirements. Increased awareness and understanding of potential physiological and toxicological effects of coatings and their raw materials have spurred development of these technologies, which are also responding to increased expectations of quality products, processes, methods, and attitudes.

Program Chairman Percy Pierce, of PPG Industries, Allison Park, PA, and his committee are developing a schedule of presentations, and have announced planned sessions on:

- Powder Coatings
- Statistical Process Control
- Color
- Regulatory Compliance
- Manufacturing Seminar
- Mattiello Memorial Lecture
- Roon Awards Competition Papers

Hotels and Reservations

The Federation headquarters hotel will be the Atlanta Marriott Marquis. Other hotels which have reserved blocks of rooms are: Atlanta Hilton, Atlanta Marriott Downtown, Holiday Inn-Downtown, Hyatt Regency, Omni International, Ritz Carlton, and Westin Peachtree Plaza. All requests for housing must be furnished on the official housing form which will be mailed to all Federation members in April.

Special Air Fares

Delta Airlines, in cooperation with the Federation, is offering a special discount fare which affords passengers a 40% minimum savings off Delta's round trip, undiscounted day coach fares for those who travel to the Annual Meeting on Delta's domestic system. (For travel from Canada the discount minimum is 30%).

To take advantage of this discount, you must:

(1) Leave for Atlanta between November 1-6, 1986.

(2) Stay no longer than 15 days.

(3) Purchase tickets at least seven days prior to departure.

(4) Phone 1-800-241-6760 for reservations. Immediately reference the FSCT file number: U0235. (The special discount fares are available only through this number).

Please note that Delta also has a variety of other promotion fares, some of which may represent an even greater savings. When phoning for reservations, please ask for the best discount available to your itinerary.

If a travel agent is used, they should place the reservation through the toll-free number to obtain the same fare advantages.

To assist attendees, Delta will maintain a transportation desk at the World Congress Center during the Federation's Annual Meeting.

Program Committee

Assisting Dr. Pierce in developing the Annual Meeting technical program are the following members of the Program Committee: *(Vice-Chairman)* William A. Wentworth, of Jones-Blair Co., Dallas, TX; Granville D. Edwards, of Shell Chemical Co., Houston, TX; Loren W. Hill, of Monsanto Co., Springfield, MA; Thomas Hill, of Pratt & Lambert, Inc., Buffalo, NY; George R. Pilcher, of Hanna Chemical Coatings Co., Columbus, OH; Ralph Stanziola, Color Consultant, Bridgewater, NJ; and Robert Thomas, of PPG Industries, Inc., Barberton, OH.

Host Committee

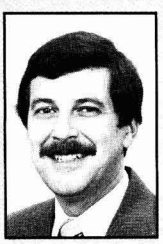
The Southern Society will serve as the Host Society for the 1986 Annual Meeting. General Chairman, James E. Geiger, of Sun Coatings, Largo, FL, will be assisted by the following committee personnel: *Program Operations*—Thad T. Broome, Precision Paint Corp., Atlanta, GA; *Registration*—Ronald R. Brown, Union Chemical Div., Charlotte, NC; *Federation Exhibit*—Dan M. Dixon, Engelhard Kaolin Co., Gordon, GA; *Information Services*—Bergen C. Justen, Justen & Associates, Tampa, FL; and *Spouses' Activities*—Lynne Geiger.

NPCA To Meet Same Week

The National Paint & Coatings Association will hold its annual meeting on November 3-5, at the Atlanta Hilton Hotel. Persons wearing NPCA registration badges (and who sign up at a special FSCT registration desk) will be admitted to the Paint Show on Wednesday only, with the compliments of the Federation.

Robert F. Ziegler Appointed Executive Secretary of Federation

William Mirick, President of the Federation of Societies for Coatings Technology, has announced the appointment of Robert F. Ziegler to the position of Executive Secretary. He will assist Executive Vice-President Frank J. Borrelle in staff management of the increasing business affairs and activities of the Federation. Mr. Ziegler's current responsibilities as Editor of the JOURNAL OF COATINGS TECHNOLOGY and Assistant Manager of the Paint Industries' Show will continue.



Mr. Ziegler joined the Federation staff in 1976 as Assistant Editor of the JCT. He was promoted to Editor in 1980 and Assistant Paint Show Manager in 1985.

Mr. Ziegler served in the U.S. Naval Reserve from 1965-71. He received the B.S. Degree in Journalism from Temple University in 1976.

Bob and Elaine Ziegler, and their daughter, Erin, live in Coatesville, PA.

INNOVATIVE PHTHALOCYANINE BLUES

DEVELOPED FROM EXPERIENCE

PIGMENT heubach INNOVATIONS

HEUCOPHTHAL -BLUE

BRIGHTER CLEANER STRONGER

BT 591 D – RED SHADE
(α/ BLUE 15)
BT 698 D – RED SHADE NC/NF
(α/ BLUE 15 : 2)
BT 583 D – GREEN SHADE
(β/ BLUE 15 : 3)
BT 617 D – GREEN SHADE NC/NF
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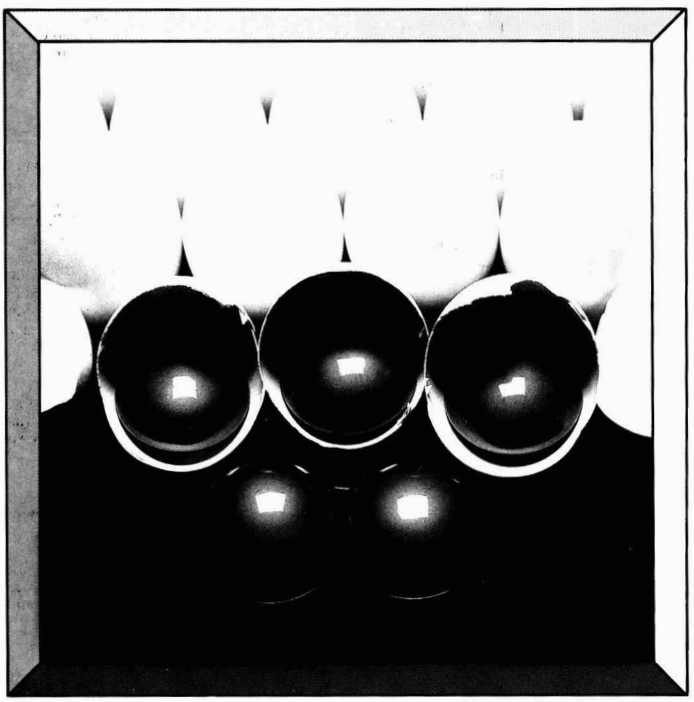

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CasChem

Witco Opens Surfactant Lab to Serve Growing Emulsion Polymerization Market

The Organics Division of Witco Corporation, New York, NY, has established a new laboratory devoted exclusively to surfactant technology for emulsion polymerization.

Located at one of the Division's technical centers in Chicago, the new laboratory is adapting existing surfactant systems and developing new products to satisfy precise end-use requirements. A major part of its program involves problem-solving assistance to companies that are seeking to improve their emulsion polymerization systems.

The laboratory works with a number of different polymers (acrylics, polyvinyl acetate, polyvinyl chloride, and styrene butadiene rubber) and draws from a broad range of surfactants supplied by the company, including alpha olefin and other sulfonates, phosphate esters, sulfosuccinates, sulfates, sulfonic acids, and specialty ethers and esters.

Development work is supported by the capabilities of adjoining synthesis and analytical laboratories where compounds are created and measured with sophisticated testing equipment. The laboratory is also equipped with an on-site pilot plant containing reactors capable of making one-gallon and two-drum batches for scale-up evaluation.

Hercules Realigns Product Groups

Hercules Incorporated, Wilmington, DE, has realigned two product groups in its Specialty Chemicals Company to provide more specialized service to its varied markets. The realigned units are organized as the Water Soluble Polymers group, headed by Vice-President Leroy V. Peiffer, and the Coatings and Additives group, managed by Vice-President W. Wells Hood, Jr.

Application areas for products supplied by these groups include the paint, paper, oilfield, pharmaceutical, cosmetic and toiletry, food, and rubber industries.

Degussa Initiates Operation At Applications Research Lab

Degussa Corporation, Teterboro, NJ, recently started operations at a new Applications Research and Technical Service Laboratory in Allendale, NJ. The 21,000 sq ft facility includes offices, labs, and pilot plant areas. Among the functions to be performed at this installation are analyses, customer formulations and product testing, quality control, new product applications, and technical support for the firm's chemical, pigment, amino acid, hydrogen peroxide, and feed additive products.

Completion of construction modifications, equipment installation, and staff assignment is expected by year's end.

United States Testing Company, Inc. Granted Accreditation by Bureau of Standards

The Chemical Services Division of the United States Testing Company, Inc., Hoboken, NJ, has been granted a certificate of accreditation by the National Bureau of Standards under the provisions of the National Voluntary Laboratory Accreditation Program for selected paints and related coatings and materials test methods.

To receive accreditation, U.S. Testing submitted a detailed application, was inspected by a representative of the Department of Commerce, maintained a laboratory quality control system, and conducted a proficiency testing program on reference paint samples provided by the National Bureau of Standards. The Chemical Services Division is accredited for 74 ASTM and two Federal Standard test procedures for paint and related coating materials. These test methods include flash point, viscosity, gloss, film thickness, abrasion, chipping, fire-retardance, adhesion, many performance procedures, measurement of chemical properties, salt spray, and a number of other accelerated aging procedures.

Additional information, including a four-page brochure entitled "Evaluation of Paints and Coatings," is available from Chemical Services Division, United States Testing Company, Inc., 1415 Park Ave., Hoboken, NJ 07030.

Farboil Sells Business Unit To Valspar

In order to expand its capacity for the rapidly growing commercial decorative powder coatings products, Farboil Co., of Baltimore, MD, has sold its marine coatings division to The Valspar Corp., Minneapolis, MN.

Through the transaction, Valspar obtains formulations but no production facilities. The coatings will be manufactured by Valspar at its own Baltimore plant, and sold by Valspar under the Farboil trade name.

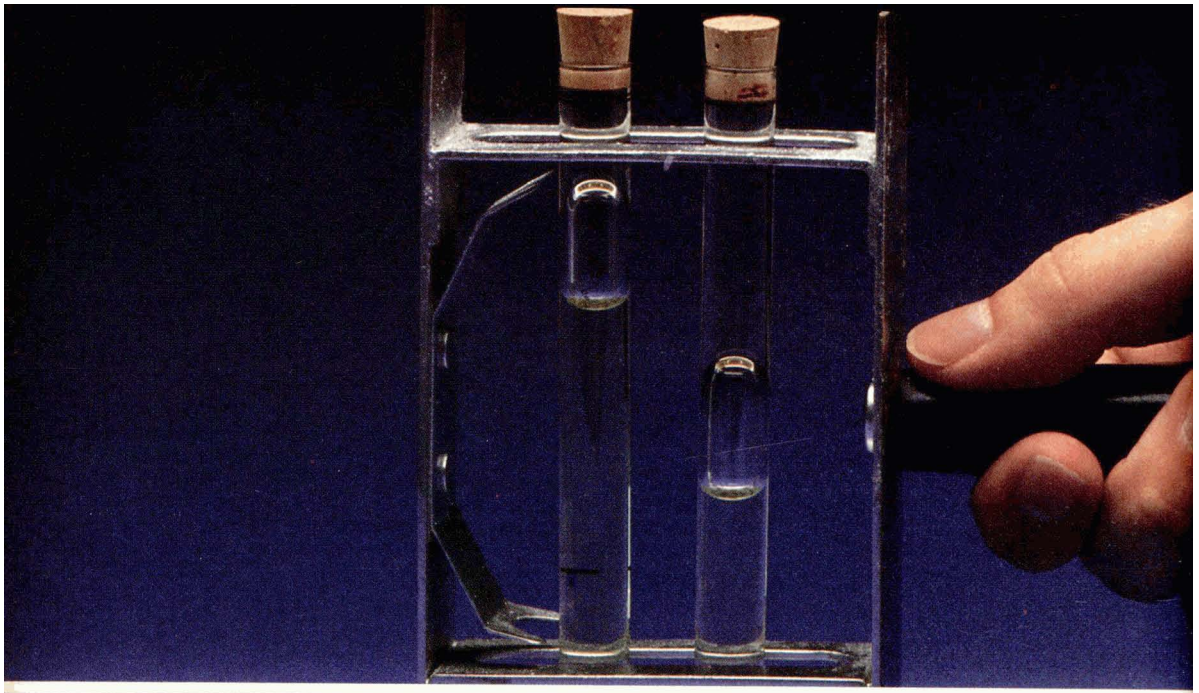
Farboil will continue to produce powder and other coatings and adhesive products at its facilities in Baltimore. "Marine Coatings no longer fit into Farboil's strategic plan which is focused on value-added products such as special-purpose coatings formulations that are backed by strong technical service and customer assistance," stated Harry C. Wechsler, President of Farboil.

Pantone Establishes Color Institute

To study the psychology of color and the color preference process, Pantone Color Institute, New York, NY, has been established. The Institute plans to provide studies and research to industries and consumers worldwide on topics concerning the psychology of color, societal color trends, and how individuals interact with color on a daily basis and its overall impact.

According to Lawrence Herbert, President and Chief Executive Officer of Pantone, Inc., "The Pantone Color Institute is designed to serve the color needs of the printing, publishing, packaging, architecture, industrial, interior design, fashion and beauty industries." Mr. Herbert has named Leatrice Eiseman Executive Director of the newly formed Institute. An advisory board of industry experts will contribute input and direction.

Projects slated for the Institute include a quarterly newsletter, an annual awards program, a monthly column, and the formation of a research panel.



CIBA-GEIGY epoxy resins and the winning battle against VOC's.

With their lower viscosity, these two unique epoxy resins significantly decrease your need for solvent or diluent.

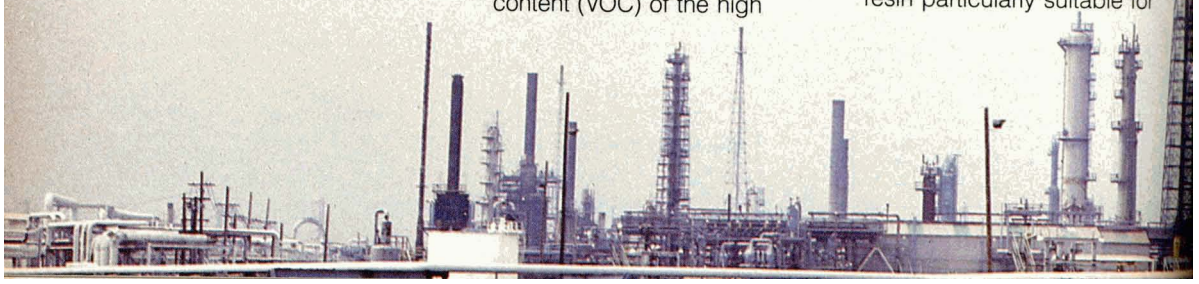
Their names are Araldite® XU GY 281 and Araldite XU GY 308. Two new products from the leading supplier of specialty resins and hardeners. Two new products you will want to use to decrease the volatile organic content (VOC) of the high performance coatings you formulate for heavy duty service in such applications as petroleum refineries, tank linings, pulp and paper mills, industrial plants and the like.

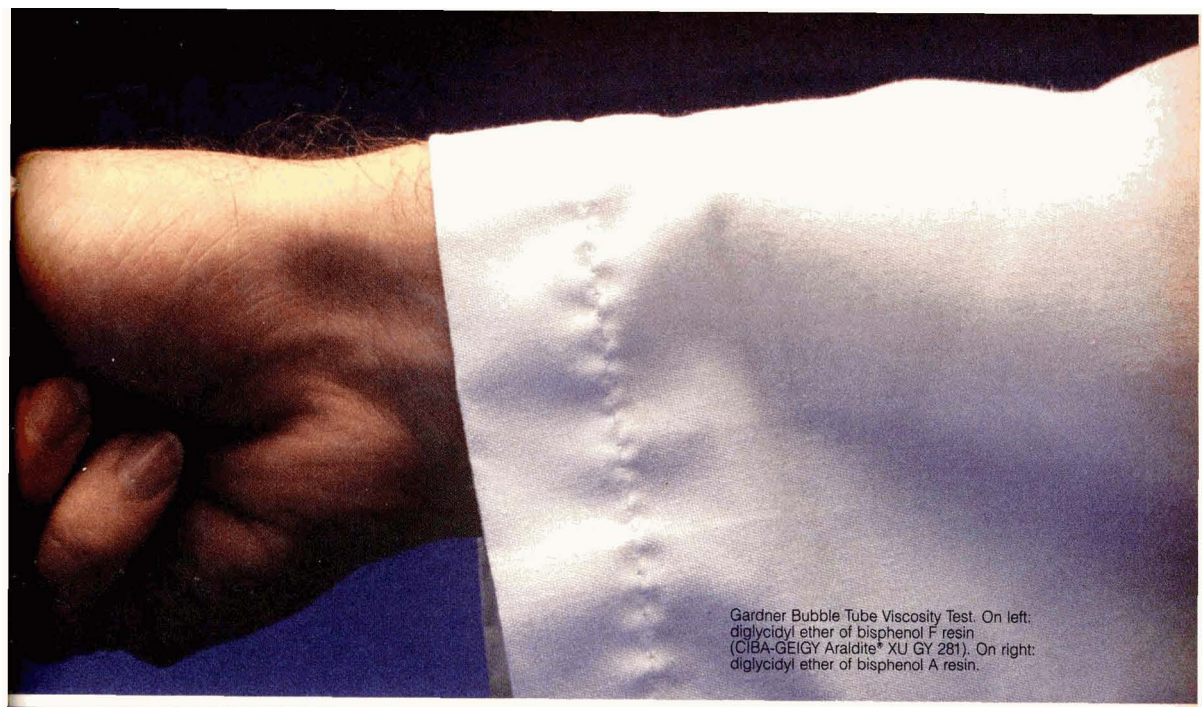
These new epoxy resins from CIBA-GEIGY for low VOC coatings let you maintain high performance without adding unnecessary solvents or diluents.

Less diluent, less cost.

Adding solvent to a coating formulation can have a negative performance effect. Adding diluents can increase cost. The low viscosity of Araldite XU GY 281 and Araldite XU GY 308 reduces the need for solvents or diluents, and provides you with another major victory in the battle to solve the VOC problem.

Araldite XU GY 281 is an unmodified bisphenol F epoxy resin particularly suitable for





Gardner Bubble Tube Viscosity Test. On left: diglycidyl ether of bisphenol F resin (CIBA-GEIGY Araldite* XU GY 281). On right: diglycidyl ether of bisphenol A resin.

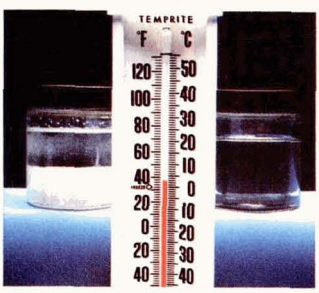
solventless and high solids coatings and linings requiring superior chemical and corrosion resistance. It also has outstanding resistance to solvents, excellent mechanical properties and conforms to 175.300 of the FDA Register.

XU GY 281 Typical Properties

Visual Appearance	Clear
Color, Gardner	3 max.
Viscosity, cP @ 25°C	5,000-7,000
Weight per Epoxide	159-172
Hydrolyzable Chlorine	0.2 max.
Volatile Content, %	0.2 max.
Pounds per gallon	10

An extra added attraction.

Araldite XU GY 308 is our second new low viscosity liquid epoxy resin. It has all the major properties of Araldite XU GY 281. And one that's unique. That uniqueness is its resistance to crystallization under normal conditions, making it easy to handle and process. As you are well aware, most low viscosity, pure epoxy resins change to a waxy white solid if left unused at low temperatures. That means heat must be applied before using. And heating a 55-gallon drum or a whole tank car is no easy task. Araldite XU GY 308's resistance to crystallization can, therefore, save you time, energy and money.



Clear epoxy resin (right), Araldite XU GY 308, resists crystallization at low temperatures.

Special solutions for special problems.

At CIBA-GEIGY, we have built a reputation as the leading supplier of specialty resins and hardeners. And we can offer the technological skill required to meet and solve the special problems that arise in formulating high performance coatings. One problem is the adverse impact of the VOC from coatings based on traditional epoxy resins. And our new products, Araldite XU GY 281 and Araldite XU GY 308, can help alleviate that problem by reducing the use of solvents and diluents in coatings. Both products, of course, come with the technical support for which we are also widely regarded. Call Rob Crespi at 800-431-1900 (in New York 914-347-4700). Or write Plastics Department, CIBA-GEIGY Corporation, Three Skyline Drive, Hawthorne, New York 10532.

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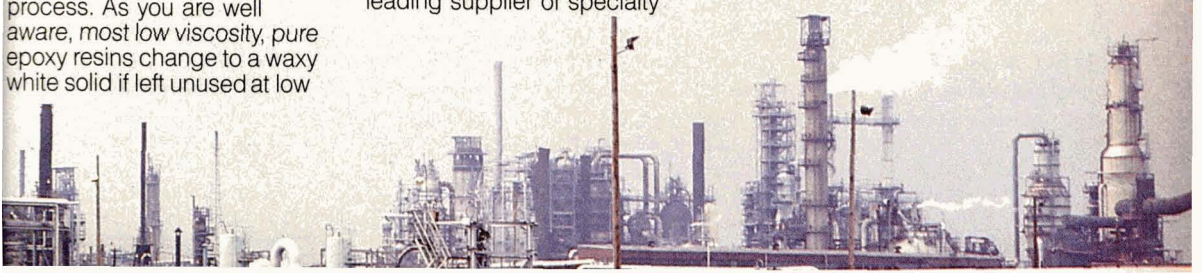
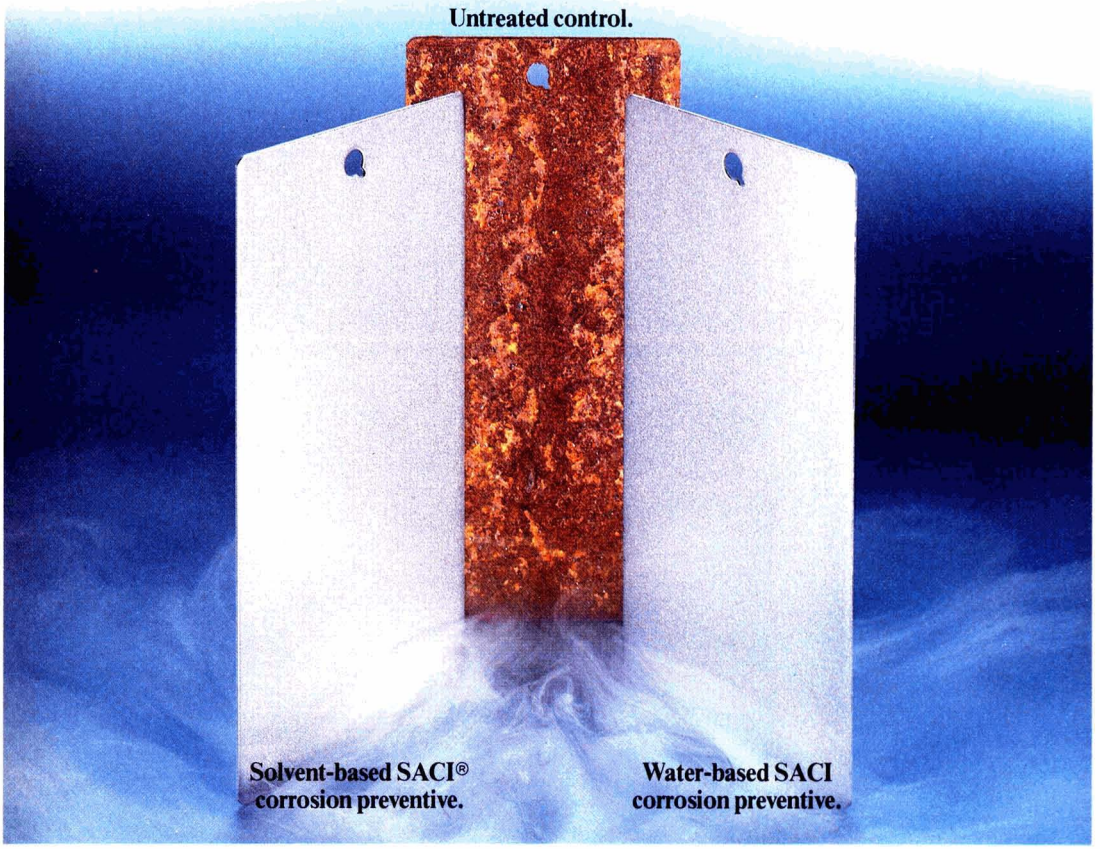


Now, a water-borne corrosion preventive that really works!



SACI water-borne corrosion preventives reduce your emission levels substantially, without reducing your product's performance. That's because SACI water-bornes have better corrosion protection, stability and a higher solids content than other water-borne formulations.

So you get corrosion protection which, in most cases, is as good as that provided by solvent-based products. In fact, the panels in the photo were used in a salt fog test. And our water-borne did as good a job as our outstanding SACI solvent-based concentrate.

Two versatile products.

SACI-450W Base is a high-solids formulating concentrate. Used alone, it yields highly-protective oily films which dry in 90 minutes.

SACI-445W is a semi-formulated product which can be used as is, to yield a moderately firm waxy film. Or you can formulate it further to get the exact properties you need.

In fact, both 450W Base and 445W can be formulated with virtually any combination of water-borne resins, latices or other additives.

Of course, if you need the properties of solvent-based formulations, we have a broad line of proven SACI concentrates to choose from.

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For more details, contact: Sonneborn Division, Witco Corporation, 520 Madison Ave., New York, NY 10022-4236. Or call 212-605-3903.

Witco

Laser Interferometry Method For Internal Stress Measurement in Coatings

R.N. O'Brien and W. Michalik
University of Victoria*

A novel method of measuring the internal strain developed in drying paint is presented. As usual the paint is applied to a metallic strip of known dimensions and modulus. The drying paint causes bending of the plate as stress develops in the paint. A small mirror attached to the end of the plate is one part of a modified Michelson laser interferometer. The number and spacing of the fringes in the mirror changes as the mirror moves to reduce the light path and change the angle of reflection. Great accuracy can be obtained by projecting the fringes for viewing at a distance, by using lengthy plates, by using plates with a lower modulus and thicker paint films. The apparatus is inexpensive and can be easily stored when not in use.

INTRODUCTION

In spite of its importance a relatively small number of investigations have been carried out in the field of internal stress in plastic materials and inorganic coatings.[1-30]

It is well known that during film formation and the drying process coatings tend to shrink. This shrinkage may be accommodated by a weaker substrate or may lead to cracking, partial adherence or detachment. There are many factors which may affect that shrinkage, such as type of vehicle, type of pigment, presence of filler, type of solvent, and percent of solids in one component, non-polymerizing paints. In polymerizing paints, the conditions are further complicated by the presence (usually) of catalysts and shrinkage on polymerization.

Most of the cited studies are of a qualitative nature and some of the equations used to calculate the internal stress in coatings are of debatable validity according to Perera.[30] Among the methods of measurement of the internal stress in coatings a representative sample is included in the following: photoelasticity,[9-12] stress gauge,[12] and cantilever (beam and plate).[1-8, 21-31]

THEORY

The cantilever method has been used for some years to measure stress developed in inorganic coatings[1-8] and organic coatings stress studies. The cantilever method was extended by Corcoran[25] for organic coatings and since has become the most frequently used method. The theory is developed from plate theory, rather than the beam theory of Brenner, and Senderoff,[31] and Sanzharovskii.[21] Corcoran's theory has recently been applied with excellent effect by Perera's group.[30]

Following Corcoran,[24] the internal stress can be calculated from the equation

$$S = \frac{dEt^3}{3CL^2(t+C)(1-v)} + \frac{dE_c(t+C)}{L^2(1-v_c)} \quad (1)$$

where d is the deflection of the cantilever plate substrate, E is the elastic modulus of the cantilever plate materials, L is the length of the cantilever plate substrate between the point at which it is clamped and the point at which deflection is measured, E_c is the elastic modulus of the coating, v is the Poisson's ratio of the cantilever plate substrate, v_c is the Poisson's ratio of the coating, C is the thickness of the coating, and t is the plate thickness.

The elastic modulus of a steel substrate is about two orders of magnitude greater than that of most organic coatings, thus the last term in the expression can be eliminated without introducing an error greater than 1%. There are, of course, some occasions when the complete expression must be used (such as high strength fiber reenforcement of the coating, or absolute accuracy requirements) and then it is necessary to know the exact (or a

*Dept. of Chemistry, P.O. Box 1700, Victoria, B.C. V8W 2Y2, Canada.

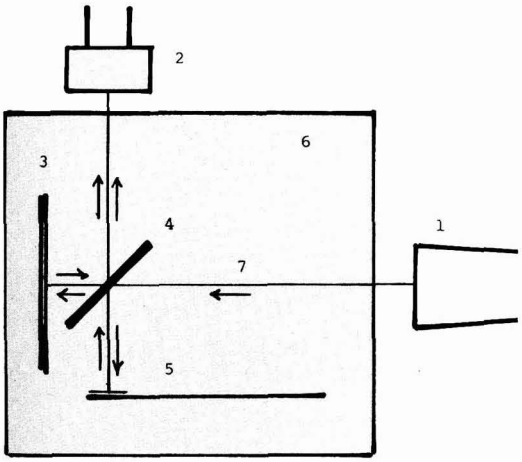

Figure 1—Schematic of the apparatus. The parts are: (1) He Ne laser of nominal 1 mW power; (2) camera, usually 35 mm and video; (3) first surface mirror; (4) beam splitter, 50% reflecting glass flat; (5) the plate or beam with coating, glued on end mirror; (6) stand, a flat metal plate arranged to support the optical parts; (7) the optical path

good estimate of) value of E_c, the elastic modulus of the coating, which can be obtained from an expression found in Corcoran.[25]

The error in internal stress measurement is caused mainly by the uncertainties of d (deflection), t (plate thickness), and C (coating thickness), and the clamping effect. According to Perrera and Eynde,[30] S becomes practically independent of L for L greater than 8 cm. For L less than 8 cm the error introduced can be more than 9%.

The principal aim of this paper is to present the laser interferometry method (following a Letter to the Editor in effect announcing the method[32]) for measuring internal stress in coatings with very high precision. The deflection "d" of the cantilever plate caused by the development of internal stress in the coating during drying can be measured interferometrically using the apparatus shown in *Figure* 1, which is a schematic diagram. A photograph of the apparatus appeared in the letter.[32] *Figure* 2 shows two interferograms taken two days apart. The distance between the fringes can be calculated by counting the fringes appearing in the mirror's image and dividing by the mirror's appropriate dimension. Or since it is the ratio that is needed, simply counting fringes as was done for *Table* 1.

Table 1—Internal Stress Measurement Laser Interferometry Method

t Minutes	Number of Fringes, Mirror 1	Fringe Shift	Deflection d(mm × 10^2)	Number of Fringes, Mirror 2	ΔN $n_t - n_o$	Deflection d(mm × 10^2)
0	17	0	0	14	0	0
4	17	0	0	14	0	0
7	18	1	0.063	14	0	0
14	18	1	0.063	15	1	0.063
20	19	2	0.126	16	2	0.126
40	19	2	0.126	17	3	0.190
70	22	5	0.316	19	5	0.316
128	27	10	0.63	25	11	0.696
200	31	14	0.885	27	13	0.822
300	33	16	1.01	29	15	0.948
400	34	17	1.08	29	15	0.948
520	34	17	1.08	29	15	0.948
600	34	17	1.08	29	15	0.948

Maximum $S_1 = 3.87$ MPa
Maximum $S_2 = 3.41$ MPa
Paint: Swiftsure Marine Enamel
Cantilever: stainless steel strip
length = 75 mm width = 8 mm thickness = 0.485 mm

The change in spacing is proportional to a change in path length between the mirror cemented to the plate and the detector (camera) compared to that from the mirror to the camera in what is essentially a Michelson interferometer with division of amplitude, the path length varying regularly along the cemented mirror.

The bright fringes in the interferogram are formed by conditions:

$$(N + \tfrac{1}{2})\lambda = 2\,nt\cos\theta \qquad (2)$$

where N is the order of interference, n is the refractive index (of air), t is the thickness of the air wedge between the mirrors, λ is the wave length of light, and θ is the angle of incidence of the light to the surface of the mirrors.

The refractive index of air is close to 1 and care should be taken that it does not change. But since the temperature or air composition do not vary appreciably this is a simple requirement in most laboratories.

The basic formula for dark fringes is:

$$N\lambda = 2\,nt\cos\theta \qquad (3)$$

The calculation of d, the deflection, is simpler. The number of fringes in the mirror cemented to the plate, which is 17 at the beginning of the run, (*Table* 1 and *Figure* 1), denotes the opposite side of a very thin triangle whose angle (opposite the opposite side) is much less than 1° of arc and therefore the side opposite to the angle ≃ the angle. The side can be calculated to be 17 × the wave length of the laser light, i.e., $17 \times 6.328 \times 10^{-4}$ mm = 1.075×10^{-2} mm or 4.24×10^{-4} in., or about .0004 in. After 600 minutes the fringe shift was steady (*Figure* 2 (b) is after two days) at 34 or 17 extra fringes had appeared or the small angle had doubled to just under 1° of arc or the mirror had moved to open the angle under the strain imposed by the drying coating on the obverse side of the steel plate. The maximum movement is again calculated to be 1.075×10^{-2} mm.

The angle of the fringes remains constant during the contraction of the paint film showing that the angle of twist to the plate has remained constant, or the paint film is both uniform in thickness and stress. The fringe system in *Figure* 1 would be more impressive if the steel strip had been straightened (a slight twist has given the diagonal fringes) but this is difficult to do and does not affect the results as long as the angle of the fringe system does not change.

The path difference or cantilever plate deflection "d" is calculated from the equation by simple trigonometry.

The wedge angle between the two mirrors is calculated by assuming a simple uniform air wedge, with the opposite side being the number of fringes in the mirror divided by the mirror length multiplied by the plate length. For each increment in time and increment in number of fringes, d can be calculated as in *Table* 1.

EXPERIMENTAL

The apparatus used was an interferometer related[33] to the Michelson called by Tolansky a "Twyman-Green" interferometer. The parts of this optical set-up for measuring the deflection d of the cantilever plate substrate as shown in *Figure* 1 consisted of a He-Ne Laser, Spectra-Physics Model 132, Nikon camera, shim-stock stainless steel, an aluminized microscope coverslip, beam splitter (½ silvered glass flat), and first surface mirror.

The interference patterns are obtained by adjusting the mirror so that the light reflected from the coverslip mirror cemented to the plate strikes the mirror at an angle of incidence very close to 90°. As the coating solidifies, the path length changes by deflection of the plate causing a change in angle in the optical air wedge between the two mirrors and hence a change in N the order of interference and so also the distance between fringes.

The substrate was stainless steel 75 mm long, 8 mm wide and 0.485 mm thick. The actual free length (not clamped and unencumbered by the mirror) was 50 mm, despite Perera's warning mentioned above.[30] Since the error is a maximum at effectively zero length and can be expected to decrease in a curve assymtotic to increasing length of plate and essentially zero at 80 mm, it can be argued that the error in our 75 mm beam (50 cm without mirror, 62 mm with mirror) will be at least less than ½ of 9% and probably at the order of 1%.

The use of a thinner cantilever plate is recommended to increase the accuracy and precision of measurement, i.e., a plate of one half the thickness should give almost (about 8 times) an order of magnitude more deflection and hence fringes to count. At some level of thickness it would be necessary to build a special acoustic shield to eliminate acoustic interference and also eventually to shield the apparatus from air currents.

The substrate was coated by brush with an enamel of 38% solids (soya alkyd) and a cyclo alkyl commercial solvent of a white (for tinting) marine enamel.* The coating thickness was measured after two days by micrometer. The original apparatus was designed to hold up to three metal strips at once. We believe that perhaps as

*(Swiftsure Marine Enamel, manufactured and kindly supplied by Dicker-Martens Paint Co., Victoria, B.C.).

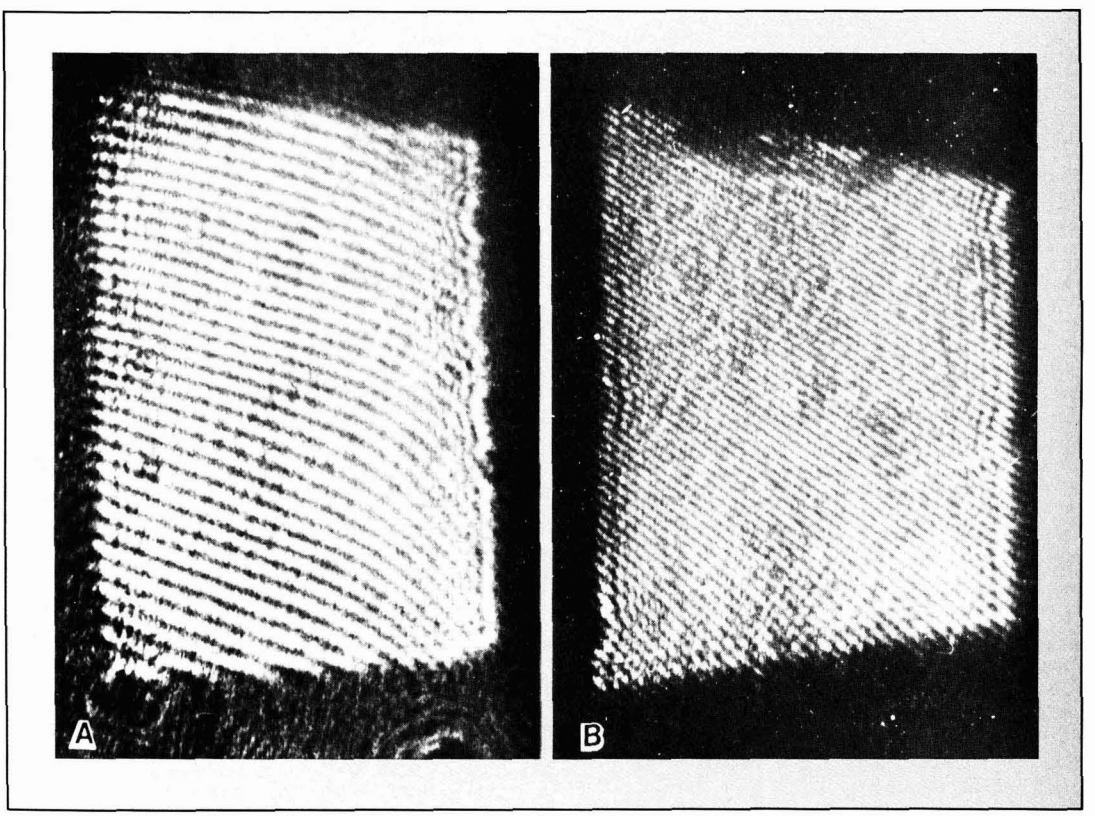

Figure 2—Two interferograms: (A) obtained at the beginning of the experiment; (B) obtained two days later

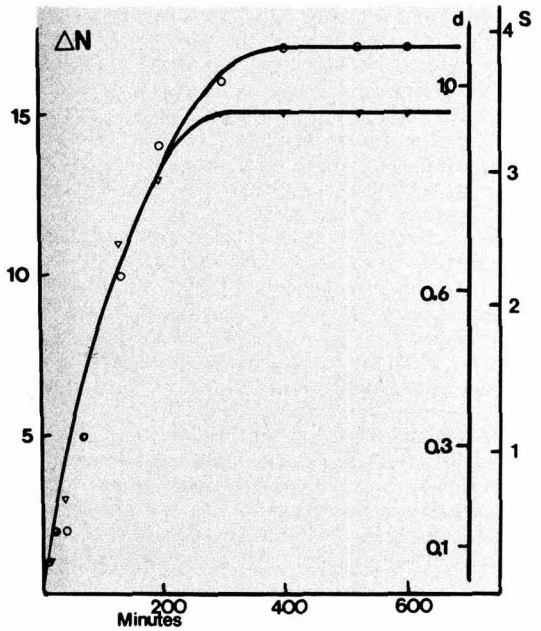

Figure 3—Results of fringe counting *(Table* 1) plotted as ΔN, the fringe shift vs time in minutes and on the right side as the deflection, d, as hundredths of a mm (0.01 mm) and the strain (S) in MPa

many as 10 strips could be accommodated at once. We measured only two each time because of the convenience of using pre-cut strips and coverslips. For a permanent laboratory set-up, a video cassette recorder and camera are recommended with screen labelling rather than a still camera. Both were used in this work.

RESULTS AND CONCLUSIONS

The development of internal stress in coatings is expressed as the change of the order of interference (or more simply the fringe separation or, in *Table* 1, the fringe shifts) with time and is shown in *Figure* 3. After the drying process the thickness of these two coatings was measured at 60.9 microns and 53.7 microns, respectively. The ratios of the thickness of the coatings 60.9/53.7 = 1.134 and that of the change in fringe count 17/15 = 1.133 at ± 0.05% are satisfactorily close together.

The results in *Table* 1 where the stress S found was 3.87 and 3.41 MPa (±6%) are to be compared with Perera's results[34] where maximum values of about 1 MPa were reported for latex and about 1.5 MPa in thermoplastics. None of these results are strictly comparable, indicating a need for further research in internal stress.

These experiments were done to show that the interferometric method is feasible. The two experiments reported varied by ~ 12%. It is predicted that with better thickness measuring, more fringe shift, and longer experience the reproducibility should be ~ 1%.

The following conclusions can be drawn: the thicker film takes longer to reach the maximum change in the order of interference ΔN, i.e., greater deflection; the use of special protection against vibration will increase the precision of "d" measurement as vibration can blur the fringes; this interferometric set-up can be miniaturized to give a very useful tool for the examination of internal stress in coatings especially if used with a video recorder and the consequent electronic magnification of about ×50; and, the complete experimental set-up is compact, easily broken down, and should cost less than $5,000. Other optical arrangements can be used, such as a photomultiplier to count the fringes as they appear[36] or to allow the fringes to be projected to a distant wall and the fringes counted as they pass a fiduciary mark, etc.

ACKNOWLEDGMENT

We thank the National Science and Engineering Research Council for support of this project and S. Visaisouk and A. Langlais for help in the initial experimental stages.

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APPENDIX

Using Corcoran's simplified formula to avoid requiring the modulus and Poisson's Ratio of the coating (which we believe will introduce less than 1% error) S is calculated using results from plate 1 (Mirror 1, *Table* 1).

$$S = \frac{dEt^3}{3CL^2(t+C)(1-v)}$$

$d = 4.24 \times 10^{-4}$ in (1.075×10^{-2} mm)
$c = 2.40 \times 10^{-3}$ in (6.09×10^{-2} mm)
$L = 2.54$ in (50 mm)
$t = .020$ in (0.508 mm)
$E = 28 \times 10^6$ lb in^2 (1904761.9 atm $= 18.7985$ Pa)
$v = 0.33$

$$S_1 = \frac{1.075 \times 10^{-5} \times 18.8 \times (5.08 \times 10^{-4})^3}{3 \times 6.09 \times 10^{-5} \times (5 \times 10^{-2})^2 (0.0224)(0.67)} = \frac{2.65 \times 10^{-14}}{6.8549 \times 10^{-9}} = 3.87 \text{ MPa}$$

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Natural Silicas in Coatings

Walter J. Polestak and Thomas D. Thompson
Georgia Kaolin Company, Combustion Engineering, Inc.*

Silica extender pigments obtained from natural sources have been used in various coating systems for some time. A brief review of the microcrystalline silicas available to the paint formulator is included for reference purposes. Cost reduction and sheen control are recognized as attributes of ground natural silica. Properties of the finer or micronized natural silicas, such as lower pigment abrasion and low oil absorption, are covered to indicate potential contributions to the traditional as well as new coating systems.

INTRODUCTION

Natural silicas as a group are used as pigments, extenders, and fillers in various paint systems. There are several commercial types available and they are usually processed from various silica sources such as soft, friable siliceous rock, crushed sand, quartz sand, and marine organisms.[1] These natural grades of silica have been described or referred to as amorphous, crystalline, cryptocrystalline, ground, diatomaceous, tripoli, novaculite, powdered, soft, or silica flour.[2-5] There are some differences to be found within the natural silicas and they relate to origin, quality, morphology, crystallinity, and method of processing. However, the one distinction common to all is their chemical composition, namely silicon dioxide.

The name silicon dioxide describes the stoichiometry rather than the structure of the material.[6] The structural units of silica are three-dimensional network structures built of tetrahedral groups of four oxygen atoms surrounding a central silicon atom. Each oxygen atom, however, is shared between two silicon atoms. In this way, the tetrahedral groups are linked by having common corners, thus giving an average stoichiometry SiO_2. Because the linkage patterns for each polymorph are different, there is a difference in the form's crystal structure and properties.[7]

Given that the natural silicas offer some diversity in structure and properties, our discussion will be limited to the quartz polymorphic SiO_2 types found in Southern Illinois. This friable microcrystalline silica is commonly known in the trade as tripoli or "amorphous" silica. Comments subsequently made about the performance and properties of this silica type in paint systems are also considered to be essentially true for the other crystalline varieties which are low in oil absorption and low in surface area.

MICROCRYSTALLINE SILICA

The following lists some of the important mineral and geological characteristics and features of Southern Illinois microcrystalline silica.

Occurrence and Processing

Tripoli is the general name for a number of very fine-grained, lightweight, minutely porous, friable and light-colored siliceous minerals.[8] It is believed to be the end product of weathering and leaching of siliceous limestones wherein all of the carbonate is removed. There are two distinct types of tripoli found in the United States; that from Southern Illinois and that from the Missouri-Oklahoma border area. Illinois tripoli is whiter, harder, and heavier than the Missouri-Oklahoma type, and it is also finer-grained.

Tripoli is mined by both open-pit and underground (room and pillar) methods. This crude silica is hauled from the mine and stored in surge sheds. When needed it is sorted, crushed in hammer mills, and then dried in a fluid-bed dryer.[9] Coarse products are made by grinding in a ceramic rod mill and then separated by air-float classification. The finer or micronized grades are milled by self-attrition using compressed air or steam. Control of key

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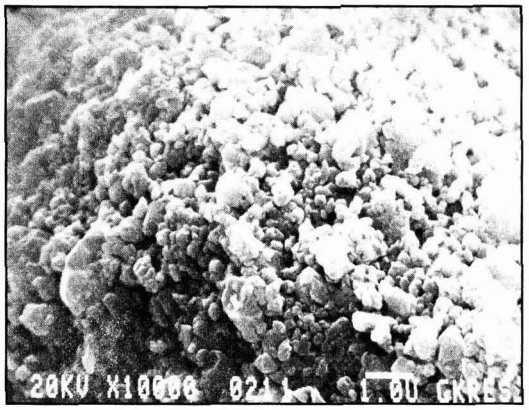

Figure 1—Scanning Electron Photomicrograph of a fine ground, commercial grade of microcrystalline silica. Note smooth, round surfaces of disaggregated particles

properties, particularly color, is achieved by selective mining and blending.[9]

Chemical and Physical Properties

A typical chemical analysis is given in *Table* 1.[10] The impurities encountered are the red to yellow iron oxides, aluminous clays, and additional miscellaneous minerals. Color variations are usually the result of iron oxide deposited from percolating surface waters.

Table 2 lists the typical physical data of coarse (air floated) and fine (micronized) grades of microcrystalline silicas.[10] The oil absorption values of the silicas are low and it is interesting to note that they change very little in going from the coarse pigments to the very fine.

Morphology and Crystallinity

Microscopic examinations (SEM) of classified or pulverized tripoli and of ground quartz sand particles reveal morphological differences. The microcrystalline material shows round smooth edges, reveals surfaces considered

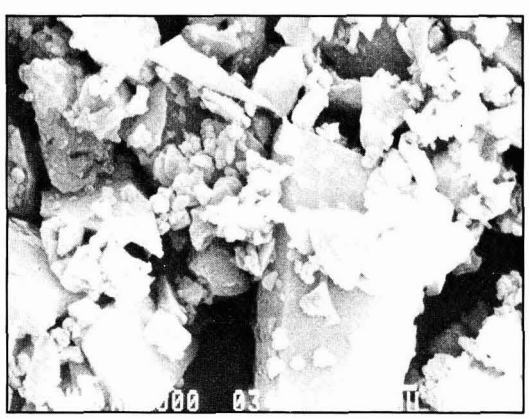

Figure 2—Scanning Electron Photomicrograph of a ground, commercial crystalline quartz. Note the sharp and fractured surfaces

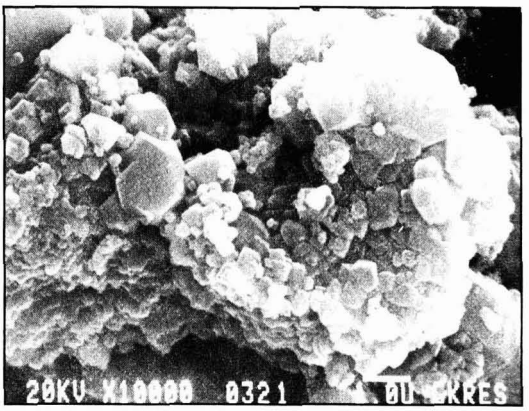

Figure 3—Scanning Electron Photomicrograph of a coarse, air-floated commercial grade of microcrystalline silica showing loosely bonded aggregates

to be original (at the time of formation), and appears to be disaggregated rather than fractured (*Figure* 1). On the other hand, the ground crystalline quartz material appears to be fracture fragments of larger particles with sharp edges and fresh surfaces (*Figure* 2).

The friable microcrystalline silica is a rather loosely bonded aggregate of exceptionally small silica crystallites that average from 0.1 to 0.5 μm in diameter (*Figures* 3 and 4). The relative ease of milling the microcrystalline silica is due to its being disaggregated into its component particles, rather than having to be broken away from a crystalline solid.[2,9]

Because the Southern Illinois materials appear amorphous under the polarizing microscope, they have been incorrectly labelled "amorphous," a term which has persisted over the years. Actually the material gives a distinct quartz x-ray diffraction pattern, and thus is clearly microcrystalline rather than amorphous. A more appropriate designation for the finely divided microcrystalline silica would be cryptocrystalline quartz. The term cryptocrystalline refers to individual grains in a crystalline

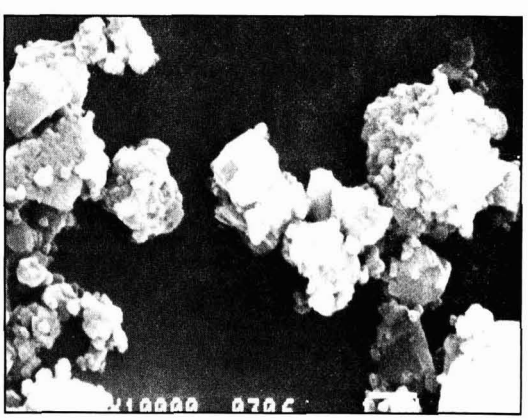

Figure 4—Scanning Electron Photomicrograph of a fine, micronized commercial grade of microcrystalline silica. Note the fine particle grain clusters

structure which are so fine that they are not recognizable even under microscopic examination.[11]

USE OF MICROCRYSTALLINE SILICAS IN COATINGS

Much has been done in recent years to characterize better the function of extender pigments in paint formulations. As the role of extender pigments has become better understood, their positive aspects, other than cost reduction, have become of greater interest.[12,13] Their capability to control and influence both the manufacturing process and the inherent properties of various coatings has been better utilized. Recent articles highlighting the properties of extender pigments in coatings have done much to summarize as well as to promote their selection and use for property balance.[14,15]

The extender pigment group is comprised of widely diverse materials having a range of properties. Usually paint formulators are not thoroughly familiar with the properties and potential advantages of all extender pigments. The microcrystalline silicas appear to be one example. This probably stems from the view that the silicas are a separate classification within the extender family and have limited or specialized utility. Also, the availability of many natural and synthetic silicas, together with their confusing terminology and trade names, has not helped to distinguish the properties and use advantages of these materials. Finally there is an absence of published data on the performance characteristics of microcrystalline silicas as a starting point in approaching paint formulations. An overview of how the paint industry has perceived the functionality of these pigments is given.

Early reference to the use of the microcrystalline silicas as colorless pigments of low refractive index appears in Mattiello's classic work on coatings.[16] These materials were classified as non-opaque extenders, since they have very little hiding power when compared to titanium dioxide, the industry's prime white pigment for opacity and tint resistance. The reasons for formulating with these natural silicas were cost, purity, inertness, hardness, and availability.

Probably the largest use of the regular microcrystalline silicas was in wood-paste fillers primarily because of their low oil absorption, filling ability, inertness toward binders, good tooth, and durability.[17] They were found useful in interior flats, undercoats, and traffic paints because of contributions to the coating's toughness and abrasion resistance. Application use, however, was limited because of the abrasiveness of the regular grades and a reported tendency to settle into a hard compact mass.

Over time, the experience and formulation recommendations from resin and emulsion manufacturers showed that Southern Illinois silicas were more versatile than originally conceived. Because of their low oil absorption, formulators were able to improve the economics of their formulations by increasing solids levels without significantly decreasing the original base properties. Furthermore, unexpected property improvements were found which were different from what was traditionally expected.

The microcrystalline silicas are marketed in two general classifications, regular or air-floated and, micronized or fine-particle (*Table* 2). The micronized grades are treated separately and their potential formulating benefits are highlighted in the following section.

Table 1—Typical Chemical Analysis of Southern Illinois Microcrystalline Silica (wt.%)

Silica	99.3
Iron oxide (Fe_2O_3)[a]	0.05
Titanium dioxide (TiO_2)	0.02
Aluminum oxide (Al_2O_3)	0.20
Magnesium oxide (MgO)	0.02
Calcium oxide (CaO)	0.02
Sodium oxide (Na_2O)	0.005
Potassium oxide (K_2O)	0.04
Loss on ignition	0.30

(a) Product grades where color is not critical may contain a slightly larger percentage of iron.

The regular larger particle grades contribute such important properties to a coating as brushing ease, sag resistance, adhesion, water spotting resistance, abrasion resistance, dirt and staining resistance, flow leveling, and tint retention. They are easy to wet and disperse in a solvent base, and require a minimum of dispersant in water-borne systems. In exterior trade sales coatings, the microcrystalline silicas contribute to non-chalking, weatherability, and to long-lasting film integrity, while preventing the problem of eave-frosting which occurs when calcium carbonate is used. In flat interior formulations, they strengthen film integrity, reduce mar resistance, and provide uniform flatness in touch-up because of their excellent sheen uniformity. Their hardness and wear resistance make them an excellent choice in traffic paints where long road life is required.[18]

MICRONIZED MICROCRYSTALLINE SILICAS

Introduction of the finer or micronized grades of the Southern Illinois silicas aided in expanding the usefulness of these materials. These grades offer a finer particle size, ranging from 2 to 4 μm, better color, excellent Hegman grinds, improved tint reduction and essentially the same low oil absorption as the regular grades (*Table* 2). The typical particle size distributions of the four grades comprising the micronized product line are found in *Figure* 5.

Table 2—Representative Physical Properties Of Southern Illinois Microcrystalline Silicas

	Air Floated	Micronized
Appearance	Fine white powder	
Specific gravity	2.65	2.65
Weight per solid gallon, lbs.	22.07	22.07
Bulking value, gal/lbs.	0.0453	0.0453
Oil absorption (Gardner-Coleman)	29-31	29-31
Specific surface area (m^2/g)	3.5-4.5	4.5-6.0
G.E. brightness (%)	85-88	88-90.5
Hardness (Mohs)	6.5-7.0	6.5-7.0
Average particle size (μm-Sedigraph)	5.0-8.2	2.1-4.4
Moisture (% max)	0.25	0.25
Specific resistance, ohm-cm (min)	20K	20K
Refractive index	1.54-1.55	1.54-1.55
Melting point, °C	1722	1722

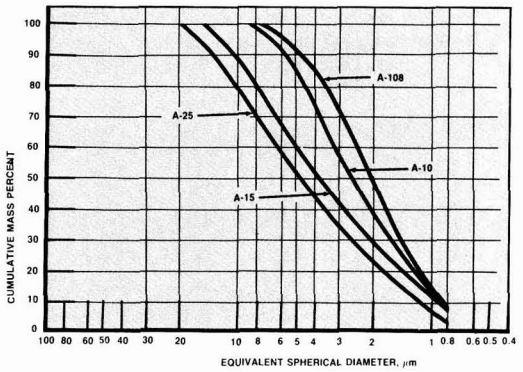

Figure 5—Particle size distributions of micronized silicas

Some of the coating contributions associated with the finer particle microcrystalline silicas include reduced dirt pick-up (trade exteriors), chip resistance (water-borne automotive primers), and quick drying (traffic paints).

Abrasion Studies

The most significant characteristic of the micronized silicas is their marked reduction in abrasiveness as shown by Einlehner abrasion values.[19,20]

The Einlehner AT-1000 Abrasion Tester is designed to give a relative measure of the abrasive action of pigments and fillers on the paper machine wire. The principle upon which the laboratory apparatus and procedure is based is that of determining the weight loss of a test screen resulting from mechanical action under prescribed conditions. Abrasion is accomplished by rotating a cylindrical abrader, for a predetermined number of revolutions, on a standard stationary test wire in the presence of a well-suspended pigment slurry.

Table 3—Latex Interior Paint Formulation

Materials (Lbs. per 100 Gal.)	45% PVC	65% PVC
Pigment Grind		
Water	144.0	200.0
Cellulosic thickener, 2% Sol.[a]	50.0	50.0
Potassium tripolyphosphate (KTPP)	2.0	2.0
Dispersant[b]	8.0	8.0
Wetting agent[c]	4.0	4.0
Antifoam[d]	3.0	3.0
Coalescing agent[e]	10.0	10.0
Ethylene glycol	25.0	25.0
Titanium dioxide[f]	150.0	150.0
Calcined clay[g]	150.0	150.0
Calcium carbonate[h]	97.0	252.0
Let Down		
Cellulosic thickener, 2% Sol.	148.0	147.0
Vinyl/acrylic copolymer[i]	341.0	218.0
	1132.0	1219.0

Volume Solids = 35%

Suppliers: (a) Natrosol® 250 HR, Hercules Inc; (b) Tamol® 721, Rohm & Haas; (c) Igepal® CO-630, GAF Corp.; (d) Colloid® 681F, Colloids, Inc.; (e) Carbitol® Acetate, Union Carbide Corp.; (f) Ti-Pure® R-901, DuPont; (g) Glomax-LL®, Georgia Kaolin; (h) Atomite® (3.0μm), Thompson-Weinman; (i) Flexbond® 325 (55% Solids), Air Products.

Table 4—Optical and Physical Test Methods

Property	Test Method
Reflectance, %	Gardner XL-20 tristimulus colorimeter
Opacity, %	Gardner XL-20 tristimulus colorimeter
Yellowness index	Gardner XL-20 tristimulus colorimeter
Sheen (85°)	Gardner multi-angle glossmeter
Tint strength	1.5 gms Tinting black/80 mL of paint (reflectance measurement)
Porosity	ASTM D 3258-80. K&N Stain
Enamel holdout, %	Semi-gloss alkyd enamel (60° gloss measurement)
Scrub resistance	Gardner straight line scrub tester (2% Comet solution)
Oil absorption, %	ASTM D 1483-60. Gardner-Coleman method.

The test is run as follows. A homogeneous pigment slurry is prepared and added into the cylinder, and the

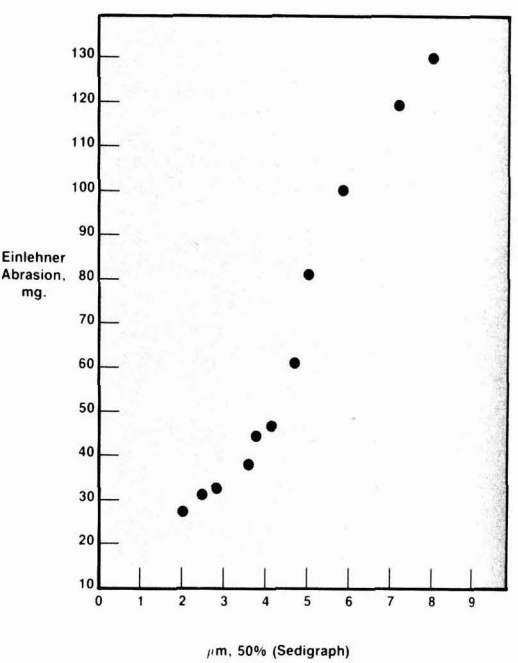

Figure 6—Einlehner abrasion values of microcrystalline silicas as a function of average particle size

Table 5—Optical and Film Properties. Micronized Silica Replacement of Calcined Kaolin in Test Formulations
2¼ mil Wet Film Thickness (Bird)

Property	45% PVC		65% PVC	
	Calcined Kaolin[a]	Micronized Silica[b]	Calcined Kaolin[a]	Micronized Silica[b]
Reflectance, %	90.8	89.7	93.2	90.6
Opacity, %	94.0	93.7	97.9	96.4
Yellowness index	2.5	3.3	2.3	3.1
Sheen (85°)	2.5	3.0	4.5	3.0
Tint strength	48.8	46.5	55.1	50.1
Porosity	10.5	5.7	32.4	18.0
Enamel holdout, %	—	—	71.4	60.7
Scrub resistance, cycles	—	—	1500+	1500+

(a) Oil Absorption, % = 54.
(b) Imsil A-108, Illinois Minerals Co., Oil Absorption, % = 26.

mixing unit is set for the desired number of revolutions or running time. After the run, the screen is cleaned, dried and reweighed. The weight loss of the test screen is a measure of the abrasiveness of the slurry.

A plot of Einlehner values against typical particle sizes found in the normal and micronized grades of microcrystalline silica is shown in *Figure* 6. Einlehner abrasion values of the micronized grades are comparable to abrasion values obtained for a typical paint grade calcined kaolin. The abrasiveness of calcined kaolins, a group representing four different producers, ranges from 20 to 30 mg. The test method uses brass screens, a 9.1% by weight pigment slurry and 87,000 revolutions. Reproducibility of the test is ± 5%.

Formulation Studies

Properties of the finest particle sized Southern Illinois silica were determined as equal volume replacements for both calcined kaolin and calcium carbonate in 45 and 65% PVC latex interior test formulations (*Tables* 3 and 4).

Replacements of silica for calcined clay (*Table* 5) reduce hiding power and reflectance values, particularly in the higher PVC paint. However, sheen control and film integrity are significantly improved even at the higher pigmentation. The enamel holdout value is worse when the micronized silica is used but tends to be much better than that obtained when the regular natural silicas are used. This apparent film property weakness of regular silicas may be due more to the absorptivity characteristics of the aggregate structure of the microcrystalline silicas.

In the second part of the replacement study, a micronized silica and a very fine particle calcium carbonate are substituted for the calcium carbonate used as one of the control pigments in the test formulations. Results are given in *Table* 6. The replacement comparison of the silica to the slighter coarser calcium carbonate shows increased opacities while essentially maintaining other properties. In the comparison of silica to the very fine calcium carbonate, which is a pigment promoted as a spacer for TiO_2 in paints, the silica matches the calcium carbonate except for its lower angular sheen.

Table 6—Optical and Film Properties. Micronized Silica Comparison to Calcium Carbonates in Test Formulations
2¼ mil Wet Film Thickness (Bird)

Property	Control[a]	Fine Particle $CaCO_3$[b]	Micronized Silica[c]
	A. 45% PVC		
Reflectance, %	90.0	91.4	89.7
Opacity, %	94.5	95.8	95.9
Yellowness index	2.5	2.6	3.6
Sheen (85°)	3.0	5.0	3.0
Tint strength	48.6	50.5	48.8
Porosity	10.8	13.4	15.0
	B. 65% PVC		
Reflectance, %	92.5	93.6	91.5
Opacity, %	97.7	98.4	98.6
Yellowness index	2.4	2.3	4.1
Sheen (85°)	5.5	12.5	6.5
Tint strength	55.3	58.1	56.8
Porosity	39.6	41.5	41.3

(a) Atomite (3.0 μm; Oil Absorption, % = 17), Thompson-Weinman.
(b) Omyacarb-UF (0.8 μm; Oil Absorption, % = 26), Omya, Inc.
(c) Imsil A-108 (2.2 μm; Oil Absorption, % = 26), Illinois Minerals Co.

The optical and film properties of the micronized silicas in these latex test formulations suggest formulating options and latitudes not typically associated with the natural silicas. Data indicate that the partial replacement of such basic extenders as calcined kaolin and calcium carbonate improves film properties while maintaining hiding power and sheen control. They suggest further that extender blending with the fine particle microcrystalline materials may be beneficial as a means to improve coating properties. The low oil absorption of the micronized silicas enables the formulator to increase pigment loadings for improved dry hide without significantly affecting

Table 7— White Coil Coating Formulation[24,25]

Materials	Supplier	Pounds
Pigment Grind		
Rhoplex AC-658 (47% Solids)	Rohn & Haas	328.6
Tamol 850	Rohm & Haas	15.9
Triton CF-10	Rohm & Haas	2.3
Nopco NXZ	Diamond Shamrock	0.6
Diethylethanolamine		1.2
Water		10.9
Ti-Pure R-960	DuPont	228.2
Silica	(See *Table* 8)	30.0
Let Down		
Rhoplex AC-658	Rohm & Haas	397.1
Butyl Cellosolve, 60/40 with water	Union Carbide	5.7
Cellosize QP-40, 5% aq. Sol	American Cyanamid	9.5
		1030.0

Solids Content = 58.1%
Pigment/Binder Weight Ratio = 0.76/1

Table 8—Optical Properties

Components	Formulations A	B	C	D	E
Pigment Grind					
Thermosetting acrylic resin	328.6	294.1	306.2	291.2	300.0
Syloid 74 (Grace)	30.0	—	25.5	22.5	15.0
Syloid 161 (Grace)	—	30.0	—	—	—
Imsil A-108 (Illinois Minerals Co.)	—	—	4.5	7.5	15.0
Let Down					
Thermosetting acrylic resin	397.1	431.6	419.5	434.5	425.7
Optical Properties					
Gloss (60°)	7	8	9	10	10
Sheen (85°)	8	12	11	14	18

(a) Drawdown: 1 mil Film Thickness—4" × 8" Al-48 Aluminum Q-Panels (25 mil)—Baked 60 seconds at 250°C.

film properties.[21,22,23] Conversely, the low binder demand of the micronized silicas can be used to strengthen film properties. The micronized silicas may also show promise as replacements for delaminated clay in high pigment loadings, where sheen increases and scrubbability are problems.

The data in *Tables* 5 and 6 also show that the substituted micronized silica develops a lower optical reflectance than either the calcined clay or the calcium carbonate. This suggests that the micronized silicas, as replacements for brighter and whiter extender pigments, would be less suitable in pure white, enamel, and perhaps, pastel formulations.

In another study, the potential of extending a synthetic silica in a low gloss coil coating formulation was determined (*Table* 7). Results suggest that it may be possible to partially replace the high surface area/high oil absorption synthetic silica in a low sheen and medium gloss coil coating formulation with micronized silica having the proper particle size. Gloss and sheen values obtained with various replacement levels are given in *Table* 8. Different amounts of the latex polymer are used in the pigment grind because the micronized silicas differ in their ease of wetting, and the consistency of the pigment grind must be retained. The micronized silicas are also finding use in water reducible coil coatings because of their water release and anti-block contributions.

In the field of new coating systems, Cargill recommends formulations containing micronized silicas in high solids primers, water reducible enamels, primers and baking systems.[26,27] These extenders meet such general pigmentation requirements of water reducible coatings as gloss control, color development, and package stability.

SUMMARY

The microcrystalline silicas are a distinct group of materials within the family of natural silicas. Their physical and chemical characteristics are indicative of their uniqueness. Application benefits derived from their use in coatings are reviewed.

Specific attention is given to the low oil absorption fine or micronized grades. The abrasiveness of these materials is shown to be significantly less than the regular grades and is comparable to that of the calcined kaolins. Potential advantages for the use of silica as particle replacements for other extenders are highlighted. Their role in the new water reducible coatings systems is also mentioned.

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Color Tolerances In Automotive Paints

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Existing color tolerances for non-metallic paints in the German automobile industry were investigated to achieve a compromise for tolerance fields in the chromaticity diagram. When paint is applied to a car on the production line or for touch-ups, color tolerances can be enlarged by a given factor. This concept involves the potential for measuring and controlling the color of the paint at the production line, which is now possible with new instrumentation.

INTRODUCTION

Expenditures for automotive repair work caused by accidents show a tendency to rise from year to year, with paint costs forming a considerable portion of the increase. This is not due to the high and unrealistic expectations and demands for an absolute (complete) color match of the repaired part as opposed to the original. Due to an ignorance of the resulting costs coupled with the corresponding obstinacy of the respective car owner this frequently leads, particularly in cases of damages not covered by insurance claims, to an expanding of the paint and therefore a considerable price increase.

Such a development could only arise as objective methods for critical examinations and measures were not available. The subjective demand was decided without consideration of an economically clever cost/profit factor. This situation resulted in the establishment of a working group and the laying of the ground work for the realization of two important assumptions for objective color control of cars:

(1) Investigation and realization of suitable, mobile colorimeters for measurement of real color differences of cars; and

(2) Establishment of colorimetric tolerances for all existing car colors.

COLOR MEASUREMENT OF AUTOS

Practice of precise laboratory color measurement shows that samples have a limited size and their surfaces are plain. However, cars are too large to bring into the laboratory for color measurement and their surfaces are usually curved. *Figure* 1 shows how the reflection 'indicatrix' of a plain surface changes under influence of the curvature and the specular reflection broadens. In the case of color measurement with 45/0-geometry *Figure* 2 shows how nearly parallel illumination beams become divergent when the surface is curved instead of plain. Depending on the size of the sample port and the radius of the sample's curvature, it may occur that instead of pure diffuse reflected light specular reflected light may also enter the receiver. *Figure* 3 shows the geometric arrangement for color measurement at plain and curved surfaces

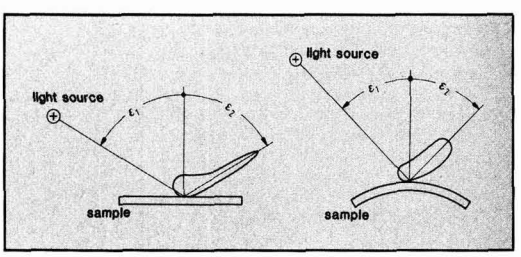

Figure 1—Reflection indicatrix of plain and curved surfaces

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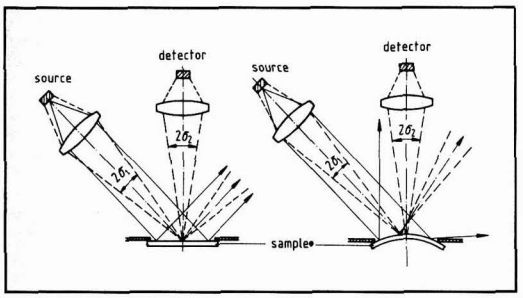


Figure 2—Color measurement with 45/0 geometry: the specular reflected radiation of plain (left) and curved surfaces (right)

with 8/d (sphere) geometry. These kinds of instruments have the possibility of excluding the specular reflected part of the radiation by means of a gloss trap. The size of the gloss trap is designed so that for parallel illumination of the sample, where the specular reflected light is also parallel, it is fully absorbed by the trap. In the case of curved surfaces, however, the specular reflected light is divergent and falls partly outside the gloss trap on the surface of the sphere and even partly back into the light source. If no gloss trap is used in the sphere and the specular reflected part is subtracted mathematically from the total reflectance factor, part of the specular reflected light may fall back into the light source if the viewing area of the sample becomes too large.

One could suggest from *Figures* 1-3 that for color measurement of curved surfaces 45/0 geometry is superior to sphere geometry. This can also be shown in *Figures* 4-6; the results from color measurements of a red sample with various curvatures in *Figure* 4 show that chromaticity coordinates for 45/0 geometry lie close together for two different sample port sizes and when the orientation of the sample is turned by 90°. However, in the case of sphere geometry with included gloss, *Figure* 5 shows that the results of the color measurements are very sensitive to larger curvatures in that orientation, where the curvatures are in the plane of the illumination. With increasing radii of the curvatures the red sample measurements are more saturated as some of the specular reflected light leaves the sphere via the port of the source. This effect is enlarged with increasing sample port, e.g., from 10 to 17 mm. When gloss is excluded by means of a gloss trap with sphere measurement, color measurements show the sample to be more unsaturated with larger curvatures (*Figure* 6). As in any orientation of the sample due to the curvature of the sample, specular light comes out of the gloss trap and falls onto the sphere. This effect is generally slightly reduced in that sample orientation where the curvature is in the plane of the illumination and part of the specular light falls back into the light source. Again, the effect of desaturation is increased with larger port openings from 10 to 17 mm.

Comparing 45/0 geometry with sphere geometry, the advantage of the 45/0 geometry of not being so sensitive against curvatures is reduced by the fact that they generally need larger viewing areas for color measurement than sphere geometries. In other words, for most of the existing motor-car curvatures color measurements can be done with instruments having 45/0 or sphere geometries provided that the viewing area and the apertures of illuminating and viewing beams are sufficiently small.

For many years, the only reliable outdoor color measurement instrument for cars was the Uni-Tone from Daido Kogyo Kaisha, Japan. This colorimeter was also advertised for some time as Photomarker PM 400 in the USA. The Uni-Tone was the first useful instrument on the market with a separate flexible measuring head in which the perpendicular illumination of a tungsten lamp and a 45° circular array of eight filtered silicon diodes were arranged. The separate measuring head was linked with a box containing the power supply, micro processor display unit and printer. The instrument was successfully introduced by some German automobile producers but unfortunately it is no longer available in Europe or America.

Meanwhile, other colorimeters were developed where the separate measuring heads were connected by means of an electric or a glass fiber cable (glass fiber optic bundle)

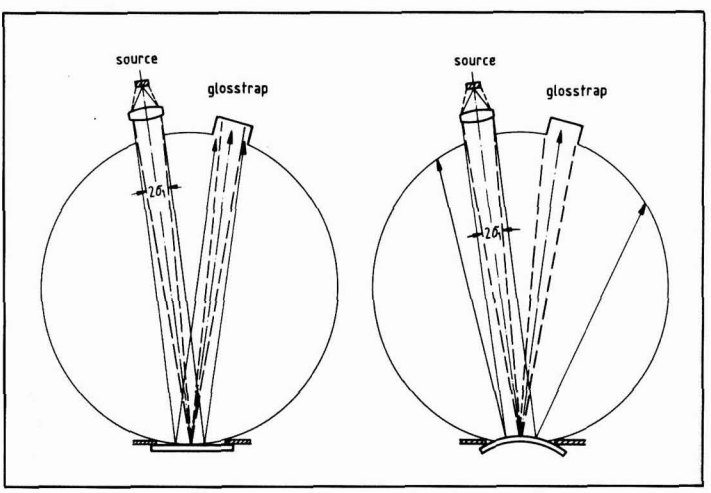


Figure 3—Color measurement with sphere geometry: the specular reflected radiation of plain (left) and curved surfaces (right)

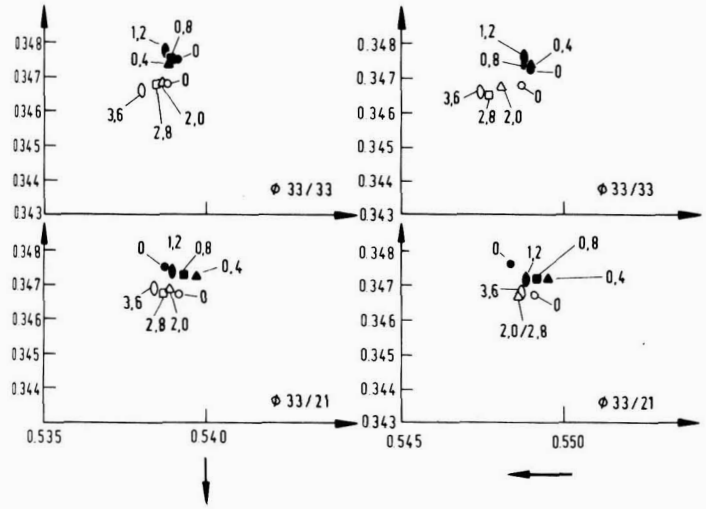


Figure 4—Chromaticity coordinates of a red sample for various cylindrical curvatures and for 45/0 geometry. Viewing area of the sample: 21 cm and 33 cm in diameter. Two sample orientations: (1) Left—Curvature in plane with illumination axis; (2) Right—Curvature perpendicular to illumination axis. The bending from 0 to 3.6 mm corresponds to curvature radii from ∞ to 261 mm

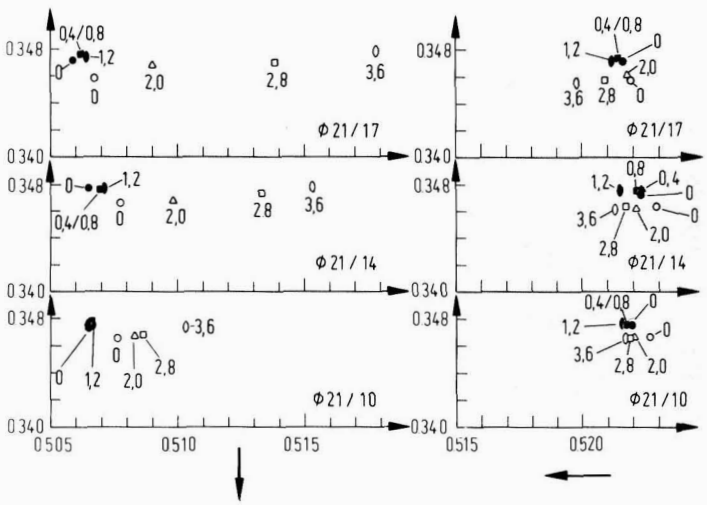


Figure 5—Chromaticity coordinates of a red sample for various cylindrical curvatures and 8/d geometry, gloss included. Viewing area of the sample: 10 cm, 14 cm, and 17 cm. Two sample orientations: (1) Left—Curvature in plane with illumination axis; (2) Right—Curvature perpendicular to illumination axis. The bending from 0 to 3.6 mm corresponds to curvature radii from ∞ to 261 mm

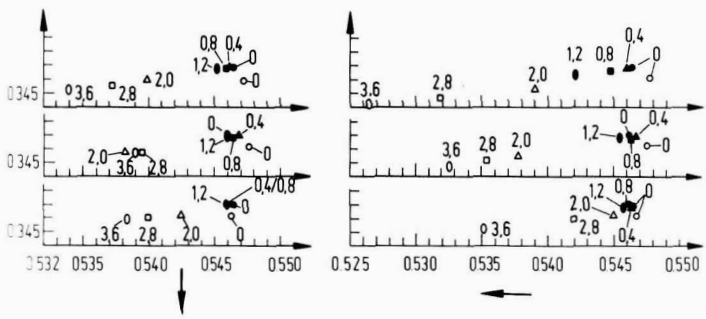


Figure 6—Chromaticity coordinates of a red sample for various cylindrical curvatures and 8/d geometry, gloss excluded. Viewing area of the sample: 10 cm, 14 cm, and 17 cm. Two sample orientations: (1) Left—Curvature in plane with illumination axis; (2) Right—Curvature perpendicular to illumination axis. The bending from 0 to 3.6 mm corresponds to curvature radii from ∞ to 261 mm

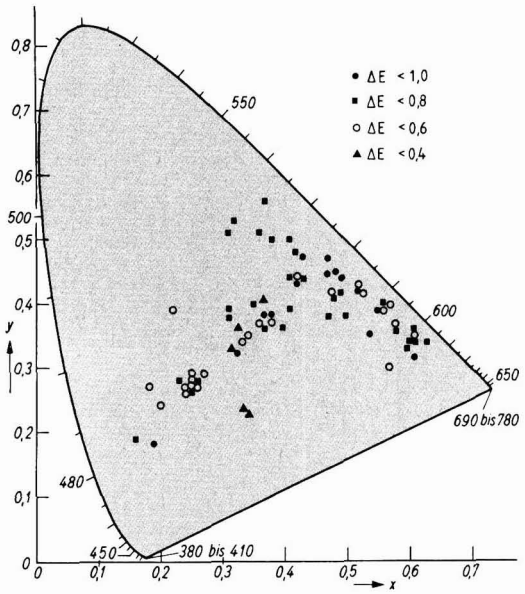


Figure 7—Required color tolerances for automotive paints of different colors of a car manufacturer

with the basic instrument. They all provide the possibility to measure the color at any part of the automobile with their mobile measuring head, having the instrument with the calibration and display unit remote from the car. Instruments of this type are discussed below.

Minolta Chroma Meter CR-131: Tristimlus Colorimeter with Xenon impulse light source in separate measuring head for bidirectional 45/0 illumination. This is connected with the instrument containing six filtered silicon photo cells via 1 m fiber optic cable. Measuring area is 25 mm, total weight is 1376g without battery. Repeatability: X,Y = ± 0,15 or $\Delta E^*_{1ab} < 0,4$.

Johne & Reilhofer Spectrometer ER10: Xenon impulse light source for 45/0 circular, d/8 or variable geometry, grating spectrometer and silicone diode array in the measuring head. PCM-modulator sends electric signals via eight or 16 m cable to the instrument. Display unit and plotter for reflection curve, etc., are provided. Illumination area is 10 mm and the measuring head weighs 6 kg. The repeatability is $\Delta E^*_{ab} < 0,3$.

Datacolor Simultan-Spectrometer: The separate measuring head contains a Xenon impulse light source of diffuse illumination. The perpendicular reflected light (d/0 geometry) goes via a 5 m fiber optic cable to the grating spectrometer with two diode arrays in the instrument. Printer, video display, and personal computer can be connected to the system. Measuring area is 15 mm, sensor weighs only 100 g and repeatability is $\Delta E^*_{ab} < 0,1$.

Colorguard System 2000/AFC: Tristimulus colorimeter with 45/0 geometry and second angle. 1.5 m flexible fiber optic cable connects sensor with colorimeter with video display. Illuminated area is 25 mm and the sensor weighs 7.4 kg. Repeatability: X, Y, Z < 0,.03.

Erichsen Colorimeter 512: Tristimulus Colorimeter with 45/0 geometry and separate measuring head. The illuminated area is 19 mm and the sensor weighs 1.1 kg. Repeatability: X, Y, Z = ± 0.1.

TOLERANCES OF AUTO COLORS

In 1976 the Commission Internationale de l'Eclairage (CIE) recommended the CIELAB color difference formula to be applied to surface colors. Until this time it was

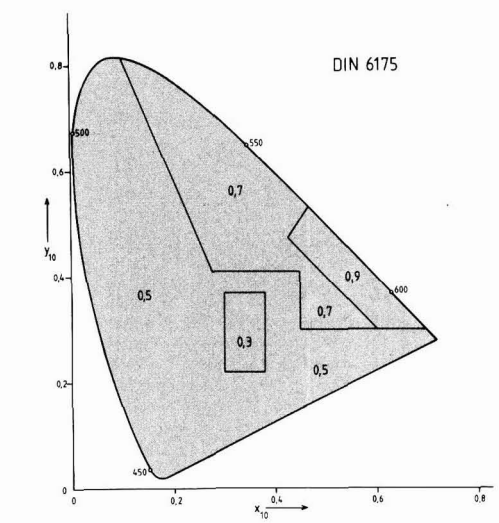


Figure 8—Chromaticity regions with different color tolerances E^*_{ab} for non-metallic automotive paints

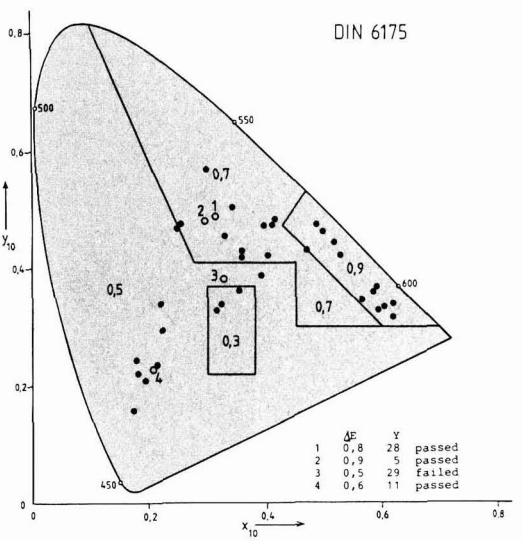


Figure 9—Pass/fail experiments with 38 different paints and tolerance fields of German standard DIN 6175

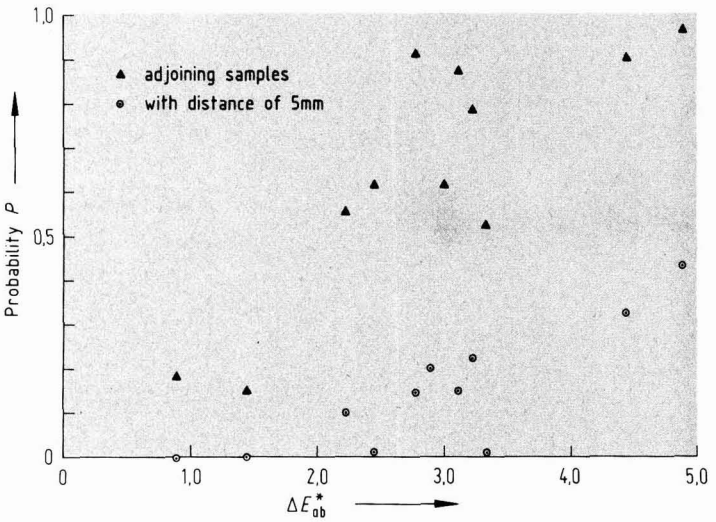


Figure 10—Probability for recognition of substantial color differences with red samples with and without a distance between the sample pairs

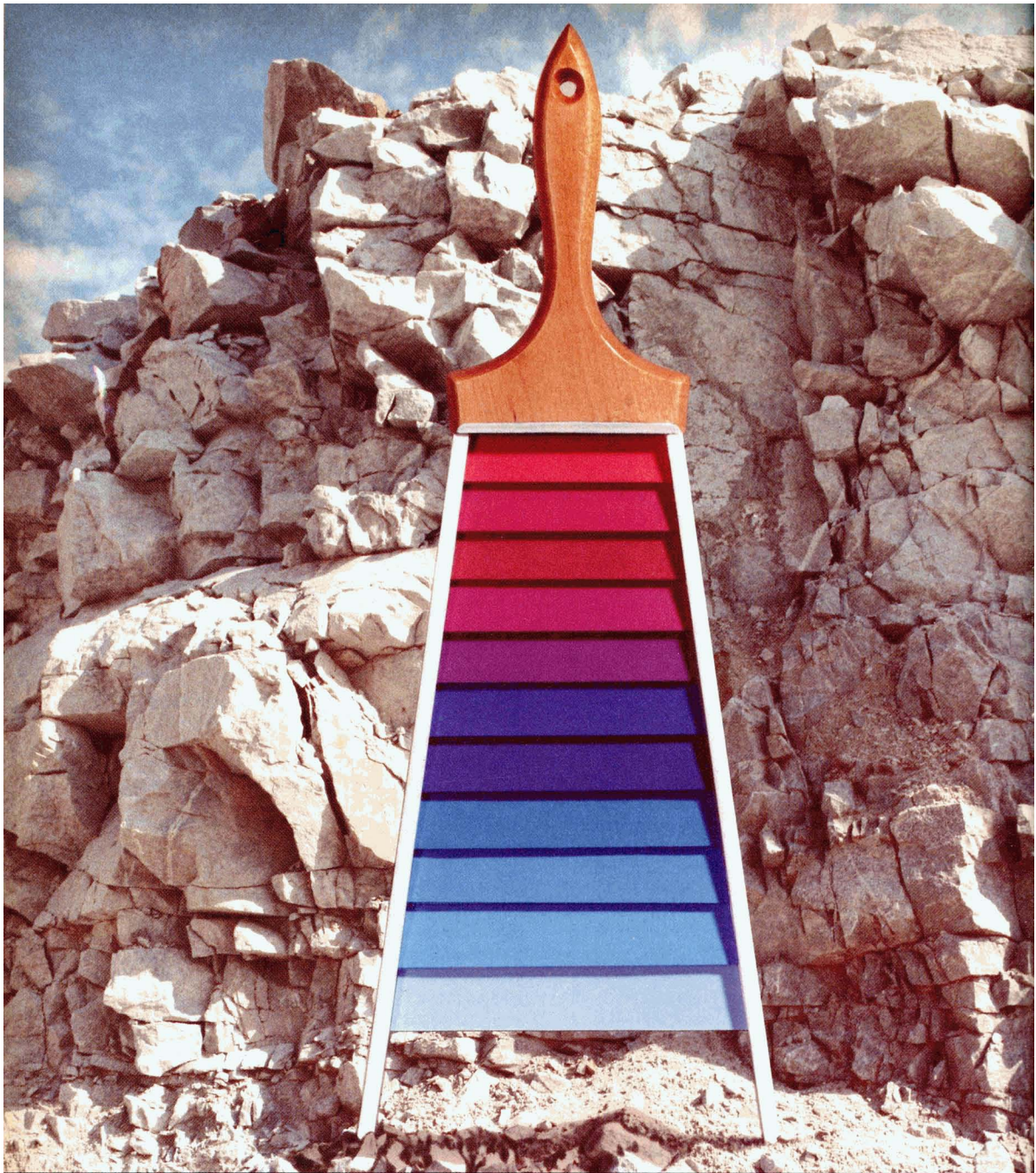
quite troublesome to compare the existing tolerance for delivery of paints in various German car manufacturing industries. The change over to the new CIE color difference formula showed that the CIELAB formula was still not ideal, as different color tolerances had to be applied to different colors, but it made a comparison of paint control in car industry easier.

Figure 7 shows a plot of automotive paints with different color tolerances for one car manufacturer in the CIE chromaticity diagram. There was no systematic dependency of the applied color tolerance on the lightness of the color and for some similar pairs of colors quite different color tolerances were applied. One could draw the conclusion that instead of modifying the CIELAB color difference formula, as the British textile industry tried with the introduction of the JPC 79 or CMC formula, one could find areas in the chromaticity diagram in which the same color difference must be applied. One can see from *Figure* 7 that generally the requirements for delivered paints are tighter for achromatic colors than for blue colors and even tighter than for yellow colors.

From the many tolerances in the German automobile industry, chromaticity regions were agreed upon as compromise tolerance fields in the chromaticity diagram. The fields, shown in *Figure* 8, indicate, for color of the same chromaticity, the tolerances for paints to be delivered from the paint companies to the automobile industry.

A final check of the proposed tolerance fields was done by visual pass/fail inspections of paints with various color differences to the master color of newly designed car colors in the automobile industry. *Figure* 9 shows that out of 38 colors, 34 colors fit into the proposed tolerance scheme. Only the green colors 1 and 2 passed in the $\Delta E < 0.7$ area although color 1 had a color difference of $\Delta E = 0.8$ and color 3 had a color difference of $\Delta E = 0.9$. The blue color 4 passed in the $\Delta E < 0.5$ area although having a $\Delta E = 0.6$, and the green color 3 failed in the area of $\Delta E < 0.5$ having just the limit of $\Delta E = 0.5$.

As mentioned before, the color tolerances for automotive paints in *Figure* 8 are meant for non-metallic paints to be delivered from the paint companies to the automobile industry and measured after being sprayed in an agreed procedure onto a test panel. When the paint is applied to the car on the production line or for touch-ups, the color tolerance can be enlarged by a factor 1.5. In the case of repair paints, the color tolerances of repaired and painted surfaces of automobile parts should have a tolerance compared with the adjoining cleaned existing paint which corresponds to a factor of 2 of the tolerances given in *Figure* 8. If repair paint and existing paint are separated by means of space, styling strip, or crimp, the factor of 2 can even be doubled as a result of visual assessments shown in *Figure* 10. This standardized concept, outlined in German standard DIN 6175, for automotive paints indeed involves the possibility of measuring and controlling the color of the paints at the production line, which is possible with instruments having a better accuracy for color differences than requested in the standard.



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OPEN FORUM

Specifications and Confidence Limits . . . Are They Related?

Edward L. Cairns
Edward L. Cairns Associates*

The mathematical confidence limit is a useful tool to set achievable specifications. Statistics are calculated from a sampling of product history and describe the percentage of product which has fallen within various limits. Done properly, this method will serve to set reasonable specifications and provide information upon which gains in product uniformity can be made to the benefit of both supplier and purchaser.

Introduction

Confidence intervals and specifications—are they related? If polled on this question, most people familiar with these terms would answer 'yes.' However, if questioned as to how these terms are related, a large amount of uncertainty would emerge. *Confidence intervals* are statistical interval estimates with a calculable probability of containing a sought after value. *Specifications* are defined simply as measureable properties which describe a product, usually in terms related to its fitness for use—in even simpler words: a specific description of something. This definition does not make clear, however, how close the relationship is.

Further definition can narrow this down:

The statistical confidence interval is very precisely defined with mathematics, although, in a sense, it describes a degree of uncertainty of our knowledge about a value. On the other hand, the specification—a specific description—seems, ironically, to have a more elusive understanding.

To understand what a specification is, one must first know how a specification is set.

Often, on new products at least, specifications are set by research and development people with little or no critical consideration of the various problems involved. Production people sometimes accuse R & D of using their job of setting specifications as a means of "getting even," although it is not completely clear what there is to get even for, other than some kind of natural rivalry. On the other hand, production people are notoriously loose specification setters. It has been rumored that if they were to set the limits for center field—right, left and part of both bullpens would be included to be sure nothing was left out.

Considerations for Specifications

What are the considerations that should be taken into account when setting specifications? First, and of major consideration are the needs in using the product. For certain, if it is not what the customer needs or wants, little else matters. At this point, no one cares much about the confidence intervals if the product is unsellable. Specifications have to take into account the market needs and competitive pressures on the product.

The second consideration is the process capability in producing the product. This becomes even more governing when the product is so new that little market feedback is available for it. If one were to set specifications tighter than the ability to produce it, he or she had better be prepared to handle a lot of substandard product and have very little with which to meet whatever market demands exist.

Thirdly, one must consider the testing method used to measure whether or not the product meets specifications. A vari-

Table 1—Percent Solids Test Results

Test	Result
1	49.0
2	47.8
3	48.7
4	50.4
5	49.3
6	49.8
7	48.6
8	51.2
9	49.5
10	48.7
	Average—49.3

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able test method will result in a variable product. A specification tolerance cannot be set any tighter than the reproducibility of the test since that determines the minimum specification range obtainable.

Of these three considerations, the first has very little relationship to any statistical confidence limits. Product needs may be better judged by using statistical methods but, by and large, competition and our marketing people will be the major influence on specification limits. And everyone knows that marketing people use statistics only to confirm their preconceived notions!

Sample New Product

As stated above, if the product is new and relatively untried in the marketplace, the second consideration, or the capabilities of the process, will probably determine—at least temporarily—what the product specifications are. For example, suppose that we have a new paint resin solution and wish to set tentative specifications on the allowable percent solids. Trial batches have probably been made, either in the laboratory or in a pilot plant (*Table* 1). Taking the results from these trial batches we could take the low and high result and use them to set a tentative minimum and maximum percent solids, respectively. To be a little more sophisticated, we might calculate a 95% confidence interval around the mean value of 49.3 and use that as the tentative specification.

Statistical Confidence Interval

There at last are both of those terms—"confidence interval" and "specification"—used in the same sentence. We are finally getting around to the title of this paper. But first, one more small diversion to illustrate what a statistical confidence interval is for those less familiar with it. As mentioned earlier, confidence intervals are describable with mathematics, but for the time being we shall look at the confidence interval pictorially. For the sake of simplicity, we will use the experimental percent solids results from the new resin from *Table* 1. The first step is to group the results by intervals (*Table* 2). Next look at the interval count graphically (*Figure* 1). Now imagine what would happen if we had more samples and made additional observations and measurements of percent solids on them and at the same time created additional interval subdivisions. The picture would more than likely look like *Figure* 2. If we then repeated this process until we had a great number of observations and infinitesimally narrow intervals, we would expect the graph to arrive at the form shown in *Figure* 3. Incidentally, the vertical scale in *Figure* 3 has also been changed to percent frequency—a minor change from number of occurrences. This is called the normal distribution curve into which a lot of natural data and all data means fall. This distribution has several interesting properties. One is its obvious symetrical bell shape. Another less obvious but extremely important property is that if it is partitioned at the inflection points, or places on the curve where the shape changes from convex to concave, as in *Figure* 4, about 2/3, or 68.3% to be more exact, of the total area under the curve is contained. At twice this interval on the horizontal axis we have 95.4% of the area, and at three times this interval there is 99.7% of the total area under the curve (*Figure* 5). What this means is that 68.3%, 95.4%, and 99.7%, respectively, of the results obtained in measuring the percent solids of this experimental resin lie within those intervals or limits. Expressing that just slightly differently, within each of those intervals we have the stated percent confidence that the true percent solids value for that product lies. It could also mean that that is the percent of the product our process will make within each of the limits. And of course the intervals are referred to as confidence intervals and the limits as confidence limits. If the difference between intervals and limits is confusing, think of the interval as a distance. The limit, on the other hand, is a single value which defines the interval.

We are more commonly accustomed to the 95% confidence interval for which the limits lie 1.96 times the inflection point distance from the mean rather than 2 times as shown in *Figure* 4. That is really what a confidence limit is all about. To reiterate, it is the point or points on the horizontal scale where the percent of area under the curve coincides with the desired degree of confidence or the desired percent of frequency occurrence for the data.

Table 2—Percent Solids Arranged By Interval

Interval	Number of Observations
46-46.9	0
47-47.9	1
48-48.9	3
49-49.9	4
50-50.9	1
51-51.9	1

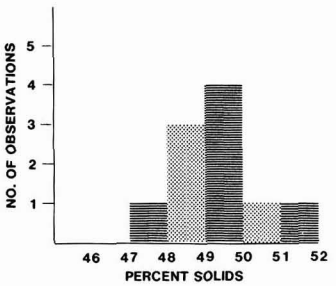

Figure 1—Plot of data from *Table* 2

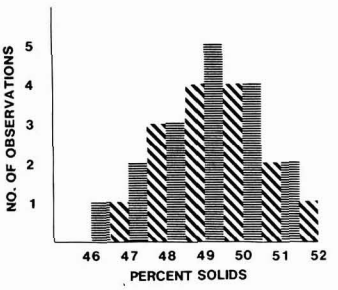

Figure 2—Plot of data after additional observations

The t Statistic

Fortunately, one does not have to collect an infinite number of observations each time to know what the confidence limits are. Fortuitously, the inflection point we mentioned earlier is located a distance of one standard deviation from the data mean. All we need to do is calculate a standard deviation from a sample of data and use that to estimate the confidence limits with this simple formula:

$$\text{confidence interval} = \text{mean} \pm t \times s$$

where "s" is the estimated standard deviation and "t" is a statistic called, fittingly enough, the t statistic. The t statistic is usually found in tables and its value is affected by the size of the desired confidence interval and the size of the sample used to estimate the standard deviation. The higher the confidence interval desired, the larger t becomes. The fewer observations used to estimate s, the stan-

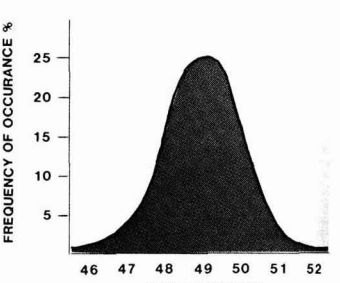

Figure 3—Distribution curve of data from *Table* 2

dard deviation, the larger t also becomes. However, once the sample observations exceed 10, the latter variable has relatively minor impact upon t. In summary, t is affected by the desired percent confidence interval and by the sample size used to estimate the standard deviation.

Now, let us relate them to specifications. Going back to our experimental data and looking at the % solids results (*Table* 1), one way of setting tentative trial operating specifications is to take the 51.2% high as maximum and the 47.8% low as minimum. What effect would these trial figures have on the rest of our operation?

Our sales people need to be heard from and very likely they would say something like "We are advertising and charging for a 49% solids material. Considering other products available, there's no way we will be able to break into this market if we ship a product lower than 48%. Not only would we get complaints, but the product would get a bad name."

And what about our financial people? Being somewhat responsible for profits, or at least reporting them, they might say something like "We cannot charge for 49% resin and ship as high as 51.2%. We'll lose our shirts on the product!" At this point the product manager might be in a dilemma. Whether he accedes to either set of limits looks like a losing game to him, so he might call in a statistician and together they conclude that at least for the trial period, maybe a 20% rejection rate might be acceptable, while giving a product which compromises on the production, marketing and financial needs. So an 80% confidence interval is determined.

Now suppose we make five batches of our resin in the plant and this time the statistician develops a procedure so that each sample is tested independently, and we can estimate both our testing variability and the process variability. Remember that these were the other factors influencing specifications. By the way, independent testing is an important distinction. If the five samples were given to our lab to test each twice, do you think the results would be independent? Most certainly not! But unfortunately that is frequently the way duplicate samples are run and the person doing so is complacently deluded into thinking the results will estimate testing variability. The proper way to do it is to submit 10 samples coded randomly so the tester has no way of knowing whether duplicate samples are even involved. The most honest testers in the world pride themselves on their ability to test reproducibly and, consciously or unconsciously, will bias their measurements to demonstrate their ability to do so.

Sources of Variation

Table 3 shows the results rearranged in logical order after the tests. Looking at the data arrangement we can see the two definable sources of variation: the testing variation in a vertical direction and the batch-to-batch variation in a horizontal direction. Using a calculation method known as analysis of variance we are able to subdivide the total variation into that caused by each of their sources. Here, the testing variability is in quite an acceptable low range relative to the process variability and we would not expect it to interfere with an accurate assessment of the process variability. If we use color measurement as an example instead of percent soluble, the opposite is true: the test method contributes a substantial amount of the observed variability in measuring products.

If we take the product sum of squares, divide it by the degrees of freedom and take the square root, we will arrive at 1.4 as the estimate for the process standard deviation. Recall that that is higher than we saw for the lab material standard deviation which was about 1. It is quite common (for the benefit of those readers not associated with product development) to have the product variability increase as we go from lab to plant.

What does this do to our tentative specifications in terms of the percent of product we might expect have fallen within specifications? We originally had our tentative specifications set at 47.9% minimum, 50.6% maximum. With the higher standard deviation indicated here, we find that our new confidence interval is such that less than 75% of the product would fall within our tentative specification. Assuming our marketing and accounting division assessments are still sound, and we cannot widen our acceptable specifications, this is clearly an unacceptable level of out of specification production.

Table 3—Percent Solids from Plant Runs

	Sample Number				
	1	2	3	4	5
Testor #1	48.9	47.6	48.5	49.8	50.2
Testor #2	49.5	47.9	48.0	49.7	49.9

Grand Mean = 49.0

Analysis of Variance:

Product sum of squares	= 7.66
Test sum of squares	= .40
Total	8.06

Product Standard Deviation = 1.4

The next logical step would be a plant program of sampling and testing to pinpoint the cause of the variations and reduce them—a program in which confidence limits will play an important part in the analysis and decision making. When we deal with color data, where measurement variability is a significant portion, a testing improvement program is also needed.

Conclusion

Where does all this get us? I hope at this point we can recognize that there is a relationship between confidence limits and specifications. It is not a relationship like one of parents dictating to their offspring, nor is it like that of distant cousins. Think of the relationship between confidence limits and specifications as one of friendly siblings where the confidence limit is like the older of the pair, trying to pass on guidance to the youngster. Usually this advice is useful, even if not always listened to with full attention.

Suggested References for Additional Reading

(1) "Specifications and the Purchasing Agent," Edward J. Gillikin, *ASTM Standardization News*, May, 1985, pp 36-38.
(2) "Introductory Statistics," TMI Grolier Programmed Textbook, Grolier, Inc., 575 Lexington Ave., New York.
(3) "Confidence Intervals and Hypothesis Tests," R. E. Miller, *Chemical Engineering*, November 26, 1984, pp 89-93.

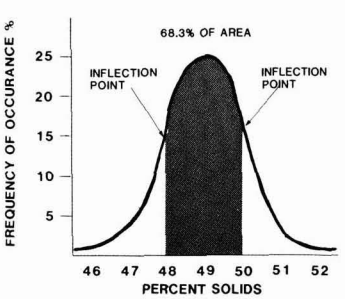

Figure 4—Distribution curve partitioned at inflection points

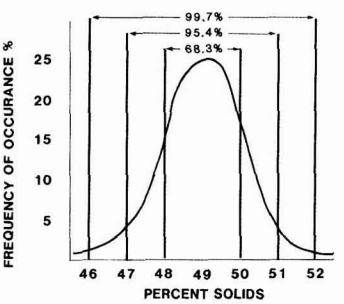

Figure 5—Percent solids of experimental resins within intervals

BALTIMORE ..... JAN.

"Inactive and Active Pigments"

A moment of silence was observed in honor of Harold Gough, Past-President of the Federation and the Philadelphia Society, who died recently.

Society President Frank Gerhardt, of Bruning Paint Co., announced that the University of Southern Mississippi would be giving a short course on "Water Soluble Polymers," February 3-4, 1986, at the Hyatt Regency Hotel in New Orleans, LA. Mr. Gerhardt also noted that the Southern Society is hosting a symposium on "Water-Borne and Higher Solids Coatings" at the Hyatt New Orleans from February 5-7, 1986.

Nominating Committee Chairman Joe Guisto, of Lenmar, Inc., announced that the Constitution and By-Laws now permit an Associate member to be an officer in the Baltimore Society.

Rolf Odenthal, of Mobay Chemical Co., spoke on "THE INFLUENCE OF INACTIVE AND ACTIVE PIGMENTS ON THE CORROSION INHIBITING PROPERTIES OF PAINT FILMS."

Dr. Odenthal began by relating the efficiency of synthetic iron oxide pigments as corrosion inhibiting pigments. The finer particle sized grades (yellowish shades) are more efficient corrosion inhibitors than the coarser types, he noted.

Next, slides depicting the greater efficiency of better pigment dispersion for corrosive resistance were shown by the speaker. The type of dispersion equipment used was found to be insignificant, he told the audience.

Lastly, Dr. Odenthal enumerated on three mechanisms of reducing corrosion. They are: preventing saponification of the binder by the formation of metallic soaps; reducing permeation of corrosion inducing chemicals through the films; and passivating the substrate.

Q. How do the more effective iron oxides compare to zinc chromate and red lead for corrosion inhibition?

A. Zinc Chromate was more effective. Red lead was not evaluated.

Q. What were the chemical treatments on the most effective, easy dispersing TiO_2s?

A. The conventional treatments of aluminate and silicates.

ED COUNTRYMAN, *Secretary*

BIRMINGHAM..... DEC.

"Labelling, Legislation, Theory and Practice"

Club President, J. Ron Jukes, of Croda Paints Ltd., presented Cyril Lawton, of Evode Ltd., with a 25-year pin in recognition of his years of service to the Federation. In addition, Mr. Jukes awarded a 50-year pin to Bob Howse, of Thomas Howse Ltd. Mr. Howse formerly served as President and Secretary of the Club.

"LABELLING, LEGISLATION, THEORY AND PRACTICE," was the topic of the evening's technical talk, delivered by Doreen Cornelius and Roy Crawford, both of CVP, and David Penrice of Newtown Industrial Paints Ltd.

Commencing the program, Mr. Penrice discussed the approach his firm was taking on the requirements of the new legislation. He explained the importance of product decision sheets and through a slide presentation discussed a computerized label printer which his firm installed to produce the necessary requirements of the labelling legislation for up to 25 litre packs.

Mr. Crawford followed with a talk on labelling. He emphasized that labels serve four purposes: to inform, to instruct, to attract, and to warn. He noted two main groups of labels are User Labels which state the name of the substance, risk, and safety phrases, and Transport Labels which show necessary information for emergency services. In contrasting the two types he stated that user labels should be on the container, whereas transport labels should be on the package.

Mr. Crawford then noted that under the new EEC regulations coming into effect on January 1, 1986, all products would have to be classified with supporting information in the form of a decision sheet available for inspection. He also focused attention on the proposed changes to Section 6 of the Health & Safety at Work Act 1974 which would account for foreseeable operator error in design of product and labelling.

Finally, Ms. Cornelius spoke on the preparation of LD50 values and the requirement to comply by December 31, 1986. She discussed the three basic classifications: very toxic, toxic, and harmful. The vast majority of the materials and products in the surface coating industry fall into the latter category, she added. In this category are three areas of concern: oral, skin absorbtion, and inhalation.

The parameters and type of labelling are decided by the individual or company putting the preparation on the market, Ms. Cornelius explained. Therefore, it is the manufacturer who is responsible. At present there are in excess of 10,000 items without LD50 values, she noted. She concluded by reminding the membership that data on all new preparations, including concentration limits, must be sent to H.S.E.

DAVID M. HEATH, *Secretary*

1985-86 OFFICERS OF THE DETROIT SOCIETY (left to right): President—Bob Feisel; Society Representative—Gary Van de Streek; Treasurer—Gabriel Gabriel; and Vice-President—Richard Schreiber

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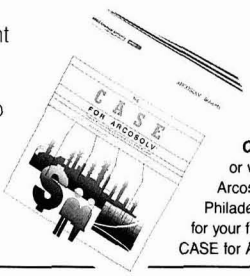

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GOLDEN GATE SOCIETY OFFICERS for 1986-86 (left to right): Ken Trautwein; Society Representative—Barry Adler; President—Robert T. Miller; Vice-President—Patricia Shaw; and Secretary—David Filson

OFFICERS AND COMMITTEE CHAIRMEN of the Montreal Society, 1985-86. Seated (left to right): Society Representative—Horace Philipp; Membership Chairman—Jean-Pierre Cote; President—Joe Fiocco; L. Issa; and Society Past-President—Robert Payette. Standing (left to right): M. Lemieux; L. Kabakian; Educational Chairman—Walter Kolanitch; V. Pederson; Technical Chairman—John Hall; N. Chaif; R. Ferrie; G. Chartrand; M. Khalil; J. Brunet; Treasurer—E. Templeton; and Secretary—D. Wilde

1985-86 OFFICERS AND COMMITTEE CHAIRMEN of the Toronto Society. Seated (left to right): Program Chairman—Peter Skelton; Educational Chairman—Roy Donnelly; A. Jones; Secretary—Hans Wittman; President—Ted Stevenson; Vice-President—Gordon Major; Society Representative—Kurt F. Weitz; and F. Reckless. Standing (left to right): D. Hollands; Membership Chairman—Scott Harvey; N. Demers; V. Rana; Environmental Control Chairman—Ron Babinsky; L. Bonikowski; Publicity Chairman—Larry Ham; Technical Chairman—Frank Chau; J. Piott; and Manufacturing Chairman—Norman Malisani

OFFICERS AND COMMITTEE CHAIRMEN of the Western New York Society for 1985-86 (left to right): Educational Chairman—James Price; Publicity Chairman—Mark K. Markoff; President—Charles C. Tabbi; Vice-President—Michael DePietro; Treasurer—Gerald F. Ivancie; and Secretary—Jean L. Luck

CHICAGO.....FEB.

"RCRA" and "Hazard Communications"

Ken Bechely, of the Illinois EPA, provided the first technical talk. He discussed "RCRA."

From a state perspective, Mr. Bechely discussed hazardous waste requirements. He also outlined the classification of a waste generator as defined by Title 35 of the Illinois Administrative Code. Exemptions for small quantity generators and pitfalls which subject waste generators to reclassify as Treatment, Storage, and Disposal (TSD) sites were also addressed.

A post-dinner presentation entitled "Are You Ready for Hazard Communication?" was given by Carol Robinson, of DeSoto, Inc.

The second phase of the OSHA Hazard Communication Rule will go into effect on May 26, 1986, stated Ms. Robinson. The rule requires employers to have an in-plant Hazard Communication program including product labelling, Material Safety Data Sheets, and employee training. She also discussed who is covered by OSHA Hazard Communication Rule and State Right-to-Know laws, what happens to trade secrets, and how to provide employee training.

Raymond Czic'zo, *Secretary*

CLEVELAND.....JAN.

"Computer Process Control"

During their annual joint meeting with the Cleveland Paint and Coatings Association, a symposium and table-top exhibition on "Computerized Process Control in the Coatings Industry" was held. The event, hosted by the Society, was a joint effort of the Society's Manufacturing Committee and the Chemical Coatings Committee of the Cleveland Paint and Coatings Association. Keynote speaker Steve Seabury, of Bailey Controls, Co., delivered a talk on "The Disappearing Mainframe."

Mr. Seabury began by discussing three integrated circuits of about the same size. Using schematic diagrams he showed one which held 16K bytes of memory, another that held 256K bytes, and a third type (not yet in production) which offered one Megabyte (1 million bytes). He noted that there are computers, minicomputers and software adequate to electronically control industrial processes in use today but that anyone considering the change should study carefully their own operation to insure getting the best and most economical system for their particular operation.

To demonstrate the improved technology of today, Mr. Seabury presented a visual of the VAX 11/780 integrated circuit which has three sizeable consoles, and necessary controlled environment. He contrasted that with a board that could be hand-held yet has all the capabilities of the 11/780 including on-board BASIC and COBOL compilers, operates slightly faster than the 11/780, and works fine at 85°F.

In closing, he explained that mainframe computers were not obsolete but that they would find new things to do, along with the expected arrival of a new generation of mainframe supercomputers. Within five years, virtually all industrial processes will be automated, he concluded.

Richard R. Eley, *Secretary*

LOS ANGELES.....JAN.

"Officers' Night"

Federation President William Mirick and Executive Vice-President Frank Borrelle gave a slide presentation on Federation activities which highlighted programs conducted throughout the country.

A legislative/environmental report was then given by Don Curl. He discussed the four year extension of the 380 gram per liter allowance for non-flat coatings (Rule 1113) by the South Coast Air Quality Management District (SCAQMD) which is being challenged by the EPA.

The EL RAP organization has met with Dave Howekamp, Director of the Air Management Division Region 9 (EPA), and his staff on December 18, reported Mr. Curl. He further explained that Mr. Howekamp has agreed not to give any citations to companies not in compliance until they further investigate in the Southern California area.

The speaker also reported that EPA desires to meet with paint manufacturers because the agency is not convinced a 250 gram per liter paint cannot be made. EPA has the right to override SCAQMD's decisions, stressed Mr. Curl. He noted that EL RAP is in position to challenge EPA's stand. Regarding Rule 1107, metal parts coatings regulations, EPA has agreed to study the Rule further in-depth. EPA seems to be listening and is willing to work with EL RAP, concluded Mr. Curl.

TECHNICAL SPEAKERS AT THE CHICAGO SOCIETY February meeting included Carol Robinson, of DeSoto, Inc., and Kenneth P. Bechely, of the Illinois EPA

Ray DiMaio, of Koppers Co., Inc., told of the upcoming Manufacturing Seminar "Managing Manufacturing Costs" to be held April 9, 1986.

Educational Committee Chairman, Melinda Rutledge, of Allo Chemical, reported that the course on Introductory Paint Technology scheduled for Cal-State L.A. campus has been postponed until March.

The technical speaker for the evening was William E. Wellman, of Exxon Chemical Co. He discussed "An Update on the Role of the Solvent in High Quality Complying Acrylic Coatings."

Dr. Wellman's presentation dealt with resin and coating manufacturers who are developing coatings to comply with upcoming EPA guidelines. To date, no viable complying systems exist for applications such as auto OEM and metal appliances, he stated.

1985-86 OFFICERS OF THE KANSAS CITY SOCIETY (left to right): Secretary—Steve Johnson; Treasurer—Roger Haines; President—Jerry P. Hefling; and Vice-President—Steve Bussjaeger

NORTHWESTERN SOCIETY OFFICERS AND COMMITTEE CHAIRMEN for 1985-86 (left to right): Past-President—Richard Johnson; Vice-President—Larry Brandenburger; Lowell Wood; Secretary—Joan B. Lamberg; Manufacturing Chairman—Dick Mundinger; Society Representative—Richard Fricker; President—Al Yokubonis; and Treasurer—Richard Karlstad

For an acrylic system, use of an appropriate ester solvent can assist tremendously with compliance by providing a suitable polymerization medium, controlling the molecular weight of the polymer, keeping the molecular weight low, providing a suitable cutting fluid, producing a coating with high resistivity spraying, and producing a coating with improved properties.

MELINDA K. RUTLEDGE, *Secretary*

LOUISVILLE ..... JAN.

"Past-Presidents' Night"

Federation President William Mirick and Executive Vice-President Frank Borrelle were among six honored guests at the meeting. Using a slide presentation, Mr. Borrelle described the Federation activities underway throughout the country.

Society President-Elect Howard Ramsay, of Du Pont Co., introduced the 19 Past-Presidents of the Society and presented each with a Past-Presidents' Pin.

LARRY F. PITCHFORD, *Secretary*

NEW YORK ..... JAN.

"Inerting for Safety"

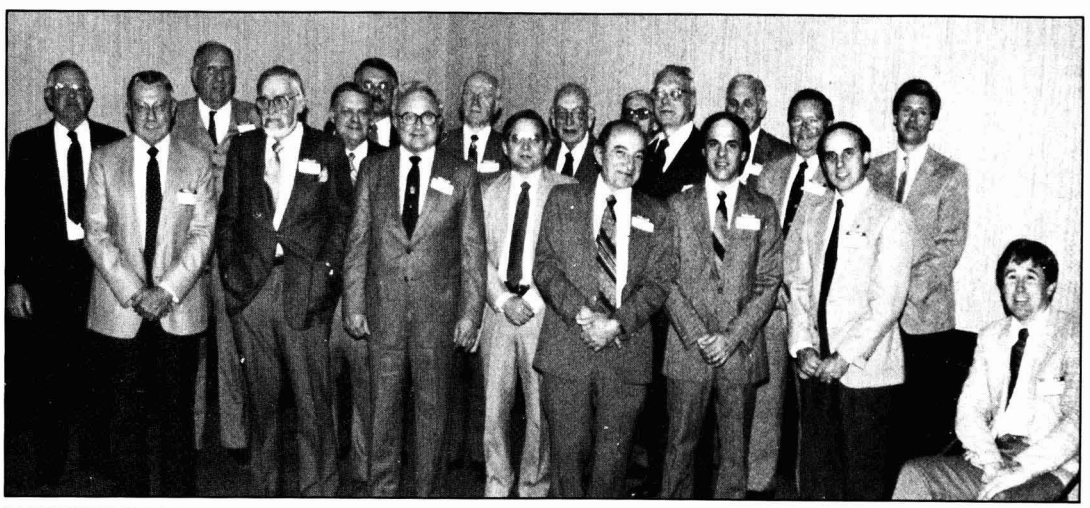
A moment of silence was observed in memory of Daniel B. Becker, Sr., of D.B. Becker Co., Inc., who recently passed away. Society President Raymond P. Gangi, of International Paint Co., Inc., offered a resolution recognizing Mr. Becker for his long association with the coatings industry.

Scholarship Committee Chairman Marvin Wexler, of Troy Chemical Co., announced that three scholarship awards each bestowing $1,000 to the recipient were to be presented. Mr. Wexler awarded the Joseph J. Mattiello Memorial Scholarship to John R. Pennacchia, currently attending Polytechnic Institute of New York in pursuit of his Ph.D. in polymer chemistry. Richard Himics, of Daniel Products Co., presented the Melvin M. Gerson Award to Edward Kubis, employed with Calgon Corp., pursuing a Masters degree at Wagner College. Floyd Nesse, of North American Paint Co., presented the Allen Feinsilver Memorial Scholarship to Steven Willner, an undergraduate at Yeshiva University, majoring in chemistry and computers.

Irwin Young, of Jesse S. Young Co., Inc., gave the first reading of a By-laws change concerning Associate Members which allows them to become an Honorary or Retired member and allows them to transfer membership from one employer to another without having to reapply.

Gary S. Halpern, of Neutronics Co., spoke on "INERTING FOR SAFETY IN COATINGS PLANTS."

Mr. Halpern elaborated on three inerting systems including the Time-Volume ap-



PAST-PRESIDENTS OF THE LOUISVILLE SOCIETY in attendance at the January meeting. Front Row (left to right): Dick Fortener (1966-67); M.C. Irvin (1947); Joseph Bauer (1969); Paul Nilles (1976); Joe Lococo (1979); Nick Lanning (1978); John Lanning (1984); and Ed Thomasson (1985). Back Row (left to right): Creel Brown (1964-65); H.L. Brinly (1954); Calvin Marcus, Jr. (1960); Horace Mahorney (1957); Jim Hoeck (1971); E.J. Klinger (1941); Herb Wilson (1975); Vic Kurk (1972); P.W. Harbaugh (1982); Fred Newhouse (1983); and Kirk Menefee (1981)

proach where an inert gas is added to a vessel to sparge or blanket it; the Pressurization approach where a pressure higher than the surrounding atmosphere insures an inert atmosphere; and the Minimum Oxygen Concentration approach which controls the amount of oxygen present and results in a savings in inert gas.

Three factors necessary to support combustion were also discussed by Mr. Halpern. They are fuel, ignition, and oxygen, with oxygen being the only controllable ingredient.

Q. Which inerting gas is the gas of choice?

A. Most systems use nitrogen because it's cheaper and more inert. However, it is lighter than CO_2 and in some cases, the heavier gas is preferable.

JOHN W. BURLAGE, *Secretary*

NORTHWESTERN ..... JAN.

"Quality Improvement and Cost Reduction"

A moment of silence was observed for Society Past-President William Thompson who passed away on January 4, 1986.

Symposium Chairman Mark Ulgem, of Creative Paint Mfg., announced plans for the symposium "Color, Its Interactions and Effects" to be held March 4, 1986, at the Marriott Hotel in Bloomington, MN.

Society Representative, Richard Fricker, of Valspar Corporation, discussed OSHA's proposal to reduce the current permissible exposure limits of formaldehyde based on the determination that formaldehyde could have a possible carcinogenic potential for humans. Hearings will be held on this proposed regulation, he noted.

Mr. Fricker also discussed the proposed expansion of "Right-to-Know" laws. He explained that the regulation was set up originally for only manufacturing industries. The courts now have said that the regulation should be applied to other businesses. Lastly, he told of a new form issued on registering underground storage tanks.

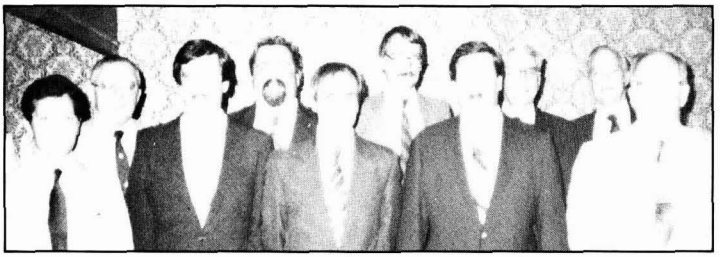
The first speaker for the evening was Robert L. Peterson, of 3M Company. He detailed the "JURAN APPROACH TO QUALITY IMPROVEMENT AND COST REDUCTION."

Annual costs of poor quality (scrap, rework, claims, etc.) are, for most companies, in the range of 10 to 20% of sales, began Mr. Peterson. They present a major opportunity for cost reduction. Quality improvement also aids in dealing with liability and government regulation. He explained that the prime objective of the Juran program is to help company management teams develop the habit of annual improvement in quality and annual reduction in quality-related costs.

Mr. Peterson also provided a background history of how the Juran approach came into being. In World War II the U.S. government asked Dr. Demming and Dr. Juran to apply their statistical quality control and quality method to the war industry in order to make quality products. The work force at that time was comprised mainly of men too old for the military and women. The quality level of the products produced was very high compared to that of the countries involved in the war.

After the war, explained Mr. Peterson, the individuals who had been taught the quality control techniques were replaced on the job by veterans returning from the war. The new employees knew little about these quality control techniques and the main concern of the time was get the product out. In the meantime, stated the speaker, a program was set up to help the Japanese recover. Dr. Demming and Dr. Juran were sent to Japan to teach them quality techniques. The techniques have worked, concluded Mr. Peterson, as the Japanese have become competitive in world markets and are moving into quality leadership.

JOAN B. LAMBERG, *Secretary*



1985-86 OFFICERS AND COMMITTEE CHAIRMEN of the Philadelphia Society (left to right): Secretary—Thomas L. Peta; Past-President—William Georgov; Membership Chairman—Timothy S. Hyde; Frank Bartusevic; President—Philip A. Reitano; Chris Hulme; Fred Lipson; Honorary Director—J. Richard Kiefer, Jr.; Society Representative—Carl Fuller; and Vice-President—Donald F. Denny

NORTHWESTERN ..... FEB.

"Cure Mechanisms" And "Handling Stress"

Society Representative Richard Fricker, of Valspar Corporation, reported that Federation Past-President Harold B. Gough had passed away on January 11, 1986. Mr. Gough served as President of the Philadelphia Society in 1943, and became President of the Federation in 1967.

Ed Ferlauto, of Valspar Corporation, reported that the Technical Committee had conducted literature searches in three areas: water vapor transmission; simulation of acid rain; and comparison of accelerated outdoor exposure color change. Water vapor transmission has been selected for the Committee's next project, he stated. The project will attempt to show the correlation of salt spray resistance with water transmission, oxygen transmission, and wet adhesion for high solids coatings. Regarding the current project "To Determine Why Measured VOC Differs from Theoretical Values," Mr. Ferlauto stated that the Committee hopes to have work ready for presentation in 1987.

Society President Al Yokubonis, of Celanese Specialty Resins, reported that he

OFFICERS AND COMMITTEE CHAIRMEN of the St. Louis Society, 1985-86 (left to right): Environmental Control Chairman—Robert F. Walsh, Jr.; Vice-President—Al Zanardi; Secretary—James McDerby; President—Charles L. Grubbs; Manufacturing Chairman—Elliott Lanson; and Treasurer—Howard Jerome

Constituent Society Meetings and Secretaries

BALTIMORE (Third Thursday—Martin's Eudowood, Towson, MD). ED COUNTRYMAN, Bruning Paint Co., 601 S. Haven St., Baltimore, MD 21224. Virginia Section—Fourth Wednesday, Ramada Inn-East, Williamsburg, VA.

BIRMINGHAM (First Thursday—Strathallan Hotel, Birmingham, England). D.M. HEATH, Holden Surface Ctgs. Ltd., Bordesley Green Rd., Birmingham B9 4TQ England

CHICAGO (First Monday—meeting sites vary). RAYMOND CZICZO, Reliance Universal, Inc., 1915 Industrial Ave., Zion, IL 60099.

CDIC (Second Monday—Sept., Jan., Apr., June in Columbus; Oct., Dec., Mar., May in Cincinnati; and Nov., Feb. in Dayton). SAMUEL KRATZER, Potter Paint Co., P.O. Box 265, Cambridge City, IN 47327.

CLEVELAND (Third Tuesday—meeting sites vary). RICHARD ELEY, Glidden Coatings & Resins, Div. of SCM Corp., D.P. Joyce Research Center, P.O. Box 8827, Strongsville, OH 44136.

DALLAS (Thursday following second Wednesday—Executive Inn, near Lovefield Airport). FREDERICK T. BEARD, Glidden Coating & Resins, Div. of SCM Corp., 1900 North Josey Ln., Carrolton, TX 75006.

DETROIT (Fourth Tuesday—meeting sites vary). JOANNE CEDERNA, Inmont Corp., 26701 Telegraph Rd., Southfield, MI 48086.

GOLDEN GATE (Monday before third Wednesday—Alternate between Sabella's Restaurant on Fisherman's Wharf and Francesco's in Oakland, CA). KARL SAUER, Pfizer, Inc., MPM Div., 776 Rosemont Rd., Oakland, CA 94610.

HOUSTON (Second Wednesday—Sonny Look's, Houston, TX). JAMES A. HARRELL, Buckman Laboratories, 5127 Wightman Ct., Houston, TX 77069.

KANSAS CITY (Second Thursday—Cascone's Restaurant, Kansas City, MO). STEVEN JOHNSON, Cook Paint & Varnish Co., P.O. Box 389, Kansas City, MO 64141.

LOS ANGELES (Second Wednesday—Steven's Steak House, Commerce, CA). MELINDA RUTLEDGE, Allo Chemical Co., P.O. Box 443, Ontario, CA 91761.

LOUISVILLE (Third Wednesday—Breckinridge Inn, Louisville, KY). LARRY F. PITCHFORD, Reynolds Metals Co., P.O. Box 3530, Plant III, Louisville, KY 40232.

MEXICO (Fourth Thursday—meeting sites vary).

MONTREAL (First Wednesday—Bill Wong's Restaurant). W WILDE, Hoechst Canada, Inc., 4045 Cote Vertu, Montreal, Que., Canada H4R 1R6.

NEW ENGLAND (Third Thursday—LeChateau Restaurant, Waltham, MA). GAIL POLLANO, Polyvinyl Chemical Industries, Inc., 730 Main St., Wilmington, MA 01887.

NEW YORK (Second Tuesday—Landmark II, East Rutherford, NJ). JOHN W. BURLAGE, Pacific Anchor Chemical, 14 Ridgedale Ave., Cedar Knolls, NJ 07927.

NORTHWESTERN (Tuesday after first Monday—Jax Cafe, Minneapolis, MN). JOAN B. LAMBERG, Horton-Earl Co., 750 S. Plaza Dr., St. Paul, MN 55120.

PACIFIC NORTHWEST (Portland Section—Tuesday following second Wednesday; Seattle Section—the day after Portland; British Columbia Section—the day after Seattle). YVON POITRAS, General Paint Co., 950 Raymur Ave., Vancouver, B.C., V6A 3L5, Canada.

PHILADELPHIA (Second Thursday—Dugan's Restaurant, Philadelphia, PA). THOMAS L. PETA, J.C. Osborne Chemicals, Inc., P.O. Box 1310, Merchantville, NJ 08109.

PIEDMONT (Third Wednesday—Howard Johnson's, Brentwood Exit of I-85, High Point, NC). CHARLES HOWARD, DeSoto, Inc., P.O. Box 22105, Greensboro, NC 27420.

PITTSBURGH (First Monday—Montemurro's, Sharpsburg, PA). MARK TROUTMAN, Bradley Paint Co., 608 W. Crawford St., Connellsville, PA 15425.

ROCKY MOUNTAIN (Monday following first Wednesday—Bernard's, Arvada, CO). MARCY S. BAUGH, Hutson Industries, 60 Tejon St., Denver, CO 80223.

ST. LOUIS (Third Tuesday—Engineers Club). JAMES N. MCDERBY, F.R. Hall & Co., 6300 Bartmer Ind. Dr., St. Louis, MO 63130.

SOUTHERN (Gulf Coast Section—Third Thursday; Central Florida Section—Third Thursday after first Monday; Atlanta Section—Third Thursday; Memphis Section—bi-monthly on Second Tuesday; Miami Section—Tuesday prior to Central Florida Section). C. LEWIS DAVIS, Ambrosia International, 802 Black Duck Dr., Port Orange, FL 32019.

TORONTO (Second Monday—Cambridge Motor Hotel). HANS WITTMAN, BASF Canada Ltd., 10 Constellation Ct., Rexdale, Ont., Canada M9W 1K1.

WESTERN NEW YORK (Third Tuesday—meeting sites vary). JEAN L. LUCK, Pratt & Lambert Inc., Powder Coatings Div., P.O. Box 22, Buffalo, NY 14240.

and Mr. Fricker had made a trip to Canada to visit the Winnipeg section. Winnipeg would like to have a say in our elections and would like to be a little more involved in what we do, said Mr. Yokubonis. He noted that the Society will attempt to improve this and would like to hear more from that section.

Loren W. Hill, of Monsanto Co., provided the first technical presentation. Mr. Hill discussed "CURE MECHANISMS."

He explored films prepared from high solids acrylic or polyester polyols and etherified melamine formaldehyde (MF) crosslinkers using an Autovibron instrument. He noted that some aspects of cure mechanism have been elucidated based on analysis of dependence of glass transition temperature (Tg) on cure temperature and acrylic/MF ratio.

The second presentation was conducted by Frances Howley, of Blaisdell YMCA. Mr. Howley addressed the topic of stress, citing four options for handling it.

JOAN B. LAMBERG, *Secretary*

PHILADELPHIA ..... JAN.

"Joint Meeting with Philadelphia PCA"

Technical Committee Chairman, Bill Fabiny, of Sermatech, International, announced that the Society technical seminar, "The Impact of Environmental Regulations and the Right-to-Know" will be held May 12, 1986, at the Airport Hilton, Philadelphia, PA.

Honorary Director, Dick Kiefer, of McCloskey Corp., discussed the Federal Standard Compliance on Hazard Communication. He announced that the PA Chamber of Commerce will hold a conference on the Federal Hazard Communication and PA Right-to-Know in Harrisburg, PA, on February 6, 1986. The PA Chamber of Commerce has made a Hazard Communication Training Manual available. New Jersey's Environmental and Cleanup Responsibility Act (ECRA) will be discussed by the Penjerdel Council on January 16, he noted.

William W. Bewley, Jr., of Hercules Incorporated, spoke on "ECONOMIC FORECAST 1986."

Using a slide presentation, Mr. Bewley told that the economy is now entering its fourth year of expansion—already above the average of post-World War II expansions. He added that it has a reasonable probability of extending into the longest period of uninterrupted peacetime growth in the past 60 years.

In spite of the prosperity, there are two important and obvious trouble spots within the nation today, the farm community and

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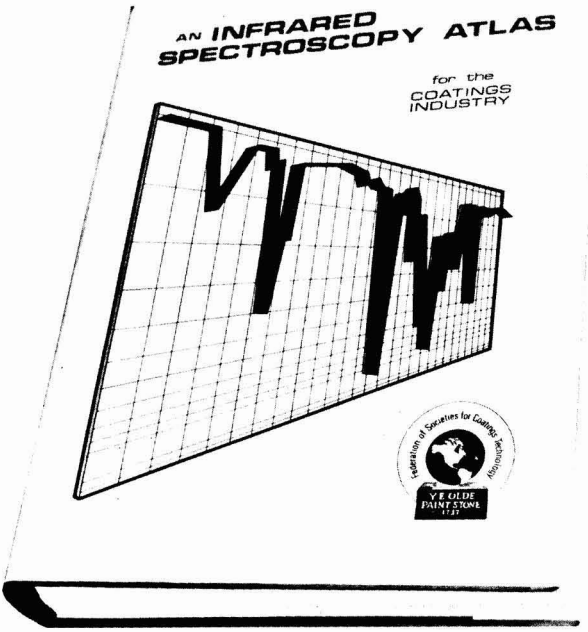

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Programming is specifically directed to Coatings, Soft Trim, and Plastics, with each addressed in separate, two-day overlapping segments (Coatings, June 3-4; Soft Trim, June 4-5; and Plastics, June 5-6).

General sessions at each two-day segment will be devoted to: color difference measurement, with a complete explanation of "J1545" and its implementation; statistics of proper sampling; effect of metamerism and alternative illuminant and standard observer; and reference standards for matching parts.

Coatings segment will also include a session on multi-angle measurement for metallic colors; and Soft Trim segment will include session on shade sorting of fabrics.

Three workshops (two on instrumental color measurement, featuring equipment demonstrations; and a tutorial on sample preparation and presentation) afford an opportunity for participants to measure provided samples and determine correlation of the various instruments for metameric and non-metameric samples.

The programming is designed to offer a "working meeting" environment, and registrants are invited to bring color samples for measurement.

Attendance will be limited to assure individual participation.

Symposium is endorsed by Inter-Society Color Council and Detroit Society for Coatings Technology.

For complete program information and registration/housing forms (specify Coatings, Soft Trim, or Plastics), contact FSCT headquarters.

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certain manufacturers. Mr. Bewley attributed the problems to a result of excessive debt levels, over-capacities, inefficient production facilities, and world-wide price competition.

In closing, Mr. Bewley explained that the negative forces which took hold of the economy in the middle sixties have now been reversed and this is why the economic outlook is quite favorable for some time to come.

THOMAS L. PETA, *Secretary*

PIEDMONT.....JAN.

"Computer Modeling for Solvent Selection"

Educational Committee Chairman Bob Matejka, of Reliance Universal, Inc., reported that a name had been selected for the Society-sponsored course. It will be called "Organic Chemistry of Coatings" and will be put forth by Dr. Hurwitz to a university that would issue credit for completing it. He also reported on the second Mini-Symposium topics which are to be presented at the March meeting.

Environmental Committee Chairman Ed West, of General Steel Drum, discussed a letter he had received from the Federation Environmental Control Committee giving notice that OSHA is requesting a lowering of the level of formaldehyde.

Society President Mike Davis, of Byk-Chemie, reported that Dr. E.O. Cummings had been voted as the recipient of the Dave Bouldin Outstanding Award.

Phil Kalina, of Dow Chemical, gave a technical talk on "COMPUTER MODELING FOR SOLVENT SELECTION IN AIR DRY COATINGS."

The role of a solvent supplier through computer aided solvent selection was detailed by Mr. Kalina. He noted that in solvent selection, the computer quickly matches current solvents used by an individual Further, he explained that solvent selection is based on two factors: solvency power and the evaporation rate. Mr. Kalina concluded the talk with a slide presentation showing how various solvents could be obtained by blends.

CHARLES T. HOWARD, *Secretary*

ST. LOUIS .....JAN.

"Joint Meeting with St. Louis PCA"

Manufacturing Committee Chairman Elliott Lanson, of Lanchem Corp., reported a 26% return on the mailing concerning the Manufacturing Seminar scheduled for May 20, 1986.

Education Committee Chairman, James McDerby, of F. R. Hall Inc., told of the Society's plans to make three cash prize awards to paint-related exhibits at the St. Louis Science Fair to be held on April 18-22, 1986. He urged members with high school students to help them make appropriate exhibits.

The University of Missouri-Rolla will supply the guest speaker of the Society's Education Night, reported Mr. McDerby. He also noted that Jim Stoffer, of University of Missouri-Rolla, has volunteered his staff to hold a six to eight hour seminar on "The Basics of Coatings Technology." A take-home test will be used to determine the winners of the Ralph Gatti Awards, he stated. Further he explained that the awards would be divided into two categories, one for Bachelor degrees and the other for non-degree recipients.

Bruce Haney, of Eastman Chemical Products, provided a talk on "REVIEW AND PREVIEW OF THE ECONOMY."

JAMES MCDERBY, *Secretary*

Future Society Meetings

Birmingham

(May 1)—"Sitting on the Fence—Most of the Time"—D. Eddowes, PPCJ.

(May 22)—Symposium—"Management and Investment Required to Achieve Coatings Laboratory Efficiency—Miracle."

(June 5)—General Meeting.

Chicago

(May 2)—Awards Night Banquet.

Cleveland

(Apr. 15)—Awards Night, Annual Meeting. "Organic and Inorganic Coatings Used in the Microelectronics Industry"—C.C. Liu, Case Western Reserve University.

(May 20)—"Aftermarket Automotive Coatings: History and Technology"—Milton I. Hardt, Sherwin-Williams Co.

Detroit

(May 14)—Joint Meeting with DPCA.

Kansas City

(May 8)—"Polyurethane Coatings—Enjoying Their Advantages While Understanding and Controlling Health Risks"—Paul Ziegler, Mobay Chemical Corp.

(June)—Joint Meeting with St. Louis Society.

Louisville

(Apr. 16)—"Legal Liability"—Ronald R. Van Stockum, Jr.

New England

(May 15-16)—Symposium—"Launching the New Revolution—Compliance for the 21st Century."

New York

(May 9)—"Composite vs Single Diserants"—Michael C. Frantz, Daniel Products Co.

Pacific Northwest

(Apr. 16)—"Closing the Gap with High Solids"—Robert M. Price, Spencer Kellogg/NL Industries, Inc.

(May 21)—"Titanium Dioxide—Why So Many Grades?"—Richard I. Ensminger, NL Industries, Inc.

Philadelphia

(May 8)—"Advantages of Predispersed Polyethylene Waxes"—Michael C. Frantz, of Daniel Products, Co.

Piedmont

(Apr. 16)—"Surface Modifiers in Coatings"—Speaker from Cavedon Chemical Co.

(May 21)—"Advances in Waterborne Epoxy Technology for Coatings"—Clifford Dukes, Celanese Specialty Resins.

Pittsburgh

(May 5)—"Reflections on the Phenomenon of Fading"—Ruth Johnston-Feller, Consultant.

Rocky Mountain

(May 12)—"Titanium Dioxide—Why So Many Grades?"—Richard I. Ensminger, NL Industries, Inc.

Southern Central Florida Section

(May 22)—"The Competitive Trade Sales Market Place"—Dick Fuchs, The Enterprise Cos.

St. Louis

(Apr. 15)—Education Night.

(May 20)—Manufacturing Seminar.

Western New York

(Apr. 15)—Manufacturing Night. "Advantages and Disadvantages of Dispersion Equipment"—Earl Baumhart, Coatings Engineering & Systems.

(May 20)—Federation Night. "Recent Advances in Radiation Coatings Technology"—Richard Kemmerer, Celanese Chemical Co.

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TOBIN, THOMAS W.—Servair Inc., Mississauga.

WESTERN NEW YORK

Active

CHLODNEY, RAY T.—Essex Spec. Products, Jamestown, NY.
HAKE, RICHARD—Spencer-Kellogg Prods. NL Chemicals, Buffalo, NY.

People

Carl W. Fuller, Jr., former Technical Director of Reichard-Coulston, Inc., Bethlehem, PA, is the 1985 recipient of the ASTM Henry A. Gardner Award. This award is presented to a member of ASTM Committee D-1 on Paint and Related Coatings and Materials who has demonstrated sustained outstanding competence in managing a unit of the committee so that its productivity is high. Mr. Fuller is Chairman of Subcommittee D01.31 on Pigment Specifications and also serves on many other D-1 subcommittees. He is a member of the Philadelphia Society for Coatings Technology.

C.W. Fuller

P. Kovacs

P. Verlodt

F. Raba

Kelco, a division of Merck and Co., Inc., Rahway, NJ, has named **Peter Kovacs** Vice-President, Marketing. Mr. Kovacs will be located at division headquarters in San Diego, CA. In addition, Kelco has promoted **Robert L. Durgan** to Senior Regional Sales Manager for the Northeast and Canadian region. Kelco has also appointed an Industrial Marketing and Business Development Manager. Assuming this position is **Giuseppe Bartolotta.**

Hercules Incorporated, Wilmington, DE, has announced the realignment of two product groups in its Specialty Chemicals Co. Heading the firm's Water-Soluble Polymers group will be Vice-President **Leroy V. Peiffer.** Other appointments within this group include: **Thomas C. Davis**—Marketing Director; **Bart Hoogerbrugge**—Worldwide Marketing Director; **John L. Lawes**—Director of Market Development; **Thomas G. Tepas**—Business Director of cellulose products; **William C. McLachlan**—Business Manager for nonionic products; **Denis E. LaSota**—Business Manager for anionics and synthetic water soluble polymers; and **Stephen N. Thorp**—Business Manager Americas/East.

The company's Coatings and Additives group will be managed by Vice-President **W. Wells Hood, Jr.** The following appointments for this group were also announced: **R.S. Sumption**—Business Director; **James G. Unger**—Business Manager; **Charles A. Carbo**—Director of Business Development; **John P. Strode**—National Sales Director for coatings; **John E. Montgomery**—National Sales Director for polymers and additives; **Noble E. King**—Product Manager for coatings; and **John D. Plowright**—Product Manager for polymers and additives.

Color Corporation of America, a division of The Valspar Corp., Minneapolis, MN, has appointed **Patricia Verlodt** to the position of Color Consultant. A member of the Inter-Society Color Council, Ms. Verlodt will be responsible for the design and planning of color systems and color preference survey work.

Dickson Y. Cannon has been elected Vice-President of Jones-Blair Co., Dallas, TX. A member of the Dallas Society, he joined the firm in 1982 as Technical Director and Manager of the laboratory division.

William J. Ashe will retire as President and Chief Operating Officer of Witco Corporation, New York, NY. His retirement will become effective on or before June 30, 1986. Succeeding Mr. Ashe will be **Thomas J. Bickett.** Mr. Bickett formerly served as Executive Vice-President, Finance and Administration.

Albert L. Eilender has been appointed Executive Vice-President and Chief Operating Officer for Cosan Chemical Corp., Carlstadt, NJ. Mr. Eilender most recently served in the position of Vice-President, Research and Development.

Unocal Chemicals Division, Unocal Corp., Schaumburg, IL, has promoted **Jack L. Tallman** to the position of Senior Account Manager. He will be headquartered in Oakland, CA.

In addition, the company has promoted **Robert D. Mackenzie** to Account Manager, responsible for bulk sales in the Houston area.

As a result of the acquisition of American Cyanamid's titanium dioxide business by Kemira-Oy, of Finland, three appointments have been announced by the newly formed company, Kemira, Inc., headquartered in Savannah, GA. **Frank J. Raba** becomes Vice-President of Sales and Marketing; **George L. Roberts** moves to Vice-President and Technical Director; and **Robert J. Scanlon** assumes the post of Vice-President of Operations.

D & L Paint Co., Inc., headquartered in Liberty, IN, has named **Joseph Indihar** to Technical Director. Mr. Indihar will be responsible for the laboratory facility in Liberty, IN.

Ronald S. Conti has been appointed Technical Manager of the Automotive Group, DeSoto, Inc., Des Plaines, IL. In his new position, Mr. Conti supervises research and product development as well as serving as liaison between laboratory personnel at the firm's headquarters and the DeSoto sales group in Detroit. Mr. Conti is a member of the Chicago Society.

David B. Fultz has been appointed General Manager, Industrial Chemicals Div., for M&T Chemicals Inc., Rahway, NJ. In this position, he will be responsible for directing the business activities of the division, as well as managing the firm's international operations.

M&T Chemicals Inc. has also named **Emanuel T. Katz** to the position of Sales Engineer, eastern district. His responsibilities will include technical sales in the company's Industrial Chemicals, Plastic Additives and Agricultural Chemicals Divisions.

Gholi Darehshori has been named Vice-President of the Resin Department of the Chemical Products Div., of Cargill, Inc., Minneapolis, MN. Mr. Darehshori is a member of the Chicago Society. In addition, Cargill has promoted **David E. Tweet** to Manager of the division's national account marketing and purchasing.

The Midland Division of the Dexter Corporation, Waukegan, IL, has announced the following promotions: **Roy Bogseth**—Analytical Research Chemist; **Benjamin P. Cummins** and **Willie C. Estes**—Coatings Specialists; and **Edwin Montano**—Senior Polymer Chemist in the Polymer Chemistry Group.

In addition, **Tuyet N. Donatt** has rejoined the Analytical Services Group of the Midland Division as an Analytical Chemist. Her areas of expertise include gas chromatographic and liquid chromatographic equipment and techniques.

Dr. Peter Winner has joined the Packaging Laboratory of the Midland Division as Supervisor, Beer and Beverage Can Group. Dr. Winner brings previous experience in polymer synthesis and in packaging coatings to this new position.

Milford B. Harp has been elected Vice-President of Nalco Chemical Co., Oak Brook, IL. Mr. Harp also holds the position of President of Nalco Pacific and is responsible for the firm's international marketing staff.

Cheryl Nelson Blomquist has been named a Senior Coatings Chemist for CasChem, Inc., Bayonne, NJ. In this position, Ms. Blomquist will be responsible for the evaluation of the firm's products in urethane industrial coatings.

Bud Cortner has joined U.S. Paint, a division of Grow Group, Inc., New York, NY, as Regional Manager of the Greater Midwest and Sunbelt region.

Henkel Corporation, Minneapolis, MN, has promoted **Dennis W. Cullen** to Vice-President/General Manager. Prior to his promotion, Mr. Cullen was President of Henkel (Japan), where he was instrumental in initiating activities in polymer development as well as in fine chemicals and mining products.

New England Society To Hold Symposium on Compliance, May 15-16

"Launching the New Revolution—Compliance for the 21st Century" is the topic of the New England Society's annual symposium, to be held at the Sheraton Hotel, Lexington, MA, May 15-16.

Scheduled sessions during the two day event will include the following:

May 15

"Economic Forecast"—Luncheon speaker, Gary Corsan, Eastman Chemical Products.

"Round Table Discussion of Federal and State Regulations":

Joseph Belloli, Mass. Dept. of Labor & Industry.

Carl Eklund, Mass. DEQE, Director of Solid & Hazardous Waste.

Elaine Goldburg, Mass. Dept. of Public Health.

Don Hasselfeld, Lawyer (Insurance, Superfund, Victim Compensation).

Mel Holman, EPA, Waste Management.

G. Montgomery Lovejoy III, Associated Industries of Mass.

Donald MacKenzie, OSHA, Worker Safety.

Al Shaines, Shaines Assoc., Lawyer serving on Environmental Comm.

Don Squires, Mass. DEQE, Air Quality.

"Excellence and Intrapreneuring"—Dinner speaker, Dennis Schendel, S.C. Johnson.

May 16

"Aluminum Crosslinkers for High Solids Coatings"—Vincent Carabin, Manchem, Inc.

"Low VOC Polyurethane Coatings for Structural Plastics"—James Mertens, Dow Chemical USA.

"The Role of Azeotropy in Speeding Up Water/Solvent Evaporation in Humid Air"—Dr. Albert L. Rocklin, Shell Development Co.

"Isocyanates for High Solids Urethane Coatings"—Speaker from Mobay.

"Solvents Point the Way to High Quality Complying Acrylic Coatings"—William Wellman, Exxon Chemical Co.

"A Unique Extender Pigment for Low VOC Industrial Coatings"—Craig Stoneback, Engelhard Corp.

"High Solids Silicone Alkyds for Low VOC Coatings"—William Finzel, Dow Corning.

"Recovery of Paint Wash Solvent: An Economic and Environmental Necessity"—Larry Durr, DCI Corp.

"Calculation of VOC Data as Required by EPA"—Joe Weinburg, Permuthane, Inc.

"UV/EB Equipment: A Proven Technology for Industrial Coating Lines"—Elinor R. Midlik, RPC Industries.

"Computer Produced Labels and MSDS's for Compliance"—Speaker from Wallace Computer Systems.

Advance registration is $80 for full time, or $50 for one-day; or, $100 and $60, respectively, at the door. Registration includes all meal functions.

For further information, please contact Ms. Maureen Lein, Davidson Rubber Co., Industrial Park, Dover, NH 03820; or call, 603-742-0720.

Ted Favata Named General Chairman Of WCS Symposium and Show in 1987

Ted Favata, of T.L.T., Inc., and a Past-President of the Golden Gate Society for Coatings Technology, will serve as General Chairman of the 18th Biennial Western Coatings Societies' Symposium and Show, to be held at the Monterey Convention Center, Monterey, CA, February 23-25, 1987.

Working with Mr. Favata will be these subcommittee chairmen: Exhibits—Barry Adler, of Royell, Inc.; Entertainment—Mel Lipscomb, of Lipscomb Chemical Co.; Publicity—Patricia M. Stull, of Pacific Coast Chemical Co.; Registration—Tom Dowd, of E.T. Horn Co.; and Technical Program—A. Gordon Rook, of Nuodex/Huls. Mr. Adler will also serve as Treasurer.

CALL FOR PAPERS

Western Coatings Societies' Biennial Symposium
Monterey, California
February 23-25, 1987

The Symposium Committee of the Golden Gate Society announces its request for papers to be presented at the 1987 Western Coatings Societies' Symposium, to be held in Monterey, CA, February 23-25.

The Symposium has as its theme, "Technical Excellence and Innovations for '87," and will present a varied program covering the current technology of coatings as well as new processing and marketing concepts. Papers will be divided into the following categories: Binders, Pigments, and Extenders; Water-Borne Coatings; High-Solids Coatings; Low Energy Conversion Systems; Additives (including Solvents and Driers); Color; Manufacturing; Marketing and Management; Government Regulations; and Computer Applications.

Original papers (not previously presented or published) which are on subjects of general interest to the coatings industry, covering fundamentals and most recent technological advances will be considered. Abstracts of 300-500 words in length (2 copies) should be submitted to the Committee by *June 1, 1986*. The complete paper should be submitted no later than *December 1, 1986*.

First right to publication will be in the JOURNAL OF COATINGS TECHNOLOGY. A copy of the "Guide for Authors" is available from either the Committee or the JCT.

Inquiries should be sent to Mr. Gordon A. Rook, Chairman, Technical Committee Symposium '87, c/o Nuodex, P.O. Box 608, Pleasanton, CA 94566.

Determination of VOC Is Topic Of Golden Gate Conference in June

The Manufacturing Committee of the Golden Gate Society will sponsor a conference on "Demonstration/Determination of VOC in Solvent- and Water-Borne Coatings" on June 16, at the Holiday Inn, S. San Francisco.

The all-day conference will feature presentations discussing the methods and procedures for determining the VOC (Volatile Organic Compounds) content of surface coatings, which were devised by Bay Area Quality Control Management District (BAAQMD) personnel. An equipment demonstration will also be held showing the procedures in effect.

The following are scheduled for presentation:

"Control of Volatile Organic Compounds"—Dario Levaggi, Director of Technical Services, BAAQMD

"Determination of Compliance of Solvents, Coatings, and Related Products"—Walter O'Yung, Senior A.P. Chemist

"Determination of Compliance of Volatile Organic Compounds for Water-Based Coatings"—Joe La Voil, A.P. Chemist II

"Determination of Compliance of Volatile Organic Compounds for Solvent-Based Coatings"—Mr. La Voil

"Determination of Volatile Weight Loss of Polyester Resins"—Jim Hesson, A.P. Chemist

"Determination of Volatile Weight Loss of Gel Coats"—Mr. Hesson

"VOC for Hazardous Waste—Gravimetric-Purge and Trap to 1% VOC to C-13"—Rudy Zerrudo, Senior A.P. Chemist

"VOC for Hazardous Waste Steam Distillation—G.C. to 1% VOC to C-13"—Steve Belestrieri, Laboratory Services Manager

"VOC in Aerospace Stripper"—Mr. Zerrudo

"Control of Toxic Air Contaminants"—Milton Feldstein, Air Pollution Control Officer.

Conference fee of $55 includes lunch and dinner.

For additional information, or to register, contact Mr. E. "Bud" Harmon, Borden Chemical Co., 41100 Boyce Rd., Fremont, CA 94538.

University of Missouri-Rolla Schedules Spring Short Courses, April 21 – May 23

The Chemistry Department of the University of Missouri-Rolla, Rolla, MO, has scheduled three short courses as part of its spring Paint and Coatings Program. "Introduction to Polymer Chemistry—Applications in Coatings" will be offered from April 21-25. "Physical Testing of Paints and Coatings" will be given on May 5-9. Scheduled for May 19-23, "Basic Microcomputer Programming for Coatings" will be presented.

"Introduction to Polymer Chemistry—Applications in Coatings" is designed for the person who has had college or university level organic chemistry or equivalent experience. Topics to be presented include the physical properties of polymers, the methods of preparation of polymers, and the chemical properties of polymers. Special emphasis will be placed on how changes of chemical structure affect the physical properties of these polymer systems. The use of instrumentation to evaluate and test polymers will be covered.

"Physical Testing of Paints and Coatings" is designed to improve testing techniques for quality assurance of paints and coatings. Concentrating on the purpose, theory and techniques of quality assurance, the course will show participants how to better measure the quality of paint from the standpoint of the coating manufacturer. Laboratory workshops will include tests on equipment discussed in the lectures and how to use the equipment and techniques in your lab. Lectures will cover monitoring the manufacturing process, finished product testing, setting up specifications, raw materials, government regulations, record keeping, complaint handling, general product liability, and modern chemical instrumentation as applied to coatings. Class size is limited to 30 people, so early registration is advised. Participants should have experience in a quality assurance laboratory, have the equivalent of one year of college chemistry, or have completed the UMR Introductory Course on the Composition of Paints and Coatings, or similar education and experience.

"Basic Microcomputer Programming for Coatings" is designed to help laboratory, purchasing, and marketing people who have a desire to use the computer as a tool to make their job faster, more efficient, and productive. Provided by the course will be knowledge about types of computers, a background in computer hardware, number systems used by computers; a review of high-level computer languages programming techniques, as well as a design of a number of useful programs, including sorting, information retrieval, invoicing, cost of inventory, and paint formulation bulking and costing. Course instructors will be Stanley W. Harshfield, Lab Manager of Devoe & Raynolds Co., Louisville, KY, and James O. Stoffer, Professor of Chemistry at the University of Missouri-Rolla. Other lecturers from industry will also be involved.

For additional information, contact Paint and Coatings Program, Dept. of Chemistry, University of Missouri-Rolla, Rolla, MO 65401-0249.

CALL FOR PAPERS

OCCA 1987 Biennial Conference
Eastbourne, England
June 17-20, 1987

The Oil & Colour Chemists' Association has announced that the 1987 Biennial Conference will be held in Eastbourne, England, June 17-20.

A total of four technical sessions are planned, focusing on the theme, "Advance and Application of Science and Technology in Surface Coatings." The objective of the conference will be to review the advances made in the science and technology of surface coatings in both the commercial and academic fields and it is intended to encompass as wide a field as possible in the paint, printing ink, and allied industries. Future trends in these areas will also be studied.

Anyone wishing to submit a paper for consideration should notify OCCA of their intention as soon as possible. Please contact the Director & Secretary, Oil & Colour Chemist' Association, Priory House, 967 Harrow Rd., Wembley, Middlesex, England HAO 2SF.

Applied Rheology Course to Be Presented at Kent State University

The Rheology and Coatings Group at Kent State University will sponsor a course on "Applied Rheology for Industrial Chemists" on April 28-May 2 at the university campus. The course is designed for technologists and scientists who desire an overview of rheology and discussions on rheological method for materials evaluation.

After an introduction of the basic concepts of rheology, course discussions will focus on the rheology of dispersions, gels, thermosets, latexes, and reinforced polymers. Also included are lectures on rheological instrumentation, rheology of high-solids coatings, tribo-rheology, chemo-rheology, characterization of the coatings cure process, rheology related to processing, as well as other industrial problems.

Topics and speakers for the course include:

MONDAY, APRIL 28

"Basic Concepts of Rheology I"—Hershel Markovitz, Carnegie-Mellon University.

"Basic Concepts of Rheology II"—Hershel Markovitz.

"Basic Concepts of Rheology III"—Hershel Markovitz.

"Rheology of Dispersions"—Irvin M. Krieger, Case-Western Reserve University.

TUESDAY, APRIL 29

"Dynamic Measurements: Significance and Their Application"—Edward A. Collins, Mitech Corp.

"Application of Rheology to Processing Problems"—Charles L. Rohn, Rheometrics, Inc.

"Application of Rheology to End Use Performance Problems"—Charles L. Rohn.

"Physical/Chemical Characterization of the Cure Process by Thermal-Mechanical Analysis"—Theodore Provder, Glidden Coatings and Resins Div., SCM Corp.

WEDNESDAY, APRIL 30

"Dynamic Mechanical Testing of Coatings and Composites"—John W. Furry, DuPont Co., Analytical Instruments Div.

"Chemorheology of Thermosetting Coatings"—Richard R. Eley, Glidden Coatings and Resin Div., SCM Corp.

"Rheological Control for High-Solids Coatings"—Clifford K. Schoff, PPG Industries, Inc.

"Application of Rheology to Industrial Problems"—Donald Bigg, Battelle—Columbus Laboratories.

THURSDAY, MAY 1

"Rheology of Gelatin"—Jehuda Greener, Kodak Research Laboratories, Eastman Kodak Company.

"Correlation of Film Morphology with Drying Behavior"—John W. Vanderhoff, Emulsion Polymers Institute, Lehigh University.

"Rheology of Latexes"—John W. Vanderhoff.

"Rheology of Reinforced Polymers"—Lloyd A. Goettler, Monsanto Polymer Products Co.

FRIDAY, MAY 2

"Processing of Reinforced Polymers"—Lloyd A. Goettler.

"Tribo-Rheology of Polymer Surfaces"—Armand F. Lewis, The Kendall Co.

Additional details are available from Program Chairman, Carl J. Knauss, Kent State University, Chemistry Dept., Kent, Ohio 44242.

Literature

Copolymer

A new water-borne copolymer emulsion for formulating high-gloss and medium gloss wood finishes is outlined in a recent data sheet. The copolymer's adhesion, resistance, and durability properties are covered in the brochure. For samples and technical information, contact Ted Krzynowek, Technical Marketing Manager, Polyvinyl Chemicals Inc., 730 Main St., Wilmington, MA 01887.

Granular Neutralizer

A recently released pamphlet highlights the performance capabilities of a granular neutralizer. Reported to inhibit evaporation and control toxicity problems stemming from diisocyanate spills, the product is designed for urethane processors using diisocyanate as the raw-material component. Full details are offered from James Steever, Technical Director, PDI, a Business Unit of ICI Americas, 54 Kellogg Ct., Edison, NJ 08818.

Viscometer

A new programmable viscometer has been introduced in literature. A rotational, continuously-sensing instrument, the viscometer is designed to be accurate within 1% of range. For details, contact Brookfield Engineering Laboratories, Inc., Dept. NR 50, 240 Cushing St., Stoughton, MA 02072.

Chelating Agents

A recently published product bulletin describes the characteristics of a new line of chelating agents specifically designed for heavy metal activity. Available in three specific chemical types, these agents reportedly bring high performance and activity in binding divalent and trivalent metal ions into a wide range of solvents. Complete information may be obtained from E.R. Young, Organic Chemicals Div., W.R. Grace & Co., Poisson Ave., Nashua, NH 03061.

Pigments

A broad spectrum of pigments, including a variety of colors, metallic-like pigments and iridescents, in a wide range of particle sizes are featured in a recently issued product bulletin. The line includes 23 exterior colors and 12 regular grades. Additional information can be obtained from The Mearl Corporation, 41 East 42nd St., New York, NY 10017.

Acrylic Emulsion

A 32-page booklet on a premium modified-acrylic polymer for top-quality exterior paints with superior adhesion has been issued. Also included in the booklet are tables which provide typical properties, as well as comparative paint performance data on wet adhesion to chalky substrates, suggested formulations, suppliers of applicable paint materials, and formulation notes. Copies of "UCAR Acrylic 516," designated F-60028A, are available from Union Carbide Corp., UCAR Emulsion Systems, Dept. K3442, 39 Old Ridgebury Rd., Danbury, CT 06817-0001.

Silicones

The efficiency of a line of silicones in troubleshooting a wide variety of processing problems is presented in a new 12-page, full-color brochure. These silicones are formulated to offer a diversity of process improvements by functioning as antifoams, mold releases, bonding agents, water repellents, paint vehicles, etc. They are intended for industrial, commercial, consumer, and specialty applications. For a free copy of the brochure, contact GE Silicones Marketing, 76 Chemicals, Unocal Chemicals Div., Unocal Corp., 1900 E. Golf Rd., Schaumburg, IL 60195.

Pyrrolidone Solvent

Recently published information describes a new pyrrolidone solvent which is effective for dissolving polymers such as PVC, polymethacrylate, polyethylene terephthalate, and polypropylene. For details, contact GAF Corporation, 1361 Alps Rd., Wayne, NJ 07470.

Bead Mill

A self-contained laboratory horizontal bead mill for wet grinding and dispersing of small samples is the subject of a technical information brochure. For further information, write: Dave Peterson, Eiger Machinery, Inc., 603 Jefferson, Bensenville, IL 60106.

Short Oil Alkyd

A 75% short oil alkyd designed to produce extremely fast air dry primers and enamels at VOC compliance levels is the subject of literature. For more information, write to Robert Skarvan, Sales/Service Coordinator, McWhorter, Inc., 400 East Cottage Place, Carpentersville, IL 60110.

Vertical Sandmill

Specifications of a new line of very high output vertical sandmills are included in a recently released technical bulletin. This new VHO sandmill series will be available in 8, 16, 30, 60, and 100 gallon vessel capacities as standard equipment with comparable motor ratings of 15, 30, 50, 75, and 100 hp. Contact E.J. Szkaradek, Morehouse Industries, Inc., P.O. Box 3620, Fullerton, CA 92632, for more details.

Industrial Chemicals

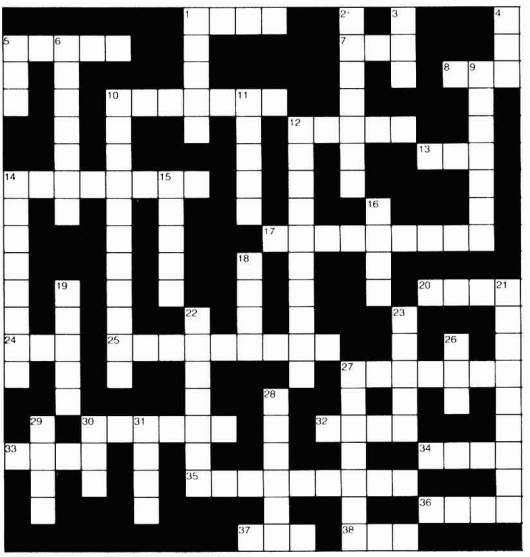
An eight-page color brochure detailing an industrial chemical product line has been issued. Featured is a comprehensive table listing products, key properties, and supply points for four product groups—functional and oxygenated organics, hydrocarbons and feedstocks, and calorinates and inorganics. Copies are available from ARCO Chemical Co., Marketing Communications Dept., 1500 Market St., Philadelphia, PA 19101.

Oligomer

A new oligomer which forms water-soluble salts and is designed to extend the range of water-based UV coatings is the subject of a new product bulletin. Details on Purelast® 159 and a range of urethane acrylic oligomers and photopolymers can be obtained from Polymer Systems Corp., 16 Edgeboro Rd., East Brunswick, NJ 08816.

CrossLinks

by Earl Hill



Solution to be published in May issue.

No. 11

ACROSS

1. Neutralizing amine, water-base (Abr.)
5. Granular carborundum
7. Adams ____ ____ (Abr.)
8. Gov't. watchdog (Abr.)
10. Horizontal molding (wood usually)
12. A can's top ring
13. Volatile content (Abr.)
14. Jacketed reaction vessel
17. Surfactant (syn.)
20. New type of mill
24. Gov't. Standards Bureau (Abr.)
25. Old name for rosin
27. Cyclic dioxide
30. Aromatic hydrocarbon solvent
32. Extender pigment
33. Sluggish; L ____
34. Absolute force unit
35. Helping solvent
36. Roof part (related to 10 across)
37. Aptitude test for color matchers (Abr.)
38. A metal for catalysts

DOWN

1. Maleic value, D____
2. Aluminum mineral
3. Moisture ____ permeability (Abr.)
4. Absolute viscosity symbol (Gr.)
5. Unit of work (related to 34 across)
6. Having to do with the environment
9. Application method, e.g.
10. How thick or thin it is
11. Synthetic resin, C____
12. Paint spraying phenomenon
14. Rheology term (gets thicker)
15. Type of color
16. Type of cloth
18. Marine oil
19. Red acid dye
21. 'Turps' component
22. Series of fatty acids, C____
23. Black
26. Source of fatty acids
27. One which dilutes
28. Hemispherical roof
29. Optical color effect
30. Viscosity ____ (equipment)
31. Goes with 20 across

Coming Events

FEDERATION MEETINGS

For information on FSCT meetings, contact FSCT, 1315 Walnut St., Philadelphia, PA 19107 (215-545-1506).

1986

(May 13-16)—Federation "Spring Week." Seminar on "Special Purpose Coatings" on 13th and 14th; Society Officers on 15th; and Board of Directors on 16th. Sheraton Station Square, Pittsburgh, PA.

(June 3-6)—Symposium on Automotive Color Control (SACC). Sponsored jointly by FSCT, Detroit Society, Detroit Colour Council, and Manufacturers Council on Color and Appearance. Michigan Inn, Southfield, MI.

(Nov. 5-7)—64th Annual Meeting and 51st Paint Industries' Show. World Congress Center, Atlanta, GA.

1987

(Apr. 28-May 2)—Combined Federation Spring Week and Pacific Northwest Society Symposium. FSCT Society Officers Meeting on April 28; FSCT Board of Directors Meeting on April 29; FSCT Spring Seminar (and PNW Society Technical Sessions) on April 30 and May 1. PNW Society activities on Saturday, May 2, will conclude the week.

(Oct. 5-7)—65th Annual Meeting and 52nd Paint Industries' Show. Convention Center, Dallas, TX.

SPECIAL SOCIETY MEETINGS

1986

(Apr. 29-May 1)—"Advances in Coatings Technology" Conference sponsored by the Cleveland Society for Coatings Technology. NASA, Lewis Research Center, Cleveland, OH. (Dr. Rosemary Loza, Standard Oil Co. (Ohio), 4440 Warrensville Center Rd., Cleveland, OH 44128).

(May 1-3)—Pacific Northwest Society. Annual Symposium. Marriott Hotel, Portland, OR. (Gerald A. McKnight, Rodda Paint Co., 6932 S.W. Macadam Ave., Portland, OR 97219).

(May 12)—Philadelphia Society. Seminar on "Impact of Environmental Regulations on the Coatings Industry." Airport Hilton Hotel, Philadelphia. (C.B. Johnson, Pennwalt Corp., Three Parkway, Philadelphia, PA 19102).

(May 15-16)—New England Society. Symposium: "Launching the New Revolution—Compliance for the 21st Century." (Maureen Lein, Davidson Rubber Co., Industrial Park Dr., Dover, NH 03820).

(May 22)—Birmingham Club. Symposium: "Miracle '86." Strathallan Hotel, Birmingham, England. (David Heath, Holden Surface Coatings Ltd., Bordesley Green Rd., Bordesley Green, Birmingham B9 4TQ, England).

(June 16)—Golden Gate Society Manufacturing Committee Conference, "Demonstration/Determination of VOC in Solvent- and Water-Borne Coatings." Holiday Inn, S. San Francisco, CA. (E. "Bud" Harmon, Borden Chemical Co., 41100 Boyce Rd., Fremont, CA 94538).

1987

(Feb. 23-25)—Western Coatings Societies' Symposium and Show, Monterey Convention Center, Monterey, CA. (Barry Adler, Royell, Inc., 1150 Hamilton Ct., Menlo Park, CA 94025).

(Apr. 28-May 2)—Combined Federation Spring Week and Pacific Northwest Society Symposium. FSCT Society Officers Meeting on April 28; FSCT Board of Directors Meeting on April 29; FSCT Spring Seminar (and PNW Society Technical Sessions) on April 30 and May 1. PNW Society activities on Saturday, May 2, will conclude the week.

OTHER ORGANIZATIONS

1986

(Apr. 27-30)—Meeting of ASTM Committee D-33, Coatings for Power Generation Facilities. Travelodge River Walk, San Antonio, TX. (Ms. Anne McKlindon, ASTM, 1916 Race St., Philadelphia, PA 19103).

(Apr. 28-May 2)—"Applied Rheology for Industrial Chemists" Short Course sponsored by Kent State University, Kent, OH. (Carl J. Knauss, Kent State University, Chemistry Dept., Kent, OH 44242).

(May 5-9)—"Physical Testing of Paints and Coatings" Short Course sponsored by the University of Missouri-Rolla, Rolla, MO. (Prof. James O. Stoffer, Dept. of Chemistry, University of Missouri-Rolla, Rolla, MO 65401).

(May 12-13)—"Coatings for Plastics" Seminar sponsored by the Paint Research Association. The Cairn Hotel, Harrogate, England. (Dip Dasgupta, Head of Information, Paint Research Association, Waldegrave Rd., Teddington, Middlesex TW11 8LD England).

(May 12-16)—"Adhesion Principles and Practices for Coatings and Polymer Scientists" Short Course sponsored by Kent State University, Kent, OH. (Carl J. Knauss, Kent State University, Chemistry Dept., Kent, OH 44242).

(May 13-14)—"Automation of Paint Lines." Educational clinic sponsored by the Society of Manufacturing Engineers and its Assn. for Finishing Processes. Westin Hotel, Detroit, MI. (Diane Korona, Program Administrator, Special Programs Div., Society of Manufacturing Engineers, One SME Dr., P.O. Box 930, Dearborn, MI 48121).

(May 13-15)—11th Annual Powder & Bulk Solids Conference/Exhibition. O'Hare Exposition Center, Rosemont, IL. (Patricia Dickinson, Show Manager, c/o Cahners Exposition Group, Cahners Plaza, 1350 E. Touhy Ave., P.O. Box 5060, Des Plaines, IL 60017).

(May 14-15)—Surfex '86. Oil and Colour Chemists' Association. Harrogate Exhibition Centre, Yorkshire, England. (Robert H. Hamblin, OCCA, Priory House, 967 Harrow Rd., Wembley, Middlesex, England HAO 2SF).

(May 19-22)—"Basic Microcomputer Programs for Coatings" Short Course sponsored by the University of Missouri-Rolla, Rolla, MO. (Prof. James O. Stoffer, Dept. of Chemistry, University of Missouri-Rolla, Rolla, MO 65401).

(May 19-23)—"Basic Microcomputer Programming for Coatings" Short Course. Univ. of Missouri-Rolla, Rolla, MO. (Prof. James O. Stoffer, Dept. of Chemistry, Univ. of Missouri-Rolla, Rolla, MO 65401).

(May 21-23)—"Advances in the Stabilization and Controlled Degradation of Polymers" Eighth International Conference. Luzern, Switzerland. (Dr. A.V. Patsis, Institute in Materials Science, State University of New York, New Paltz, NY 12561).

(June 2-6)—"Dispersion of Pigments and Resins in Fluid Media" Short Course sponsored by Kent State University, Kent, OH. (Carl J. Knauss, Kent State University, Chemistry Dept., Kent, OH 44242).

(June 2-6)—"Advances in Emulsion Polymerization and Latex Technology" Short Course sponsored by Lehigh University, Bethlehem, PA. (Dr. Mohamed S. El Aasser, Dept. of Chemical Engineering, Sinclair Lab #7, Lehigh University Bethlehem, PA 18015).

(June 10-16)—CHINAPLAS 86. International Exhibition Centre, Beijing, China. (Kallman Associates, 5 Maple Court, Ridgewood, NJ 07450).

(June 11-12)—"Coatings for Wood" Seminar sponsored by the Paint Research Association. Forum Hotel, London, England. (Dip Dasgupta, Head of Information, Paint Research Association, Waldegrave Rd., Teddington, Middlesex TW11 8LD England).

(June 15-18)—60th Colloid and Surface Symposium. Georgia Institute of Technology, Atlanta, GA. (Symposium Chairman, M.J. Matteson, School of Chemical Engineering, Georgia Institute of Technology, Atlanta, GA 30332).

(June 15-18)—1986 Annual Meeting of Inter-Society Color Council. Ryerson Polytechnical Institute, Toronto, Ont. (Dr. Peter Kaiser, Dept. of Psychology, York University, 4700 Keele St., N. York, Ont. M3J 1P3).

(June 17-19)—"Industrial Painting Processes" clinic sponsored by AFP/SME. Toronto, Ont., Canada. (Diane Korona, SME Special Programs Div., SME Dr., P.O. Box 930, Dearborn, MI 48121).

(July 3-6)—Oil and Colour Chemists' Association Australia. 28th Annual Convention. The Estate, McLaren Vale, South Australia. (OCCAA, 6 Wilson Ave., Felixstow, South Australia 5090, Australia).

(July 7-11)—"Organic Coatings Science and Technology" Twelfth International Conference. Athens, Greece. (Dr. A.V. Patsis, Institute in Materials Science, State University of New York, New Paltz, NY 12561).

(Sept. 3-5)—"Estimating for Painting Contractors and Maintenance Engineers" Short Course. Univ. of Missouri-Rolla, MO. (Prof. James O. Stoffer, Dept. of Chemistry, Univ. of Missouri-Rolla, Rolla, MO 65401).

(Sept. 7-12)—Symposium on High Solids Coatings. Sponsored by the ACS Div. of Polymeric Materials: Science and Engineering. Anaheim, CA. (George R. Pilcher, Hanna Chemical Coatings Corp., P.O. Box 147, Columbus, OH 43216).

(Sept. 8-13)—190th National Meeting. American Chemical Society. Chicago, IL. (ACS, A.T. Winstead, 1155 16th St. N.W., Washington, D.C. 20036).

(Sept. 9-11)—RadCure '86—Association for Finishing Processes of the Society of Manufacturing Engineers Conference and Exposition. Baltimore Convention Center, Baltimore, MD. (AFP/SME Public Relations, Society of Manufacturing Engineers, One SME Dr., Dearborn, MI 48121).

(Sept. 15-17)—13th International Naval Stores Meeting. Waldorf-Astoria, New York, NY. (Douglas E. Campbell, Executive Director, Pulp Chemicals Assn., 60 E. 42nd St., New York, NY).

(Sept. 15-19)—53rd Introductory Short Course on "The Basic Composition of Coatings." Univ. of Missouri-Rolla, MO. (Prof. James O. Stoffer, Dept. of Chemistry, Univ. of Missouri-Rolla, Rolla, MO 65401).

(Sept. 21-23)—Canadian Paint and Coatings Association. 74th Annual Convention. Hilton Hotel, Quebec City, Que., Canada. (CPCA, 515 St. Catherine St. W, Montreal, Que., Canada H3B 1B4).

(Sept. 21-26)—XVIIIth Congress of FATIPEC. (Federation of Associations of Technicians in the Paint, Varnish, and Printing Ink Industries of Continental Europe). Venice, Italy. (C. Bourgery, Secretary General of FATIPEC, 76 Blvd. Pereire, 75017 Paris, France-or-Amleto Poluzzi, AITIVA, Piazzale R. Morandi 2,20121 Milano, Italy).

(Sept. 22-25)—"Your Chosen Finish." FINSTRAT Conference and Exposition sponsored by the Association for Finishing Processes of the Society of Manufacturing Engineers. Long Beach, CA. (Gerri Andrews, SME, Public Relations Dept., One SME Dr., P.O. Box 930, Dearborn, MI 48121).

(Sept. 23-25)—"Industrial Painting Processes" clinic sponsored by AFP/SME. Indianapolis, IN. (Diane Korona, SME Special Programs Div., SEM Dr., P.O. Box 930, Dearborn, MI 48121).

Advertisers Index

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'Humbug' from Hillman

Mark Miller, who was two years old when his grandfather's copy of Brady's Material Handbook was published in 1944, took up my recent challenge and remembered(?) "lithopone." At least he is young enough to raise his hand to be counted and old enough to know where to look. Brady offered a choice of Albalith, Beckton White, Ponolith, Sunolith, Sterling White and Zincolith. You only get full credit if you remember five out of six.

A letter from Sal Sanfilippo, outgoing President of the Southern Society of Coatings Technology, told of some of driving experiences since transplanting to the deep, deep South from Yankee land. Incidentally, those of you who were lucky enough to hear Jim Valvano's luncheon talk at the 1985 Annual Meeting will probably remember the Italian Club of North Carolina—him and Angelo! Sal is the Italian Club of Alabama!

Sal tells of coming upon "Loggers" when driving on nearby two lane roads. "Loggers" are trucks that "carry pine logs cut to four foot lengths for use in making plywood. These can be easily recognized as they are found at regular intervals on all two lane roads going at 15 to 20 mph, have at times a tail light, which usually doesn't work and never heard of registration tag or license plate."—"You may also fall behind a good, law abiding citizen going at 30 mph, with blue smoke pouring out and displaying a bumper sticker reading, 'I may be slow, but I sho am ahead of you!' "

Since this is the season—"Some might be interested to know that Easter can and sometimes does coincide with Passover. Recently the two have coincided in 1954 (April 18) and 1981 (April 19). They will do so in 2123 (April 11) and in 2143 (March 31). March 22nd is the earliest possible date for Easter and has not fallen that early since March 22, 1818 and will not again until 2285."

This priceless information (and probably not worth much more) is from Maureen Lein's favorite source book—*The Old Farmer's Almanac.*

Last month, courtesy of Jim Tomecko, we reported some of Eric Nicol's saga of his high school chemistry years and his suffering instructor, Mr. Strunk. Now, more—

"To be an able scientist, you must have good hands. Manual dexterity is what makes the difference between a successfully conducted experiment and the smoking hulk of a building prodded by firemen. Mr. Strunk learned early in the course that I did not have good hands. Since I also did not have good legs, such as excused some of the girls in his class, I became in Mr. Strunk's estimation, a total write-off. I was so bad at experiments that he was drawn to me as a person is to the edge of a cliff, to watch with morbid fascination my efforts to fathom the cold water tap on the sink. He knew that the water was going to land on the floor, but couldn't resist watching how I managed it.

I remember that I never really mastered the technique of boiling ordinary water. My "bete noire" was residues. After mixing a couple of chemicals in a beaker, we boiled away the liquid to find the residue. I never found any.

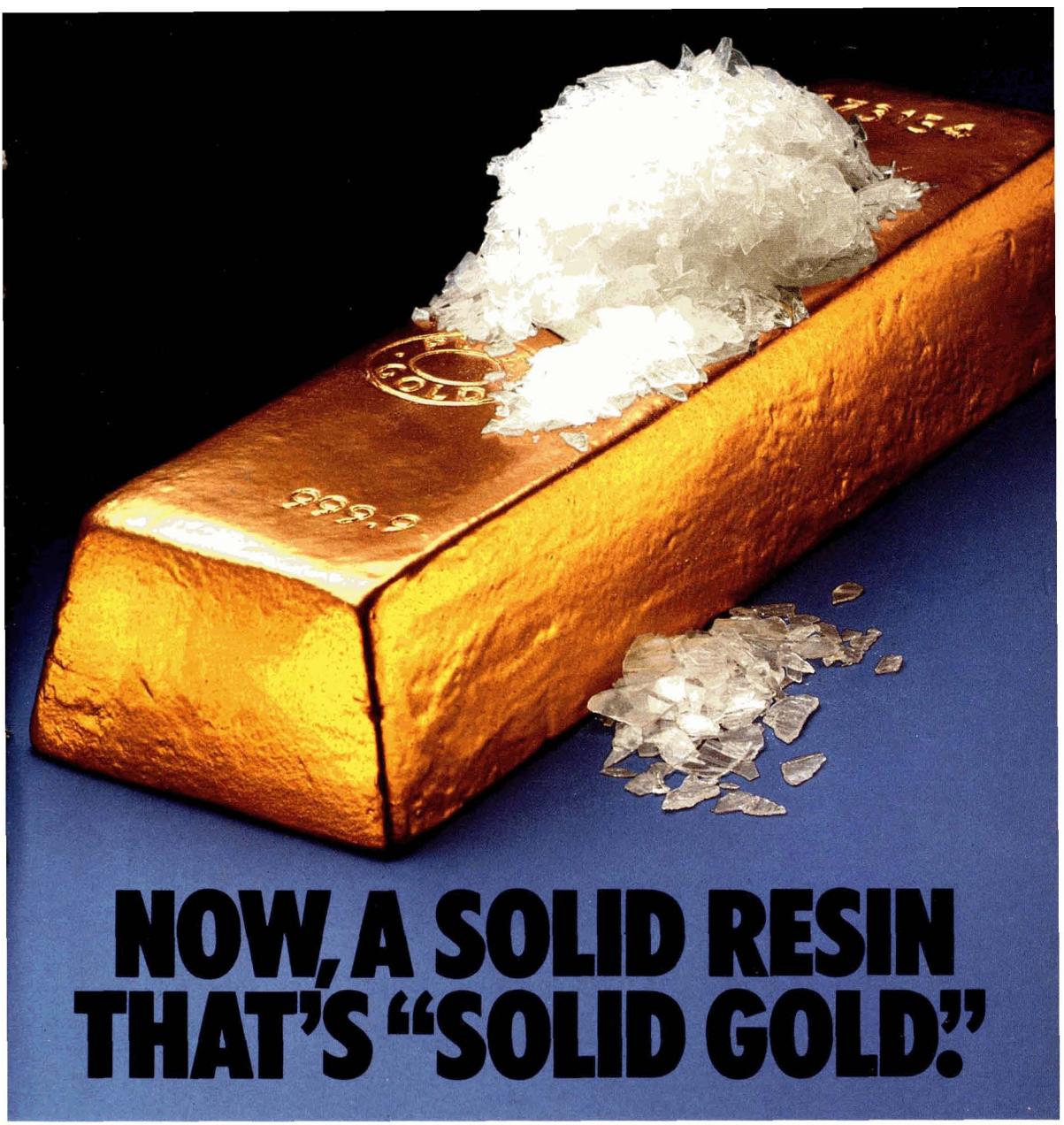
"But there MUST be crystals," Mr. Strunk would roar. "It is chemically impossible for anyone to do this experiment without getting a residue of crystals."

Seeing the tears well up in his eyes, I felt guilty enough to bring my own residue from home, a handful of crystals. When nobody was watching I dropped them into the beaker. Arriving at my counter, Mr. Strunk stared at the crystals and smelled them.

"Camphor?" he whispered hoarsely, "You produced camphor crystals from a mixture of silica and sodium chloride?

"I passed Chem. 1, of course. The thought of having me repeat his lab period for another year was enough to cause Mr. Strunk to relax his marking standards enough for me to become available to M.I.T. or any other institution interested in the maker of modern miracles."

—Herb Hillman
Humbug's Nest
P.O. Box 135
Whitingham, VT 05361



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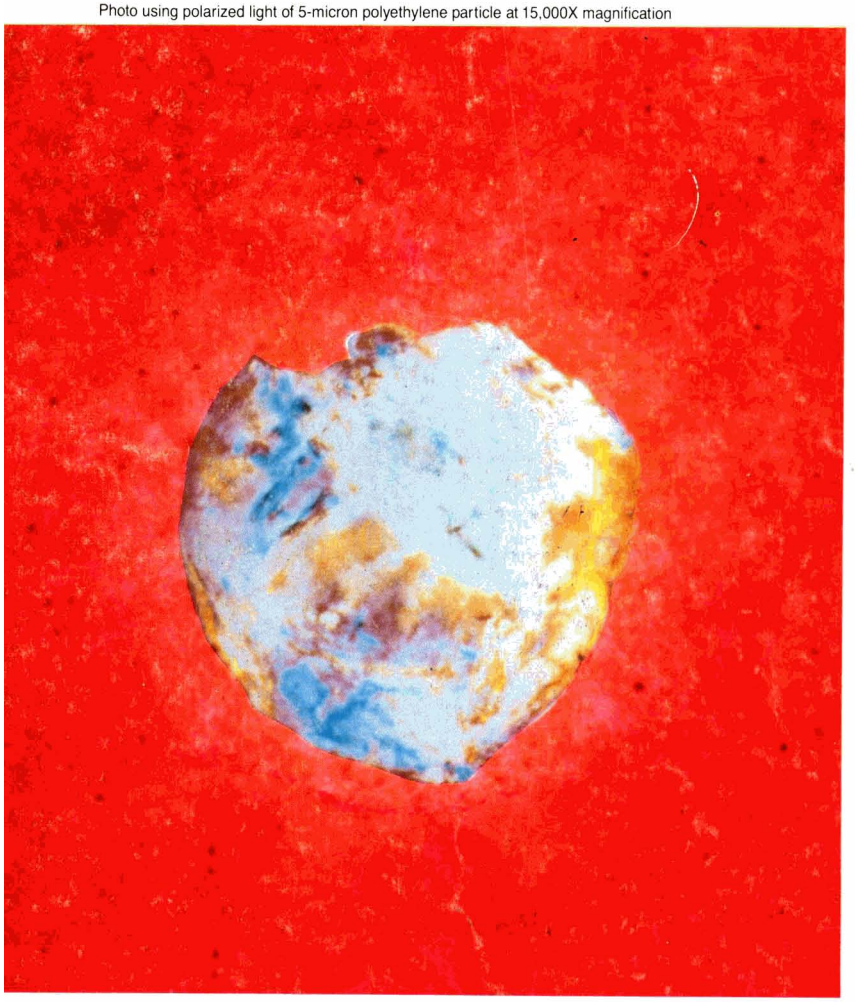

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