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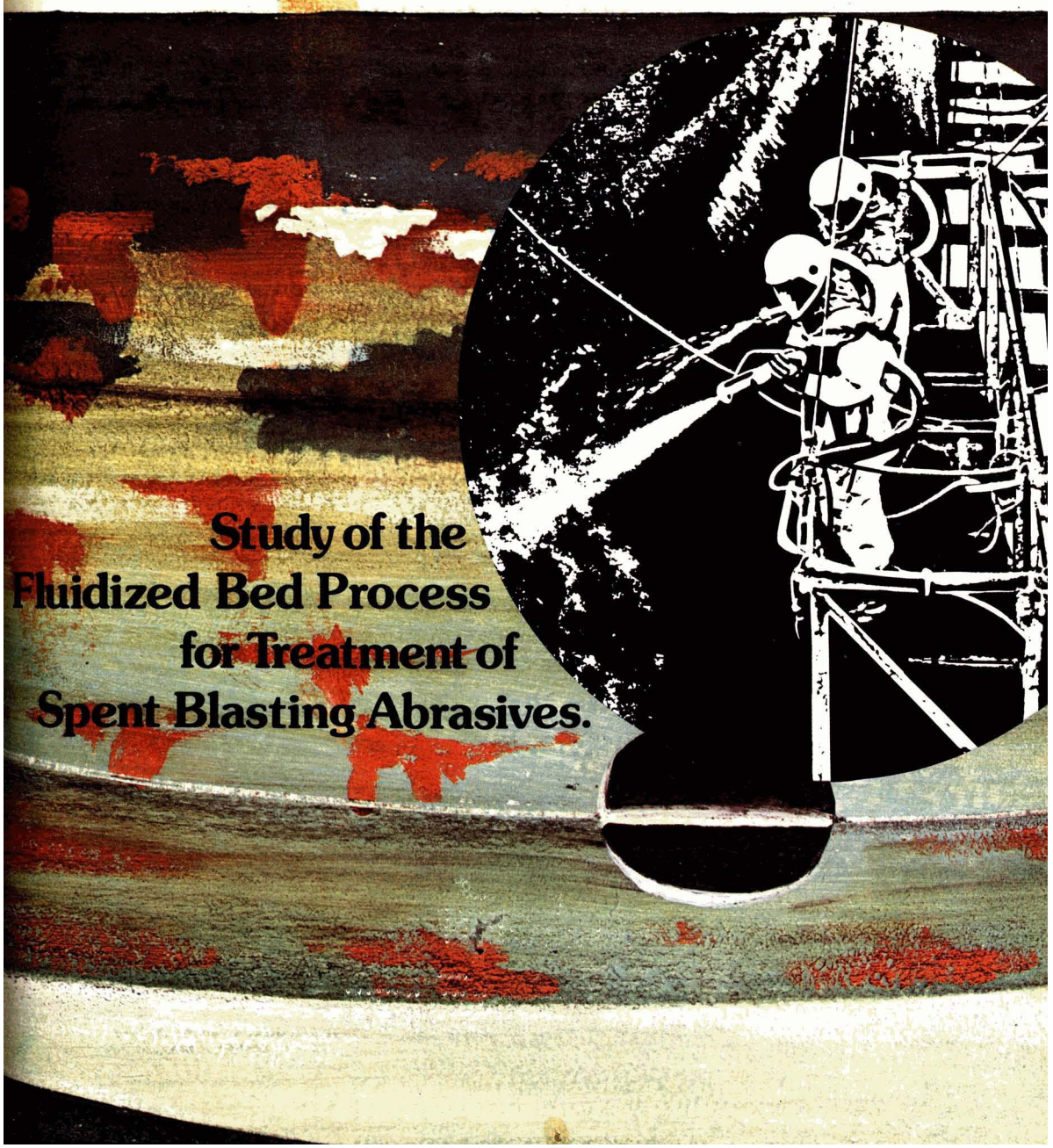
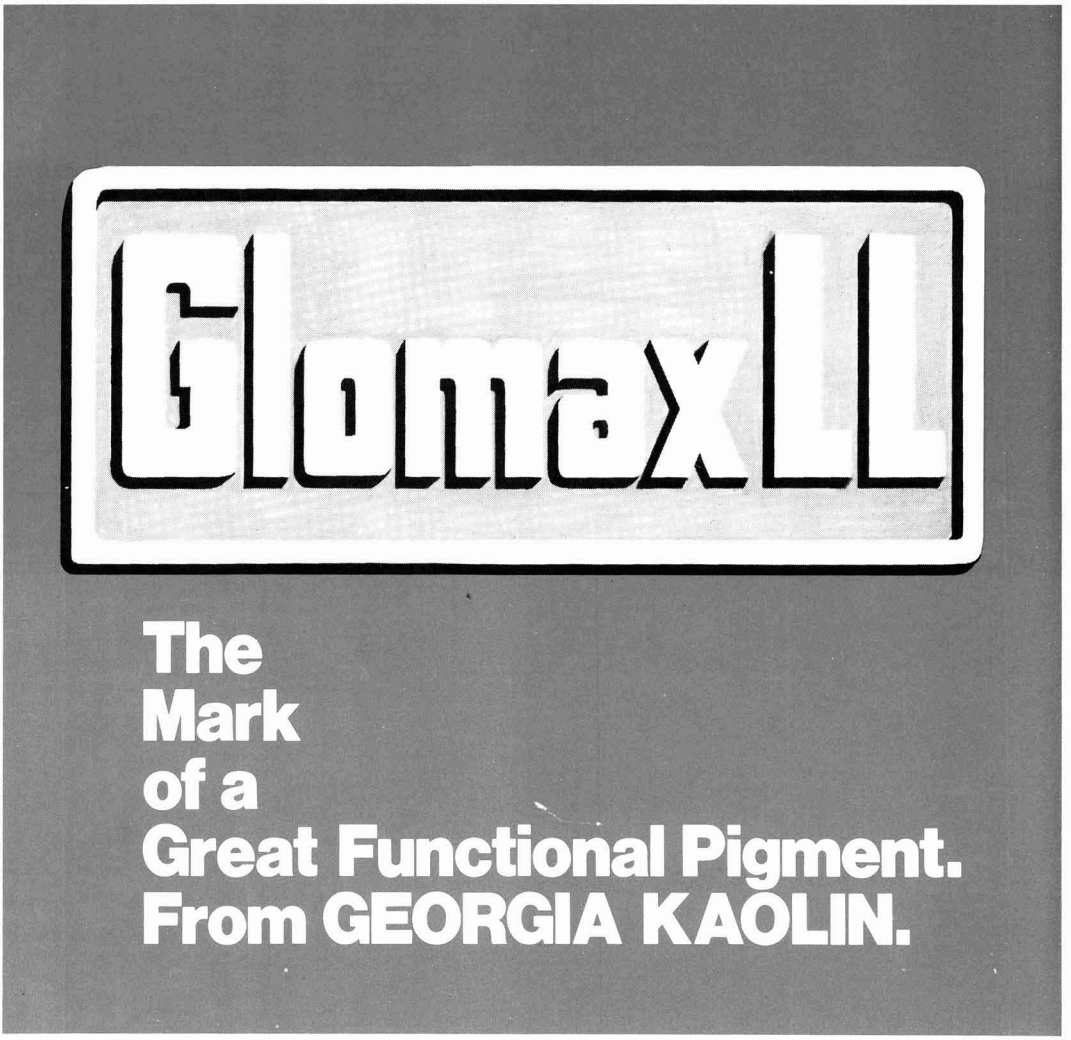
MARCH 1977

JOURNAL OF COATINGS TECHNOLOGY

Volume 49 Number 626



Study of the Fluidized Bed Process for Treatment of Spent Blasting Abrasives.



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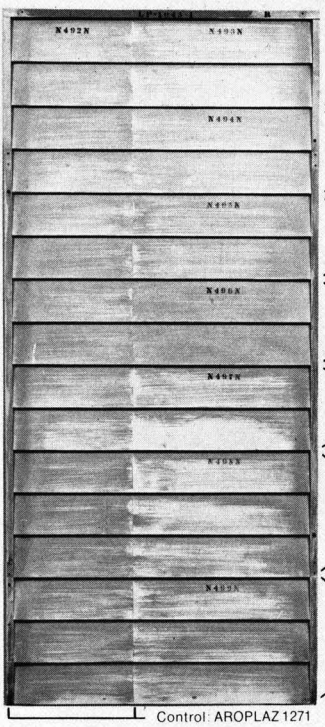
For more information on these products and on other alkyd resins from Ashland, contact us. Resins and Plastics Division, P.O. Box 2219, Columbus, Ohio 43216.

House Siding Exposure Test (87 months exposure)



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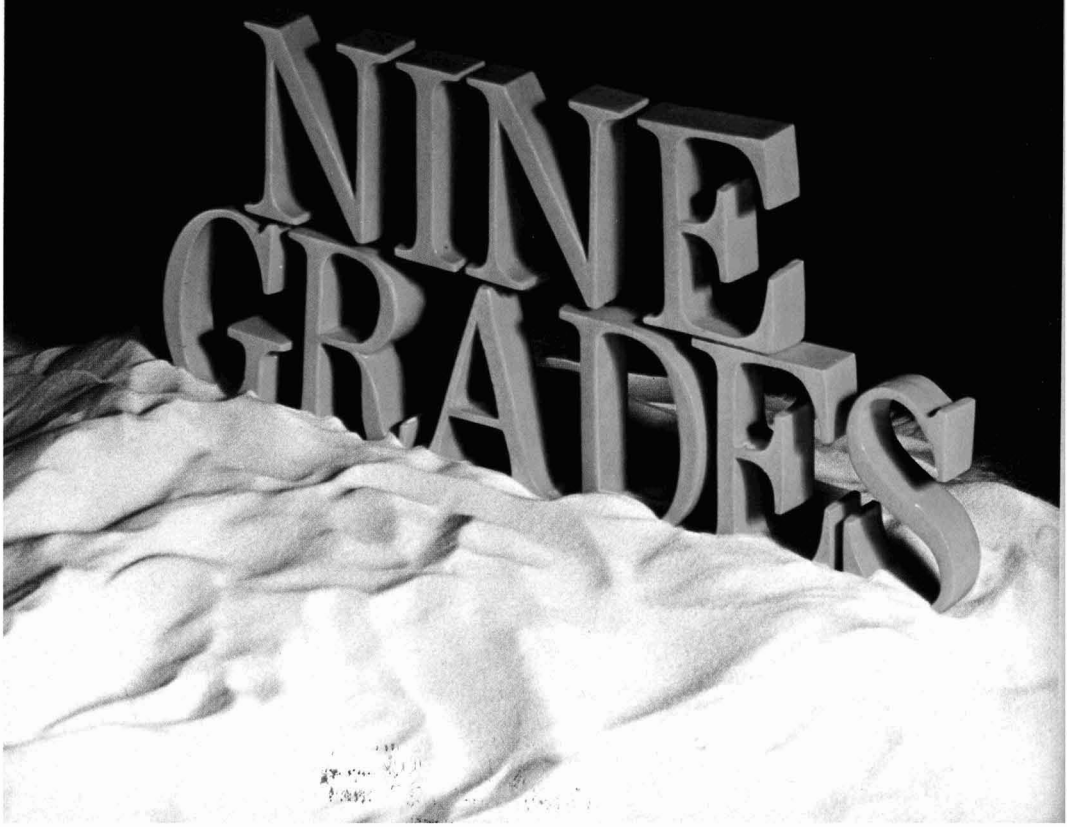

MARCH 1977

JOURNAL OF COATINGS TECHNOLOGY

Volume 49 Number 626

Features

Federation Activities

Departments

E JOURNAL OF COATINGS CHNOLOGY is published monthly by ederation of Societies for Coatings hnology at Cresent & Mulberry ts, Harrisburg, Pa. 17104. Editorial Executive offices are located at 1315 ut St., Philadelphia, Pa. 19107. e: (215) 545-1507.
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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
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2 Years	$37.00	$52.00	$48.00
3 Years	$52.00	$72.00	$68.00

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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

"Energy Efficient Coatings"

There is no more appropriate opportunity than the present to discuss the theme of the Federation's 1977 Annual Meeting and Paint Industries' Show in Houston, October 26, 27, and 28.

At the time this page was written, the eastern half of the U.S. was shivering in a prolonged deep-freeze. From snow-bound Buffalo to not-so-sunny Florida, newspaper banner headlines spotlighted the frigid temperatures and the dwindling supplies of natural gas.

Also in the east, some oil tankers lost the battle of winter and spilled their precious cargoes into the icy waters.

Even the West Coast has its problems. In Northern California, there is a severe shortage of water.

ENERGY is the big news right now and is likely to remain so for a long time.

How prophetic was Elder Larson, Chairman of the Federation's 1977 Program Committee, when he picked the theme, "Energy Efficient Coatings" — more than seven months ago! And where better to present such a program but in the land of energy itself — the State of Texas.

An invitation for papers related to the theme brought the Program Committee some interesting abstracts for consideration.

Already lined up for presentation in October are:

(1) "Microemulsions, a Means to Replace Solvents in Paints" — by Dr. Stig Friberg, of the University of Missouri-Rolla.

(2) "Economic and Energy Savings Through Coatings" — by Harold R. Powers, of The Sherwin-Williams Co.

(3) "Surface Preparation Profile for Anti-Corrosive Coatings" — by Dr. John D. Keane, of the Steel Structures Painting Council.

(4) The Mattiello Memorial Lecture by a well-known industry scientist.

(5) The Keynote Address by a researcher with a national reputation in the area of materials and energy.

And there'll be others which will make the three-day program one of the most stimulating the Federation has ever presented.

Running concurrently will be the Paint Show, which has attracted enthusiastic exhibitor response and which promises to be the largest in Federation history.

There'll be much for you to see and hear at the 1977 meeting. So save *your* energy and come to Houston in October. — FJB

After Channel Blacks... What?

The last U.S. Channel Black production facility has shut down. Fewer grades are available in Europe. What can Channel Black users do?

For years high-color channel blacks were considered irreplaceable as colorants in coatings such as automotive lacquers and enamels, where extremely dark, jet color is required.

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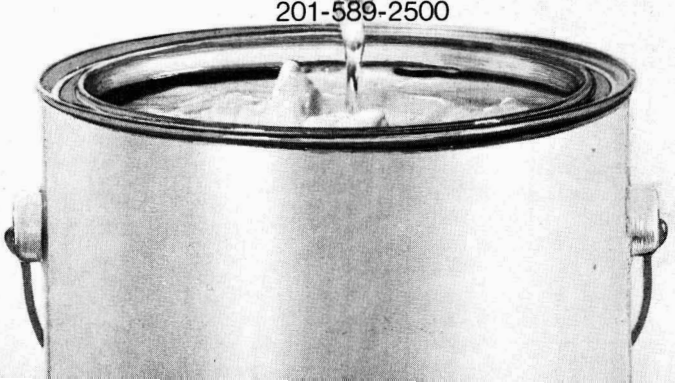


Abstracts of Papers in This Issue

QUALITATIVE AND QUANTITATIVE ANALYSIS OF UV INITIATORS IN CURED ACRYLIC COATINGS—J.T. Geary

Journal of Coatings Technology, 49, No. 626, 25 (March 1977)

This paper describes a procedure for qualitative and quantitative determination of five commonly encountered UV initiators in cured acrylic coatings. Initiators studied were benzophenone, diethoxyacetophenone, p-bromoacetophene, and two benzoin ethers marketed under the trade names of Vicure 10 and Trigonal 14.

STUDY OF THE FLUIDIZED BED PROCESS FOR TREATMENT OF SPENT BLASTING ABRASIVES—A. Ticker, H.S. Preiser, and J. Diliberti

Journal of Coatings Technology, 49, No. 626, 29 (March 1977)

In recent years, problems related to the safe handling and disposition of organotin materials have gained in prominence. This paper describes a fluidized bed incineration method for the treatment and disposal of spent blast cleaning abrasives containing organotin paint particles. Results of laboratory experiments such as thermogravimetric analysis (TGA), paint film ignition studies, and bio-toxicity tests are presented. Information is also included concerning blasting production data, paint system weights, and characterization of the abrasive. In addition, a design basis for a mobile prototype treatment unit is established. It is concluded that the spent abrasive can be treated dockside in a fluidized bed reactor at 700°F (370°C) and that a mobile, truck-mounted, fluidized bed system is feasible and can be demonstrated using current technology and commercially available equipment.

NEW TECHNIQUES FOR MAKING CELLULOSE DERIVATIVES—R. B. Seymour

Journal of Coatings Technology, 49, No. 626, 36 (March 1977)

Since cellulose is not soluble in organic solvents, it has been the custom to prepare its derivatives by heterogeneous reactions. The preparation of solutions of cellulose in dimethyl sulfoxide and formaldehyde has made homogeneous reactions possible. Thus esters and ethers of cellulose can be readily prepared without degradation of the polymers at room temperature. This technique may be used to produce classical and new derivatives with degrees of substitution from 0.1 to 2.0

INVESTIGATION OF THE FACTORS INVOLVED IN MILDEW GROWTH—C-D-I-C Society for Coatings Technology

Journal of Coatings Technology, 49, No. 626, 38 (March 1977)

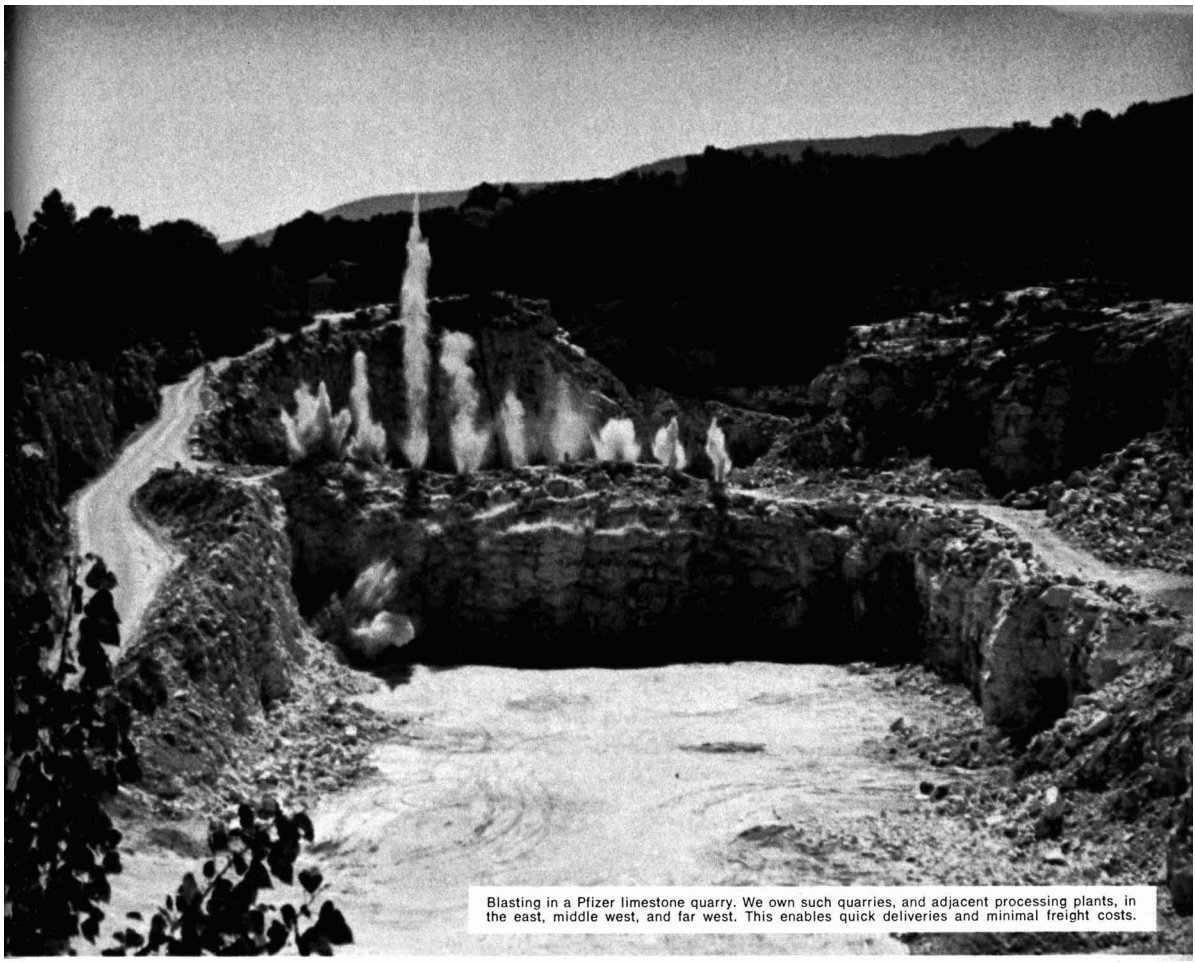
Unglazed ceramic tiles, 4.5 cm square, were self-primed with two batches of the PRI experimental unprotected acrylic latex coating, and were exposed vertically for various periods of time on the Battelle Columbus Laboratory test fence in West Jefferson, Ohio. When returned to the laboratory after exposure, each tile was aseptically scored and a 1.3 cm wide vertical segment was removed for microbiological study. The remaining portion of each tile was extracted for two hr in sterile deionized water; the extract of each tile was used to prepare 0.5% solution of hydroxyethyl cellulose. Following a standard incubation period of two hr at 25° C, the viscosities of the HEC solution prepared from each tile extract were compared by Ostwald viscometry to that of a standard 0.5% HEC solution prepared in sterile deionized water and to deionized water alone. The results of the microbiological and enzyme study are discussed in their relationship to the presence of visible disfigurement of the coating.

WEATHERING RACK FOR SEALANTS—K. K. Karpati, K. R. Solvason, and P. J. Sereda

Journal of Coatings Technology, 49, No. 626, 44 (March 1977)

An important factor influencing sealant performance on the outside of buildings is the cyclic movement induced by daily and yearly temperature changes. Although the sealant itself expands and contracts with temperature, these dimensional changes are negligible and largely reversed by changes in the building elements surrounding the joint. At the present time sealant manufacturers suggest that for the best quality sealants, joints should be designed with such width that the movement produced in them by the surrounding building elements will not be more than ±25% of the joint width. The exposure rack here described produces various amounts of movement covering a range reaching beyond 25%.

The cyclic movement of the rack is produced by changes in weather conditions that induce different amounts of movement in two kinds of metal used in the construction of the rack.



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Initial Paper Presentations Announced For 1977 FSCT Annual Meeting in Houston

A preliminary list of program activities scheduled for the 1977 Annual Meeting of the Federation of Societies for Coatings Technology, October 26-28, at the Astrohall, Houston, Texas, has been announced by Program Chairman Elder C. Larson, of Shell Development Co., Houston. The event is being held in conjunction with the Federation's annual Paint Industries' Show.

Mr. Larson and the members of his Program Steering Committee are developing presentations around the theme, "Energy Efficient Coatings," and have invited prospective speakers to address this subject in its many ramifications.

To date, three papers have been selected by the Committee for the program:

"Microemulsions, A Means to Replace Solvents in Paints" — Dr. Stig Friberg, of University of Missouri - Rolla.

"Economic and Energy Savings Through Coatings" — Harold R. Powers, of Sherwin-Williams Co.

"Surface Preparation Profile for Anti-Corrosive Coatings" — John D. Keane, of Steel Structures Painting Council

Other featured program presentations will include: Keynote Address; Mattiello Lecture; Society Papers; Roon Awards Papers; Paint Research Institute Seminar; Overseas Papers; Manufacturing and Educational Seminars; and Panel Discussions and Workshops.

Concurrent sessions will be held throughout the three-day meeting, but papers will be scheduled to avoid conflicting presentations.

Assisting Mr. Larson on the Program Steering Committee are: Fred G. Schwab, of Coatings Research Group, Inc., Cleveland, Ohio; William A. Wentworth, of Napko Corp., Houston, Texas; Morris Coffino, of D.H. Litter Co., Inc., New York, N.Y.; and William F. Holmes, of DeSoto, Inc., Garland, Texas.

The Houston and Dallas Societies for Coatings Technology will serve as joint hosts for the event — the first ever to be held by the Federation in Texas.

Paint Show

To be held concurrent with the Annual Meeting at the Astrohall, the Paint Show is the only national exhibit of raw materials and equipment used in the formulation, testing and manufacture of paints and related coatings.

Houston Astrohall will be site of 1977 Federation Annual Meeting and Paint Industries' Show. The Y-shaped structure occupies more than 16 acres and boasts world's largest convention center on one level. The Paint Show will be in area beneath striped roof section. Building in background is famed Astrodome.

Approximately 90% of available booth space has already been reserved. And with more than seven months to go, the event promises to be the largest in Paint Show history.

Show hours will be: 1:00 to 6:00 pm on Wednesday, October 26; 10:00 am to 5:00 pm on Thursday, October 27; and 9:00 am to 4:00 pm on Friday, October 28.

Headquarters Hotel

The Shamrock Hilton will be headquarters hotel, with the Astrovillage hotels serving as co-headquarters.

Free shuttle buses will provide transportation between the hotels and the Astrohall.

Room Reservations

All requests for rooms and suites must be on the official housing form and sent to the Houston Convention and Visitors Council. These forms have been mailed to all FSCT members, and additional copies are available from Federation headquarters.

NPCA Meets Same Week

The National Paint and Coatings Association will hold its Annual Meeting on October 24-26 at the Hyatt Regency Hotel, in downtown Houston.

NPCA registration badges will be honored for admission to the Federation Annual Meeting and Paint Show on Wednesday, October 26.

Meetings Committee

Members of the Houston Society are serving on the Meetings Committee under General Chairman Robert J. Klepser, of PPG Industries, Inc. Chairing the various subcommittees are: Program Operations — Ken Confer, of Cook Paint and Varnish Co.; Information Services — Charles Lundquist, of Ribelin Distributors, Inc.; Entertainment — Gordon Schreiner, of Gulf States Paint Co.; Publicity — Glenn W. Holladay, of Pfizer, Inc.

Mrs. S.G. (Betty) Hays and Mrs. Paul (Fran) Crozier are in charge of the Spouses' Program.

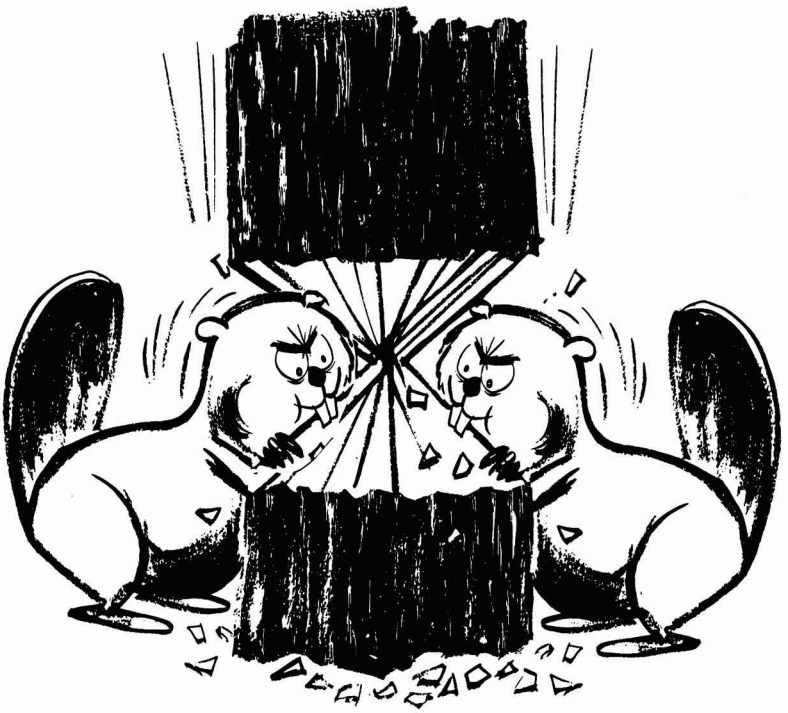
Registration Fees

Regular "on-site" registration fees will be $35.00 for Federation members and $50.00 for non-members. Advance registration will be available for $30.00 for members and $45.00 for non-members. Fee for Ladies' Activities will be $25.00 on-site and $20.00 in advance.

Once again, there will be a special $15.00 advance registration fee for retired members.

Registration forms will be included in future issues of the JOURNAL OF COATINGS TECHNOLOGY, and will also be mailed to all members of the Federation in August.

A HARDWORKING TEAM . . .



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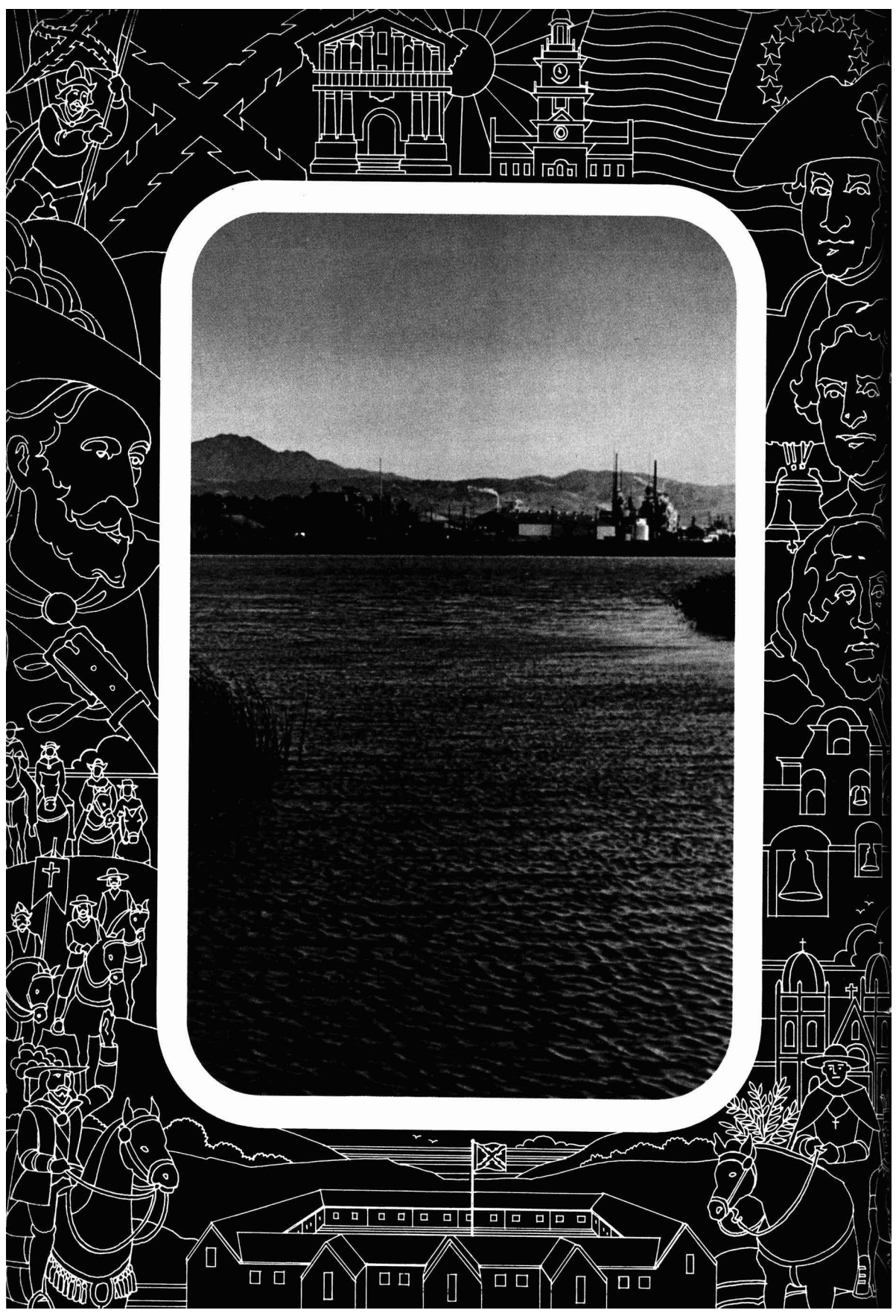

Progress in Pigments  Comes from DuPont

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George Washington... Thomas Jefferson... Benjamin Franklin... Juan Bautista de Anza...

Juan Bautista de Anza? He was a Founding Father too, of sorts. 200 years ago, while a new nation was being born on the East Coast, Colonel de Anza was exploring northern California and laying the groundwork for what would become our most populous state. His achievements were recently honored near the grounds of our Antioch, California plant, which served as his main campsite.

Folks west of the Rockies have always been proud of their unique heritage, and we are proud to have the only titanium dioxide facility in the West. And now a new slurry line is on stream which provides our Western customers with Ti-Pure® TiO_2 in its most efficient and economical form.

Our three domestic TiO_2 plants have a total capacity of 425,000 tons, all by the modern chloride process which we introduced in 1948. And a fourth plant is on the way, anticipating the increased demand for TiO_2 in the 80's and beyond.

Juan Bautista de Anza may not have foreseen his contribution to the territorial growth of our country, but we can foresee ours to its industrial growth.

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News from Washington

DOT Grants Shipping Amendment Extension

The U.S. Department of Transportation, in response to two petitions filed by the National Paint and Coatings Association, has agreed to a six-month extension of the labeling requirements in the Docket HM-112 amendments to the shipping regulations for hazardous materials, originally scheduled to take effect January 1, 1977.

In its announcement, DOT stated, "A package *filled, marked or labeled before January 1, 1977,* in accordance with regulations in effect on June 30, 1976, may be offered for transportation and transported, even though it does not comply with the packing, marking, and labeling provisions of this amendment (HM-112), if it (i) is offered for transportation before July 1, 1977, and (ii) complies with the package, marking, and labeling regulations in effect on June 30, 1976." Originally, this clause stated that packages filled, marked, or labeled before June 30, 1976, could not be shipped after January 1, 1977.

The HM-112 amendments, also known as the *Consolidation of Hazardous Materials Regulations,* is an attempt by DOT to simplify and shorten the Hazardous Materials Regulations into a single volume of the Code of Federal Regulations. The amendment also includes changes in the preparation of paints and coatings for transportation which will have a major impact on the industry.

Requirements for shipping by the various modes are now spread over Titles 14, 46, and 49 in the *Code of Federal Regulations.*

Additionally, the definition of a "consumer commodity" in the amendment has been expanded by this recent correction. The definition now includes materials suitable for retail sale but which may, in fact, be intended for some other use. For example, paints going to a commercial or industrial account, but packaged in a manner that would be acceptable for retail.

NPCA has prepared a guide to the amended requirements.

The latest changes to HM-112 cover more than 50 pages in the December 30, 1976 *Federal Register,* and contain corrections to previously issued changes in the September 20, 1976 *Federal Register.*

Status Report Issued On Toxicity Study Of Acrylonitrile Monomer

Results contained in a status report of a long-term toxicity study of acrylonitrile monomer (AN), used principally in the manufacture of fibers, films, and other plastics, were recently given to government agencies, according to the Manufacturing Chemists Association, which is administering the study.

The study, which is to run two years and involves exposure of rats to drinking water containing concentrations of zero, 35, 100, or 300 parts per million (milligtams per liter) of AN, is being funded by nine companies, and conducted by Dow Chemical U.S.A. Toxicology Research Laboratory.

Highlights of the 13-month status report show that administration of AN at the two higher concentrations to rats under conditions of the study has resulted in: decreased food and water consumption which was associated with lowered body weights; higher incidence of subcutaneous masses in the mammary region; higher incidence of observable masses of the ear canal; proliferative lesions of the brain; and pathologic changes in stomach linings.

The study is being funded by American Cyanamid Co., Borg-Warner Chemicals, The Dow Chemical Co., E. I. du Pont de Nemours & Co., Gulf Oil Corp., Monsanto Co., Tennessee Eastman Co., UNIROYAL Chemical Co., and Vistron Corp.

The results were reported to the Food and Drug Administration, Environmental Protection Agency, National Institute for Occupational Safety and Health, Occupational Safety and Health Administration, Consumer Product Safety Commission, and the National Cancer Institute.

NPCA to Sponsor Two Occupational Health Studies

The Executive Committee of the National Paint and Coatings Association has approved two studies which will focus on the occupational health of workers in the coatings industry. To be undertaken by Stanford Research Institute, the general mortality study and the medical surveillance study will begin as soon as contract arrangements are completed.

The general mortality study is a 19-month investigation of death records for paint manufacturing workers. Researchers will try to discover any worker fatalities from diseases or illnesses which are proportionately higher than the national average. This study will involve approximately 60 plants and 150,000 man-years of experience in paint manufacturing.

The medical surveillance, to be run concurrent with the mortality study, will involve the development of forms and procedures which could enable a paint manufacturer to document any health problems among his workers. When the study is completed, SRI will submit a report describing how prospective morbidity (disease or illness) studies may be carried out using information obtained from these forms and procedures.

Following completion of these two studies, NPCA will analyze the data to determine whether further studies are warranted. A general worker environment program is tentatively planned (which must still be approved by the Executive Committee), which would document worker exposure to plant materials and recommended controls. This study would take approximately 19 months and involve 10 plants ranging in size from those employing over 100 workers to those with less than 25.

The new Occupational Health Research Program has been under study by the Occupational Health Task Force for almost three years.

The NPCA membership recently voted a 15% increase in dues to finance the program.

ENERGY REPORT NEWSLETTER

The Petrochemical Energy Group (PEG) has begun publication of an "Energy Report" newsletter. To be issued periodically, the "Energy Report" will present capsule case histories of member company projects and products that contribute to increased energy supply or efficiency.

PEG is an ad hoc group of independent petrochemical companies formed in 1972. Its purpose is to contribute to development of constructive national energy policies, including maintenance of an adequate supply of petrochemical feedstocks. Copies of the newsletter are available from The Petrochemical Energy Group, 1701 Pennsylvania Ave., N.W., Washington, D.C. 20006.

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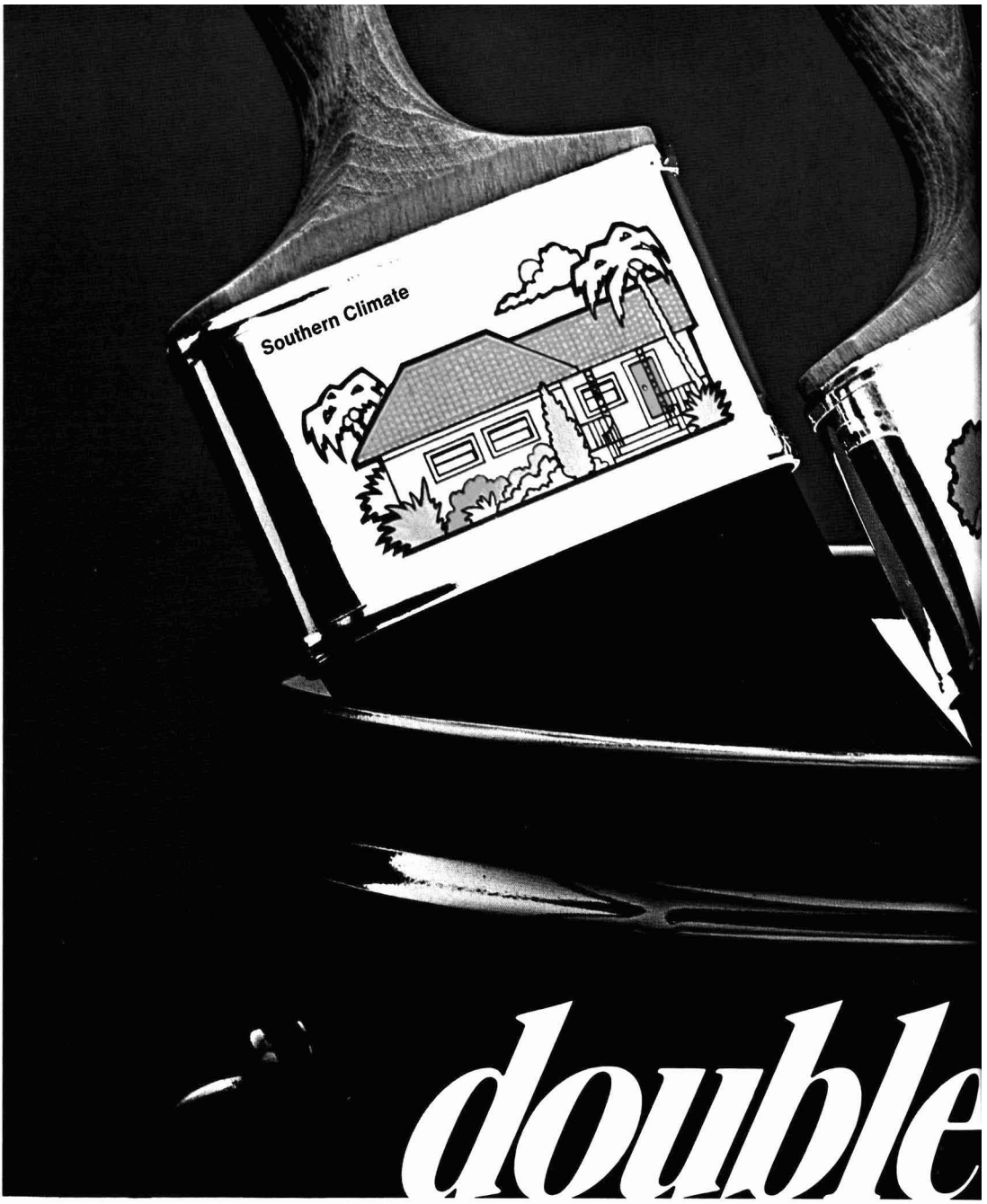

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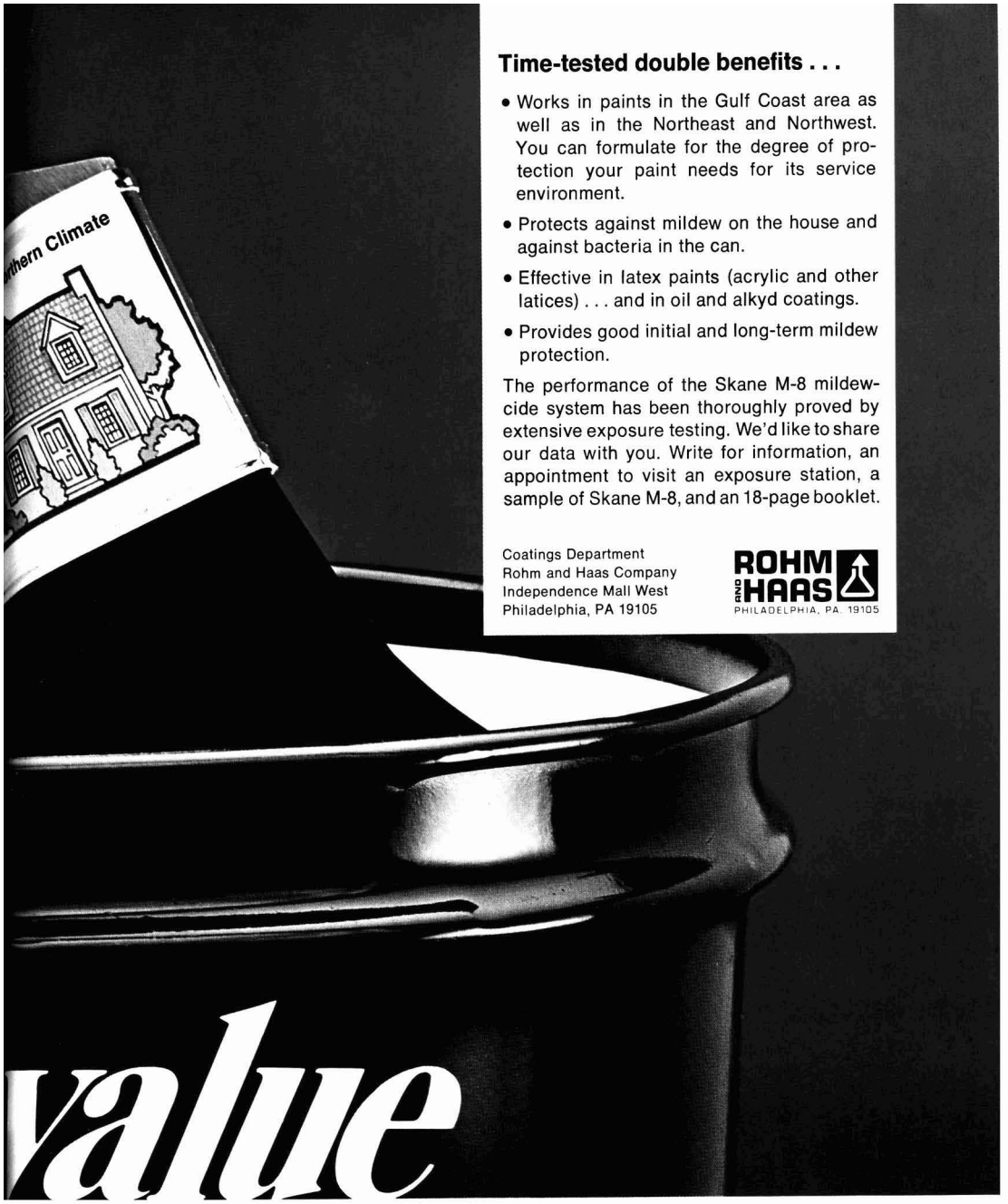

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Qualitative and Quantitative Analysis Of UV Initiators in Cured Acrylic Coatings

J. Terrance Geary
Lord Corporation*

This paper describes a procedure for qualitative and quantitative determination of five commonly encountered UV initiators in cured acrylic coatings. Initiators studied were benzophenone, diethoxyacetophenone, p-bromoacetophene, and two benzoin ethers marketed under the trade names of Vicure 10 and Trigonal 14.

KEY WORDS: Ultraviolet (UV) initiators; Photoinitiators; Cure; Diluent; Thin layer chromatography (TLC); Hydrazone.

INTRODUCTION

Impending legal restrictions and economic considerations have hastened development and commercialization of solventless, radiation-cured resins. The arrival of these resins has created a need for new analytical procedures to monitor many compounds, including UV initiators, in cured films. An extensive literature search failed to uncover any published methods dealing with the analysis of initiators in cured coatings. For this reason we undertook to develop a method capable of qualitatively identifying five of the more commonly-encountered initiators and estimating their level in cured acrylic films.

After a brief examination of the typical UV system and photoinitiation process shown in *Figure* 1, it can be seen that the choice of an analytical procedure was not straightforward. *Figure* 1 illustrates a typical UV cure system. The system consists of a prepolymer or oligomer dissolved in an active diluent, often an acrylate, and a photoinitiator. The oligomer contains reactive end groups, sometimes acrylic moieties, that are capable of polymerizing with the diluent. In the polymerization process, the first step is initiation. The photoinitiator decomposes to form two radicals which may react either with the diluent or the oligomer to initiate polymerization. Propagation then proceeds via the free radical mechanism until the polymer chain is terminated. Terminations can occur in a variety of ways and will not be discussed here.

In addition to initiation, the free radicals generated by the photoinitiator may react with impurities in side reactions and be lost, or they may simply recombine. From the preceding explanation, it can be seen that, at least theoretically, all or most of the initiator could be consumed by the process either in initiation or through side reactions.

Although recombination of the initiator radicals to reform the parent compound is possible, there was no way of knowing if the level of recombination was significant. The question then was to decide whether to look for possible initiator by-products, initiator end groups, or the parent initiator itself. Clearly, detection and estimation of initiator end groups was not feasible. Without knowing the identity of the many possible by-products which could be formed, it would be equally difficult to develop a method capable of detecting and identifying initiator by-products, and quantitative analysis would be impossible. The most practical approach would be to assume that the level of recombination would be high enough to allow analysis of the polymer films for residual initiator. The assumption is warranted in the case of UV coatings because of their high viscosity. In high-viscosity systems, the initiator radicals are held in close proximity to each other by the "solvent" which acts like a cage. This cage effect favors recombination of the radicals to reform the parent initiator. Most UV coating systems are of high enough viscosity that the cage effect could occur.[1]

Sensitivity and selectivity was of prime importance in selecting an analytical method, due to the sample size and complex sample matrix. We expected the sample size to be less than 0.1 mg, and we expected the sample

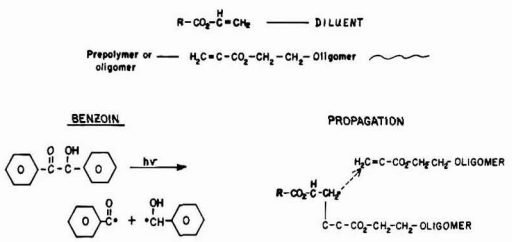

Figure 1 — Typical UV cure system

This paper was presented at the Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy on March 1, 1976.

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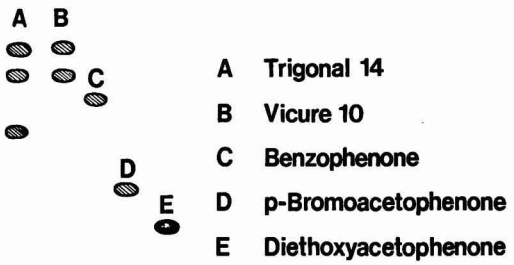


Figure 2 — Typical chromatogram illustrating the initiators studied

matrix to contain oligomer, plasticizers, and any low molecular weight impurities that could be solvent-extracted from a cured film. Thin layer chromatography (TLC) offered the best chance of obtaining both the sensitivity and selectivity required.

EXPERIMENTAL

REAGENTS:

Acetic acid (J. T. Baker Co., reagent grade)
Ethyl alcohol (Pharmco, 95%, Publicker Industries, Inc.)
p-nitrophenylhydrazine (Eastman Chemical Products, Inc., reagent grade)
Ethyl acetate (Eastman, reagent grade)
Carbon tetrachloride (Baker, reagent grade)
Pyridine (Baker, reagent grade)

INITIATORS:

Diethoxyacetophenone (Union Carbide Corp.)
Trigonal® 14 (Noury Chemical Co.)
Vicure® 10 (Stauffer Chemical Co.)
p-Bromoacetophenone (Noury Co.)
Benzophenone (Aldrich Chemical Co.)

EQUIPMENT:

TLC Plates (Chromar® 7GF 20 x 20 Byk-Mallinckrodt GmbH)
Rectangular flat-bottom developing chamber
Cary 14 Spectrophotometer
Beckman 1.0 cm match UV cells

PREPARATION OF STANDARDS

p-Nitrophenylhydrazone derivatives were prepared for each of the initiators according to the procedure described by Shriner, Fuson, and Curtin.[2] The initiators were used as received. Approximately 0.5 g of initiator was added to a 50 ml beaker followed by 0.5 g of p-nitrophenylhydrazine and 10 ml of ethyl alcohol. Solution was obtained by warming gently on a hotplate. The solution was then brought to a boil, and three drops of glacial acetic acid were added. The solution was allowed to boil for an additional 10 min and then removed from the hotplate and allowed to cool to room temperature.

Of the five initiators, benzophenone, diethoxyacetophenone, and p-bromoacetophenone formed solid derivatives which precipitated readily from ethanol. The Vicure 10 and Trigonal 14 (benzoin ethers) did not form solid precipitates. The benzoin derivatives were separated by adding H_2O dropwise to a boiling solution of the hydrazone in ethanol until a slight cloudiness developed. Upon cooling, the hydrazones separated as a tarry mass. Each of the derivatives was purified by recrystallizing twice from ethanol.

Table 1 — R_f Values of p-nitrophenylhydrazones in Carbon Tetrachloride/Pyridine; 90/10 (v/v)

Initiator	R_f Values
Benzophenone	0.47
p-Bromoacetophenone	0.13
Vicure 10	0.67, 0.58
Diethoxyacetophenone	0.
Trigonal 14	0.32, 0.58, 0.67

SAMPLE PREPARATION

Films of acrylic coating were prepared on aluminum panels and cured using a standard UV curing unit. Approximately 0.5 g of each film was weighed on an analytical balance and the weight recorded to the nearest milligram. The weighed film was then transferred to a screw-top vial and 50 ml of ethyl acetate added to each vial. The films were extracted for two hours by shaking on a laboratory shaker. The extract was transferred to an evaporating dish and the solvent evaporated to dryness. We investigated both room temperature evaporation and the use of a hotplate and found no difference in the results.

After evaporation of the ethyl acetate, the residue was washed into a 50 ml beaker using two 10 mm portions of boiling ethanol. The washings were concentrated to approximately 1/2 volume, allowed to cool, and transferred to a 10 ml volumetric flask. The washings were then brought to a final volume of 10 ml. A 1.0 ml aliquot was removed from the flask, diluted to 50 ml, and saved for UV analysis. The remainder of the solution was transferred to a 30 ml beaker, and 11 mg of p-nitrophenylhydrazine was added. The solution was brought to a boil, and two drops of acetic acid were added. The solution was allowed to concentrate to approximately 5 ml and then removed from the hotplate. The solutions were spotted on a chromatographic plate that had been conditioned for one hour at 115°C. The conditioned plate was developed for 30 min in a chamber saturated with carbon tetrachloride and pyri-

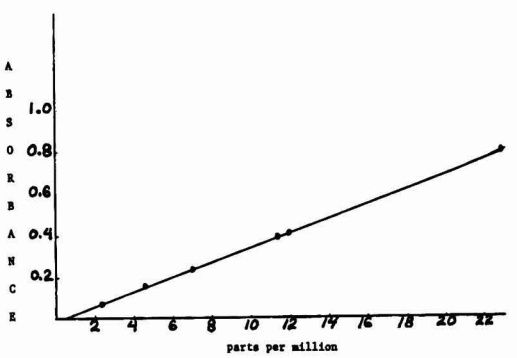


Figure 3 — Calibration curve for Vicure 10 showing absorbance vs. concentration

Table 2 — Values of Wavelength of Maximum Absorption and Molar Extinction Coefficients of Various Photoinitiators

Compound	λMax.	ε
p-Bromoacetophenone	2710	12,150
Benzophenone	2530	20,313
Trigonal 14	2480	18,371
Diethoxyacetophenone	2480	11,818
Vicure 10	2480	12,365

Solvent: 95% Ethyl alcohol

dine vapors using CCl_4: Pyridine (90:10 v/v) as the developing solvent. The above initiators can be determined from the R_f value (R_f is defined as the distance travelled by the spot, divided by the distance travelled by the solvent front). A typical chromatogram is illustrated in *Figure* 2. The R_f values of each of the initiators appear in *Table* 1. Although visualization can be accomplished by spraying with methanolic KOH, it is not usually necessary, as 5 micrograms (μg) of the hydrazones produces a fluorescent spot easily detected with the naked eye.

QUANTITATIVE ANALYSIS

The diluted sample prepared from the aliquot taken prior to derivitization was used to determine the initiator level quantitatively. The sample is simply scanned from 4000 to 1900 Å on a UV spectrophotometer. It may be necessary to dilute the sample before completing the UV analysis. Quartz cells with a 1.0 cm path length were used for all analyses. The concentration of the initiator in solution was determined from a calibration curve. The concentration of photoinitiator in the film can then be calculated from the concentration of the solution. A calibration curve for Vicure 10 is shown in *Figure* 3. The curve was prepared by observing the absorption of 2,4,6,8 and 12 ppm solutions of Vicure 10 in ethanol at 2480 Å (wavelength of maximum absorption). The λ_{max} (wavelength of maximum absorption) and ϵ (molar extinction coefficient)* for each of the initiators studied are listed in *Table* 2.

Table 3 — Recovery of Initiators from Cured Acrylic Coatings

	Vicure 10	
mg. Added	mg. Recovered	% Recovery
4.987	4.589	92.02
4.990	4.571	91.60
4.500	4.171	92.69
		Avg. 92.10%
	Benzophenone	
mg. Added	mg. Recovered	% Recovery
4.999	4.291	85.84
5.037	4.332	86.00
4.997	4.304	86.13
		Avg. 85.99%
	Diethoxyacetophenone	
mg. Added	mg. Recovered	% Recovery
5.011	4.509	89.98
5.000	4.494	89.88
5.010	4.509	90.00
		Avg. 89.95%

Recovery studies were run using films that had been initiated with benzophenone, diethoxyacetophenone, and Vicure 10. The films were prepared from resins that had been carefully formulated to contain 1.0% initiator by weight. The analysis was carried out in triplicate for each film. Results of the recovery work appear in *Table* 3. The precision was satisfactory. The results were surprising, however, in that they indicated most of the initiator was recovered unchanged from the cured polymer film. The lowest recovery encountered was for benzophenone, and it averaged better than 85% recovery. The difference between recovery levels observed for each initiator type agrees with observations from other work, indicating that benzophenone is more reactive than diethoxyacetophenone and that both benzophenone and diethoxyacetophenone are more reactive than Vicure 10 under the conditions employed.

DISCUSSION

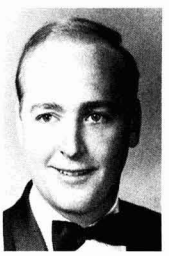
The choice of p-nitrophenylhydrazine as the derivitizing agent was based solely on its availability. Other derivatives such as the semicarbazone, oxime, and 2,4 dinitrophenylhydrazone could probably be used with the understanding that the TLC procedure would have to be optimized for whatever derivative was used. Several attempts to separate the initiators without forming a derivative were attempted unsuccessfully.

A total of five solvent systems were investigated. These were:

*ϵ is defined as $\frac{\text{absorbance}}{\text{gram-moles}}$

Table 4 — R_f Values of p-Nitrophenyl Hydrazones For Various Solvent Systems

Initiator	C_6H_{14} $CH_3CO_2C_2H_5$ (4:1)	$CHCl_3$	C_6H_{14} $CH_3CO_2C_2H_5$ (50:50)	C_6H_6 CH_3OH (95:5)
Benzophenone	0.58	0.44	0.67	0.45
p-Bromoacetophenone	0.75	0.47	0.71	0.70
Vicure 10	0.58	0.75	0.65	0.68
Diethoxyacetophenone	0.45	0.28	0.68	0.44
Trigonal 14	0.58	0.75	0.65	0.68



J. TERRANCE GEARY received the BS Degree in chemistry from Wheeling College, Wheeling, W.V. in 1969. After four years with du Pont de Nemours & Co., Inc., he joined Lord Corp. as Group Leader of Special Analysis and Methods Development. He is a member of the American Chemical Society and currently serves as Professional Relations Chairman for the Erie Section.

(1) Hexane: Ethyl acetate (4:1)
(2) Hexane: Ethyl acetate (50:50)
(3) Benzene: Methanol (95:5)
(4) Chloroform
(5) Carbon tetrachloride: Pyridine (90:10)

As can be seen from the R_f values in *Table* 4, solvent systems 1-4 did not provide adequate separation to allow qualitative identification of the initiators by TLC. Benzene and ethyl acetate at a ratio of 4:1 failed to separate benzophenone from Vicure 10. Chloroform failed to separate benzophenone from p-bromoacetophenone. A 50/50 mixture of hexane and ethyl acetate made it practically impossible to differentiate between benzophenone and diethoxyacetophenone. The benzene/methanol system failed to separate benzophenone from diethoxyacetophenone and also showed poor resolution between bromoacetophenone and the benzoin ethers Vicure 10 and Trigonal 14. The TLC procedure was almost abandoned when we discovered a paper by Dhont[3] describing the use of carbon tetrachloride and pyridine as a solvent system suitable for hydrazone separation. Development of a TLC procedure that would allow qualitative identification was critical, since UV spectroscopy could not be used qualitatively. Re-analysis of the TLC spots, the procedure we were using, was too time-consuming for routine analysis. The carbon tetrachloride/pyridine system gave surprisingly good separation of the hydrazones and solved the problem of qualitative identification.

Visualization can be enhanced by spraying with Methanolic KOH. Although visualization is not usually necessary, it can be advantageous when examining films from tiles. In cases where a vinyl asbestos type substrate is used, the characteristic colors produced by the hydrazones after spraying with KOH can help differentiate the initiator spot from contaminants such as plasticizers and low molecular weight oligomers.

This method has been applied successfully to coatings applied to substrates as well as free films. Films as old as eight months have been successfully analyzed for initiator identity. Quantitative work is complicated when analyzing coatings taken from some substrates. Care must be taken to separate the coating from the substrates prior to analysis. Mechanical methods of separation such as scraping with a razor blade have proven superior to chemical methods.

CONCLUSION

Thin layer chromatography coupled with UV spectroscopy provides a convenient method for the qualitative and quantitative analysis of UV initiators in cured acrylic coatings.

ACKNOWLEDGMENT

I wish to acknowledge the contributions of V. M. Barber for the preparation of the UV spectra and D. L. Branch for assisting in the preparation of this paper. □

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Study of the Fluidized Bed Process For Treatment of Spent Blasting Abrasives

A. Ticker, H. S. Preiser, and J. Diliberti
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In recent years, problems related to the safe handling and disposition of organotin materials have gained in prominence. This paper describes a fluidized bed incineration method for the treatment and disposal of spent blast cleaning abrasives containing organotin paint particles. Results of laboratory experiments such as thermogravimetric analysis (TGA), paint film ignition studies, and bio-toxicity tests are presented. Information is also included concerning blasting production data, paint system weights, and characterization of the abrasive. In addition, a design basis for a mobile prototype treatment unit is established. It is concluded that the spent abrasive can be treated dockside in a fluidized bed reactor at 700°F (370°C) and that a mobile, truck-mounted, fluidized bed system is feasible and can be demonstrated using current technology and commercially available equipment.

KEY WORDS: Fluidized bed incinerator; Organotin antifouling paints; Mobile detoxification process; Pollution abatement; Spent blasting abrasive disposal; Pyrolysis.

INTRODUCTION

The commercial use of organotin antifouling paints on the underwater hulls of ships is undergoing substantial increase. These substances require proper procedures for safe disposal after blast cleaning operations due to their hazardous nature. This paper describes a proposed method for dockside treatment of spent blast-cleaning abrasives containing organotin paint particles to allow reuse of the abrasives and safe disposal of the blast residue.

APPROACH

At the outset, a study was made of candidate processes for organotin decomposition, removal or disposal. These included:

- Solvent extraction of the organotin paint from the contaminated bulk abrasive.
- A proprietary chemical paint-stripping process to dissolve and soften the antifouling paint on a ship's hull so as to enable removal of the paint by manual scraper.
- Ultraviolet irradiation to degrade the organotin compounds.
- *In situ* low-temperature heating by use of microwave techniques to degrade or volatize the organotin compounds.
- Preparation of cement or concrete blocks utilizing contaminated spent abrasives.
- Bio-oxidation of the organotin compounds.

After the advantages and disadvantages of each of these processes were considered, each was rejected as being either too slow, too costly or too inefficient for practical shipyard application. In addition, in some instances, additional air or water pollution problems were created by the use and/or disposal of solvents and paint stripping chemicals. Thermal decomposition emerged as the most plausible candidate technique.

INVESTIGATION

Paint Particle Concentration

In view of the large volumes of abrasive involved in routine shipyard blasting operations, methods to concentrate the paint particles in the bulk abrasive before decontamination were considered. Various particle concentration processes were investigated. Of these, two procedures appeared promising: a gravity separation system and a centrifugal-froth-flotation process. Both of these processes yielded waste waters that involved additional problems related to storage and disposal of dissolved organotin compounds. Air separation techniques, eliminating the contaminated process waste waters, were also investigated. However, acceptable levels of separation of organotin from the bulk abrasive could not be achieved. For these reasons, efforts to concentrate the paint particles in the bulk abrasive so as to reduce the volume of abrasive requiring treatment, were terminated.

Thermal Decomposition

Heating the contaminated abrasive would result in decomposition of the organic portion of the organotin molecule, thereby converting the tin to an inorganic form. Consultation with knowledgeable represen-

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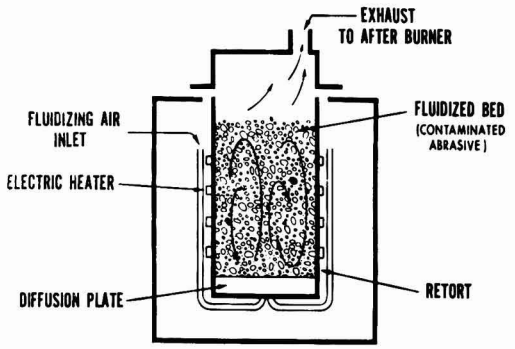

Figure 1 — Typical fluidized bed furnace (indirect heating)

tatives of industry and several universities confirmed the soundness of this judgment. As further verification, a laboratory experiment was conducted. This test involved the ignition in a muffle furnace of two duplicate weighed samples of a black, dried paint film of known organotin content (Formula 1020A). The specimens were treated for 45 min at a temperature ranging between 1000° and 1400°F (538° and 760°C) to yield a white fluffy residue. Calculations based on the weights of this residue indicated a conversion of 93% of the tin theoretically present in the original sample. The remaining seven percent was probably lost during a short

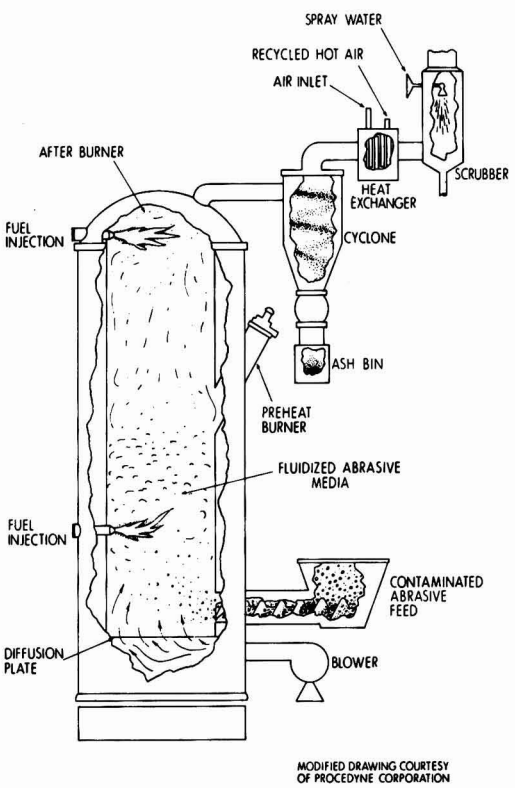

Figure 2 — Industrial type fluidized bed reactor (direct fired)

Table 1 — X-Ray Analysis of Uncontaminated Abrasive (Semiquantitative)

Element	Estimated Content wt %
Arsenic	0.01
Barium	0.09
Chromium	0.01
Copper	0.02
Iron	14.00
Lead	0.01
Manganese	0.03
Nickel	0.02
Rubidium	0.01
Strontium	0.02
Titanium	0.2
Yttrium	0.01
Zinc	0.03
Zirconium	0.02

Note: The lower detection limit for tin by this method is 20 ppm; therefore, tin was not detected. No check was made for elements with atomic numbers less than 22 (Titanium).

fuming period (approximately 1 to 2 min) encountered in the initial heating stages. This result was well within the limits of experimental error and confirmed the feasibility of this approach.

Numerous types of incineration equipment were investigated for applicability to the problem. These included incinerators, modified incinerators — such as the Tumble-Burner, fluidized bed furnaces, fixed and rotary kilns, and calciners, and other thermal processing devices. After consideration of the pros and cons for each of the above systems, the fluidized bed furnace appeared most suitable for the proposed decomposition process.

Fluidized Bed Process

The mode of operation for a typical fluidized bed furnace is schematically illustrated in *Figure* 1. If air is correctly fed through a bed of solid particles, a state of fluidization can be achieved. The individual particles become microscopically separated and assume liquid-like characteristics, such as excellent heat-transfer properties and the ability to attain very high temperatures. For our purposes, the fluidized bed consisted of the contaminated abrasive. *Figure* 2 depicts an industrial type fluidized bed reactor showing the after burner and cyclone-scrubber arrangement to ensure that any fumes or particles are not ejected into the atmosphere. In addition, a heat exchanger is included in the exhaust stream so that waste heat can be recycled to dry and preheat and spent abrasive before it enters the combustion chamber.

CHARACTERIZATION OF ABRASIVE

Unused Abrasive (Uncontaminated)

The abrasive grit used for the blasting operations consisted of a steel slag which had been prepared at high temperatures and was essentially devoid of organic matter. Chemical analysis of the unused grit re-

Table 2 — Fluidization Properties of Abrasive

Moisture content (free-drained)	11% by weight
Bulk density, lb/ft³ (gm/cc)	
Initial (free-drained)	76.25 (1.22)
Incinerated	87.36 (1.40)
Fluidization air velocity, fpm (cm/sec)	
Incipient	16.4 (8.33)
Normal operating	68.4 (34.8)
Maximum operating	246.0 (125.0)
Fluidization expansion	
Maximum operating, %	50

vealed an inorganic tin content of 11 ppm. Other tests failed to detect organotins. Results of x-ray analysis of the uncontaminated abrasive grit are shown in *Table* 1.

Contaminated Abrasive

Contaminated abrasive mixed with water was received at the laboratory in 55-gal metal drums. A sample of this material was free-drained to establish moisture content in the drained condition. The free-drained product was fluidized at ambient temperature and fluidizing air velocities were measured for producing incipient, normal, and maximum fluidization. Expansion of the fluidized bed at maximum fluidization was also determined. Samples of the free-drained contaminated abrasive were incinerated for approximately one hour under fluidized conditions at 700°, 800°, 900° and 1150°F (372°, 427°, 482° and 621°C). The 700° and 800°F (372° and 427°C) tests each exhibited exothermic peaks caused by combustion of organic material in the abrasive. These exothermic peaks maintained the temperature level of the charge above the control temperature for approximately 40% of the cycle. The temperature rise during the 900°F and 1150°F (482° and 621°C) test runs presented a first-order step response from 70°F (21°C) to 900°F (482°C) and 1150°F (621°C), respectively. A bulk density measurement was made before and after the 900°F (482°C) treatment. No problems were encountered in incinerating these samples as fluidized beds. In these experiments, no attempt was made to analyze the exhaust stream. The results of these tests are summarized in *Table* 2. A portion of the contaminated abrasive was dried and particle size distribution was determined by sieve analysis. The results of this test appear in *Table* 3.

Table 3 — Particle Size Distribution (Contaminated Abrasive)

Mesh Retained On	Weight %
20	46.7
25	6.5
40	29.1
50	10.4
60	2.9
70	2.5
100	1.6
140	0.2
<140	0.1
	100.0

Table 4 — Abrasive Blasting Operation Data[a] (Pounds Used per Blaster)

Coating System	Degree of Surface Preparation: White Metal, Abrasive per sq ft	White Metal, Abrasive per hr	Commercial Blast, Abrasive per sq ft	Commercial Blast, Abrasive per hr	Sweep Blast, Abrasive per sq ft	Sweep Blast, Abrasive per hr
Vinyl F-117, 119, 121 12.5-mil total	18	1170	5	395	3	258
Epoxy-vinyl F-150, 151, 154, 121 12-mil total	15	975	4.4	348	2.5	215
Hot plastic F-117, 14N, 15HNP 30-mil total	14	910	4	316	2	172

(a) Based on estimated data submitted by Long Beach Naval Shipyard.

BLASTING OPERATIONAL DATA

To further define the potential magnitude of the disposal problem and to determine equipment size and capacity requirements, information was gathered from various shipyards concerning abrasive use rates during blast cleaning operations. A typical set of such data, presented in *Table* 4, indicated an upper limit use rate of approximately five tons of abrasive per blasting nozzle per eight-hour shift. In addition, the weight of dry coating film per unit area of ship's hull was calculated for several coating systems currently in use. These data appear in *Table* 5. Calculation of these values is based

Table 5 — Paint System Weight (Pounds per 1000 sq ft of Hull Area)

Formula	System: Epoxy/ Cu_2O AF	Epoxy/ TBTO AF	Vinyl/ Cu_2O AF	Vinyl/ TBTO AF
F-150 (3 mils)	32.37	32.37		
F-151 (3 mils)	31.56	31.56		
F-154 (2 mils)	20.74	20.74		
F-117 (0.5 mil)			6.80	6.80
F-119 (8.0 mils) Vinyl AF			153.12	153.12
F-121 (4 mils) Vinyl TBTO (F-1020A)	98.48		98.48	
(4 mils)		31.24		31.24
Total System, lb	183.15	115.91	258.40	191.16

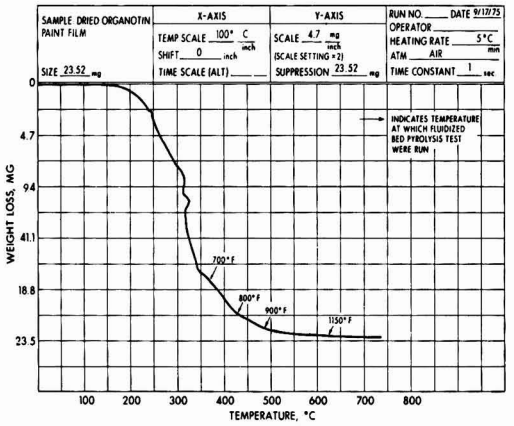

Figure 3 — Thermogravimetric analysis curve obtained for a sample of dried organotin paint film (formula 1020A)

on certain approximations, such as coating loss during application (over spray, drip, spills, etc.), and can therefore only be considered as approximate values. With this understanding, *Table* 5 indicates that the weight of paint on a ship's hull ranges between 0.1 and 0.25 lb/ft² (0.49 to 1.22 kg/m²). Combining information in *Tables* 4 and 5 indicates that the antifouling paint concentration in the spent abrasive is slightly in excess of one percent.

THERMOGRAVIMETRIC ANALYSIS

To evaluate the effectiveness of the fluidized bed furnace procedure for the destruction of *all* organic material in the spent abrasive, the following samples were subjected to thermogravimetric analysis (TGA):

- Dried organotin paint film (Formula 1020A).
- Unused abrasive (noncontaminated).
- Used abrasive (contaminated).
- Contaminated abrasive after treatment in a fluidized bed reactor at 900°, 800°, and 700°F (482°, 427°, and 372°C).

In this procedure, each sample was heated in air at a preset increasing temperature rate of 5°C per min and weight loss due to heating of the organic material in the sample was recorded. The results of these tests appear in *Figures* 3 and 4. A sample consisting only of dry organotin paint film, tested as described above, produced the weight loss curve seen in *Figure* 3. It is apparent that combustion of most of the paint sample occurred between the temperature range of approximately 200° and 500°C (392° and 932°F), with the minimum leveling off slightly above total weight loss so as to account for the weight of the remaining metallic oxide residue. It is noted that, in addition to the organotin, the paint film also contains other organic compounds (e.g., vinyl resin) which contributes to this weight loss.

Applying this TGA treatment to the unused abrasive indicated a zero weight loss (straight line), as shown in item (A), *Figure* 4. In fact, a slight weight gain was registered due to oxidation of the steel slag abrasive. Repeating this procedure with a sample of contaminated abrasive yielded the weight loss curve seen in item (B), *Figure* 4. Here, we note a much smaller total weight loss than seen in *Figure* 3 over a temperature ranging between 200° and 500°C (293° and 932°F). Calculations based on the calibration of the instrument and the magnitude of the recorded weight loss indicated a 1.6% concentration of paint in the abrasive sample. This is in agreement with previously described calculations based on the data presented in *Tables* 4 and 5. Items (C) and (D), *Figure* 4, show weight-loss curves obtained from similar TGA tests using samples of contaminated abrasive which had been treated in a fluidized bed furnace at 900° and 700°F (482° and 372°C), respectively. Both of these curves appear identical to the curve obtained for the unused abrasive seen in item (A), *Figure* 4, indicating complete destruction of the organotin paint in the spent abrasive. The sensitivity of this method for the detection of organotin paint in the abrasive is approximately 10 ppm. Arrows in *Figure* 3 indicate the points along the paint ignition curve at which fluidized bed treatments were run.

BIOTOXICITY TEST

The presence of organotin paint in the treated, contaminated abrasive could not be detected during TGA studies below a concentration of about 10 ppm. Assum-

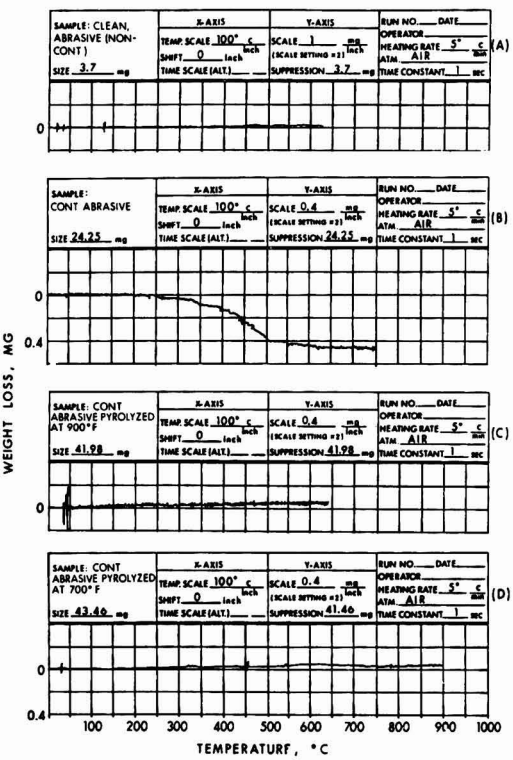

Figure 4 — Thermogravimetric analysis curves obtained for samples of abrasive

Figure 5 — Typical aquaria used to determine biotoxicity characteristics of untreated and treated abrasive blasting residues (tank size 8.5 litres, fish length - approximately 6 cm)

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ing a 25%* organotin content in the aged antifouling paint film, this is equivalent to an approximate concentration of 2.5 ppm organotin. Although this represents a relatively low concentration, it was considered essential to determine whether the processed contaminated abrasive would exert any toxic effects on life in the marine environment. Biotoxicity tests were therefore conducted.

Six liters of filtered Chesapeake Bay water were placed in each of four 8.5-liter glass tanks. Tank 4 was retained as a control, containing only Bay water with no abrasive added. A 500 g quantity of abrasive was added to each of the other three tanks as follows:

(1) Tank 1 - Unused, uncontaminated abrasive.

*Allowing for organotin compounds leached out of the antifouling paint film while in service.

Table 6 — Biotoxicity Tests

Marine Life Form	Test Abrasives, g	Water, ml	Test Duration Days	Results: Contaminated	Results: Processed
Minnow fish	500	6000	29	All fish died	No ill effects
Minnow fish	500	6000	17	All fish died	No ill effects
Minnow fish[a]	500	6000	7	All fish died	No ill effects
Soft shell clams	500	6000	8	All clams died	No ill effects
Barnacle larvae	2.5	30	0.83 (20 hrs)	All larvae died	No ill effects
Barnacle larvae	2.5	30	1	All larvae died	No ill effects

(a) Contaminated abrasive was washed 10 times in distilled water.

Table 7 — Detoxification Process Characteristics (1000°F (538°C))

Operation Hours[a]	Equipment Size Diameter, ft Inside	Outside	Fuel Consumption[b] lb/lb solids	Hp/Lb/Hr Solids	Fuel and Power Operating Costs[b] $K	Estimated Capital Costs $K
			No Concentration (Bulk Abrasive)			
8	8.0	10.6	0.037	0.0048	0.165	390
16	5.7	8.7	0.037	0.0048	0.165	240
			Concentration 5:1			
8	3.6	6.6	0.004	0.0021	0.024	175
16	1.7	5.1	0.004	0.0023	0.024	125
			Concentration 10:1			
8	2.5	5.9	0[d]	0.0015	0.006[d]	180[e]
16	0.8	4.3	0	0.0015	0.006	115

(a) Based on time required to process 50 tons of abrasive, free-drained to 11% water by weight.
(b) Assumes fuel heating value of 20,000 Btu/lb, fuel at $15 per barrel, and power at 5 cents per kilowatt-hour.
(c) Assumes cost of concentrating operation of $35K.
(d) Assumes contaminant at 6% (weight) level with a heating value of 11,000 Btu/lb. This process is autogenic once operating temperature is achieved, i.e., no fuel required for sustaining operation.
(e) Assumes cost of concentrating operation of $45K.

(2) Tank 2 - Used, contaminated abrasive.
(3) Tank 3 - Contaminated abrasive that had been incinerated in a fluidized bed furnace at 700°F (372°C).

All four tanks were aerated and maintained at ambient temperature. After allowing these systems to equilibrate for eight days, five minnows were added to each tank. These fish were fed the day before entering the test tanks but thereafter received no additional food during the first 10 days of the test. Fish in tanks 1, 3, and 4 had suffered no ill effects after 29 days of exposure. In comparison, all fish in tank 2 soon died. To verify these results, the above procedure was repeated with other fish and new abrasives. In each test run, the outcome remained unaltered. Typical fish tank set-ups are shown in *Figure* 5. These tests were repeated using soft shell clams and barnacle larvae with similar results.

Results of these tests are summarized in *Table* 6 and indicate that incineration of the contaminated abrasive yields a product which is completely nontoxic to the marine life forms tested. Since these results were so conclusive, it is quite probable that the treated material will have no adverse effect on marine life. It is believed that all organic matter in the abrasive, including the organic portion of the organotin molecule, was oxidized thus rendering the contaminated abrasive harmless. The processed abrasive could therefore be safely recycled, diverted for other purposes, or disposed of by conventional means.

PROTOTYPE UNIT

Prototype

Information developed in this study indicated that a fluidized bed incineration process was indeed feasible for the treatment of the contaminated abrasive grit. Based on data derived from abrasive characterization experiments, blasting production data presented in *Tables* 4 and 5, and after consultation with technical personnel from industry, a design basis for a process model was established at a maximum feed rate of 50 tons per eight-hour day and abrasive contamination of 0.6 wt %. Initial experimental results suggested a fluidized air velocity of 246 fpm (75 m/min) at a temperature range of 1000° to 1150°F (538° to 621°C). Subsequent studies have shown that with slight adjustment of the residence time period within the reactor, the fluidizing temperature can be reduced to 700°F (372°C) without a loss in operating efficiency. This would serve to simplify the choice of construction materials, reduce equipment size (diameter) and weight, and reduce energy requirements for the process. Stress-corrosion-resistant materials may be required since the wet spent abrasive may contain trace amounts of chlorides. It may therefore be necessary to construct the reactor vessel and porous base plate of a more corrosion-resistant alloy.

Energy Balance

Energy requirements for the proposed process were calculated for the following cases:

- Operating temperature — 1000°F (538°C).
- Concentration ratios — 1:1, 5:1 and 10:1.
- Operating hours per day — 8 and 16.

For each case the following conditions were assumed:

- Heat capacity of abrasive grit — 0.3 Btu/lb/°F (1.25 J/kg/°C).
- Concentration of contaminating paint - 0.6 wt%.
- Operating temperature at burners - 1800°F (982°C).
- Exhaust gas temperature from incinerator - 1000°F (538°C).
- Gross fuel availability - 46%.
- Excess air at burners - 160%.
- Heat losses from equipment - 20%.

Results of these energy balance calculations are summarized in *Table* 7. No heat recovery from the incinerator was assumed for these cases. Information is not

available at this time for the process operating at a temperature of 700°F (372°C); however, indications are that equipment size and energy requirements would be substantially reduced. In addition, as indicated in *Table* 7, under certain conditions, the process becomes autogenic with no fuel required for sustaining the operation.

Equipment size

For each case considered, the incinerator was sized with respect to diameter. A superficial fluidization velocity of 246 fpm (75 m/min) was assumed for sizing the inside diameter. The outside diameter was approximated on the basis for maintaining heat losses at 20%.

CONCLUSIONS

The following conclusions are based on the results of this study:

(1) Fluidized bed incineration with or without a paint concentration step is a suitable procedure for the proposed process.
(2) Paint particles containing organotin in the spent abrasive, subjected to fluidized bed incineration at 700°F (372°C) can be completely destroyed.
(3) A mobile, truck-mounted, fluidized bed system for dockside operation is feasible using current technology and commercially available off-the-shelf items.

ACKNOWLEDGMENTS

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The opinions expressed in this paper are solely those of the authors and do not necessarily reflect the official views of the Naval establishment. □

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ERRATA

In the paper, "Polyesteramides From Linseed and Soybean Oils for Protective Coatings," by L.E. Gast, W.J. Schneider, and F.L. Baker, which appeared in the January 1977 JCT, *Figures* 1 and 2 (pages 60 and 61) were transposed.

New Techniques For Making Cellulose Derivatives

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Since cellulose is not soluble in organic solvents, it has been the custom to prepare its derivatives by heterogeneous reactions. The preparation of solutions of cellulose in dimethyl sulfoxide and formaldehyde has made homogeneous reactions possible. Thus esters and ethers of cellulose can be readily prepared without degradation of the polymers at room temperature. This technique may be used to produce classical and new derivatives with degrees of substitution from 0.1 to 2.0.

KEY WORDS: Cellulose, ethers, esters; Solubility; Degree of substitution (DS); Dimethyl sulfoxide (DMSO); Pyridine.

INTRODUCTION

Cellulose in the form of flax, ramie, cotton, and wood has been used for thousands of years and many of the advances in civilization have been based on the use of this widely occurring macromolecule as paper for printing, textiles for clothing, and lumber for structures. Yet, in spite of its general availability as an essentially pure organic compound, no cellulose derivatives were synthesized prior to 1846 when Schonbein produced cellulose nitrate.

This ester, like cellulose itself, was responsible for many pioneer developments in coatings, plastics, man-made fibers, and explosives. Menard's preparation of collodion by dissolving cellulose nitrate in an equimolar mixture of ethanol and ethyl ether was a momentous empirical discovery. Hyatt produced celluloid by adding camphor and fillers to collodion and Chardonnet prepared artificial silk by the evaporation of the solvent from the filament formed when collodion was forced through small holes or spinnerets. The growth of the early automobile industry was aided by the development of protective pigmented cellulose nitrate finishes.

Other derivatives such as cellulose xanthate, cellulose di- and triacetate, methylcellulose, and carboxymethylcellulose were essential for the development of rayon and cellophane, acetate rayon, water-soluble coatings, and thickeners. However, there were few applications of these products in the paint industry.

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Today, the use of cellulose nitrate lacquers is limited because of their flammability. Nevertheless, cellulose is a renewable resource and the preparation and application of its derivatives continue to present a challenge to creative coatings chemists.

Unfortunately, because of strong hydrogen bonding, cellulose is insoluble in most solvents. While its derivatives, such as esters, ethers, and xanthates are soluble, cellulose itself is soluble only in a few aqueous solvents, such as copper ammonia hydroxide and quaternary ammonium hydroxide. However, the recent discovery of the solubility of cellulose in dimethyl sulfoxide (DMSO) in the presence of formaldehyde has provided new pathways for the homogeneous preparation of old and new cellulose derivatives. Solutions of cellulose are also being made in hot hydrazine but high pressures are required for this solution process.

CELLULOSE SOLUTIONS

Dry cellulose, such as cotton or filter paper (10 g), will dissolve in DMSO (250 ml) in the presence of formaldehyde or paraformaldehyde (15 g) at 80°C.[1,2] When excess formaldehyde is removed by heating at temperatures above 100°C, a viscous solution of methylolcellulose is produced in which the methylol group is located almost exclusively on carbon number 6 in the repeating anhydroglucose units in the nondegraded cellulose molecule. The soluble cellulose is readily precipitated in water or methanol as amorphous cellulose.

CELLULOSE ESTERS

In contrast to the classical heterogeneous acetylation which yields an acetone-insoluble cellulose triacetate, the degree of substitution (DS) of the cellulose esters may be controlled in the room temperature esterification of methylolcellulose in DMSO by organic anhydrides in the presence of pyridine.[3] The reaction of the methylol hydroxyl group by chloroacetic acid in the presence of triethylamine has been reported.[4] Since the methylol group is hydrolyzed when DMSO solutions of methylolcellulose are precipitated in water, the DS of these esters is limited to a maximum of 2.

The anhydride-pyridine technique has been used to produce cellulose esters with DS ranging from 0.2 to 2.0 from acetic anhydride, butyric anhydride, methacrylic anhydride, maleic anhydride, and succinnic anhydride. All esters except the succinnate were yellow and this coloration increased with DS. While the maleate was insoluble, the colorless succinnate was soluble in water.

The cellulose methacrylate which is an unsaturated ester should be of interest as an air-curable coating resin. It may be used for the formation of graft or block copolymers with vinyl monomers.

Solutions of methylolcellulose in DMSO are compatible in all proportions with solutions of polyacrylonitrile, polyvinylpyrrolidone and poly vinyl alcohol in DMSO. The water absorption, adhesion, and physical properties of films cast from these polymeric mixtures vary with composition.

CELLULOSE ETHERS

Water soluble ethers with DS of 0.2 to 2.0 may be produced by the addition of ethylene oxide to methylolcellulose in DMSO. Carboxymethylcellulose (CMC) with a DS of 0.14 to 0.21 was obtained when methyl bromoacetate (0.076 mole) was added dropwise at 19°C to sodium cellulose (0.079 mole). The latter was prepared by the addition of sodium hydride (0.250 mole) to methylolcellulose in DMSO at 19°C.[4]

While the DS of CMC was limited by its solubility in DMSO, the more soluble methylcellulose with DS up to 2 was obtained when methyl iodide was added to sodium cellulose at 19°C.[4]

SUMMARY

Cellulose may be dissolved, without degradation, in dimethyl sulfoxide in the presence of formaldehyde.

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Cellulose esters may be produced by the addition of an acid anhydride to the clear viscous solution of cellulose in the presence of pyridine at room temperature. Ethers may be produced by adding organic halides to sodium cellulose. The latter is prepared by the addition of sodium hydride to the solution of cellulose in DMSO.

ACKNOWLEDGMENT

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Investigation Of the Factors Involved In Mildew Growth

C-D-I-C Society for Coatings Technology
Technical Committee*

Unglazed ceramic tiles, 4.5 cm square, were self-primed with two batches of the PRI experimental unprotected acrylic latex coating, and were exposed vertically for various periods of time on the Battelle Columbus Laboratory test fence in West Jefferson, Ohio. When returned to the laboratory after exposure, each tile was aseptically scored and a 1.3 cm wide vertical segment was removed for microbiological study. The remaining portion of each tile was extracted for two hr in sterile deionized water; the extract of each tile was used to prepare 0.5% solution of hydroxyethyl cellulose. Following a standard incubation period of two hr at 25° C, the viscosities of the HEC solution prepared from each tile extract were compared by Ostwald viscometry to that of a standard 0.5% HEC solution prepared in sterile deionized water and to deionized water alone. The results of the microbiological and enzyme study are discussed in their relationship to the presence of visible disfigurement of the coating.

KEY WORDS: Mildew growth; Ostwald viscosities; Mildew succession; Hydroxyethyl cellulose; Hydroxyethyl cellulase; *Aureobasidium pullulans; Alternaria* sp.

INTRODUCTION

The C-D-I-C Society has a history of studying the various parameters of the problem of mildew defacement of organic coatings dating back to the mid-60s. At the 45th (1967) Annual Meeting of the Federation, the C-D-I-C Society presented the results of a comparison of the effectiveness of six nonmercurial fungicides in latex paint formulations for the control of the growth of paint mildew. Both wood and cement blocks were coated with the experimental formulations; the red cedar coated panels were exposed at Columbus, Ohio, New Orleans, La., and in Southern Florida, while interior testing of similar panels and the cement blocks was done in a QCT® Cyclic Environmental Tester. Contamination of the specimens was accomplished by natural means or by spraying or brushing the coating with an admixture of *Aspergillus niger, A. repens, Chaetomium globosum,* and *Streptomyces rubrireticuli* or by coating with paint contaminated in the can by the mixed culture. The results[1] showed that 2, 3, 5, 6-tetrachloro 4-methyl sulfonyl pyridine was the most effective of the nonmercurials, with or without zinc oxide and compared favorably with phenyl mercuric acetate in mildew control.

In 1968, the Society presented "Some Further Observations on Mildew Growth".[2] The paper included an extension of the 1967 study, plus several mini-studies pertaining to paint mildew. The result of the Florida exposure of glass coated with (1) an ordinary linseed oil, outside house paint containing zinc oxide and (2) an alkyd type without zinc oxide was: the mycelia completely penetrated the alkyd coating and was progressing in the paint-glass interface, whereas the fungus virtually had not penetrated the linseed oil plus zinc oxide paint. The paper also included a comparison of type of wood used for the panels, i.e., red wood, cedar, white and yellow pine, against three types of primer systems: self-primed, oil-primed, and recommended primer (Federal Specification TT-P-25a). Heaviest mildew occurred on the self-primed areas, least mildew on the oil-primed areas of the conventional polyvinyl acetate latex topcoat. Mildew was heaviest over white pine, least over cedar, and intermediate and about equal over yellow pine and redwood. An additional observation on the white pine panels revealed a difference in type of growth of *Aureobasidium* (Pullularia) *pullulans;* growth over the oil-primed area was "nodular", whereas over the self-primed area it was practically all diffuse mycelium. When a conventional acrylic latex top coat was used, almost no mildew developed, presumably due to the presence of calcium carbonate in the film and its buffering effect in maintaining the film in a more alkaline condition.

The C-D-I-C paper at the 1970 meeting[3] presented results obtained by continuation of the investigation first reported in 1967, and a description of a new series of exposures involving alkyd-modified acrylic exterior house paints. It was reported that after 24 months exposure in Miami, Fla. and New Orleans, and 36 months in Columbus, nine of the original short-term conclusions had to be changed. The more salient conclusions were:

* Presented by Dr. John A. Schmitt at the 54th Annual Meeting of the Federation of Societies for Coatings Technology in Washington, D.C., October 28, 1976.
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(1) Mildew control was best when the 100-gal paint formula included 100 lb of zinc oxide and 4.5 lb of 10% solution of phenyl mercuric succinate;

(2) Very good mildew control was obtained with 100 lb of zinc oxide alone per 100 gal;

(3) Nonmercurials did not afford the long-term protection provided by the mercurials or zinc oxide;

(4) Purposeful inoculation is not an effective means of accelerating mildewcide evaluations;

(5) An evaluation of mildew control agents should include exposure in both protected and exposed areas of the panels; and

(6) A mildew control agent should be evaluated both immediately after the paint has been made and after a period of storage.

The most recent previous contribution of the C-D-I-C Society, presented in 1973,[4] evaluated 18 additional nonmercurial fungicides in an exterior alkyd-modified acrylic latex paint with and without zinc oxide. Summarily, most of the nonmercurial protected paints had better mildew resistance than the unprotected control, but none was as good as the control containing zinc oxide plus phenyl mercuric propionate, based on exposure in Miami and Columbus.

Additional literature pertinent to the current program of the C-D-I-C Society Technical Committee includes the following:

Winters and co-workers[5,6] reported *Pseudomonas aeruginosa* as being responsible for the in-can spoilage of a vinyl acrylic coating due to a loss in viscosity. They reported *in vitro* studies with purified enzymes obtained from three isolates of *Pseudomonas*, clearly establishing that the cellulase(s) produced by these bacteria were responsible for the loss of viscosity. The studies by Schmitt and co-workers[7,8,9] suggested that, when a pure culture of *Aureobasidium pullulans* is aseptically inoculated onto a cured and aged film of an unprotected acrylic coating, growth was not sustained on a virgin film, but rather only on a film modified, in this case, by an isolate of *Pseudomonas*. Tests in liquid 0.5% HEC media confirmed this; *A. pullulans* did not grow when HEC was the sole organic available, nor did the type of substrate to which the coating was applied have any appreciable effect although included in the study were yellow pine, glass with and without finely-ground white pine, porcelain tiles, and plastic. By itself, *A. pullulans* would not grow for more than 2-3 weeks before becoming dormant.

Through the results of two independent fungal succession studies, Winters, Isquith, and Goll[10] and Schmitt, Padgett, and Achmody,[9] reported apparent succession of fungal genera culminating in an almost total dominance of *A. pullulans*. Again, *A. pullulans* was not an early organism to appear on the RODAC* lift-offs, unless it was present in the ambient air as the finish coat was applied to the panels.[9] These two successional studies are somewhat comparable, since panel exposure for both was at the Cosan Chemical Co. test fence in St. Petersburg, Fla.; the Schmitt, *et al.*

*Replicate Organism Detection and Counting (R-O-D-A-C) plates obtained from the BBL Div. of Bio Quest.

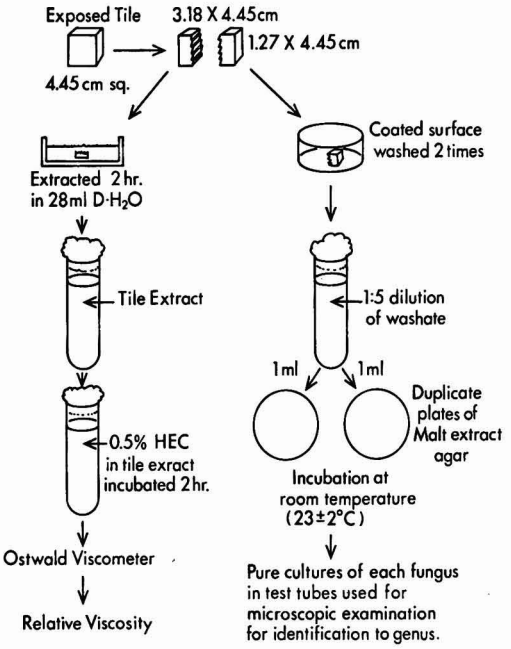

Figure 1 — Flow sheet showing treatment of each tile after retrieval from the test fence

study[9] included data derived from panels exposed south of New Orleans, on a test fence of Cecil Shilstone Associates. Winters, *et al.*[10] reported data supporting the following succession of fungi leading to an ASTM rating of 3: *Aspergillus* sp. → *Alternaria* sp. → *A. Pullulans*. In a subsequent paper, Winters and Guidetti[11] presented evidence explaining, in part, the role(s) of *Aspergillus* sp. and *Alternaria* sp. in their proposed succession. *Aspergillus* sp. and *Alternaria* sp. produced *in vitro* in broth cultures extra-cellular polysaccharide material which *A. pullulans* was able to hydrolyze, thereby enabling the fungus to utilize the hydrolytic products for its energy source for growth. These authors further theorized that the primary roles of *Aspergillus* sp. and *Alternaria* sp. may concern primary attachment of *A. pullulans* propagules as well as serving as a nutrient source.

Schmitt, *et al.*[9] were unable to obtain data significant to a succession thesis from their St. Petersburg panel exposures. The panels were topcoated in a shed adjacent to the test fence; plates of malt extract agar (MEA) and brain heart infusion agar (BHIA) exposed on the tables used for the finish coat application indicated heavy contamination of the ambient air in the shed by *A. pullulans*, sufficient evidence to conclude that relatively large numbers of cells of *A. pullulans* were deposited in or on the finish coat and hence negate use of those panels for successional inferences. Significantly though, these data clearly show that when a film is overwhelmed by *A. pullulans* inoculum, the fungus can grow in the absence of any preconditioning factors or organisms. Those St. Petersberg data, however, include evidence that may, in part, support the idea that

Table 1 — Mycologic Evaluation and Comparative Ostwald Viscosity Readings of Extracts from Exposed Tile

	Viscosity, (Ostwald times)[b]
D-H_20	24.7
0.5% HEC in D-H_20	40.0

Days on Exposure	Fungi Recovered[a]	Viscosity, (Ostwald times)[b]	Days on Exposure	Fungi Recovered[a]	Viscosity, (Ostwald times)[b]
0	(negative)	33.0	35-N	*Epicoccum* sp.	33.0
0-N[c]	(negative)	29.5		*Rhodotorula* sp.	
2	*Cladosporium* sp.[b]	30.0		*Cephalosporium* sp.	
	Fusarium sp.			(several colonies of 2 bacteria)	
	Acremonium sp. ?		42	*Alternaria* sp.	34.0
2-N	*Penicillium* sp.	34.0		nonsporulating moniliaceous fungus	
	(2 bacterial types in abundance)		42-N	*Geotrichum* sp. ?	29.0
4	*Cladosporium* sp.[c]	33.3	84	*Acremonium* sp. ?	30.5
4-N	*Alternaria* sp.	33.0		(several colonies each of 4 bacteria)	
	Cephalosporium sp.		84-N	*Alternaria* sp.	29.5
	Acremonium sp. ?			*Cladosporium* sp.	
7	(negative)	29.0		*Fusarium* sp.	
7-N	1 nonsporulating dematiaceous			*Penicillium* sp.	
	fungus	27.0	120	*Epicoccum* sp.	29.0
9	(negative)	28.5		nonsporulating moniliaceous fungus	
9-N	(negative)	27.5		*Rhodotorula* sp.	
11	*Saccharomyces* sp. ?	30.0	120-N	*Alternaria* sp.	27.0
11-N	(negative)	28.0		*Epicoccum* sp.	
14	*Acremonium* sp. ?	31.0		*Fusarium* sp.	
14-N	(negative)	37.1		*Rhodotorula* sp.	
21	*Cladosporium* sp.	34.0		*Saccharomyces* sp. ?	
21-N	(negative)	33.0	150	*Alternaria* sp.	31.0
28	*Alternaria* sp.	36.0		*Cladosporium* sp.	
	Cephalosporium sp.			*Epicoccum* sp.	
28-N	Cephalosporium sp.	34.0		*Rhodotorula* sp.	
35	*Cephalosporium* sp.	29.5	150-N	nonsporulating dematiaceous fungus	29.0
	Epicoccum sp.			nonsporulating moniliaceous fungus	
	Rhodotorula sp.			*Rhodotorula* sp.	
	(many colonies of a bacterium)			*Saccharomyces* sp. ?	

(a) Duplicate plates of malt extract agar were inoculated with 1.0 ml aliquots of a 1:5 dilution of the washate from an approximately 1.27 cm x 4.45 cm portion of each coated. exposed tile; numbers shown in parentheses denote different tile, based on differences in colonial and micromorphology.
(b) Ostwald times indicated are the average of 4 individual tests of 0.5% HEC solutions prepared from two-hr extracts of each 3.2 cm x 4.5 cm tile portion. Viscosities were determined at a temperature of 25°C ±0.5°C.
(c) N designates the newly formulated paint.

Alternaria sp. elaborates a substance or substances inhibitory to *Aspergillus* sp. *Alternaria* was one of the organisms recovered early in the study and recurred throughout the isolations, whereas the occurrence of *Aspergillus* was at best spotty. In the New Orleans data, *Alternaria* sp. and *Cladosporium* sp. preceded *A. pullulans* with the virtual absence of *Aspergillus* sp. In the Schmitt, *et al.* study,[9] the St. Petersburg panels reached an ASTM rating of 0-1 in five months, whereas the New Orleans panels took 13-14 months to reach such a rating.

The entire question of the importance of the state of the film to mildew development is still moot. Winters (personal communication) reported on several biotic and abiotic factors involved in the degradation of hydroxyethyl cellulose-thickened latex paints. The biotic modification include those mentioned above in the successional study, as well as a potential role of bacteria, such as *Pseudomonas* sp. (see Winters[5]). They report as important abiotic factors: (1) one type or another of oxidants, especially related to the oxidation-reduction potential of the system; (2) presence of extra-cellular polyanionic polymers and their ability to either aid in the attachment of *A. pullulans* to the film or to bind any fungicide within the film; and (3) irradiation through its production of H_2O_2 and hydroxyl-free radicals which are capable of degrading cellulose ethers and latex polymers or of inhibiting cellulase activity.

The Technical Committee decided to look into the relationship between the microbiological successional history, evidence of the presence of cellulase, and the appearance of visible defacement. Since, at least in the early stages of exposure, HEC would be the most probable point of attack, a system was devised to evaluate these three parameters. In an effort to eliminate all potential energy sources for whichever microorganisms might eventuate, unglazed porcelain tiles were selected as the base to which we applied the experimental acrylic coating used earlier in the Paint Research Institute studies (see Schmitt, *et al.*[7]). Tiles were obtained that were 4.5 cm square; these were self-primed with either of two batches of the PRI coating, one newly mixed and one mixed approximately six months prior to application; tiles coated with the two batches were coded for later recognition. Tiles were coated on March 20, 1976, and held at 50% relative humidity and 21.1°C until they were placed on exposure at the Battelle Columbus Laboratory test fence at West

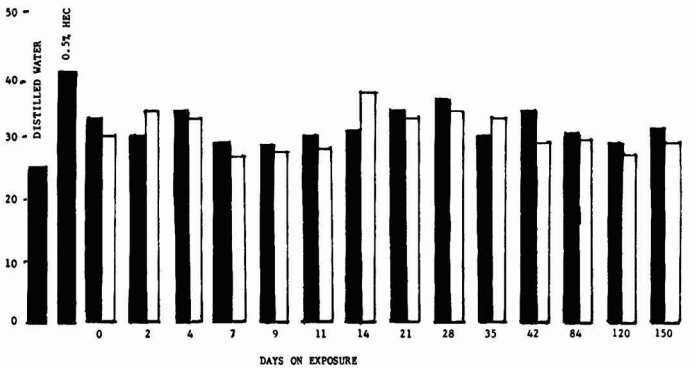

Figure 2 — Ostwald viscosities (in sec) of tile extracts prepared as 0.5% HEC solutions (closed bars, old paint; open bars, new paint)

Jefferson on March 29, 1976. Paired, i.e., new and old-batch—tiles were removed on the dates according to a predetermined schedule. With minimal handling, each tile was placed in a presterilized plastic zip-lock bag for transport to the Mycology Laboratory, Dept. of Botany, The Ohio State University, where the following procedures were done.

Figure 1 depicts the experimental protocol used in the study. Each tile was aseptically removed from its bag and placed in a sterile, disposable Petri dish. An alcohol-soaked, flamed tile tool was used to score and remove an approximately 1.3 cm-wide, vertical segment of the tile for microbiological study. The remainder of each tile was placed in a sterile, disposable Petri dish for subsequent enzyme extraction.

The inoculum for the microbiology study was obtained by twice washing the coated surface with 10 ml of sterile deionized water, then using 1 ml aliquots of a 1:5 dilution of the washate to inoculate duplicate plates of malt extract agar (MEA).

The 3.2 × 4.5 cm remaining segment of each tile was used for enzyme extraction. To each segment in a sterile Petri dish 28 ml of sterile deionized water was added; preliminary studies showed that 3 ml of extractant were retained by the piece of tile. The approximate 25 ml extract was used to prepare a 0.5% HEC solution, the original concentration of HEC in the coating. Following a two-hour incubation period, the several experimental solutions of HEC and the controls (distilled water and 0.5% HEC in sterile deionized water) were subjected to Ostwald viscometry determinations.

RESULTS AND DISCUSSION

This is an interim report, based on 29 weeks of observation and investigation. Only with the tiles removed on October 4, 1976, and not yet completely processed for inclusion in this report, was there evidence of defacement visible by macroscopic examination.

Results to date for both the mycology and viscosity parameters are shown in *Table* 1. Some of the findings cannot be definitively explained at this time. Since the exposure site is west of Columbus and without a weather station, there is no record of the local climatic conditions during the exposure period. Hence, we are unable to rule in or rule out the relationship of precipitation to the two parameters of the study.

The Ostwald viscosities were done at a standard temperature of 25°C±0.5°C. The experimental viscosities of 0.5% HEC in D-H_2O had an average reading of 40 in the Ostwald.

It would appear that one or more of the raw materials used to formulate the two coatings contained some HECase as a contaminant since the readings on the extracts from tiles of both paints on the day they were placed on exposure are less than the control HEC solution.

Figure 2 presents the viscosity data in a mode more easily compared. Note that Days 2 and 4 indicate comparatively high viscosity readings, whereas Days 7, 9, and 11 have somewhat lower values. In light of the failure to obtain positive cultures for either bacteria or fungi on any of those days, the results are paradoxical. Note, however, that although the viscosities for Day 4 are comparatively high, Day 4 tiles cultured out *Cladosporium* sp. and *Alternaria* sp., both of which have been incriminated as significant in fungal succession leading to *A. pullulans* dominance by Winters, *et al.*[10] An alternative explanation could relate to precipitation, i.e., it is possible that those higher viscosities occurred in extracts from tiles removed after several days of low humidity and no rain, whereas the lower viscosities might be explained by a leaching of both HEC and HECase during the following rainy days.

Two other possible explanations that might account for some slight variation in the viscosity reading of a particular extract relate to the mechanics of protocol. Each tile was aseptically removed from the originally sterile bag in which it was transported and a flame-sterilized tile cutter was used to score and snap off a vertical portion approximately 1.3 cm wide. Even though a sterile jig with marks delineating the line was used, it was not always possible to score the tile precisely nor snap it off cleanly. Thus, some tiles used to prepare the extracts had slightly more and some slightly less than the theoretical 4.5 cm × 3.2 cm. This is probably negligible in its effect on the cellulase extract.

Then too, small volumes of liquid were used in an effort to make the potential enzyme extract as highly concentrated as possible. Approximately 25 ml of

Table 2 — Fungi Recovered During the Study, 3/29–8/9/76

Days on Exposure	Fungi Isolated	Days on Exposure	Fungi Isolated
2	*Cladosporium* sp.	42	*Alternaria* sp.
	Fusarium sp.	42-N	*Geotrichum* sp. ?
	Acremonium sp. ?	84	*Acremonium* sp. ?
2-N	*Penicillium* sp.	84-N	*Alternaria* sp.
4	*Cladosporium* sp.		*Cladosporium* sp.
4-N	*Alternaria* sp.		*Fusarium* sp.
	Cephalosporium sp.		*Penicillium* sp.
	Acremonium sp. ?	120	*Epicoccum* sp.
7-N	*N-S Dematiaceous fungus[a]		1 N-S Moniliaceous fungus
11	*Saccharomyces* sp. ?		*Rhodotorula* sp.
14	*Acremonium* sp. ?	120-N	*Alternaria* sp.
21	*Cladosporium* sp.		*Epicoccum* sp.
28	*Alternaria* sp.		*Fusarium* sp.
	Cephalosporium sp.		*Rhodotorula* sp.
28-N	*Cephalosporium* sp.		*Saccharomyces* sp. ?
35	*Cephalosporium* sp.	150	*Alternaria* sp.
	Epicoccum sp.		*Cladosporium* sp.
	Rhodotorula sp.		*Epicoccum* sp.
35-N	*Epicoccum* sp.		*Rhodoctorula* sp.
	Rhodotorula sp.	150-N	1 N-S Dematiaceous fungus
	Cephalosporium sp.		1 N-S Moniliaceous fungus
			Rhodotorula sp.
			Saccharomyces sp. ?

(a) N-S = nonsporulating

extract of each tile was used to prepare the 0.5% HEC solutions. To prepare that concentration of HEC, 25 mg of dry HEC were added to the extract after being weighed on tared papers. It is not certain that all 25 mg of HEC from any one weighing was removed from the paper; 1-2 mg retained on the weighing paper would result in a slightly lower HEC concentration. This in turn would be reflected in the viscosities.

Table 2 summarizes the mycological data obtained. Note the complete absence of the genus *Aspergillus*. Winters, *et al.*[10] proposed that *Aspergillus* sp. prepared the coating for invasion of *Alternaria* sp., which in turn was prerequisite to the establishment of *A. pullulans*. It appears that in the Columbus area during tests through September some genus other than *Aspergillus* sp. must be responsible for the primary modification of the coating. The most likely candidate, based on frequency of isolation prior to appearance of *Alternaria* and on the relative numbers of colonies per plate, is the genus *Cladosporium*. This genus was cited by Winters, *et al.*[10] as one of the primary invaders along with *Mucor, Aspergillus,* and *Alternaria,* yet they did not include it in their proposed successional scheme. Note also the absence of *Mucor* sp. from the isolations listed in *Table* 2.

We believe that the data presented here are in general agreement with the previous successional studies reported. Pending additional studies at sites other than south Florida, south of New Orleans, and Columbus, it is unwise to be definitive in designating one or more primary and/or intermediate invaders of the film that condition it for the colonization of *A. pullulans*. It is acknowledged that the film seemingly has to be colonized, albeit perhaps not visibly, by one or more microorganisms, such modification being prerequisite to manifestation of the ultimate, almost total dominance, of *A. pullulans*.

SUMMARY

Unglazed porcelain tiles (4.5 cm square) were coated with one of two lots of the PRI unprotected acrylic emulsion point, cured for eight days at 50% r.h. and 21.1°C, then placed on the Battelle Columbus Laboratory test fence at West Jefferson. One tile of each lot of paint was removed immediately, placed in a presterilized plastic bag for transport to the Mycology Laboratory, Dept. of Botany, The Ohio State University, for mycologic evaluation and preparation of an extract of each tile. Each tile was scored and broken to produce a vertical fragment 1.3 × 4.5 cm for mycologic evaluation. The remaining fragment was soaked in sterile distilled water for two hr to obtain possible enzyme extracts. The extract from each tile was prepared as 0.5% HEC solution, on which quadruple Ostwald viscometry tests were done.

There were no extremely dramatic viscosity changes that could be inviolately correlated with the mycologic findings, although changes of up to 13 sec on the average were found on two occasions. Both of these were obtained from tiles analyzed for the collection date

following one on which both *Cladosporium* sp. and *Alternaria* sp. were isolated.

The data fail to confirm the importance of the genus *Aspergillus* in the scheme of succession, proposed by Winters, *et al.*,[10] as leading to the final establishment of *Aureobasidium pullulans*.

The investigation is being continued and will be reported in totality at the next Annual Meeting. *(October 26-28, 1977, Houston Astrohall, Tex.—Ed.).*

ACKNOWLEDGMENTS

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Weathering Rack for Sealants

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An important factor influencing sealant performance on the outside of buildings is the cyclic movement induced by daily and yearly temperature changes. Although the sealant itself expands and contracts with temperature, these dimensional changes are negligible and largely reversed by changes in the building elements surrounding the joint. At the present time sealant manufacturers suggest that for the best quality sealants, joints should be designed with such width that the movement produced in them by the surrounding building elements will not be more than ±25% of the joint width. The exposure rack here described produces various amounts of movement covering a range reaching beyond 25%.

The cyclic movement of the rack is produced by changes in weather conditions that induce different amounts of movement in two kinds of metal used in the construction of the rack.

KEY WORDS: Aluminum; Temperature change; Sealant; Concrete; Thermocouples; Gauges; Temperature difference; Exposure.

INTRODUCTION

The performance concept of testing and evaluating building materials implies that a given material has been subjected to either actual or simulated conditions of service and that its behavior with time is predictable in relation to criteria of acceptable performance.

Laboratory testing to characterize the mechanical capability of each class of sealant (silicones and two-part polysulphides) has now been developed to a considerable degree by the Division of Building Research.[1-4] Similarly, the actual movements of various types of joints in buildings have been measured to give information regarding the rates of strain and elongation or compression to which sealants may be subjected in service.[1,5] What is yet unknown is sealant behavior under cyclical movement and simultaneous temperature changes, where the specimen is subjected to compression at high temperature and extension at low temperature while undergoing normal aging conditions. A testing facility designated as a weathering rack was therefore designed and constructed to permit a study of the behavior of sealants under simulated conditions of service. This paper gives its details of design and presents an assessment of its operation.

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DESCRIPTION

Figure 1 shows the sealant weathering rack. It is 41 ft (12.5 m) long and 3.5 ft (1.1 m) wide and can accommodate 216 specimens of the same dimensions as are used for testing to CGSB specifications: a sealant bead of 0.5 × 0.5 × 2 in. (1.3 × 1.3 × 5.0 cm) between substrate bars of 0.5 × 1 × 3 in. (1.3 × 2.5 × 7.6 cm). Various substrates can be used, but that shown is aluminum. A close-up of the center portion of the rack can be seen in *Figure* 2.

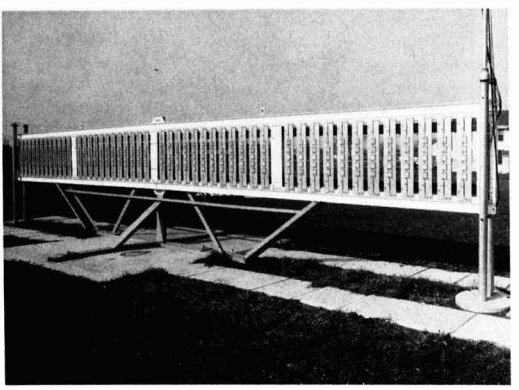

Figure 1 — Sealant weathering rack

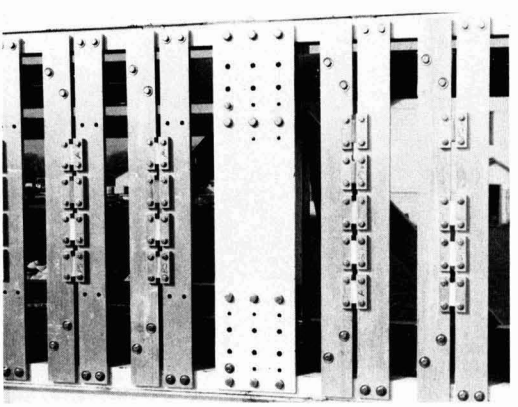

Figure 2 — Close-up of center portion of rack

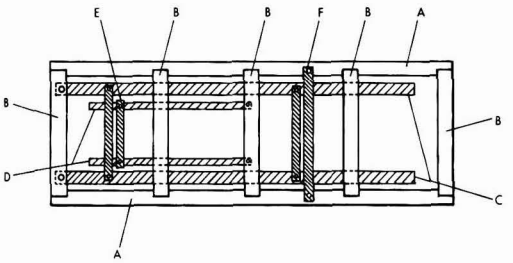

Figure 3 — Schematic representation of the working principle of the weathering rack

The rack undergoes cyclic movements in response to temperature changes, utilizing the difference in the thermal coefficient of expansion between steel and aluminum. *Figure* 3 is a schematic drawing showing how the differential thermal movement is applied. At the top and bottom of the rack steel bars (A) are joined by five vertical steel plates (B) painted white. Two double 2 × 2 in. (5 × 5 cm) aluminum bars (C) run the full length, attached only on the left side so that they are free to move, guided by steel cylinders behind the vertical steel plates. Another pair of single 2 × 2 in. aluminum bars (D) are attached to the central steel plate, free to expand along their full length in the direction opposite the expansion of the longer bars (C). As ambient temperature changes, the steel and aluminum components of the frame expand and contract by different amounts. At any vertical cross-section of the assembly the relative movement between the steel frame and the aluminum bars is determined by the difference of the thermal coefficients of linear expansion and the lengths of metals contributing to the movement. In order to utilize the differential movement, pairs of vertical aluminum plates (not painted) are attached to the steel or to the aluminum bars. Because the specimens are bolted to these vertical plates (*Figures* 2 and 4) the differential movement is transmitted to the sealant bead.

Load produced by straining the sealant specimens is transmitted to the horizontal steel and aluminum members. Their cross-sectional area had to be made as large as was practical so that strain in the members would not seriously reduce differential movement.

From the point of view of operation, the rack can be divided into two areas. In *Figure* 1, all the specimens in the first quarter (left) receive cyclic movements with identical amplitude; but on the remaining area of the rack, the amplitude increases progressively from the left to right for each pair of vertical plates. This results from the different ways of attaching the vertical aluminum plates in the different areas (*Figure* 3). In the first quarter of the rack, one of the plates (E) is bolted to the short aluminum bars and in the remaining three quarters, to the steel frame (F). The second pair of plates is always attached to the long aluminum bars (C). As a result, in the first quarter two different types of aluminum bars move in opposite directions with temperature change, being bolted separately at opposite ends to the same steel frame. Consequently, the total length of steel and aluminum bars affecting the movement is constant for any location in this area, resulting in the same movement for all the specimens.

In the remaining area of the rack where the long aluminum bars are attached to the vertical steel end plates only at one end, the length of metals to be taken into consideration when calculating movement increases from left to right for each pair of vertical aluminum plates. The amount of movement at a given point can be estimated from the coefficient difference, the total length from the left end of the rack, and the temperature difference.

The weight of the structure is carried by two V-shaped legs resting on a one-piece concrete slab. The supporting elements are anchored to the concrete slab by bolts cast in the concrete. The vertical tubing at each end of the frame guides movement and prevents bending during strong winds (*Figure* 1).

Movement occurring on the rack was determined by joint movement gauges described in reference (1). The corresponding temperature readings were taken by means of thermocouples fastened with adhesive to the surface of both the aluminum and the steel bars on the side facing south. The correlation between movement of the rack and temperature readings was statistically analyzed. The results are given in *Table* 1, and *Figure* 5 illustrates the plot obtained with one of the gauges.

Three gauges were used for taking movement readings: No. 1 was located in the first quarter of the

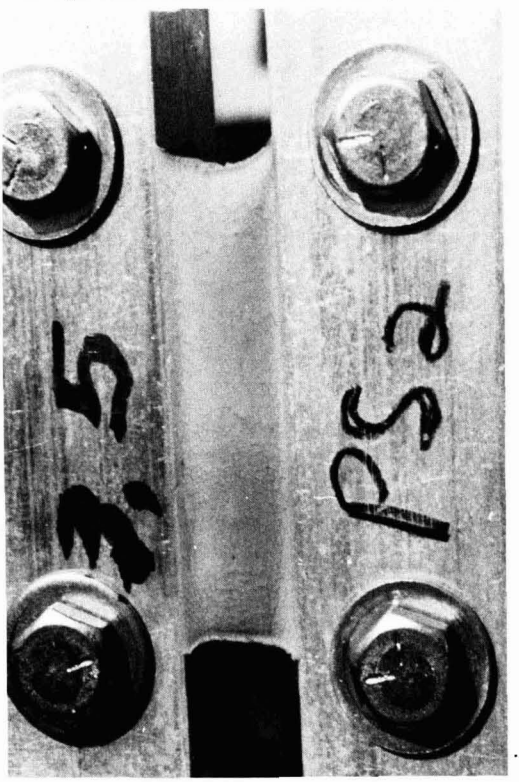

Figure 4 — Specimen attached to vertical plates

Table 1 — Statistical Evaluation of Cyclic Movements At Various Positions on the Rack

Gauge	No. 1	No. 2	No. 3
Location (left to right on *Figure* 1)	Column 6	Column 30	Column 43
Correlation coefficient	–0.966	–0.979	–0.934
Slope of best fitting line			
in./F	–0.00108	–0.00143	–0.00210
cm/C	–0.00486	–0.00644	–0.00945
Standard error of slope			
in./F	0.00001	0.00002	0.00002
cm/C	0.00005	0.00009	0.00009
Observed movement (calculated from slope)	±13.1%	±17.3%	±25.4%
Movement estimated from thermal coefficient	±18.5%	±23.1%	±33.4%

rack where there is a constant amplitude of the cyclic movement for 12 pairs of vertical aluminum plates; No. 2 was placed at the 30th pair of plates; and No. 3 at the 43rd pair. The readings now reported cover a period of a full year, from the end of November 1974. They were taken once every working day for the first four months to confirm the smooth operation of the rack. Afterwards, the frequency of readings was reduced to two per week. Each consisted of a maximum, a minimum, and a reset gauge value and the corresponding minimum, maximum, and reset temperature readings, where the gauge readings are taken in inches, and indicate the position of one side of the joint in relation to the other. From this one can derive the width change the sealant specimens undergo.

Because a maximum temperature produces a minimum width on the specimens, and vice versa, they are correlated and plotted in this manner. These are extreme readings that occur during the time interval between two observations. The reset readings are taken immediately after the extreme readings, when the gauge is reset to start a new interval of observation. (For further details about the operation of the gauges see reference (1)). The various types of readings are illustrated with different symbols in *Figure* 5. The three lines are the result of statistical analysis: the outer two are the 95% confidence limits, the centerline being the best fitting line of the data. It is the best fitting line that calibrates the rack movement, and its slope is the length change per degree temperature change. When multiplied by temperature difference for one year they give the total yearly movement.

Statistical analysis was carried out with readings of all three movement gauges, using the observed temperature for both the aluminum and steel bars which were painted black and white, respectively. The maximum temperature difference readings of aluminum were 3.5°F (1.9°C) and the minimum temperatures 0.2°F (0.1°C) higher on the average than those of steel, with standard deviation of the differences 2.3°F (1.3°C) and 0.9°F (0.5°C), respectively. The above values did not change significantly when the data were divided into winter and summer readings and analyzed separately.

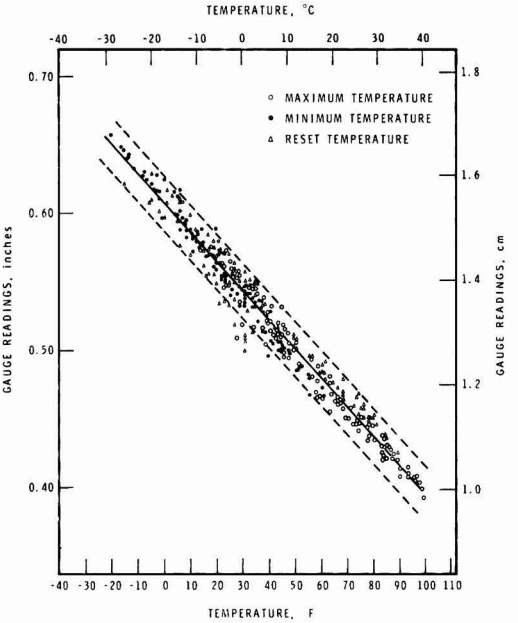

Figure 5 — Weathering rack movement at gauge No. 3 vs. aluminum temperature

The difference in temperature of the two bars is not large enough to justify considering them separately.

Table 1 presents the summary of the analysis using temperatures for aluminum only. Correlation between rack movement and temperature is good, as may be seen from the values obtained for the correlation coefficients. The slope of the best fitting line for the data can be used to calculate movement occurring on the rack at the location of each particular gauge. The reliability of the values obtained for the slopes is confirmed by their small standard error.

Maximum yearly movement is calculated by multiplying the value of the slope by the yearly temperature difference (121°F, or 67.2°C) and converting it to the percentage of the specimen width. As can be seen from *Table* 1, the maximum movement at gauge No. 1 is ±13%. This movement applies to all specimens exposed in this section of the rack, and increases from the 13th pair of vertical plates to the last, the 48th; it is ±17% at gauge No. 2 and ±25% at gauge No. 3. Movement at any position can be calculated from these findings. One can also estimate movement from the coefficients of linear expansion. As *Table* 1 shows, the estimated movements are considerably higher than the observed movements, indicating restraint, which can be partly attributed to the load that the sealant specimens exert on the bars and partly to friction.

SUMMARY

An outdoor sealant weathering rack was built on which exposed standard sealant specimens underwent the natural aging process experienced by exterior sur-

faces of buildings. This includes physicochemical changes induced by radiation, temperature changes, the effect of air and moisture, and by the movement to which joints are subjects. This movement, produced by using the differential thermal movement between steel and aluminum, was measured with gauges at three locations on the rack. One quarter of the total rack area produced identical maximum movements on the specimens, ±13% per year; the remaining area produced from about ±9 to ±30% in 36 steps. Restraints prevented the attainment of movement estimated from the thermal expansion coefficient of the metals, partly due to the load imposed by the specimens and partly to friction.

Two types of observations can be obtained from this rack: on the area that gives constant yearly movements one can evaluate relative fatigue performance of a large number of specimens; on the remaining three quarters of the area, with movement increasing in small increments, one can observe the ultimate movement a sealant can safely tolerate, i.e., the movement capability of a sealant.

Various types of sealants have already been exposed and observations of their behavior will be reported later. □

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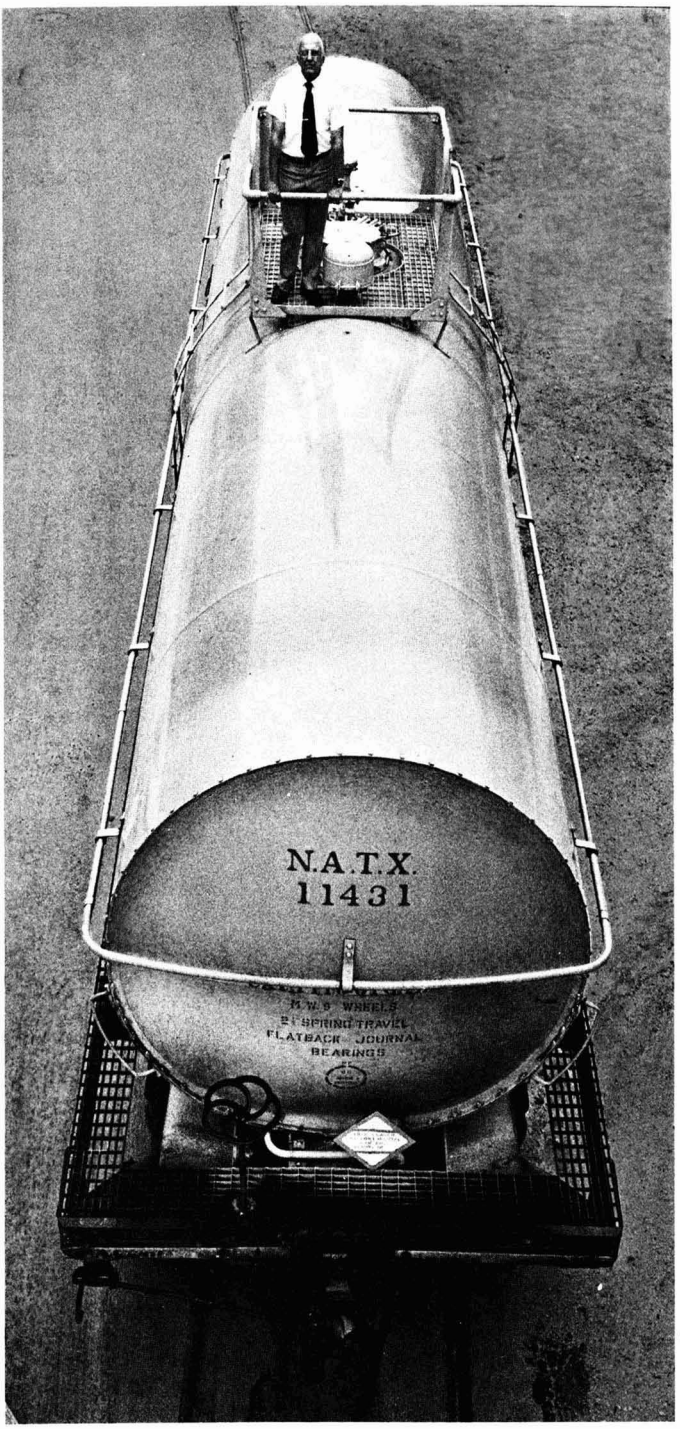

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January 1977 Subcommittee Reports Of ASTM Committee D-1

The January 1977 Winter Meeting of ASTM Committee D-1 on Paint and Related Coatings and Materials was held on January 12 in the Sheraton Hotel, Philadelphia, Pa. Philadelphia was chosen for this meeting so that the committee could hold a celebration of its 75th Anniversary at ASTM Headquarters. A banquet was held there on the evening of January 10 to commemorate the occasion and to honor the Honorary Members of D-1.

The D-1 Honorary Members able to attend were: W.W. Becker, J.G. Calbeck, W.A. Gloger, A.E. Jacobsen, S.B. Levinson, J.C. Moore, F. Scofield, M.E. Stearns and H.A. Wray. Mr. Gloger, former D-1 Secretary, acted as Master of Ceremonies. The speakers were J.C. Weaver and W.C. Cavanaugh.

In the three and one-half days preceding the final general meeting of Committee D-1, the 170 registrants met in 132 scheduled meetings of D-1 subcommittees and working groups. Membership of Committee D-1 is now 541.

One of the highlights of this session was the attendance of Dr. Howard I. Forman, U.S. Dept. of Commerce Deputy Assistant Secretary for Product Standards. Dr. Forman presented information on, and answered questions about, the D.O.C.'s "Voluntary Label Program" at sessions of Sub. D01.13 on Consumer Affairs and its Task Group D01.03.02 on Individual Paint Consumers.

Memorial Resolutions were adopted on the passing of Louis E. MacCardle and Wesley G. Vannoy.

Subcommittee Officer appointments by Chairman E.F. Rogers were: Sub. D01.09, SSPC — W.W. Pearson, Chairman; Sub. D01.26, Optical Properties — P.B. Mitton replacing S.J. Huey as Chairman; Sub. D01.28, Biodeterioration — D.L. Campbell replacing J. Hanus as Secretary; Sub. D01.33, Varnish & Resins, Including Shellac — O.C. Keplinger replacing J.S. Autenrieth as Chairman; and Sub. D01.44, Traffic Paint — L.S. Sander replacing D.L. Andres as Chairman and K.C. Schumann as Secretary.

SUBCOMMITTEE D01.94 AWARDS AND MEMORIALS

G.G. Schurr, Chairman

The W.T. Pearce Award and Honorary Membership in D-1 will be presented to F.B. Stieg, Consultant. Honorary Memberships in D-1 also will be presented to S.B. Levinson, of David Litter Laboratories, Inc., and H.A. Wray, retiree from E.I. du Pont de Nemours & Co., Inc.

A new award, to be called the Henry A. Gardner, Sr. Award, was approved, in principle, by the Executive Committee. In essence, an endowed award will be established to honor Dr. Gardner, with the recipient chosen by Sub. D01.94 because of sustained competence in managing a unit of D-1.

Memorials resolutions have been prepared for L.E. MacCardle, of NL Industries, Inc., and G. Vannoy, retiree from E.I. du Pont de Nemours & Co., Inc.

DIVISION 1 ADMINISTRATIVE

SUBCOMMITTEE D01.05 INTERCOMMITTEE RELATIONS

J.C. Weaver, Chairman

Committee A-5 on Metallic Coated Iron and Steel Products and its subcommittees A05.11 and .14 on Sheet Specifications and Tests has interest in Standards for organic coated steel and therefore needs liaison with Sub. D01.53 on Coil Coatings, where a comprehensive Recommended Practice is in its first draft.

Committee C-24 on Building Joint Sealants is augmenting its C719 Standard Method with a new Method of Test for Adhesion and Cohesion of Elastomeric Joint Sealants Under Simulated Thermal Cyclic Movement. It uses temperature cycles between -15 and 158F (-26 and 70C) and in a Compression Extension Machine through slow cycles. Cf Sub. D01.23.10.

Committee E-15 on Analysis and Testing of Industrial Chemicals, at its January 13 and 14 meetings in Dallas, Tex. approved a new Standard Method for determination of diethylene glycol at less than 0.1% w in ethylene glycol. Cf Sub. D01.35.03.

E-15's Standard E180 on Developing Precision Data on ASTM Methods for Analysis and Testing of Industrial Chemicals is a Practice nearly ready for operation by ASTM's own computer at Headquarters (T.M. Brye). Cf Sub. D01.20.

Committee G-3 on Deterioration of Nonmetallic Materials is revising its title and scope to accommodate its assumption from inactivated Committee E-1 of about eight Standards pertaining to atmospheric conditioning and testing. Cf D01.20, .27, *et al.* Committee D-1 cooperation is invited.

Future meeting sites and dates of Committee D-1 are:

June 26-29, 1977 - Denver, Colo. | **January 22-25, 1978 - Atlanta, Ga.**

June 25-28, 1978 - Boston, Mass. | **January 21-24, 1979 - New Orleans, La.**

G-3 is seeking a measure of hours of wetness and is considering devices from Verfinstituut TNO, Delft, and the National Research Council in Ottawa. Cf Sub. D01.27.

SUBCOMMITTEE D01.07 GOVERNMENT CONTACTS

L.S. Birnbaum, Chairman

The chairman furnished the following information concerning the status of conversion of Fed. Std. 141 methods/standards to ASTM methods/standards:

(1) A total of 12 Federal specifications for pigments have been cancelled since the last meeting of Sub. D01.07 in June 1976.

(2) A list of Fed. Std. 141 test methods/standards was forwarded to Sub. D01.07 members and interested parties with a request that they indicate their recommended order of priorities for conversion action. Twenty out of approximately 160 received "high priority" votes. Most receive a recommended intermediate order of priority.

(3) GSA is now reviewing the entire Fed. Std. 141 list to determine: (a) use as a reference in Federal or military specifications; in those instances where a particular method/standard is not referenced, GSA will propose cancellation, and (b) availability of an ASTM method/standard for the same purpose; in those instances where purpose is identical, GSA will suggest to cognizant government agencies that they use the ASTM method as a substitute. The target date for completion of this review is March 31, 1977.

(4) Results of the above review will be incorporated into a proposed revision to Fed. Std. 141 to be circulated to government agencies for their comments. Target date for proposed revision is April 15, 1977, with a June 30 deadline for receipt of comment. Proposed revision will be forwarded for comment to those government activities who have indicated an interest in response to a recent letter by GSA on this subject.

(5) These comments will be incorporated, insofar as practicable, into a new revision of Fed. Std. 141 with a target completion date of September 1, 1977. Concurrently, a list of "important" methods which cannot be converted at this time will be submitted to appropriate ASTM subcommittees for their suggestions for resolution of differences or preparation of new ASTM methods, if appropriate, in the form of a proposed write-up for government review. It should be understood that the government will continue to maintain its own method in those instances where the suggested ASTM method is considered unacceptable.

The chairman announced that a meeting of Sub. D01.07 was tentatively planned for Wednesday, April 27, 1977, in the Metropolitan Washington area after the Washington Paint Technical Group Annual Symposium to be held at the Marriott Twin Bridges Motel, Arlington, Va., on April 25 and 26, 1977.

SUBCOMMITTEE, D01.08 JOINT FEDERATION-ASTM

H.M. Werner, Chairman

The chairman distributed copies of a draft of a letter to be sent to the Presidents and Technical Committee Chairmen of each local Society for Coatings Technology, relative to cooperation on round-robins and other work on test method development.

With a slight addition to the letter, there was agreement on its contents and distribution. Local Societies will be urged to have a local active D-1 member give a presentation on D-1 and its activities at one of their future meetings.

S.J. Huey, Sub. D01.08 member, who is also Chairman of the Audio Visual Committee of the Cleveland Society for Coatings Technology, gave the Sub. D01.08 chairman a report on the Federation Audio Visual programs and a list of subjects and availability.

This report, and list, is as follows:

"The Federation of Societies for Coatings Technology, and many of the constituent Societies, have embarked on a comprehensive program to produce a series of 35-mm slide/sound shows primarily in the educational and paint manufacturing areas. A number of these have already been produced and

Subject	ASTM	Society
(1) Weight Per Gallon*	D 1475	Cleveland
(2) Stormer Viscometer*	D 562	Cleveland
(3) Surface Tension*	D 1331	Pittsburgh
(4) Flash Point T.C.C.*	D 56	Golden Gate
(5) Porosity*	D 3258	Pacific Northwest
(6) Specular Gloss*	D 523	Los Angeles
(7) Acid Number*	D 1639	Pacific Northwest
(8) Sag Test*	-	Rocky Mountain
(9) Leveling*	D 2801	Rocky Mountain
(10) Non-Volatile*	D 2369	Louisville
(11) Sward Hardness*	-	Houston
(12) Hiding	D 344, 2805	Kansas City
(13) Film Thickness	D 1005, 1186, 1400	Pittsburgh
(14) Scrub Resistance	D 2486, 3450	Western New York
(15) Stain Resistance	D 2198, 3023	Western New York
(16) Impact	D 2794	Western New York
(17) Preparation of a Test Panel - Ind. Ctgs.	D 609	Louisville
(18) Fineness of Grind	D 1210	Seattle
(19) Stormer Viscometer (Stroboscope)*	D 562	Golden Gate
(20) Microbiological Contamination	D 3273, 3274	Philadelphia
(21) Dry Time	D 1640	
(22) Color, Mask	-	
(23) Tinting Strength	-	Cleveland
(24) Flexibility	D 522, 1737	
(25) Chemical Resistance	D 1308	
(26) Abrasion	D 658, 968, 1395	
(27) Adhesion	D 2197	
(28) Chalking	D 659	
(29) Salt Spray	B 117, 287	Golden Gate
(30) Water Immersion	D 1647	
(31) Overbake	-	
(32) Blister Resistance (Ext. H.P.)	D 2366	
(33) Wet Film Thickness	D 1212	Golden Gate
(34) Setaflash	D 3278	Birmingham
(35) Viscosity Cups	D 1200	Toronto
(36) Conical & Cylindrical Mandrels	D 522, 1737	Toronto

*These programs are available from the Federation office. See ad page 21.

previewed at recent Annual Meetings of the Federation.

"Such shows are sound technically because they are prepared by Federation members whose daily work is in the particular field covered. These shows are designed for use at constituent Society meetings, technical committee meetings, for students in paint courses, and for in-plant and in-laboratory training on the theory and practice of paint technology.

"To date, the Federation and Constituent Society Educational and Manufacturing Committees have been most active in this field. A related group in which the Federation is represented, the Inter-Society Color Council, has contracted for several such shows in the field of color.

"These audio/visual shows should be of interest to ASTM because they are test methods. They are test methods put to sight and sound which makes them very effective. Many of them make reference to ASTM methods. All of the audio/visual shows in the planning stages must adhere to the rules established by the Federation so as to be uniform in the manner in which they are presented and up to the standards set by the Federation.

"The preceding list of 36 subjects should indicate the wide range of test methods covered. All of the 36 subjects are not as yet completed, but soon will be."

SUBCOMMITTEE D01.09 STEEL STRUCTURES PAINTING COUNCIL

W.W. Pearson, Chairman
L. Sander, Chairman Pro Tem

J.C. Weaver reviewed past activities of SSPC and their function in ASTM.

D. Berger reported on some of the activities of the SSPC meeting in Pittsburgh, Pa. in Fall 1976. He reported on the successful completion of a chlorinated rubber primer and topcoat specification. He also reported that the epoxy primer specifications have been revised to include an Elcometer adhesion test and performance specification.

It was suggested by Dr. Weaver, since ASTM is an advisory group, to recommend the new test methods to SSPC, PACE, or other groups. One of the proposed methods was the determination of an electrolytic-cell test for coating failure or sacrificial electrolytic life of zinc-rich coatings. Another possible new test is a SHYUDU viscometer to determine pot-life of two-package epoxy systems.

SUBCOMMITTEE D01.13 CONSUMER AFFAIRS

E.T. Mooney, Chairman

The minutes of the last meeting, held June 28, 1976 in Chicago, were approved with minor corrections. The minutes were corrected to show that four states — North Carolina, Virginia, South Carolina, and Georgia — are now using the "Weighted Cost of Prime Ingredients" method of purchasing their trade sales paints requirements

Group 1: State and Institutional Consumer Affairs, S.B. Levinson, Chairman. Mr. Levinson reported that the latest draft of a proposed recommended practice with the title "Standard Prices for the Procurement of Paint" was distributed to those present. This document consists of two parts:

(1) The determination of low bids by the use of the weighted cost of primary hiding pigments and binder solids, and

(2) Limited performance tests on samples of those paints to be supplied in greatest quantity by the low bidders determined in No. 1 above.

Representatives from the states of North Carolina and Virginia described, in detail, the way in which they operate to buy state paint requirements by the above method.

The draft will be reviewed by all members of Group D01.13.01 prior to submission to the Editorial Subcommittee, and subsequent letter ballot by Sub. D01.13. All comments and suggestions are to be submitted to Mr. Levinson.

Group 2: Individual Consumer Affairs, J. Csernica, Chairman. Mr. Csernica reported that Dr. H. Forman, Assistant Deputy Secretary of the Dept. of Commerce, was present at their meeting and explained the Voluntary Labeling Program proposed by D.O.C. in the Federal Register of May 25, 1976. He said the nation is becoming "consumer-minded". Dr. Forman will be chairman of an Interagency Advisory Committee of 15 people to be selected from consumer advocate groups, manufacturers, retail groups, trade association, and representatives of the academic world.

The voluntary program would propose to label consumer products to tell the consumer more about the expected performance of the product. The Dept. of Commerce would offer an official label, to be placed on the consumer product, for which a fee would be charged to the manufacturer. Dr. Forman explained that their definition of labels included educational and promotional literature of all types.

A great deal of discussion followed Dr. Forman's talk, and he was very helpful in answering questions from the committee.

SUBCOMMITTEE D01.16 DEFINITIONS

S. LeSota, Chairman

H.A. Wray reported that the definition of "flash point" has been balloted and approved. He also reported that the ASTM Committee on Terminology discourages the use of absolute terms in definitions — terms such as fireproof or waterproof.

Proposed definitions for the new "Pictorial Standards for Coatings Defects" were discussed. These included: blistering, dirt, filiform corrosion, mildew, print resistance, and rust.

Because of the poor attendance, these revised proposed definitions will be mailed to the other members who did not attend this meeting for their critique and comments. We will review these again at the June meeting.

DIVISION 20 RESEARCH AND GENERAL METHODS

SUBCOMMITTEE D01.20 SAMPLING AND STATISTICS

S.L. Lopata, Chairman

The history of Sub. D01.20 was discussed. The scope was defined as sampling, statistics and standard conditions. It was decided to form a liaison with Committee E-11 on Statistics.

The statistics standard for an interlaboratory test will be submitted to a subcommittee vote. The sampling standard will be reviewed.

SUBCOMMITTEE D01.21 CHEMICAL ANALYSIS OF PAINTS AND PAINT MATERIALS

R.W. Scott, Chairman

Group 3: Metals in Low Concentration, H.D. Swafford, Chairman. D 3335-74, "Test for Low Concentrations of Lead in Paint by Atomic Absorption Spectroscopy," has been revised to include cadmium and will appear in Part 27 of the 1977 Book of Standards as "Standard Method of Test for Low Concentrations of Lead and Cadmium in Paint by Atomic Absorption

Spectroscopy." The method is now being evaluated for inclusion of cobalt at the 50-2000 ppm level. The initial round-robin was successful and the cobalt version of the method was submitted for Sub. D01.21 letter ballot in December 1976. Preliminary response included one negative from W.C. Spitzer and several comments. The negative was editorial in nature and was ruled nonpersuasive by a vote of 11-0. Mr. Spitzer will be notified of the action. The various comments will be incorporated into a new draft of the method.

A proposed method for the determination of mercury in coatings at the 10-1000 ppm level was submitted to Sub. D01.21 letter ballot on December 22, 1976, and has received some comments to date. A new draft will be prepared after all comments are in and satisfied, followed by submission to D-1 letter ballot.

The group is also working on a method for the determination of antimony in coatings at the 50-200 ppm level and chromium at the 50-10,000 ppm level.

A new standard, "Method of Test for Detection of Lead in Paint and Dried Paint Films," was voted on in the August 20, 1976 D-1 letter ballot. This is the "Go-No-Go" method for the detection of lead at the 0.5% level in dried films. Four negative votes were received from the following persons: W. Singer (withdrawn by letter); R. Ashley, A. Chasan, and J. Csernica. The last three negatives had similar reasons for the vote — the method was not relevant since the new regulation is assumed to be 0.06% as far as CPSC is concerned. It was decided, by a vote of 11-0 in the task group, that these negatives were nonpersuasive since the 0.5% lead level is still in effect in other government agencies and in other countries which have members in ASTM; these include Canada, England, and several European countries. The group chairman, Mr. Swafford, will correspond with the negative voters to discuss the decision and, also, to remind them that we are now working on a revision of the method which should permit its use at the 0.06% level.

Group 3B: Analysis of Metals in Air Particulate Samples, J.A. Devlin, Chairman. Several methods for the determination of lead and chromium were reviewed but were found to be inadequate for our purposes. A new method, based on one used by du Point, will be prepared and distributed to collaborators for comment. Standard samples will then be prepared and sent to the collaborators for analysis.

Group 4: Chemical Analysis of Whole Paint, J. Hartshorn, Chairman. The chairman reported that Group 4C on Solvent Composition would be placed on inactive status at this time since a leader for the group could not be found. Group 4B on Pigment Content of Emulsion Paints has been taken over by Mr. Hartshorn, and he reports that a final round-robin will be run very soon to determine the precision and accuracy of the method.

Group 4D: Chemical Analysis of Basic Lead Silico Chromate in Paints, L. DiCarlo, Chairman. Mr. DiCarlo reports that three negative votes were received for the proposed new method, "Analysis of Basic Lead Silico Chromate in Whole Paint," when it was voted on in the Sub. D01.21 and D0104 letter ballot of August 20, 1976. The first negative, from L.F. Fall, at the Sub. D01.21 level, was editorial and was resolved by letter. Negatives at the D-1 level from Mr. Ashton and E.R. Lewis have not been resolved as yet but should be taken care of at the June meeting.

Group 4H; Analysis of Electrodeposition Coatings, J.T. Vandeberg, Chairman. There has been little activity in this group since the June meeting other than the submission of the procedure, "Standard Methods of Test for Characterizing Electrocoat Batch Samples," to Sub. D01.21 letter ballot. Work continues on resolving one negative from Mr. Ashton and incorporating several comments. A method for the determination of amine solubilizers and hydroxyl-containing solvents will soon be the subject of a new round-robin.

Group 5: Revision of D 564-47(70), L. Bazarko, Chairman. Methods for the determination of iron, zirconium, cerium, and cerium in rare earth driers were prepared. A round-robin was initiated to test these procedures. Initial results are very good, and it is anticipated that the methods will be acceptable with relatively little revision. These new procedures will be included in the proposed revision of D 564-47(70), "Testing Liquid Driers".

Group 6: Atomic Absorption Spectroscopic Analysis of Pigments, W.V. Mosely, Chairman. A round-robin will be initiated prior to the June meeting to determine the concentration of TiO_2 in a latex flat wall paint. A method has been prepared and will be evaluated.

Group 9: Analysis of TiO_2, R.W. Scott, Acting Chairman. A final revision of the proposed, "Standard Method for Quantitative Determination of Anatase and Rutile in TiO_2 Pigments," has passed a Sub. D01.21 letter ballot. Some minor editorial revisions have also been made, and the method will now be submitted for D-1 letter ballot. Further work is not contemplated for this group, unless a new chairman can be found.

Group 19: Recommended Practice for the Determination of Metals, F. Scofield, Chairman. Mr. Scofield reported that relatively little had been done in the past six months. Tabulation of information relating to all methods of analysis available for the several metals of interest continues.

Group 19A: Ferrous Iron in Synthetic Black Iron Oxide, K.R. Hancock, Chairman. The chairman reported that a method had been sent to interested parties for review and comment. He will now rewrite the method in ASTM format and prepare samples for a round-robin. Six laboratories have agreed to participate.

Group 21: Steering Committee on Analysis for Metals, J.C. Weaver, Chairman. Dr. Weaver reported that CPSC has contracted with the Association of Official Agricultural Chemists (AOAC) to have a CPSC method for the determination of low levels of lead evaluated. This method is not the same as that described in D 3335-74 and is felt to have some discrepancies. It is hoped that industry and government analytical chemists can get together soon to discuss the various aspects of both procedures. Late April has been suggested as the time, Washington, D.C. as the place.

Sub. D01.21 has taken the following action on negative votes:

Letter Ballot D0104 dated August 20, 1976 (Item 1):

(1) Mr. Singer's negative was editorial; resolved by letter.

(2) Mr. Ashley's negative was determined to be nonpersuasive by a vote of 11-0.

(3) Mr. Csernica's negative was determined to be nonpersuasive by a vote of 11-0. Mr. Csernica was present and still retained his negative vote. He is not a member of D01.21.

(4) A.A. Chasan's negative was determined to be nonpersuasive by a vote of 11-0.

Letter Ballot D0104 dated August 20, 1976 (Item 2):

(1) Mr. Fall's negative was editorial; resolved by mail.

(2) Mr. Ashton's negative was not resolved and is still being acted on.

(3) Mr. Lewis' negative was not resolved and is still being acted on.

SUBCOMMITTEE D01.22 HEALTH AND SAFETY

H.A. Wray, Chairman

Group 1: Policy, H.A. Wray, Chairman. The group discussed the need for establishing a new group for liaison with Federal government regulating agencies. A letter was read from the Office of Management and Budget that proposed the agencies cooperate with standards organizations. The group suggested that this matter be brought up at the Sub. D01.22 meeting.

Group 2: Intercommittee Relationships, W.H. Tuke, Chairman. Mr. Wray chaired the meeting in the absence of W.H. Tuke. It was indicated that there is a need to establish a policy of contacting other committee, subcommittee, and group chairmen with specific problems that concern us and that we ask for solutions to these specific problems as opposed to just asking for minutes of their respective meetings.

Mr. Wray agreed to write to other subcommittee chairmen of D-1 indicating a procedure to follow in obtaining answers to specific problems which are outside the scope of capabilities of D-1.

D.L. Campbell will prepare, in the future, a summary of minutes of various predetermined committees in which Sub. D01.22 is interested and send them to the Sub. D01.22 group chairmen.

Group 3: Information Resources, D.L. Campbell, Chairman. The chairman reported that the bibliography of safety references is ready to send to J.P. McGuigan for inclusion in the D-1 Handbook. The chairman agreed to include a letter which indicates that this bibliography is not all-inclusive. The letter will also ask that the group be contacted as to changes, revisions, and further information. Revisions of the bibliography will be made from time to time as necessary.

Group 4: Safety and Health Standard Statements, A. Austin, Chairman. Mr. Wray explained the purpose of the group and asked for volunteers from those present to review standards and to write applicable safety statements. The statements would be reviewed by the chairman and then be submitted to Sub. D01.22 for approval. Five individuals volunteered.

Group 5: Hazard Statements, J.A. Austin, Chairman. The chairman read a number of hazard statements, proposed by Mr. Wray, to the group. The group discussed 12 statements and made changes which were agreed upon by those present. It was moved that the revised list be submitted to Sub. D01.22 for review and approval.

Group 16: Flash Point — General, J.L. Abbamondi, Chairman. The chairman reported that both D 1310-72, "Test for Flash Point of Liquids by Tag Open-Cup Apparatus," and D 3278-73, "Test for Flash Point of Liquids by Setaflash," each received negatives. The group agreed that one of the negatives on the D 1310-72 ballot was nonpersuasive, two comments were editorial in nature, and one negative was withdrawn. It was moved that after editorial changes, D 1310-72 be submitted to ASTM D-1 committee ballot. The motion was passed.

The negatives on D 3278-73 were discussed, and it was agreed that all but two were editorial in nature, dealing with the sample size increase for viscous materials and a request that a round-robin be run.

It was agreed that the above sample size increase would be allowed in the appendix only and that a note would be inserted in the appendix indicating that 2 ml was the proper sample size for the regular methods. Also, it was agreed to complete a round-robin in the future.

A motion was passed to submit D 3278-73 to ASTM Committee D-1 ballot after the editorial changes have been made.

Mr. Wray reported on the Ad Hoc Committee work on flash point. He reported that Sub.'s D01.16 and D01.22 have approved definitions of liquid and solid as applies to transportation regulations. Committee E-27 is now working on approving other flammability definitions.

He also reported that the committee is working on a recommended practice for flash point determination. Also, it is currently doing work on determining practical flammability of mixtures. Some preliminary results should be available for the April meeting in Washington.

Group 17: Fire Retardancy and Smoke Problems, H. Teicher, Chairman. The chairman reported that the two-foot tunnel test has undergone final revision and has been submitted to ASTM for simultaneous committee/subcommittee balloting.

The chairman reported that the revised D 1360-70, "Test for Fire Retardancy of Paints (Cabinet Method)," had negatives involving the use of the current diagram of the apparatus. The group agreed that both a picture and a diagram be included in the standard. The chairman agreed to contact Custom Scientific to see if the manufacturer would agree to provide a diagram which would be useful for inclusion in the standard.

Group 20: Toxicity, T.W. MacDougal, Chairman. Mr. Wray chaired the meeting in the absence of Mr. MacDougal. The revised, "Proposed Standard Practice for Determining Constituents Classified as Hazardous Contained in Protective Coatings," has been examined by the Editorial Subcommittee and will be sent to Sub. D01.22 members for balloting in the near future.

W. Spangenberg brought out the point that the scope should contain some type of statement to indicate that we are dealing with whole paint even though the wording of the title implies that fact.

Mr. Wray asked the member of the group to contact the chairman whenever they know of any new state or local ordinances that might concern us.

F. Scofield indicated that Group 20 should consider looking into asbestos at some time in the future for inclusion in our standard. He also indicated that the group should consider listing undesirable methods in addition to desirable ones.

Group 24: Potentially Dangerous Effluents, D.L. Campbell, Chairman. The chairman indicated that he is working on the listing of all methods currently available on the 10 substances previously identified has having high priority.

When the list is complete, it will be sent to all Sub. D01.22 members for their review and comments. The members will be asked to furnish further information, if available. The revised list will then be included in the D-1 Handbook.

It was suggested that the chairman of Sub. D01.22 investigate the possibility of making a visit to NIOSH in Cincinnati, Ohio by a representative of Sub. D01.22 for the purpose of establishing liaison with this agency.

SUBCOMMITTEE D01.23 PHYSICAL PROPERTIES OF APPLIED PAINT FILMS

M.P. Morse, Chairman

The subcommittee is revising the following methods to incorporate editorial changes suggested in recent subcommittee and committee letter ballots:

(1) D 658-44(70), "Test for Abrasion Resistance of Coatings on Paint, Varnish, Lacquer and Related Products With the Air Blast Abrasion Tester;"

(2) D 823-53(70), "Producing Films of Uniform Thickness of Coatings on Test Panels;"

(3) D 1186-53(73), "Measurement of Dry Film Thickness of Non-Magnetic Organic Coatings Applied on a Magnetic Base;" and

(4) D 1400-67, "Measurement of Dry Film Thickness of Non-Metallic Coatings of Paint, Varnish, Lacquer and Related Products Applied on a Non-Magnetic Metal Base."

Group 10: Adhesion, H.E. Ashton, Chairman. It was reported that the revision of D 3359-74, "Measuring Adhesion by Tape Test," has been approved by D-1 letter ballot. An inter-laboratory test for this method has been completed and the results analyzed. Precision statements have been drafted which will be submitted to subcommittee letter ballot.

An inter-laboratory test is underway to determine the usefulness and precision of the Tooke Gauge for measuring adhesion.

Results of a questionnaire sent to Committee D-1 members indicate that the tape test is the most widely used and generally preferred method for measuring adhesion. However, the great variety of methods in use suggests that the tape test is not the ultimate test, and investigations of other methods should be continued.

Group 11: Wet Film Thickness, H.A. Ball, Chairman. An inter-laboratory test has been conducted to determine the precision of the Interchemical and Pfund wet film thickness gauges specified in method D 1212-70, "Measurement of Wet Film Thickness of Organic Coatings," and, also, to determine the usefulness and precision of other types of gauges. The results obtained will be reviewed to determine if the data are sufficient for establishing precision statements for the various types of gauges.

Group 12: Dry Film Thickness, M.P. Morse, Acting Chairman. This group is updating method D 1186-53(73), "Measurement of Dry Film Thickness of Non-Magnetic Organic Coatings Applied on a Magnetic Base." An inter-laboratory test will be conducted to obtain accuracy and precision data for various film thickness gauges commonly used in the paint industry. If found suitable, these gauges will be inserted into the method that presently describes only the Magne-Gauge.

Group 14: Hardness, Mar Resistance and Abrasion Resistance, M.P. Morse, Acting Chairman. This group is revising method D 968-51(72), "Test for Abrasion Resistance of Coatings of Paint, Varnish, Lacquer and Related Products by the Falling Sand Method," to provide for an alternate source of the specified type of sand, and to require that only unused sand be used at the beginning of the testing of each specimen.

An inter-laboratory test is being initiated to determine the precision of both the falling sand and air blast methods for abrasion resistance. The suitability of using carborundum in place of sand in D 968-51(72) will be investigated in this study, as will the usefulness of other available abrasion test procedures.

Group 15: Slip Resistance, P.R. Guevin, Chairman. This group is being formed to develop a test for the slip resistance of floor and deck coatings. Plans are being formulated to investigate instrumental methods for measuring this property.

SUBCOMMITTEE D01.24 PHYSICAL PROPERTIES OF LIQUID PAINTS AND PAINT MATERIALS

J.F. Hutson, Chairman

Group 18: Fineness of Dispersion, G.B. Taylor, Chairman. A subcommittee letter ballot is in the mail at the present time. The first ballot returned was a negative. This negative and comments were discussed, and when we have completed the balloting, we agreed to send out a new subcommittee ballot as soon as possible.

Group 19: Efflux Viscosity Cups, J.F. Hutson, Chairman Pro Tem. Group 19 is still working to send a second draft of the "New Standard Method of Viscosity by Dip Type Cups" to subcommittee letter ballot.

In order to obtain reapproval of D 1200-70, "Test for Viscosity of Paints, Varnishes and Lacquers by Ford Viscosity Cups," we have reaffirmed our intention to conduct a round-robin test to obtain data for a new precision statement based on paint materials instead of calibrating oils.

Group 19 voted to abstain (option 4) on ISO Document N-579, "Determination of Flow Time by Use of Flow Cups." We do so because our (USA) flow cup viscosity standards for paints are based mainly on the Ford Cup (ASTM Method D-1200-70) and at the present time we have no data to compare Ford Cups with ISO Cups.

Group 20: Viscosity by Rotational Viscometers, F.C. Underhill, Chairman. Mr. Underhill reported that the three negative votes and several comments on the revision of D 562-55(72), "Test for Consistency of Paints Using the Stormer Viscometer," were considered persuasive and a new draft will be written to incorporate these changes. The method will then be resubmitted for subcommittee letter ballot.

The revised draft of D 2196-68(74), "Tests for Viscosity Measurements and Thixotropic Properties of Non-Newtonian Materials Using the Brookfield Viscometer," has been approved by subcommittee letter ballot, but it lacks a precision statement. A round-robin test, using paints, is being initiated to obtain this data.

Group 24: Particle Size Determination, F.J. Steslow, Chairman. The chairman discussed possible objections for this group. Mr. Steslow and the members present voted that Group 24 remain on inactive status.

Sub. D01.24 was asked and agreed to distribute a tentative draft of a method of test measuring density using the Mettler/Poor calculating digital density meter for comments by the subcommittee.

SUBCOMMITTEE D01.25 PICTORIAL STANDARDS OF COATING DEFECTS

S. LeSota, Chairman

In liaison with the Philadelphia Society for Coatings Technology's Pictorial Standards subcommittee, chaired by W. Sonntag, our subcommittee is in the process of updating the Federation's Exposure Standards Manual.

Two sets of standards are being replaced because of poor negatives; another is being replaced with better defined prints, and we plan to add new pictorial standards.

The revised manual will be issued as a loose-leaf binder containing all approved pictorial standards and provisions for future pictorial standards. Because of the disproportionately higher cost of the Swedish Color Standards for Corrosion, an order form will be included with the binder for those desiring a copy at additional cost. Individual pictorial standards will also be available without the binder.

Work will start immediately on revising the present text, including definitions for all the defects. These terms are being defined by Sub. D01.16 on Definitions.

The pictorial standards will be as close to representing a 1:1 reproduction of the defect as we can make them, and still fit on a 8½" x 11" page.

Work will be started immediately to have those sets of standards in an acceptable condition reproduced. We will attempt to have about 100 copies prepared by September for publicity and sale at the 1977 Federation Annual Meeting and Paint Show.

SUBCOMMITTEE D01.26 OPTICAL PROPERTIES

P.B. Mitton, Chairman

After many years in ASTM, S.J. Huey is retiring as chairman of this subcommittee. P.B. Mitton is the new chairman. C. Sherman will become the new secretary. The minutes of the June 1976 meeting were approved as distributed.

Group 2: Color Measurement, J.C. Davidson, Chairman. Messrs. Hunter, Hammond, and Brady will prepare a revised draft of D 2244-68, "Instrumental Evaluation of Color Differences of Opaque Materials," which will include new CIE L*a*b* equations, plus suitable modifications. N. Hale, aided by Messrs. Kissler and Sherman, will prepare a "Recommended Practice on the Evaluation of Metamerism." Mr. Sherman, aided by Mr. Davidson, will evaluate the new Westinghouse "Metamerism Lamps."

Group 11: Gloss and Goniophotometry, R. Kissler, Chairman. Messrs. Hunter and Hammond will aid Mr. Kissler in revising D 523-67(72), "Test for Specular Gloss," to include some of the information from ISO, and to include a new precision statement. It will then be balloted by Sub. D01.26. The proposed revision of D 1471-69, "Two Parameter, 60-Degree Specular Gloss," has been drafted and will be sent out on a subcommittee letter ballot when the already available precision statement is added. Mr. Hunter is making plans for a round-robin on distinctness-of-image gloss.

Group 17: Hiding Power, P.B. Mitton, Temporary Chairman. Based on the answers received to a questionnaire that was circulated to Sub. D01.26, a meeting was held to further explore the need for a modified hiding power procedure. Included in the proposals were the need to include flow as part of the hiding value, some provision for visual rating, and simplified techniques, even though the precision may not be as good as the present D 2805-70(75), "Test for Hiding Power of Paints." A further questionnaire is expected to be circulated with the D-1 mailing.

Group 22: Sample Preparation for Determination of Optical Properties, H.K. Hammond, Chairman. A preliminary draft of "Recommended Practice for Selection of Coating Specimens and Their Preparation for Appearance Measurement," was discussed in detail, and a second draft will be prepared by the chairman for circulation before the next meeting.

Methods to be reapproved this year include:

(1) D 387-60(72), "Test for Mass Color and Tinting Strength of Color Pigments;"

(2) D 2616-67(72), "Evaluating Change in Color with a Gray Scale;"

(3) D 3022-72, "Test for Color and Strength of Color Pigments by Use of a Miniature Sandmill;"

(4) D 523-67(72), "Test for Specular Gloss;" and

(5) D 2244-68, "Instrumental Evaluation of Color Differences of Opaque Materials."

Of these methods, D 523-67(72) and D 2244-68 are being revised as given earlier. Methods D 2616-67(72) and D 3022-72 will be balloted by Sub. D01.26. Those present, in response to a letter from Mr. Zeller, agreed that D 387-60(72) needed to be revised and modernized. Messrs. Sherman and Fuller expect to supply drafts of their methods to go along with Mr. Zeller's to provide the basis for this revision. A new group, number 24, with the title Color and Strength of Color Pigments, will be organized at the next meeting.

The ISO draft paralleling D 1544-68(74), "Color of Transparent Liquids (Gardner Color Scale)," was reviewed and no objections were found. This method was voted on by Sub. D01.26 in January 1975 to be returned to the jurisdiction of the subcommittee which uses it (presumably Sub. D01.33), although Sub. D01.26 will advise on the optical part at any time.

SUBCOMMITTEE D01.27 ACCELERATED TESTS FOR PROTECTIVE COATINGS

E.A. Praschan, Chairman

Group 2: Water Tests, G.W. Grossman, Chairman. The status of the task group action on the following three related methods was reviewed:

(1) D 870-54(73), "Water Immersion Test of Organic Coatings on Steel;"

(2) D 1735-62(73), "Water Fog Testing of Organic Coatings;" and

(3) D 2247-68(73), "Testing Coated Metal Specimens at 100 Percent Relative Humidity."

After some discussion, it was decided to update and retain the three models. A round-robin will be conducted, prior to the June meeting, to form the basis for precision statements. In addition, the chairman will prepare a recommended practice to describe the various water tests, and outline their appropriate usage.

Group 4: Light and Water Exposure Apparatus, S. Totty, Chairman. Two negative votes and comments obtained on the recent subcommittee ballot on a proposed revision of D 822-60(73), "Recommended Practice for Operating Light- and Water-Exposure Apparatus (Carbon-Arc Type) for Testing Paint, Varnish, Lacquer and Related Products," were resolved with editorial revisions. These revisions were accepted by a subcommittee vote of 20-0. Several additional ballots are needed to meet the 60% return requirement. Unless these ballots necessitate further action, the revision will be forwarded for D-1 ballot.

The results of the subcommittee questionnaire on D 3361-74, "Recommended Practice for Light- and Water-Exposure Apparatus (Unfiltered Carbon-Arc Type) for Testing Paint, Varnish, Lacquer and Related Products Using the Dew Cycle," were reviewed. It was agreed that better definitions of scope, significance, and procedure should be made. A draft will be prepared for the next meeting.

Group 9: Evaluation of Corroded Specimens, W. Williamson, Chairman. This group met to consider the reinstatement of the air blow-off method of removing loose paint after corrosion testing in D 1654-74, "Evaluation of Painted or Coated Specimens Subjected to Corrosive Environments." This air blow-off method was replaced by a tape adhesion procedure in 1974 to avoid the question of operator safety. However, the tape method has proved unreliable in certain instances. The group agreed to revert to the air blow-off method with adequate safety precautions. The group chairman will draft a revision for review with Sub. D01.22 on Health and Safety, as well as with Sub. D01.27.

Group 10: Outdoor Exposure Tests, M.P. Morse, Chairman. The chairman reviewed the results obtained after 12 months exposure of a large series of coatings tested under various exposure conditions and locations. As expected, the gloss loss and color change of the coatings varied considerably. The 18-month exposure results will be available soon, and more meaningful conclusions regarding correlations, degradation rates and precision values are anticipated for review at the June 1977 meeting.

Group 16: Chalk Rating, J.S. Robbins, Chairman. Several types of visual rating scales were discussed for use in round-robin evaluation of several types of coatings now on exposure in Florida. The group agreed to a 1-10 scale, based on Munsell Gray Color Difference stan-

dards. With the assistance of the Kollmorgen Co. and Art Jacobsen, the chairman will prepare sets of standards for approval of the task group.

A discussion was held concerning the comments received on the recent D-1 ballot on D 358-70, "Standard Specification for Wood to be Used as Panels in Weathering Tests of Paints and Varnishes." It was agreed to incorporate the editorial comments into the specification which will be issued in the 1978 Book of Standards. Concerns were expressed over the inability to obtain wood having the specifications called for, and it was proposed that a poll of D-1 members be made in order to determine what type of wood is being used for panels. Since Sub. D01.27 appears to have so few members who use wood panels, it was agreed to determine if the jurisdiction of D 358-70 could be transferred to Sub. D01.52 on Factory Coated Wood Products where more expertise is available to deal with the questions involved. If Sub. D01.52 agrees to their transfer, the Executive Committee will be requested to make the change.

Preliminary comments on D 2454-68(73), "Recommended Practice for Determining the Effect of Overbaking on Organic Coatings," were offered by E. Haney. This method requires reapproval action in 1978. The subcommittee members were requested to review the method and comments prior to the June meeting so that appropriate action can be taken.

SUBCOMMITTEE D01.28 BIODETERIORATION

R.T. Ross, Chairman

Group 1: Package Stability, E.R. Tefft, Chairman. Rustoleum Corp. has agreed to prepare the paints required for a cooperative test employing the revised procedure for determining the resistance of latex paint in the container to bacterial spoilage. Merck & Co. will supply each cooperator with the challenging organisms. Laboratories that have agreed to participate include New Jersey Zinc Co., Buckman Labs., Abbott Labs., Dow Chemical Co., Troy Chemical Corp., Rohm and Haas Co., Merck, and Glidden Pigments Div., SCM Corp.

Group 2: Enzymes, P. Rosenberg, Chairman. A tentative method for determining the presence of free cellulytic enzymes in raw materials and finished paint was reviewed. A method used currently by Hercules Incorporated was reviewed, but discounted in favor of the group's tentative method because the Hercules method does not distinguish between free enzyme and enzymes produced by living microorganisms.

Group 3: Accelerated Tests, R.H. Lalk, Chairman. The group chairman, who could not be at this meeting, had sent word that the first draft of the paper comparing exterior exposures with accelerated tests had been completed and would be sent to the subcommittee for review.

The materials for conducting a cooperative test used by Rohm and Haas designated the "Popsicle Stick" Test have been sent to those labs who agreed to participate. This test method is of considerable interest to the subcommittee because of its simplicity as compared to the Environmental Chamber used in D 3273-76, "Test for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber."

D. Campbell, from Rustoleum Corp., accepted the position of secretary of Sub. D01.28.

DIVISION 30 PAINT MATERIALS

SUBCOMMITTEE D01.31 PIGMENT SPECIFICATIONS

W.C. Spangenberg, Chairman

The chairman reported that the subcommittee continues to remain in balance and stands at a roster of 65 total members and one affiliate, representing a net increase of two since last June.

The following standards requiring review in 1978 were discussed and, as a group, these are to be placed (by a vote of 8-0) on a Sub. D01.31 ballot for reapproval as is unless comment results from the letter ballot to full membership. These are:

(a) D 83-73, "Specification for Red Lead;"

(b) D 211-67(73), "Specification for Chrome Yellow and Chrome Orange;"

(c) D 475-67(73), "Specification for Pure Para Red Toner;"

(d) D 476-73, "Specification for Titanium Dioxide Pigments;"

(e) D 962-66(73), "Specification for Aluminum Pigments, Powder and Paste for Paints;"

(f) D 2218-67(73), "Specification for Molybdate Orange;" and

(g) D 2744-68(73), "Specification for Tribasic Lead Phosphosilicate."

D 603-66(73), "Specification for Aluminum Silicate Pigments (Hydrous)," requiring review in 1978, is presently being revised. It now has, in revised form, been through both subcommittee and main committee ballots, and has received committee action resulting from comments and negatives, and is to be returned for a final D-1 balloting.

A letter from Committee D-24, regarding Carbon Black, was discussed and assigned to Carl Fuller for early comment to Bill Spangenberg.

Reference to D 1649-65(70), "Specification for Strontium Chromate" — This method, under revision, was balloted on D-1 Letter Ballot D0104 (dated 8/76). A single negative ballot was received from Mr. deWilde. As his negative addressed itself to points other than those to which the ballot was limited or open, the subcommittee voted (8-0) this negative to be nonpersuasive. Additionally, the same negative responses have been fully discussed and discharged at subcommittee and main committee meetings in June 1976. It is also understood that the points raised by Mr. de Wilde are being studied by the task group. This standard should probably now go to Society ballot.

The secretary reported on the Sub. D01.31 ballot of August 13 on revision of D 477-45(70), "Specification for Zinc Sulfide Pigments." There being no negatives, a 75% response, and three comments addressed to editorial correction, it was voted 7-0 to submit this method for D-1 ballot with the corrections. The secretary will submit the revised form.

Three New Standards for Iron Oxides and Withdrawal of D 84-51(74), "Specification for Red and Brown Iron Oxide Pigments" — C. Fuller, J. Landis, and K. Hancock reviewed the many comments from Messrs. Ray, Ashton, and Fall, and negatives from Messrs. de Wilde and Singer. Mr. deWilde's negative is primarily based on the desire for a single specification, values which differ from ISO documents and nonparallel form to ISO. The subcommittee, by vote of 8-0, found this negative to be nonpersuasive, and they desire three separate specifications covering the same ground. The subcommittee also wishes the U.S. parameters, as they are generally tighter and more descriptive.

Mr. Singer's negatives were found largely to be persuasive on technical grounds. The appropriate changes are being made, and the items are to go to reballot at the D-1 level and Sub. D01.31 level, simultaneously.

The comments by Mr. Fall were found to be pertinent and will be included in the final document. The com-

ments by Mr. Ashton, which were found pertinent, are also being attended to. Mr. Ray's comments, which were editorial, are also to be addressed.

New Standard Specification for Aluminum Silicate, Anhydrous — The balloting on this specification generated negative votes from Messrs. Montle (Carboline Co.) and Ashton. Various comments were received from Messrs. Eickhoff, deWilde, Morris, and Ray.

Mr. Montle's objection was found to be nonpersuasive since 0% retention on a 325 mesh screen, although desirable, is technically impossible. This was confirmed by a vote of 8-0 on January 11. This also holds true for Mr. Montle's negative on D 603-66(73).

Attending to Mr. Ashton's negative, we found these to be entirely editorial in nature, except for the suggestions regarding the use of MgO as a standard of reflectance in 2.5.1. By a vote of 8-0, the subcommittee determined to retain MgO until such time as Committee E-12 is further along with their new method. In part, the committee agreed to the editorial suggestions by Mr. Ashton and, in part, disagreed where they felt it was a matter of editorial choice. The committee appreciates his careful editorial review.

Mr. Eickhoff's comment is being changed (editorial). It paralleled one of Mr. Ashton's.

Mr. Ray's verbage on 3.1 was found to be preferred, and is being changed.

Mr. Morris' comments regarding a typo admission on Fe_2O_3 content mox limit will be attended to, and his verbage on clause 2, line 3, will be used (editorial).

Mr. deWilde's comments have been already independently handled by the chairman.

Mr. Brady, of GSA, reported that several Federal specifications on pigments have been cancelled during 1976 to be superseded by absolute ASTM equivalents. The subcommittee thanks Mr. Brady for his advice, cooperation and direction to these efforts.

A copy of the above will be circulated to the members of the subcommittee, along with the minutes.

SUBCOMMITTEE D01.32 DRYING OILS

L.V. Anderson, Chairman J.C. Weaver, Chairman Pro Tem

This subcommittee met, in the necessary absence of its chairman, L.V. Anderson.

Group 4: Detection of Fish Oil in Drying Oils, P. Stievater, Chairman Pro Tem, from Spencer Kellog, reviewed, in detail, a draft of a new test method employing gas chromatography of methyl esters, prepared from the sample, and compared with reference standard fatty esters. Extensive revisions will be incorporated in another draft.

SUBCOMMITTEE D01.33 VARNISH & RESINS, INCLUDING SHELLAC

O.C. Keplinger, Chairman

Group 12: Urethanes, P. Guevin, Acting Chairman. The "New Method for Monomeric Toluene Diisocyanate in Urethanes by Gas Chromatography," is ready for D-1 letter ballot. Mr. Guevin will contact Dr. Sandridge to prepare final copies for this letter ballot.

Dr. R. Evans recommended gel permeation chromatography be used for determination of high-boiling isocyanate monomers in aliphatic urethanes. Mr. Guevin affirms that this method appears to be suitable, and will ask Dr. Sandridge to draft a method for use in a forthcoming round-robin.

Group 14: Alkyds, W.C. Golton, Acting Chairman. The "New Method for Silicone in Silicone-Modified Alkyds," will be submitted to D-1 letter ballot in the immediate future. Mr. Malek will prepare a set of appropriate terms and definitions applicable to water-compatible alkyds and polyesters for consideration by the next meeting. The chairman will establish an agenda for the June meeting. This will include methods for water-based alkyds and a proposal to review D 2689-73, "Recommended Practices for Testing Alkyd Resins," and D 2690-73, "Test for Isophthalic Acid in Alkyd and Polyester Resins," for reapproval.

Group 26: Polymer Emulsions, J.S. Autenrieth, Acting Chairman. This group is still seeking a chairman. On requesting volunteers, the acting chairman obtained the names of three individuals who will be contacted for the position.

The "New Method for Percent Nonvolatile of Polymer Emulsions," still needs a precision statement before Sub. D01.33 letter ballot. The results of the last round-robin will be submitted to Sub. D01.20 on Sampling and Statistics for a precision statement.

Six individuals agreed to participate in a round-robin on free monomer content and agglomerates. Samples will be distributed to the collaborators, along with a method for each test.

It was suggested that a device for measuring specific gravity be considered for use on polymer emulsions systems. The group felt that such a test would be of broader interest and should be referred to another subcommittee, namely Sub. D01.24 on Physical Properties of Liquid Paints and Paint Materials.

SUBCOMMITTEE D01.35 SOLVENTS, PLASTICIZERS & CHEMICAL INTERMEDIATES

T.M. Brye, Chairman

J. Trebellas was introduced as the new chairman of Group 2 on Oxygenated Solvents.

Negative ballots were received from R.M. Evans on items 12, 13, 14 and 16 of ASTM Committee D-1 ballot D0104 (dated 8/76) regarding the water content of urethane grade solvents. The negatives were upheld and the methods were returned to the subcommittee for study.

ISO drafts for the Platinum-Cobalt Color Test and Distillation Test have been distributed to the subcommittee. All comments received will be made on copies for return to Dr. Weaver.

Group 1: Hydrocarbon Solvents, S.A. Yuhas, Chairman. Work continues on:

(1) New specifications for VM&P Naphthas.

(2) New specifications for high-flash aromatic naphthas.

(3) D 1133-61(73), "Test for Kauri-Butanol Value of Hydrocarbon Solvents."

(4) D 1616-60(73), "Test for Copper Corrosion by Mineral Spirits (Copper Strip Test)."

(5) D 1720-62(73), "Test for Dilution Ratio in Cellulose Nitrate Solutions for Active Solvents, Hydrocarbon Diluents and Cellulose Nitrates."

Group 2: Oxygenated Solvents, J. Trebellas, Chairman. Work continues on:

(1) Analysis of water at low levels for urethane-grade solvents.

(2) Precautionary statements concerning peroxides in two test methods; D 1078-75, "Test for Distillation Range of Volatile Organic Liquids," and D 1353-74, "Test for N V Matter in Volatile Solvents for Use in Paint, Varnish, Lacquer and Related Products."

(3) Development of a new color standard for permanganate time test, D 1363-67(72), "Test for Permanganate Time of Acetone and Methanol."

(4) Precision statement for D 1209-69(74), "Test for Color of Clear Liquids (Platinum-Cobalt Scale)."

(5) Gas chromatographic analysis of

methyl n-amyl ketine, methyl n-butyl ketone, and methyl isoamyl ketone.

Group 3: Chemical Intermediates, G.T. Myers, Chairman. Work continues on:

(1) Test for methyl ether of hydroquinone in acrylates and acrylic acid.
(2) Formaldehyde specifications for 37% and 50% products.
(3) D 600-73, "Specification for Liquid Paint Driers."
(4) D 1728-73, "Test for Phthalate Ester Color of High-Gravity Glycerin."

DIVISION 40

PAINT PRODUCTS APPLIED ON SITE

SUBCOMMITTEE D01.42 ARCHITECTURAL FINISHES

S.B. Levinson, Chairman

D 3129-72, "Recommended Practices for Testing Exterior Latex House Paints," was submitted to Committee D-1 letter ballot. The results were two negatives and four comments. These have been forwarded to J. Ingram for action.

The following Standards are up for review:

(a) D 1736-73, "Test for Efflorescence of Interior Latex Paints;"
(b) D 1848-63(73), "Reporting Paint Film Failures Characteristic of Exterior Latex Paints;"
(c) D 1849-73, "Test for Package Stability of Latex Paint;"
(d) D 1911-73, "Specification for Asbestos-Cement Shingle Blanks to be Used as Panels in Weathering Tests of Exterior Architectural Paints," and
(e) D 3258-73, "Test for Porosity of Paint Films."

These will be sent to the custodians for review, then submitted for D-1 letter ballot.

Group 3: Leveling, C.W. Vanderslice, Chairman. The "Proposed Test Method for Leveling, Using the Leneta Blade," was reviewed and is now ready for review by the Editorial and Safety Committees. However, an unexpected modification in the Leneta blade will require another round-robin to determine whether the 3 mil or 4 mil blade should be specified, and to obtain the required precision data.

Group 8: Film Porosity, R.F. Hall, Chairman. This task group is attempting to develop a test method for the determination of the coalescence of a latex paint using D 3258-73 as the test method. The results, to date, have not met precision requirements. Therefore, a new round-robin will be started increasing the number of cooperators.

Group 9: Color Compatibility, K.A. Kieselburg, Chairman; S.G. Levinson, Acting Chairman. The latest revision of the "Proposed Test Method for Color Compatibility in Paints" was reviewed and corrected. It has been reviewed by the Editorial and Statistical Committees.

The corrected copy will be sent to Mr. Kieselburg for submission to the Safety Committee, and then to D-1 letter ballot.

Group 11: Gloss and Sheen Uniformity, R.S. Armstrong, Chairman. The task group is attempting to develop a test method for sheen uniformity of flat wall paints. The results of the last round-robin were unsatisfactory due to the highly subjective nature of the test method. A new round-robin will be run attempting to tighten up the method by specifying a time limit for paint application.

Photographic standards for comparison with actual brushouts would be very helpful. However, since this appears to be impractical, the use of wet paint standards will be investigated.

Group 13: Brushability, J.S. Powell, Chairman. This task group has been inactive for the past two years because of the inability of the previous chairman to attend meetings.

The results of the last two round-robins comparing high shear viscosity measurements with subjective brushing were reviewed. It was decided to develop a new test program expanding the test paints to include oil-based paints and to use the new "Standard" brush being considered for ASTM approval.

Group 16: Practical Opacity, J. Csernica, Chairman. The problem faced by this group is the obtaining of opacity charts, with a number of grey stripes of decreasing reflectance, which will not exhibit any undesirable side effects, such as edge lifting or color bleeding, and which are reasonable in cost.

Mr. Csernica has been able to obtain charts which look fine when painted, but which still cost about $3 for a 34" x 6' panel. This still is far above the $1 cost desired. One possibility is to cut panel size to 34" x 2'. Mr. Csernica will continue his search for a lower cost panel.

Group 17: Roller Spatter, F.B. Burns, Chairman. Mr. Burns presented a detailed report demonstrating the results of the round-robin in which three latex paints and three oil-based paints of increasing spatter tendencies were tested with low spatter and high spatter rollers.

The results demonstrated that differences in spatter tendency could easily be determined. However, the results were considerably affected by the operator and the type of roller used. Low spatter rollers generally gave good results and high spatter rollers generally gave poor results.

Mr. Burns will develop a roller which is not operator-dependent and will make the test method more specific as to depth of paint in the pan, weight of paint on the roller, pressure of the roller during application, and time of application.

Mr. Levinson discussed the results of his meeting of Group D01.13.01 on State and Institutional Consumer Affairs. The proposed tentative "Standard Recommended Guide for Purchasers of Paint" will be submitted for review by those present and by members of the task group. A special meeting will then be held in Washington on Wednesday, April 27, 1977.

The following groups will be formed and possibly meet at the June meeting of D-1:

(a) Sag Resistance (the Federal agencies need this).
(b) Foam and Cratering of Latex Paints.

SUBCOMMITTEE D01.43 COATINGS FOR POWER GENERATION FACILITIES

A.H. Roebuck, Chairman

All subcommittee work required at meetings of Sub. D01.43 was completed on the manuscript for the *Manual of Coating Work*. Additional work is required for the following to prepare them for submittal to ASTM for editing: Foreword; Preface; Introduction; Chapter 1 on General Considerations; Chapter 2 on Specification and Preconstruction Design Considerations; Chapter 8 on Surface Preparation; Chapter 13 on Coating Inspection and Maintenance in Operating Plants (Licensed); Appendix A; and Appendix B. All material from the Foreword through Appendix B should be sent to Mr. Levy. The target date is November 1, 1977. Mr. Levy will edit and then send to ASTM.

All material edited by J. Cornillot of ASTM will be sent to Mr. Levy, who will send the edited copy (with comments, if required) to the task group chairmen, who will return them to Mr. Levy for return to ASTM.

A good start was made on establishing revision procedures for both ANSI Standards N101.2 and N101.4.

SUBCOMMITTEE D01.44 TRAFFIC PAINT

L.S. Sander, Chairman

Group 1: Hot Melt Pavement Marking Materials, D. Miller, Chairman; L.S. Sander, Chairman Pro Tem. A discussion developed as to test methods that might be used in the evaluation of a material to a specification. A series of tests were suggested including bond strength, direct impact, indirect impact, bead settling in melt, hardeners, and pigment-glass bead extraction. It was suggested that tests should be approved, one at a time. The first test to be evaluated will be bond strength. Those wishing to participate are asked to contact Mr. Miller.

The age-old question of the composition specification vs. the performance specification came up. Many representatives were very receptive to the performance specification.

Final recommendations called for this subcommittee to develop tests and recommendations in three areas: (1) quality control; (2) application procedures; and (3) durability.

Group 2: Accelerated Testing, R. Davidson, Chairman. There was a review of all previous test methods for accelerated testing of traffic paints. A study by Maryland DOT agreed with previous studies on the Taber Abrader by other laboratories that this test is not applicable to traffic paints. The previous suggestions to delete this test from traffic paint evaluation was upheld.

There was some discussion about a previous round-robin on bleed test. There was a question whether this test, too, should be eliminated. It was suggested that a mini-study be done at the summer meeting. For that reason, a series of panels and photographs will be brought to the June meeting where they will be rated by all present by D 868-48(74), "Evaluating Degree of Bleeding of Traffic Paint." We will look at the precision of the test at that time.

Group 3: Night Visibility, J. Ritter, Chairman. A verbal report was given on the interest of industry and government to develop a portable unit for evaluation of horizontal marking materials. There is a good possibility of a performance study of any and all instruments available throughout the world. The study would consist of two stages: (1) evaluate every instrument; (2) if none are satisfactory, look at strong and weak points of different instruments and develop one that is satisfactory.

Organizations known to have units which might be evaluated are the States of Kentucky, Minnesota, Florida, Colorado, Maryland, and Pennsylvania, as well as Georgia Tech and 3M. A request was made for any information on other sources of instruments to be reported to Mr. Ritter, of Potters Industries.

The discussion then moved to glass beads. A round-robin was announced for re-evaluation of test methods for glass beads. There was an attempt to generate comments on sampling procedures. The only agreement was that there was disagreement throughout the country on the proper procedure.

Group 5: Consistency, Dry Time and Stability, E. Countryman, Chairman. A lengthy discussion was held on the initial results of a D 711-75, "Test for No-Pick-Up Time of Traffic Paints," dry time round-robin. This study utilized a variation of air flows across the test films. Initial results show definite variances. No real decisions will be made until all the results are in.

The settling round-robin was also discussed. No results are in yet due to the limited number of Heliopath RVT viscosimeters.

Mr. Sander announced the official resignation of D. Andres as chairman. He has taken over as chairman of Sub. D01.44. K. Schuman resigned as secretary of Sub. D01.44; R. Davidson was appointed as Mr. Schuman's successor.

J. Ritter reported on his meeting of Sub. D01.26. The subcommittee formed a new group with N. Johnson as chairman, to study retroreflective materials for horizontal surfaces. Mr. Ritter was appointed liaison between Sub. D01.26 and Sub. D01.44.

TT-P-85e was briefly discussed to determine any difficulty with the described test methods. Mr. Countryman suggested a new subcommittee should be formed to study latex or water-based traffic paints. Mr. Sander will bring the suggested program to the June meeting.

There were no methods for review under the jurisdiction of Sub. D01.44.

SUBCOMMITTEE D01.45 MARINE COATINGS

J.R. Saroyan, Chairman

Group 2: Shallow Submergence, L. Birnbaum, Chairman. The major portion of the group meeting was discussion of the proposed new "Standard Method for Testing Antifouling Panels in Shallow Submergence." Results of the subcommittee ballot were: seven affirmative, four abstentions, and two negatives. Negative ballots by W. Briggs and H. Stoner were resolved to their satisfaction. Editorial changes suggested by H. Ashton were adopted. Comments by H. Wray and C. Perez were fully discussed and appropriate improvements made. The subcommittee voted to submit the revised method to simultaneous ballot of Sub. D01.45 and D-1 as quickly as possible.

Group 3: Intermittent Submergence. A new group chairman is being sought from among personnel at the Naval Ship R&D Center, Annapolis, Md.

Group 4: Marine Atmospheric Testing, S. Lopata, Chairman. After one year at Miami Beach, Fla., the exposure results of a standard topside coating system were unexpectedly poor. Chairman Lopata will canvas subcommittee members for volunteers to provide paint and prepare panels for a new exposure test. Extra panels will be provided for testing by Miami Marine Research who are developing an accelerated test based upon intermittent spraying of panels with salt water.

Chairman Saroyan appointed the following task force on Dynamic Testing of Marine Coatings in Shallow Submergence: A. Freeman, Chairman; I. Poretz; C. Perez; H. Dear; and L. Birnbaum. They will survey what methods are available, the advantages and disadvantages of each, and recommend a program for future action by the subcommittee.

The next meeting of the subcommittee will be at 1 p.m., April 27, 1977 in Washington, D.C. Mr. Briggs will make the arrangements and chair the meeting in the expected absence of Chairman Saroyan.

SUBCOMMITTEE D01.46 INDUSTRIAL PROTECTIVE PAINTING

D.M. Berger, Chairman

The first item on the agenda was consideration of a number of Standards that must be reapproved, because of a number of modifications and changes required. W. Briggs will rewrite D 1014-66(73), "Conducting Exterior Exposure Tests of Paint on Steel," for balloting in the Spring. Also, a ballot will be sent out for reapproval of D 1010-66(70), "Testing Asphalt Emulsions for Use as Protective Coatings for Metal;" D 1730-67(73), "Preparation of Aluminum and Aluminum-Alloy Surfaces for Painting;" D 1731-67(73), "Preparation of Hot-Dip Aluminum Surfaces for Painting;" D 1732-67(73),

"Preparation of Magnesium Alloy Surfaces for Paintings;" D 2200-67(72), "Pictorial Surface Preparation Standards for Painting Steel Surfaces;" and # 3276-73, "Recommended Guide for Paint Inspectors."

The next item was a request from J. Moore on whom to send copies of the study reports of the volunteer compounds on topcoating zinc-rich primers. It was decided to send all of the raw data reports to J. Deane, SSPC, for his Zinc-Rich Committee to include in his total report on this subject, provided that credit is given to ASTM, and the volunteers. Except as contributors, proprietary names are not to be included in the SSPC/PACE report. It was further suggested that an interim report would be appreciated.

The next item was a discussion of new problems to work on, a matter suggested at the previous meeting. R. Davidson, from Pennsylvania DOT, requested answers to "what methods to use in cleaning structures, other than present blasting methods, in order to prevent lead particle dissemination." Discussion on various considerations followed. J. O'Leary, from the West Virginia Highway Dept., requested information on qualifications needed by painters for quality work, similar to the requirements demanded for application of coatings in nuclear containment work.

Ensuing discussion brought out the following aspects: Mr. Davidson will supply his organizations instructions, and Sub. D01.46 should write out a statement of what is required.

What has been done by Sub. D01.43 on Coatings for Power Generation Facilities — the qualifications for journeymen painters, is spelled out in detail. This procedure is already approved by the International Painters' Union. Its requirements have already been applied in several nuclear power plants. Men who qualified, in accordance with the requirements, have and are doing an excellent job. It is appropriate for nonnuclear work, including highways.

The next item discussed was the Maryland Pictorial Standards. The West Virginia Standards for shot blasting steel surfaces for painting have been turned over to SSPC, and copies were sent to members of the subcommittee.

The last discussion was about an inspection manual. SSPC is to work on this project. The Inspection School, of which Chairman Berger is an essential member, holds classes on this subject. Considering the many problems to be handled in this area, Mr. O'Leary will make up a questionnaire, covering pertinent aspects.

SUBCOMMITTEE D01.47
HIGH-BUILD COATINGS SYSTEMS

P.R. Guevin, Chairman

Prior to the meeting, the new "Standard Recommended Practice for Testing High Performance Architectural Coatings" was sent to the subcommittee for balloting. There were 20 affirmative votes (ten producers, three users, and seven general interests), four negative votes (two producers and three general interest) and five abstaining votes. The subcommittee discussed the negative votes and the comment made on an affirmative vote. J. Moore was present to discuss his negative vote. His points were resolved, and editorial changes made to the recommended practice. Most of the other negative voters' comments were found persuasive, and editorial changes will be made to the recommended practice in the form of footnotes. The remainder were found nonpersuasive. The subcommittee voted to send the recommended practice out for concurrent Sub. D01.46/D-1 letter ballot after making the editorial changes.

It was mentioned that our subcommittee now has formal liaison with Committee C-3 on Chemical-Resistant Nonmetallic Materials, and will discuss concrete surface finishes at our next meeting.

DIVISION 50
PAINTS FOR FACTORY APPLICATION

SUBCOMMITTEE D01.51
POWDER COATINGS

D.W. Mabrey, Chairman

Former chairman, Frank Steslow, chaired the meeting in the absence of Chairman Mabrey.

Because of the absence of the group chairmen, there were no group reports.

No old or new business was brought up. The meeting closed with Secretary J.I. Maurer resigning as secretary of Sub. D01.51 after this meeting.

SUBCOMMITTEE D01.52
FACTORY-COATED WOOD PRODUCTS

R.C. Marck, Chairman

Group B: Hardboard, K.L. Krueger, Chairman. A four-hour work session was used to analyze data from the round-robin on accelerated test methods for hardboard siding. The analysis indicated that two test methods were deficient in one or more areas, so further work on these tests will be stopped. Five tests were inconclusive, so additional tests will be undertaken as quickly as possible with the goal of completing the analysis at the June meeting.

Group 11: Dirt Collection, J.J. Medica, Chairman. The "Proposed Standard Method for Determining the Dirt Collection Index on Exterior White Coated Panels" has been submitted to Sub. D01.52 for a letter ballot. Negative ballots have been resolved. It will now be submitted to D-1 for a letter ballot.

Group 12: Textured Board, R.C. Marck, Chairman. The analysis of finish for textured interior panels was continued. Discussion concerned stain tests and tape adhesion tests. Suggested modifications will be incorporated into a round-robin involving all the changes in the finish tests.

Group 52/55: UV Cured Coatings, K.G. Hahn, Chairman. The proposed practice of a "Standard Method for Reporting Cure Time on UV Cured Coatings" has been revised and will be submitted to Sub. D01.52 for a letter ballot.

A new round-robin with seven cooperators is planned to test the stability of UV cured coatings.

The Editorial Sub. D01.18 has reported several discrepancies in D 2336-75, "Recommended Practices for Specifying Properties of Paint from the Liquid State Through the Curing Stage for Factory-Applied Coatings on Wood Products." Necessary revisions will be made, after which it will be submitted to Sub. D01.52 for a letter ballot.

SUBCOMMITTEE D01.53
FACTORY-COATED STRIP METAL

E.A. Stockbower, Chairman

Group 4: Recommended Practices for Testing Coil Coating Finishes. R. DeGraaf, Chairman. The first draft of the recommended practice was submitted to review and comment. In addition to reviewing the practice, assignments were made for the writing of procedures for conducting Tinius Olsen, Ericksen, and Taber Abrasion tests; these will be added to the practice.

E.E. Haney will act as principle reviewer of D 3281-73, "Test for Formability of Attached Organic Coatings with Impact-Wedge Bend Apparatus." All members are asked to send their comments prior to the June meeting so that action can be taken on the method at the June meeting.

SUBCOMMITTEE D01.55 FACTORY APPLIED COATINGS FOR PREFORMED PRODUCTS

J.M. Behrle, Chairman

The following four methods were approved with agreement to submit them for D-1 letter ballot:

(a) D 1308-57(73), "Test for Effect of Household Chemicals on Clear and Pigmented Organic Finishes;" submit for D-1 letter ballot with two editorial changes submitted by R. Cole as follows:

2.1.1 - The reagent is placed on the test surface and immediately covered with a watch glass.
5.3 - Change reference 4.1.11 (second sentence) to 4.1.10.

(b) D 2353-68(73), "Test for Flow Ratings of Organic Coatings Using the Shell Flow Comparator;" submit for D-1 letter ballot with editorial changes submitted by R.L. Smith.
(c) D 3133-72, "Quantitative Determination of Cellulose Nitrate in Alkyd Lacquers by Infrared spectrophotometry;" submit for D-1 letter ballot with no changes.

(d) D 3260-73, "Test for Resistance to Acid and Mortar of Factory-Applied Clear Coatings on Extruded Aluminum Products;" submit for D-1 letter ballot with no changes.

A motion to remove the following three methods from the Standards Book was made and seconded (seven affirmative and one negative):

(a) D 2198-68(73), "Test for Stain Removal from Multicolor Lacquers;"
(b) D 2337-68(73), "Test for Freeze-Thaw Stability of Multicolor Lacquers;"
(c) D 2338-68(73), "Determining Particle Size of Multicolor Lacquers."

The following three methods, or portions thereof, will be submitted to Sub. D01.55 letter ballot:

(a) D 2199-68(73), Standard Method for Measurement of Plasticizer Migration from Vinyl Fabrics to Lacquers;"

(b) D 3002-71, "Standard Recommended Practice for Evaluation of Coatings for Plastics;" ballot will pertain to paragraphs 16.1 and 17, Effect on Substrates, "Determine the physical properties of the substrate such as hardness, tensile strength, flexibility, or surface smoothness before and after applying the coating under test. Select appropriate tests for the substrate from Parts 35 and 36 of the *Annual Book of Standards.*"

(c) D-3023-72, "Recommended Practice for Determination of Resistance of Factory-Applied Coatings on Wood Products to Stains and Reagents;" ballot will pertain to revisions to paragraph 6.2 was rewritten by R. Cole.

SUBCOMMITTEE D01.56 PRINTING INKS

F.A. Falk, Chairman

Group 1: Viscosity Measurements, W. Rusterholz, Chairman. Mr. Rusterholz, from Sun Chemical, sent a message that he intends to resign as chairman of this group. Until official notification is received, J. Petsko will direct the efforts of this group. Under her guidance, a study of ambient vs. sample temperature was made for falling rod viscometers. One result of this study lead to the conclusion that a thermistor or precision thermolmeter should continuously record sample temperature.

The above work clears the way for meaningful calibration of falling-rod viscometers by the Ernst method utilizing standard fluids supplied by Cannon Instrument Co. A round-robin, in which six parties will participate, is to follow.

Sub. D01.56 was balloted on tentative methods for four different tackmeters. Two negative votes were received. Efforts will be made resolving the negative votes and to rewrite the methods so that they can be combined into one all-encompassing write-up.

R. Wint gave a report on "Government Contracts" and several persons indicated an interest in forming a task force on "fineness of grinding" for printing inks.

Society Meetings

Baltimore
January 20

Honored Federation guests in attendance were President Neil Estrada; Treasurer James McCormick; and Executive Vice-President Frank Borrelle.

Mr. Estrada congratulated the Society for their efforts as Host Committee during the 1976 Annual Meeting in Washington, D.C. He then presented a tie clasp to Mr. McCormick to designate his official election as Treasurer of the Federation. President Estrada remarked on the reorganization efforts of the Federation and the Paint Research Institute.

Mr. Borrelle presented a slide show of the various activities and publications of the Federation, and a wrap-up of the past Annual Meeting.

Treasurer McCormick, Host Committee Chairman for the Washington Annual Meeting, presented awards to his assistants, Colin Penny, Gordon Allison, Tom Cochran, and to his wife, Elaine McCormick, hostess of the ladies' activities. Society President Calvin Tatman presented President's Awards to each of these chairman for their efforts. A 25-year pin was also presented to Philip Link, of W.R. Grace & Co.

Phil Aidt, of Penniman & Browne, spoke on "DETERMINATION OF LEAD CONTENT IN PAINT."

Mr. Aidt said that his organization uses ASTM D33-35, atomic absoption, for determining the values of lead content. He indicated that there are other methods; however, they are either more time consuming or more costly.

Q. What is the average charge for sample?

A. About $15 to $20 each.

Q. Will the percent lead fall below 0.06% when no known lead has been added?

A. Yes.

Q. Have any local manufacturers used your company's services?

A. Yes. Random samples were selected and checked. All fell below the 0.06% level.

Q. Does the lead legislation apply to commercial or residential structures?

A. As it is understood, only to residential structures subsidized or financed with federal funds.

TOM COCHRAN, *Secretary*

Officers of the Kansas City Society for Coatings Technology for the year 1976-77. From left to right: Secretary—Hugo Manco, of Farmland Industries, Inc.; Treasurer—William Fitzpatrick, of Cook Paint & Varnish Co.; President—Ray Lawson, of Southwest Grease & Oil Co., Inc.; Vice-President—James Edwards, of Conchemco, Inc.; and Council Representative—Terryl Johnson, of Cook Paint & Varnish Co.

Cleveland
January 20

This was a joint meeting of the Cleveland Society and the Cleveland Paint and Coatings Association.

CHARLES K. BECK, *Secretary*

Golden Gate
January 17

A moment of silence was observed in honor of Manuel Philips, of Borden Chemical Co., who died recently.

Donald S. Onnen, of AMF Cuno Div., spoke on "CARTRIDGE FILTRATION IN THE COATINGS INDUSTRY."

Mr. Onnen defined a filter as "a device for the separation of solid and semi-solid particles, impurities, etc., from a liquid by passing it through a porous substance." He explained the difference between filtration by absorption, centrifuge, gravity, chemical separation, and electrostatic separation. Mr. Onnen discussed in detail the selection of cartridges for different types of enamel grinds, and his talk was supported by a series of slides. Practical tips in the selection of the proper filtration methods was also given.

Q. How would a screen filter compare with a felt cartridge impregnated with phenolic resin?

A. The screen filter would perform as well as a wound cartridge but would be less effective than a hard felt cartridge.

FRED APFEL, *Secretary*

Kansas City
January 13

Honored guests in attendance included Federation President-Elect John Oates, and Executive Vice-President Frank Borrelle.

Mr. Oates remarked on the reorganization of the Federation's governing body and encouraged more interest and participation in the Paint Research Institute.

Mr. Borrelle accepted on behalf of the Federation a $200 contribution from the society to PRI. He then presented slides showing the highlights of the recent Annual Meeting in Washington, D.C., Federation publications and aids available to the membership.

William A. Smith, Chairman of the Education Committee, announced that the Society Executive Board voted a $125 contribution to the University of Missouri at Rolla for a scholarship.

President Ray Lawson awarded 25 year pins to John Ormsby, of Farmland Industries, Inc.; Herb Haas, of Pratt & Lambert, Inc.; and Honorary Members Willard Vasterling, Harold Kicker, and R.W. Griswold.

Warren O. Manley, of Cook Paint & Varnish Co., spoke on "COPING WITH THE LEGISLATIVE BURDEN."

Mr. Manley mentioned many of the agencies which affect the coatings industry, such as EPA, OSHA, CPSC, and DOT. He also discussed a number of regulations affecting classification of hazardous materials, labeling, employee safety, and material data sheets.

HUGO MANCO, *Secretary*

Constituent Society Meetings and Secretaries

BALTIMORE (Third Thursday—Eudowood Gardens, Towson). WILLIAM T. COCHRAN, Bruning Paint Co., Inc. 601 S. Haven St., Baltimore, Md. 21224.

BIRMINGHAM (First Thursday —Warwickshire County Cricket Ground). P.A. HARRIS, Midland Specialty Powders, Unit 8, Bilston Industrial Estate, Staffs, England.

CHICAGO (First Monday—meeting sites in various suburban locations). WALTER J. KRASON, JR., Enterprise Paint Mfg. Co., 2841 S. Ashland Ave., Chicago, Ill. 60608.

C-D-I-C (Second Monday—Sept., Jan., Mar. in Columbus; Oct., Dec., Apr. in Cincinnati; Nov., Feb., May in Dayton). LLOYD J. REINDL, Inland Div., GMC, P.O. Box 1224, Dayton, Ohio 45401.

CLEVELAND (Third Friday—meeting sites vary). CHARLES K. BECK, Addressograph Multigraph Corp., 19701 S. Miles Rd., Warrensville Hts., Ohio 44128.

DALLAS (Thursday following second Tuesday—Vic's Gallery Restaurant). SAMUEL F. BIFFLE, Sherwin-Williams Co., 2802 W. Miller Rd., Garland, Texas 75040.

DETROIT (Fourth Tuesday—Rackham Memorial Bldg.). WALTER STUECKEN, Grow Chemical Co., P.O. Box 45, Pontiac, Mich. 48056.

GOLDEN GATE (Monday before Third Wednesday—Sabella's Restaurant, San Francisco). FRED APFEL, International Paint Co., Inc. 220 S. Linden Ave., S. San Francisco, Calif. 94080.

HOUSTON (Second Tuesday—Sonny Look's Sir-Loin Inn). THOMAS RULAND, Cook Paint & Varnish Co., P.O. Box 3088, Houston, Tex. 77001.

KANSAS CITY (Second Thursday—Fireside Inn). HUGO R. MANCO, Farmland Industries, Inc., P.O. Box 7305, N. Kansas City, Mo. 64116.

LOS ANGELES (Second Wednesday—Steven's Steak House). ALBERT SENEKER, Ameron, Research & Development, 4813 Firestone Blvd., South Gate, Calif. 90280.

LOUISVILLE (Third Wednesday—Essex House). J.B. LOCOCO, Reynolds Metals Co., P.O. Box 1800, Plant III, Louisville, Ky. 40201.

MONTREAL (First Wednesday—Bill Wong's Restaurant). J. W. A. MELSBACH, Sico, Inc., 2505 de la Metropole Longueuil, Que., Canada.

NEW ENGLAND (Third Thursday—Pantasia Restaurant, Cambridge). GEORGE MULVEY, Dampney Co., 85 Paris St., Everett, Mass. 02149.

NEW YORK (Second Tuesday—varies between New York and New Jersey locations). SAUL SPINDEL, David Litter Laboratories, Inc., 116 E. 16th St., New York, N.Y. 10003.

NORTHWESTERN (Tuesday after first Monday—Jax Cafe). ROBERT HESKIN, Valspar Corp., 1101 3rd St., S., Minneapolis, Minn. 55415.

PACIFIC NORTHWEST (Portland Section—Tuesday following second Wednesday; Seattle Section—the day after Portland; British Columbia Section—the day after Seattle). MICHAEL GRIFFIN, Reichhold Chemicals Ltd., P.O. Box 130, Port Moody, B.C., Canada.

PHILADELPHIA (Second Thursday—Williamson's Restaurant, Presidential Apartments). LOTHAR S. SANDER, N L Industries, Inc., Industrial Chemicals Div., P.O. Box 700, Hightstown, N.J. 08520.

PIEDMONT (Third Wednesday—Howard Johnson's Coliseum, Greensboro, N.C.). CHARLES B. WILSON, Reliance Universal, Inc., P.O. Box 2124, High Point, N.C. 27261.

PITTSBURGH (First Monday—Skibo Hall, Carnegie-Mellon University Campus). J.H. DAHL, J. H. Matthews Co., 1315 W. Liberty Ave., Pittsburgh, Pa. 15226.

ROCKY MOUNTAIN (Monday prior to second Wednesday—Gasthaus Ridgeview, Wheatridge, Colo.). JIM PETERSON, Peterson Paint Co., P.O. Box 311, Pueblo, Colo. 81002.

ST. LOUIS (Third Tuesday—Salad Bowl Restaurant). MORRIS D. GILLIAM, Lanson Chemical Co., P.O. Box 128, E. St. Louis, Ill. 62202.

SOUTHERN (Gulf Coast Section—Second Tuesday; Central Florida Section—Thursday after third Monday; Atlanta Section—Third Thursday). ALFRED L. HENDRY, A.L. Hendry & Co., P.O. Box 17099, Tampa, Fla. 33612.

TORONTO (Second Monday—Town and Country Restaurant). H. ZAPPE, Ashland Oil Canada Ltd., 2620 Royal Windsor Dr., Mississauga, Ont., Canada.

WESTERN NEW YORK (Second Tuesday—Cavalier Restaurant, Amherst, N.Y.). LEONARD H. GIELINSKI, Spencer-Kellogg Div., Textron, Inc., P.O. Box 210, Buffalo, N.Y. 14225.

Los Angeles
January 12

A moment of silence was observed in honor of three society members who died recently. They were: Thomas Toxby, of Santa Barbara Paint Corp.; Tscharner C. Hough, retired from Trail Chemical Corp.; and John C. Zola, of John C. Zola Laboratories.

Donald S. Onnen, of AMF Cuno Div., spoke on "CARTRIDGE FILTRATION IN THE COATINGS INDUSTRY."

Mr. Onnen discussed the importance of filtration and separation and placed contaminants in three categories: grit, fibers, and gum. Filters, he said, are also of three basic types: precoat (filter aid); surface (screen, paper, bags, stacked discs, cheesecloth); and depth (cartridges, both felt and wound).

Q. What are the engineering principles behind precoat filters?

A. The same as for cartridge filters. You are actually building a cartridge as you deposit filter aid on the substrate. It is important to select the proper size filter aid.

Q. How do you arrive at the micron rating for filters?

A. By a particle size distribution method. Ninety percent or more of the rated size particles are removed. However, we would like to change to a turbidity based measurement technique.

ALBERT SENEKER, *Secretary*

Louisville
January 19

Education Committee Chairman Lloyd Browning reported that 15 persons have enrolled at the Society-sponsored course on Instrumental Analysis at the University of Louisville.

Edward Landowski, of Rohm and Haas Co., spoke on "DEVELOPING INTERIOR AND EXTERIOR LATEX TINT BASES."

JOE V. LOCOCO, *Secretary*

New York
January 11

A moment of silence was observed and a resolution read honoring Charles Gardner, of Gardner Chemicals, Inc., who died recently.

President William Singer presented a Past-President's Pin to Al Sarnotsky in recognition of his service to the society.

Ted L. Kolski, of E.I. du Pont de Nemours & Co., Inc., spoke on "BEHAVIOR OF RUTILE TITANIUM DIOXIDE PIGMENTS IN WATER-BORNE INDUSTRIAL COATINGS."

Mr. Kolski indicated that optical performance of industrial water-borne finishes containing TiO_2 can be equal to, better than, or poorer than that of conventional solvent-borne finishes, depending upon the vehicle systems chosen. Vehicle selection affects optical performance more than TiO_2 selection.

Q. What is the effect of organic vs. inorganic surface treatment on TiO_2?

A. This study was limited to inorganic treated TiO_2. However, based on other work in solution type paints, there is no effect whereas variations in performance are noted in emulsion type paints.

Q. Why, in your work, was hiding power constant in the latex paints, even though TiO_2 percentages decrease significantly?

A. This was probably due to the many variables associated with emulsions, e.g., coalescents, film laydown, the surfactant system, etc.

SAUL SPINDEL, *Secretary*

Pacific Northwest
January 20

Donald Onnen, of AMF Cuno Div., spoke on "CARTRIDGE FILTRATION IN THE COATINGS INDUSTRY."

R.P. STEWART, *Secretary*

Philadelphia
January 13

A moment of silence was observed in honor of Dr. Edward C. Haines, Past-President of the Society, who died recently.

William Machemer, of Troy Chemical Corp., spoke on "MICROBIOLOGICAL PROBLEMS ASSOCIATED WITH WATER REDUCIBLE INDUSTRIAL COATINGS."

Mr. Machemer reviewed the bacterial vulnerability of water thinned industrial coatings by comparing their susceptibility to that of water-based trade sales paints. He pointed out that water reducible coatings in dip tanks, electro-coat, flow, and curtain-coating equipment involve rather unique exposure of uncured films to fungal organisms.

Q. What level of mercury compound is necessary to give satisfactory in-can preservation for latex paints?

A. Depending on the type of system, we recommend between 0.5 to 1.0 lb/100 gal.

Q. Does pH play an important factor in bactericidal inhibition or effectiveness?

A. Yes. We have seen greater effectiveness of these bactericides in water reducible coatings at pH of 9.0 or higher.

Q. Is there any comparison of liquid bleach vs. sterilizing compounds in your study?

A. Bleach is an effective mildew killer and in addition will clean any color defacement due to the mildew. Sterilizing solutions do not have this bleaching capability.

LOTHAR S. SANDER, *Secretary*

Piedmont
January 19

Wolfgang Zinnert, of Byk-Mallinckrodt, Inc., spoke on "NEW CONCEPT OF PIGMENT WETTING IN AQUEOUS COATING SYSTEMS."

Mr. Zinnert stressed the fact that hydrophobic wetting agents, in general, performed better than surfactants in water-reducible resin systems.

CHARLES B. WILSON, *Secretary*

Elections

BALTIMORE

Active

BRASWELL, THOMAS E. — Baltimore Paint & Chem. Co., Baltimore, Md.
CHADWICK, JOHN L. — A.B. Kohl Sales, Towson, Md.
GROVE, RONALD R. — W.R. Grace & Co., Curtis Bay, Md.
HELMS, GERALD C. — Lenmar Lacquers, Inc., Baltimore.
HOPPER, THEODORE R. — Jotun-Baltimore Copper Paint Co., Baltimore.
KNIGHT, MELVIN G. — Hanline Bros., Inc., Baltimore.
RATAGEBER, WILLIAM J. — Conchemco, Inc., Baltimore.

Associate

SCHIRM, BRUCE H. — Thibaut & Walker Co., Inc., Newark, Del.

C-D-I-C

Active

BENDIS, JOHN E. — DeSoto, Inc., Columbus, Ohio.
BOAZ, DONALD P. — Perfection Paint & Color Co., Indianapolis, Ind.
CHRISTIAN, ROBERT L. — Surface Research Corp., Blacklick, Ohio.
CRIBB, THOMAS P. — Surface Research Corp., Blacklick.
HOFFMAN, PAUL J. — Surface Research Corp., Blacklick.
KARCHER, RAYMOND P. — Hanna Chemical Coatings Co., Columbus.
KIRKEGAARD, PHILLIP C. — DeSoto, Inc., Columbus.
LABAZZO, JOSEPH P., JR. — Tenneco Chemicals, Inc., Lockland.
MELESTER, MALCOLM T. — Foy-Johnston, Inc., Cincinnati, Ohio
MONTAGUE, ROBERT A. — Hanna Chemical Coatings Co., Columbus.
PATEL, KANTILAL D. — Foy-Johnston, Inc., Cincinnati.
REINSEL, ROBERT W. — PPG Industries, Inc., Delaware, Ohio
ROYER, JOHN S. — Hanna Chemical Coatings Co., Columbus.
SCHLAKE, BERNARD H. — Neyra Industries, Inc., Cincinnati.
ZIMMERMAN, WILLIAM L. — Hanna Chemical Coatings Co., Columbus.

Associate

DEWIGGINS, RICHARD J., II — Continental Can Co., Cincinnati, Ohio.
FLANAGAN, JAMES E. — Flanagan Associates, Cincinnati.
GUNDLACH, EUGENE C. — Tenneco Chemicals, Coatings & Colorants Div., Cincinnati.
PALM, JOSEPH P. — Rohm and Haas Co., Cincinnati.
REITZ, ROBERT D. — Systems Technology Corp., Xenia, Ohio.
WILSON, JAMES D. — N L Industries, Inc., Atlanta, Ga.

LOS ANGELES

Active

BANGLE, DONALD R. — TEC Chemical Co., Monterey Park, Calif.
BISADA, SAMIR K. — Deft, Inc., Irvine, Calif.
BORNEO, JOSE C. — Frank D. Davis Co., Los Angeles, Calif.
ENGELN, FRIEDHELM F. — Reliance Universal, Inc., Brea, Calif.
GILES, JULIAN — Douglas Aircraft Co., Long Beach, Calif.
JUMP, WILLIAM S. — Engard Coatings Corp., Huntington Beach, Calif.
MINAMYER, MARK A. — Whitaker Coatings & Chemicals, Inc., Colton, Calif.
MONTES, ERNESTO — Ameron Protective Coatings Div., Brea.
MUI, DANIEL — Rockwell International, Space Div., Downey, Calif.
NUCUP, AMELIA M. — Sycwin Coatings & Wires, Inc., Balintawak, Quezon City, Philippines.
PERALTA, DIONISIO L., JR. — Advanced Coatings & Chemicals, Inc., S. El Monte, Calif.
WESTPHALEN, DONALD E. — Chemical Coatings Corp., Pico Rivera, Calif.

Associate

LEE, GEORGE W. — Buckman Laboratories, Inc., Placenta, Calif.
STRAIGHT, RICHARD K. — Itasco, Stanton, Calif.

MONTREAL

Active

SONDHI, DHARAM P. — International Paints (Canada) Ltd., Montreal, Que.

Associate

ANTZ, THOMAS — Philipp Brothers (Canada) Ltd., Montreal, Que.
CADORET, LEO C. — Binks Mfg. Co. Canada Ltd., Montreal.
CARTIER, JEAN-MARE — Shell Canada Ltd., Montreal.

NEW ENGLAND

Active

ARONSON, STEVEN R. — Hapco Manufacturing Co., Hanover, Mass.
HATFIELD, RICHARD A. — Haartz Auto Fabric Co., Acton, Mass.
JEKNAVORIAN, ARAM A. — Coating Systems, Inc., Nashua, N.H.
WILLARD, ANNE — Sterling-Clark-Lurton Corp., Malden, Mass.

Associate

BRINCAT, LOUIS A. — American Hoechst Corp., Coventry, R.I.
CAMPBELL, RICHARD A. — Dow Corning Corp., Newton, Mass.
LAVENGHETTA, NICHOLAS — John R. Hess & Sons, Providence, R.I.
LUDES, JOHN H. — Olin Chemicals, Norwood, Mass.
MACINTOSH, DAVID B., JR. — Neville Chemical Co., W. Yarmouth, Mass.

NORTHWESTERN

Active

ELSAFY, ABD ELAZIM I. — Whittaker Corp., Minneapolis, Minn.
FUGE, PETER K. — Diamond Vogel Paint Co., Marshalltown, Iowa.
NIELSEN, SUSAN M. — Midland Cooperatives, Inc., Minneapolis.
STUHR, JAMES A. — Whittaker Corp., Minneapolis.

Associate

CRANSTOUN, RICHARD L. — N L Industries, Inc. — ICD., Deerfield, Ill.

Educator/Student

LUNDEEN, RICHARD HARRY — North Dakota State University, Fargo, N.D.

PHILADELPHIA

Active

COURTRIGHT, JAMES R. — E.I. DuPont de Nemour & Co., Inc., Philadelphia, Pa.
HANNENIG, CHRIS — Best Bros. Paint Co., Sinking Spring, Pa.
POLSTON, NORMAN L. — E.I. DuPont de Nemour & Co., Inc., Philadelphia.
SMYRK, CHARLES M., JR. — E.I. DuPont de Nemour & Co., Inc., King of Prussia, Pa.

Associate

DAVIS, J. MICHAEL — IMC Chemical Group, Inc., Voorhees, N.J.
GRAFF, DOUGLAS — Cargill, Inc., Philadelphia, Pa.
LOZANOFF, MICHAEL — Dow Chemical U.S.A., Moorestown, N.J.
MCLAUGHLIN, GLENN R. — Pioneer Salt & Chemical, Philadelphia.
POWERS, MICHAEL D. — Dow Chemical U.S.A., Moorestown.

PIEDMONT

Active

EDISON, BRUCE A. — Reliance Universal, Inc., High Point, N.C.
FORTESCUE, MARGARET L. — Union Carbide Corp., Charlotte, N.C.

Associate

ROBINSON, SARA M. — AMSCO Div. Union Oil of Calif., Charlotte.

SOUTHERN

Active

ADAMS, WAYNE Y. — Crown Paint, Inc., Hialeah, Fla.
BAIRD, ROBERT J. — E.I. du Pont de Nemours & Co., Inc., Tucker Ga.
BOYLE, KEVIN J. — Wyandotte Paint Products Co., Norcross, Ga.
GOLDSMITH, EDWARD — Ocean Chemicals, Inc., Savannah, Ga.
HAAGENSON, KENNETH A. — Buckman Labs., Inc., Memphis, Tenn.
HOWARD, PORTER L. — Wingerter Laboratories, Inc., N. Miami, Fla.
STIEG, FRED B. — Pigmentech Consulting, Jekyll Island, Ga.
WELLS, ROBERT H. — AZ Products Co., Eaton Park, Fla.

Associate

CREPEAU, RAY M. — Tenneco Coating & Colorants, Atlanta, Ga.
CRISP, JOHN R. — Industrial Chemicals, Inc., Atlanta, Ga.
KRAUSERT, RUSEEL L. — Scholle Corp., Atlanta.
RICE, CLAYTON D. — Chemetron Corp., Tucker, Ga.
ROZEA, PETER C. — Stauffer Chemical Co., Atlanta.

Educator/Student

GROSS, TIMOTHY P. — University of Southern Mississippi, Petal, Miss.
LICHATOWICH, MICHAEL J. — University of Southern Mississippi, Hattiesburg, Miss.

TORONTO

Active

BENSON, BARBARA J. — Canadian Pittsburgh Industries Ltd., Toronto, Ont.
CHAU, FRANCIS T.C. — Tonecraft Ltd., Toronto.
FERRETTI, G. GIACOMO — Reed - Pigments Div., Toronto.
HAMILL, IVAN — Selectone Paints, Weston, Ont.
KAPOOR, SUBHASH C. — Mobile Chemical Canada Ltd., West Hill, Ont.
KELLY, WILLIAM E. — L.V. Lomas Chemical Co. Ltd., Mississauga, Ont.
KOE, STEVEN K. — Benjamin Moore Co. Ltd., Toronto.
MATWEY, STEVEN S. — Bate Chemical (Polyresins), Don Mills, Ont.
PANKO, STEPHEN J. — Bayer (Canada) Inc., Mississauga.
SCHINDLER, GERHARD — Naz-Dar Canada Ltd., Toronto.
WALTON, BASIL V.E. — Dussek Bros. (Canada) Ltd., Belleville, Ont.

Associate

BOOTH, MURRAY W. — Ashland Oil Canada Ltd., Toronto, Ont.
BOWSKILL, LARRY J. — Montedison Canada Ltd., Toronto, (Willowdale).
CAMPBELL, MICHAEL H. — Monsanto Canada Ltd. Rexdale, Ont.
GARDINER, JAMES S. — Shell Canada Ltd., Toronto.
HAM, LARRY T. — Reichhold Chem. Ltd., Weston, Ont.
HAY, COLIN F. — Maple Leaf Mills Ltd., Toronto.
KINMOUTH, ANDREW C. — Shell Canada Ltd., Toronto.
MCBROOM, PETER L. — Shell Canada Ltd., Toronto.
URBANKIEWICZ, WALTER, G. — Ashland Oil Canada Ltd., Industrial Chemical & Solvents, Toronto.
VAN VLYMEN, MICHAEL V. — Esso Chemical Canada, Toronto.

Meetings/Education

ISCC Annual Meeting Set for April 18-19

The 46th Annual Meeting of the Inter-Society Color Council will be held April 18-19 at the Statler-Hilton Hotel, New York City.

Open meetings of the ISCC Problems Subcommittees are scheduled for April 18, in both morning and afternoon sessions and, as in the past, members and friends of the Council are urged to attend. In a departure from previous practice, meetings of the Problems Subcommittees will be held in five consecutive 1½-hr periods to minimize, insofar as possible, conflicts resulting from simultaneous sessions.

The program on April 19 will begin with a symposium presented by members of the Optical Society of America Color Group on "Systems of OSA Committee on Uniform Color Scales." Five short presentations (all by prominent ISCC members) will be given on the new uniform-color-scale system devised and illustrated by the Committee.

Two additional presentations are scheduled for the morning: "Color Systems in Relation to the History of Painting," by Professor Charles Parkhurst, of the National Gallery of Art; and "Dye Strength," by Charles D. Sweeny, Chairman of the Subcommittee for Problem 25 D, Determination of the Strength of Colorants, Dyes Section.

The Annual Meeting banquet will be replaced this year with a luncheon, at which the Godlove Award will be presented to Hugh R. Davidson, of Davidson Colleagues. Mrs. Ruth M. Johnston-Feller, will read the Award Citation. Luncheon speaker will be Dr. Norbert Baer, Coordinator, Conservation Center, of the New York University.

The annual business meeting of the Council will be held immediately after the luncheon and will include presentation of reports by chairmen of member-body delegations, as well as by officers and standing committee chairmen. The Federation of Societies for Coatings Technology is one of the member organizations of the ISCC.

Detailed information on programming and registration may be obtained from ISCC Secretary Dr. Fred W. Billmeyer, Jr., c/o Department of Chemistry, MRC Room 217, Rensselaer Polytechnic Institute, Troy, N.Y. 12181.

CALL FOR PAPERS

Cleveland Society for Coatings Technology

Symposium on Advances in Coatings Technology

March 9 and 10, 1978

The symposium will cover a broad spectrum of coatings technology to afford speakers, a greater range of topics, as well as to provide a more diverse program.

Prospective speakers having an original contribution on any area of coatings technology are invited to submit their topics and a 250-word abstract by September 15. Final deadline for a completed manuscript is December 1, 1977.

Speakers will be notified of acceptance of their papers by January 1, 1978.

Manuscript style should be in accordance with the "Guide for Authors" published by Journal of Coatings Technology, and available from FSCT, 1315 Walnut St., Philadelphia, Pa. 19107.

Abstracts or inquiries should be addressed to Carl J. Knauss, Cleveland Society Educational Committee Chairman, Kent State University, Chemistry Dept., Kent, Ohio 44242.

Coatings Combustibility Hazards Topic of WTPG Annual Symposium

The 17th annual symposium of the Washington Paint Technical Group will be held at the Marriott Twin Bridges Motel, Washington, D.C., on April 25-26. Theme of the 1977 event is "Combustibility Hazards of Coatings and Their Control."

The Keynote Address, "Man, Materials, and Fire," will be delivered by Dr. Robert S. Shane, of the National Research Council, National Academy of Sciences.

Other presentations will feature:

"Factory-Applied Finishes for Wood-Based Products" — This topic will be discussed by both manufacturers of wood-based products and producers of industrial finishes for these products. The Finish Formulators' viewpoint will be presented by Paul Leary, of Reliance Universal, and a speaker from Inmont Corp. Representing the Wood Panel Manufacturers will be Robert Brummel, of Weyerhauser, and James Purcell, of Vanply Corp.

"Flame Spread Test Methods — Their Development and Current Value" — This subject will be explored in two presentations: "European Requirements and Developments" — A.C. Walker, of Anzon, Ltd.; and "Two-Foot Tunnel and Related Devices" — Harry Teicher, of Monsanto Chemical Co.

"Toxicology of Combustion Products" — Dr. Merritt Birky, of National Bureau of Standards.

Concluding the program will be an ASTM Committee report, covering work of Subcommittees D.01.21 (Chemical Analysis) and D.01.22 (Health and Safety).

Registrants will have the option of attending a meeting of ASTM Subcommittee D.01.07 on April 27 at the National Bureau of Standards, followed by a tour of the NBS Fire Control Section.

There will be a reception and banquet on the evening of April 25 at the Marriott Twin Bridges.

Registration fees are $50 for industry personnel (additional registration from same company, $45) and $40 for government personnel. Additional fee for spouses attending the banquet is $15.

For additional information, or to register, contact Washington Paint Technical Group, P.O. Box 12025, Washington, D.C. 20005.

Initial 1977 Contributions Received for PRI

Funds in support of the research efforts of the Paint Research Institute have been received from the Kansas City and Cleveland Societies, and from Shell Chemical Co. and Daniel Products Co.

These contributions are the first received this year for the Federation's research affiliate, and will supplement the funds committed by the Federation in support of PRI's 1977 projects.

Last year, funds were received from a total of 52 contributors.

Detroit Society Sponsoring "FOCUS '77" Symposium

The Detroit Society for Coatings Technology will hold its second annual "FOCUS" symposium (Future of Coatings Under Study) on April 27 at the Michigan Inn, Southfield, Mich.

Program Chairman Stephen Peng, of Ford Motor Co., has announced the symposium will encompass the many facets of corrosion and the protection of automobiles.

For additional information on the event, contact J.M. Dentler, Publicity Committee Chairman, 765 Dellwood Drive, Ann Arbor, Mich. 48103.

AOCS to Hold Meeting In New York in May

The American Oil Chemists' Society will hold its 68th Annual Spring Meeting at the Americana Hotel in New York City on May 8-12.

More than 200 technical papers will be presented during 35 technical sessions on such topics as: edible fat processing; tall oil processing; regular fatty acid processing; palm oil processing; synthetic fatty acid processing; biosynthesis of fatty chemicals; pollution control in the fats and oils industry; extraction plant safety; marine lipids; glycolipids; analytical methods; and trace metals in fats and oils.

This will be the only national meeting of the Society during 1977, a departure from the pattern of holding two meetings annually.

Frank Naughton, of N L Industries, Inc., Hightstown, N.J., is General Chairman for the meeting. Technical Program Chairman is David Berner, of CPC International, Union, N.J.

Two-Phased Polymer Systems Topic of Lehigh Short Course

An introductory short course on "Polymer Blends, Grafts, and Blocks (Two-Phased Polymer Systems)," will be held at Lehigh University, Bethlehem, Pa., June 5-10.

Inter-relationships among synthetic detail, morphology, and mechanical behavior will be stressed during the week-long course, and examples will be given of industrially important materials, such as impact resistant plastics, thermoplastic elastomers, polymer impregnated wood and concrete, polymer surfactants, low creep fibers, insulating materials, coating materials, polymeric plasticizers, and noise and vibration damping.

The course is designed for chemists, engineers, materials scientists, managers, and others involved in research, development, or engineering related to two-phased polymer systems.

The course is under the direction of Dr. Leslie H. Sperling, associate professor of chemical engineering and senior staff member of Lehigh's Materials Research Center, and will feature the following presentations:

"Review of Polymer Fundamentals"—Dr. L.H. Sperling.

"Introduction to Polymer Blends, Grafts, and Blocks"—Dr. Sperling.

"Impact Resistant Polymer Blends and Grafts"—Dr. J.A. Manson, of Lehigh University.

"Block Polymers and Multiphase Polymer Systems: An Overview of Present Status and Future Potential"—S.L. Aggarwal, of The General Tire & Rubber Co.

"Morphology and Mechanical Behavior of Block Copolymers"—Dr. D.J. Meier, of Midland Macromolecular Institute.

"Industrial Applications of Polymer Blends, Grafts, and Blocks"—Dr. Sperling.

"Use of Electron Microscopy to Study Two-Phased Polymer Morphology"—Dr. D.A. Thomas, of Lehigh University.

"Interpreting Polymer Networks and Related Materials"—Dr. Sperling.

"Miscibility and Behavior of Polymer Blends"—Dr. D.R. Paul, of University of Texas at Austin.

"Relationships Between Polymer Blends and Polymer Composites"—Dr. Manson.

"Overview of Two-Phased Polymer Systems"—Dr. Manson.

There will also be laboratory demonstrations of electron microscopy and mechanical behavior presented by the Lehigh University staff.

Fee for the course is $400 and includes a copy of the book, "Polymer Blends and Composites," by Drs. Manson and Sperling. *(This book was reviewed in the Jan. 1977 JCT—Ed.).*

For additional information, or to register, contact Ms. Jone Svirzofsky, Materials Research Center, #32, Lehigh University, Bethlehem, Pa. 18015.

XIVth FATIPEC Congress Slated For Budapest in June 1978

The XIVth FATIPEC Congress (Continental European Federation of Associations of Paint, Varnish, Enamel and Printing Technicians) will be held June 4-9, 1978 in Budapest, under the auspices of the Hungarian Chemical Society.

The topic of the international conference will be "Recent Progress in the Production, Processing and Properties of Varnishes and Paints," and a number of plenary lectures and discussion papers will be featured.

An exhibition at the site of the Congress is also planned, with limited participation.

Complete information on the event, as well as registration forms, are available from XIVth FATIPEC Congress Organizing Committee, c/o Magyar Kemikusok Egyesulete, H-1061 Budapest, Anker koz 1, Hungary.

April Seminar to Spotlight Metal Surface Treatment

New York University School of Continuing Education will hold a three-day seminar in Chicago, Ill., on "Cleaning, Coating and Finishing Metals," April 11-13.

The seminar is a training program designed to cover all aspects of metal surface treatment, and is for all levels of personnel including plant managers, engineers, supervisors, metallurgists, design engineers and quality control specialists. In addition to a detailed consideration of processes, special emphasis is placed on presentation of production difficulties and on trouble-shooting. The seminar will cover basic principles, definitions, applications, industry characteristics and economics in metal finishing; cleaning and surface preparation; coating and finishing; plated and organic coatings; process automation and pollution abatement.

For further information and a detailed brochure on this seminar, please contact Heidi E. Kaplan, Information Services Manager, New York Management Center, Dept. 14NR, 360 Lexington Avenue, New York, New York 10017, or call (212) 953-7262.

Technical Articles in Other Publications

Compiled by the Technical Information Systems Committee — H. Skowronska, Chairman

Journal of the Oil and Colour Chemists' Association

Published by Oil and Colour Chemists' Association, Priory House, 967 Harrow Road, Wembley, Middlesex, HAO 2SF England

Vol. 60 No. 1 January 1977

Walz, G. - "Molecular Structure and Film Properties of Alkyd Resins;" 11-17.

Naser, A.M., El-Azmirly, M.A., and Gomaa, A.Z. - "Recent Aspects on the Preparation and Evaluation of Some Polyesteramides for Surface Coatings. Part I: Parameters Affecting the Formation of Various Dihydroxydiethylamide Derivatives of Fatty Acids;" 18-21.

Bright, A.W. - "Surface Films Produced by Electrostatic Powder Deposition;" 22-27.

Wells, C.H.J. - "Colour, Structure and Electrons" (Student Review); 28-30.

Double Liaison - Chimie des Peintures (in French)

Published by Les Presses Continentales, Rue du Cherch-Midi, F-75006, Paris, France

Vol. 23 No. 255 November 1976

Ullman, R. and Demetz, P. - "Water-Soluble Stoving Paints;" 33-42.

Legrand, M. - "Austrian Micaceous Iron Oxide as an Anticorrosive Pigment for Paints;" 43-45.

Nys, M. - "Paints and Marketing;" 49-54.

Defazet (Deutsche Farben-Zeitschrift) (in German)

Published by Lack- und Chemie-Verlag Elvira Moeller GmbH, Karl-Benz-Strasse 11, Postfach 11 68, 7024 Filderstadt 1, Germany

Vol. 30 No. 11 November 1976

Herbst, W. and Merkle, K. - "Pigmentation Problems of Yellow Publication Gravure Inks;" 486-489.

Garret, M.D. - "Carbon Black Pigment Blending for Printing Ink Application;" 490-494.

Zorll, U. - "Device for Testing the Extractability of Coatings;" 495-497.

Vol. 30 No. 12 December 1976

Kunze, S., Merten, E., and Schmidt, H.-R. - "Coatings Systems with Different Degrees of Gloss for Nuclear Plants;" 554.

Farbe und Lack (in German)

Published by Curt R. Vincentz Verlag, 3 Hannover, Postfach 6247, Schiffgraben 43, Germany

Vol. 83 No. 1 January 1977

"The Coatings Engineer—Preparing the Way for Taking Over New Scientific Knowledge into Industrial Practice" (Abridgment of H.L. Gerhart's 1976 Mattiello Lecture); 5–8.

Zosel, A.—"An Instrument for Determining the Impact Resistance of Paint Films;" 9–12.

Mondt, J.—"Vehicles Non-deleterious to Environment with Good Penetration Properties, Based on Finely Dispersed Plastic Dispersions;" 13–17.

Kämpf, G., and Papenroth, W.—"Observation of Degradation Processes and Critical Evaluation of the Test Methods for Weathering of Plastics Pigmented with TiO_2;" 18–29.

Daniel, F.K., and Pineiro, R.—"Economical and Technical Parameters of Tinting Colour Pastes in Modern Coatings Industry;" 30–33.

Brushwell, W.—"Scientific Determinations in the Field of Coatings" (Literature Review with 39 References); 34.

Anon.—"Future Strategies of the Petrochemical Companies; Implications for the Paint and Coatings Industry;" 59.

Skandinavisk Tidsskrift för Färg och Lack

Published by Dansk Bladforlag K/S, Holbergsgade 20, 1057 Copenhagen, Denmark

Vol. 22 No. 10 October 1976

Eikers, E.—"Progress Marches - Over a Wide Front? New Standards for Rust and Cleaning Degrees;" 319-320, 323-324, 327 (in Danish).

Sorensen, P.—"Dispersion Technology;" 328, 331-332, 335-336, 339-340 (in Danish).

Vol. 22 No. 11 November 1976

Hansen, C.M.—"Receding Contact Angles and Coatings Performance—The Cos Θ_R Plot;" 373–377 (in English).

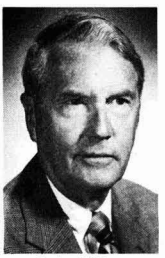
Vol. 22 No. 12 December 1976

Kjellin, A. - "From Coatings Chemistry to Petrochemistry; From Market Demand to Process Technology; From Lack of Chemistry to Luck of Oil" (in Swedish); 392-409 (7 pps.).

People


H.S. Wheeler


J.H. Arendt


G.A. O'Hare


E.E. Moran

CIBA-GEIGY Corp. has named **Howard S. Wheeler** President of the Plastics and Additives Div., Ardsley, N.Y. He succeeds **H.W. Zussman** who has retired but will continue to serve the company as a consultant. Mr. Wheeler was formerly the Director of commercial services for CIBA-GEIGY.

John H. Arendt has been appointed Research Director of the Paint Research Association, England. Formerly with the Geneva laboratories of the Battelle Memorial Institute as a polymer chemist, he has had broad experience in management and control of research projects. Mr. Arendt has also taught polymer chemistry at both the undergraduate and postgraduate levels at the Universities of Lausanne and Neuchatel. He joins **Dr. G. de W. Anderson,** who was appointed Managing Director of P.R.A. in 1976.

Spencer Kellogg Div. of Textron, Inc. has named **George A. O'Hare** Chairman. He had served as President of the division since 1973. Succeeding Mr. O'Hare in that position is **G. William Harrison** who was Executive Vice-President.

Edward E. Moran has been elected President of Whittaker Corp. Prior to joining the Los Angeles-based company in 1975, he was Market Manager of coil coatings for PPG Industries, Inc.

PFD/Penn Color, Inc. has appointed **Arthur M. Rawes** National Sales Manager. He will direct all agent sales from the company's headquarters in Doylestown, Pa. Meanwhile, **Theodore Movellan, Jr.** has been named Vice-President — Operations and will be responsible for plant operations at both the Doylestown and Flemington, N.J. facilities.

Richard R. Missar has been elected Executive Vice-President and Chief Operating Officer of DeSoto, Inc., Des Plaines, Ill.

Carl F. Pozzani has been named President of General Mills Chemicals (Japan) Ltd. (formerly DAI-ICHI Chemical Ltd.), Osaka, Japan.

Fred E. Switzer has been named President of Day-Glo Color Corp. He succeeds **Robert C. Switzer** who will remain Chairman of the board.

Celanese Coatings & Specialties Co. has appointed **Edward W. Melvin, Jr.** West Coast Region Manager for its Resins Div. Headquartered in Los Angeles, Calif., he will head all sales functions for the area.

Dr. Summer B. Twiss has been appointed Manager, Technical Service for the Cab-O-Sil Div., Cabot Corp. He will direct both the field and technical service laboratory work for the division.

Glidden Pigments, SCM Corp. has named **Wilham M. Burr, Jr.** as Sales Representative for TiO_2, inorganic pigments, and fine particle silica in eastern Pa., Wilmington, Del., and Trenton, N.J.

Allentown Paint Mfg. Co. has elected **Tilghman G. Fenstermaker, Jr.** as Executive Vice-President. He most recently served as Vice-President of sales and advertising.

Devoe & Raynolds Co., Inc. has promoted **Arthur E. Davis** to Group Leader, Marine Div. He will be responsible for planning, supervising, and coordinating development and support projects.

Dresser Minerals Div., Houston, Texas, has appointed **Spencer B. Smith** Eastern Area Sales Manager for extenders and fillers. **Doyne E. Sizemore** has been named Western Area Sales Manager.

Frank M. Chamberlain has been elected President of Porter Paint Co., Louisville, Ky. He was formerly Executive Vice-President and succeeds **William H. Cary III** who has retired.

Robert S. Wang has joined the Research and Development Dept. of The Flecto Corp., Inc. as an Analytical Chemist.

Harvey Lieberman and **Leo Masciulli** have announced the formation of Cardinal Color and Chemical, Inc. with offices at 22 E. 22nd St., Paterson, N.J. The company manufactures flushed colors and dispersions for the paint, plastics, and ink industries, and also chemical additives used as formulation aids.

Dexter-Midland has named **Richard Vogel** Technical Director of its Waukegan, Ill. facility.

Wallace G. Bennett has been named President of Bennett's following the unexpected death of **Richard S. Bennett,** Dec. 3, 1976. His appointment caps a 28-year relationship with the company.

Bruning Paint Co., Inc., at its 55th annual meeting, announced the following promotions: **Irvin Ebaugh, Jr.,** formerly Vice-President of Sales, becomes Executive Vice-President of the company and General Manager of the Baltimore facility; **Lawrence M. Harris,** Eastern Sales Manager, is promoted to Vice-President of Sales; **W. James Dee** becomes Vice-President of Store Operations; **William A. Battles** was named Eastern Sales Manager; and **Thomas Cochran** was appointed Technical Director. Also, **Joseph E. Scarry** has joined the company as Laboratory Manager.

Craig J. Hartzell has joined the marketing staff of Glidden Pigments, SCM Corp. as Sales Representative in the New York metropolitan area for TiO_2, inorganic pigments, and fine particle silica.

Kelco Div. of Merck & Co., Inc. has appointed **Dr. David Hopgood** Section Head of Industrial Development. Previously, he was Manager of the applications laboratory of the Industrial Specialty Chemicals Dept. of Pfizer, Inc.

People (Continued)

Ronald H. Yocum, Director of Research and Development for Dow Chemical Latin America, has been appointed director of R & D for The Dow Chemical U.S.A. Designed Products Dept., Midland, Mich. He suceeeds **W.A. Rogers,** who recently was named Director of Product Research for Dow U.S.A.

John K. Bice, President of John K. Bice Co., Inc., has retired from that position after 33 years. He will continue as Chairman of the Board of the company.

Robert J. Nelson has joined the staff of the National Paint and Coatings Association as a Coatings Engineer in the Technical Div. He will work with NPCA committees and task forces, including the Roof Coatings Technical Subcommittee, Occupational Safety Task Force, Metric Conversion Task Force, and Packaging Committee. He was formerly Plant Technical Director for DeSoto, Inc., in Columbus, Ohio. In other staff assignments, the following were announced: **Raymond J. Connor** was given expanded duties as Assistant Technical Director; **Larry L. Thomas** was named Associate General Counsel; **Bruce Hamill** was appointed Assistant General Counsel; **Michael J. Duff** was named Legislative Counsel; **Georgene Savickas** was named Director of Meetings and Conventions, succeeding **Alan Darrow** who was given full-time duties as Assistant Director of the Trade Sales Div.

In a series of appointments, Union Carbide Corp. has named **Dr. Raymond G. Azrak** and **James P. Carolan** Market Managers in the Coatings Materials Dept. Both have responsibilities in the adhesive, binder, and sealant areas. Also, named as Technical Representatives are: **Brian Belluomini** with the Chemicals and Plastics Unit serving the metropolitan Chicago area; and **Richard Szymanski,** also with the Unit, serving the Cleveland area.

Fred F. Boehle, of Boehle Chemicals, Inc., Southfield, Mich., has been elected Secretary of the Chemical and Allied Industries Association of Michigan for 1977.

William H. Willert, Vice-President of Egan Machinery Co., has been chosen to receive the Society of Plastics Engineers' most prestigious honor, the International Award in Plastics Science and Engineering. Presentation will be made at the Society's Annual Technical Conference banquet on April 27 in Montreal. The Award is presented for outstanding contributions to the science and technology of plastics.

Obituary

Ben G. Robertson, 58, Chairman of the Board and Chief Executive Officer of Reliance Universal, Inc., died January 16. He has served as director of the company since 1941 and became its President in 1957.

Federation Seeks Technical/Education Director For Permanent Staff in Philadelphia Office

The Federation Board of Directors has approved the addition of a new position — Technical/Education Director — to its permanent staff operation in Philadelphia.

The position requires a person with a technical background and at least five years' experience in the coatings field.

The T/E Director will be primarily concerned with coordinating the technical, educational, and manufacturing activities of the Federation and its Societies, as well as representing the Federation in various industry liaison capacities, and other staff responsibilities, such as Annual Meeting, Communications, and Field Travel.

Interested persons are invited to contact Frank J. Borrelle, Executive Vice-President, Federation of Societies for Coatings Technology, 1315 Walnut Street, Philadelphia, Pa. 19107

Literature

Anti-Foam

Literature is now available which discusses a new nonpersistent anti-foam used to prevent the excessive foam in concentrate and refuse thickeners that traps mineral particles and prevents their recovery. The product is also reported to be beneficial as a filtering and de-watering aid in lead-zinc and taconite operations. When used as such, lower filter cake moisture can result. It is noncorrosive and can be used for any process where long anti-foam persistence would be detrimental. For more information on Nalco 7810, write Nalco Chemical Co., 2901 Butterfield Rd., Oak Brook, Ill. 60521.

Adhesion Testing

Information on a new, miniature, low-cost device to measure the adhesion, brittleness, and flexibility of coating materials on metal substrates is now available. The Gardco Mini-Cross-Cut Tester meets ASTM specifications. Further information may be obtained from Paul N. Gardner Co., P.O. Box 6633, Sta. 9, Ft. Lauderdale, Fla. 33316.

Test Charts

A newly-published catalog describes the complete line of paint test charts and laboratory equipment available from the Leneta Co. The 28-page booklet contains illustrations of over 30 test charts and details information on test methods and apparatus for the evaluation of leveling, sagging, and scrub resistance. A free copy of catalog No. 3 may be obtained from The Leneta Co., Ho-Ho-Kus, N.J. 07423.

Pigments

The performance and processing characteristics of pearlescent pigments are outlined in a new, 16-page brochure entitled "The Look of Pearl." To obtain a copy write E.I. du Pont de Nemours & Co., Inc., Pigments Dept., Wilmington, Del. 19898.

Closed Mill

A horizontal closed mill, developed in Britain, incorporates an internal pressure-limiting device on the main shaft, which contributes to a high output rate and permits handling viscous and difficult materials because it eliminates ball and roller milling. The C.H. Mastermill can be used for continuous production or large and small batches in wet milling of materials for the paint, printing ink, adhesive, and ceramic industries. For additional information write Matermix Engineering Co. Ltd., Heming Rd., Washford Industrial Estate, Redditch, Worcestershire B98 ODW England.

Filter Cartridges

A new, four-color brochure describes the features, advantages, applications, and operating information of a new line of filter cartridges. The filters may be used to handle both raw materials and end products with viscosities to 15,000 SSU, and at temperatures to 250°F. An interchangeability chart is also included. For more information, or to obtain the brochure on VIP filters, write The Carborundum Co., Filters Div., State Rt. 32 W., Lebanon, Ind. 48052.

Colorants

A new technical bulletin discusses a line of pigment dispersions designed for easy incorporation into a variety of commonly used plastic polymers. Less pigment is needed in these colorants to arrive at full color development because the dry pigments are predispersed. The bulletin points out that this system functions by establishing a wetting affinity between the preseparated pigment particles and the plastic. The colorants are available in two forms — granular and fine powder. Copies of this bulletin on Mupco® colorants are available from the Coatings & Specialty Products Dept., Hercules Incorporated, 910 Market St., Wilmington, Del. 19899.

Rust Prevention

A brochure has been published which lists the properties, performance, and suggested formulations of rust preventive concentrates. The 16-page booklet is designed as a guide for formulators and manufacturers of rust and corrosion preventatives and other protective coatings in selecting base applications. The concentrates are modified overbased metal salt dispersions which differ from other inhibitors in their dense layers of overlapping particles which provide a moisture barrier. For copies of the brochure, "SACI® Rust Preventive Concentrates," write Witco Chemical Corp., Sonneborn Div., 277 Park Ave., New York, N.Y. 10017.

Disperser/Mixer

A full-color, six-page brochure has been published which describes the availability, advantages, and specifications of a high-speed disperser. Operating at 9000 fpm, it is reported to be the fastest available commercial dissolver for difficult to dissolve materials. The brochure also includes photographs and detailed drawings illustrating the principle of operation. To obtain the booklet on the Daymax® mixer write Day Mixing, 4932 Beech St., Cincinnati, Ohio 45212.

Painting Systems

A new catalog listing directions for writing coatings specifications is now available. The 58-page publication also includes selection charts for quick determination of proper coatings products for all types of interior and exterior surfaces under normal exposures, and a guide for special purpose/heavy duty coatings. Product descriptions include recommended uses, performance information, surface preparation, application instructions, drying times, coating analysis, and film characteristics. Copies of the "Painting Systems Catalog for Specifiers and Applicators" are available from the General Manager, Professional Coatings Div., The Sherwin-Williams Co., 101 Prospect Ave., N.W., Cleveland, Ohio 44115.

Latex Stains

A new booklet on latex-based stains for exterior wood is now available. The booklet describes the availability of solid-color and semi-transparent stains for protecting and enhancing the grain and texture of wood. The use, effectiveness, and application methods are detailed. For a copy of the booklet, F-45641, "Latex Stains for Exterior Wood," write Union Carbide Corp., Coatings Materials, Dept. JLS, 270 Park Ave., New York, N.Y. 10017.

Directory

The 1977 Product Capability Directory, listing 47 coil coating companies, is now available. Each listing describes minimum and maximum metal thicknesses available. Also included are special capabilities, locations, and personnel contacts for each company. Free copies may be obtained from the National Coil Coaters Association, 1900 Arch St., Philadelphia, Pa. 19103.

Literature (Continued)

Coupling Agents

A newly released bulletin contains 43 figures and 32 tables outlining current significant developments in the area of highly filled PVC, epoxy, and coatings. Alternatives for metal chromate replacement, lowering the temperature of baked alkyds, and corrosion protection are suggested. The bulletin supplements two previous releases. For a copy write Kenrich Petrochemicals, Inc. E. 22nd St., Bayonne, N.J. 07002.

Viscosity Measurement

Articles and reprints covering the complete spectrum of rheological studies in viscosity measurement and control are now available. Authored by independent authorities, they may be obtained, free of charge, from Brookfield Engineering Laboratories, Inc., Dept. NR24, 240 Cushing St., Stoughton, Mass. 02072. It is advised that an updated listing of titles and summaries described in Data Sheet 091-B be consulted first.

Tank Cleaning

Literature is now available which describes a new high impact rotating tank cleaning spray nozzle. Developed for high impact spray impingement cleaning, the nozzle's ¾" inlet connection makes it adaptable to most pipe headers and pumping systems. It operates by hydraulic pressure and uses no external air motors or drive mechanisms. For complete information on the Turbojet spray nozzle write Wellco Chemical Co., Dept. RN, P.O. Box 11504, Chicago, Ill. 60611.

Paint Driers

A new 12-page bulletin now being offered lists extensive technical information on the use of metallic carboxylate driers in paints and varnishes. The brochure discusses drier technology, types of metals used in applications, and the factors that influence proper drier selection. Copies of bulletin No. 418 are available from Witco Chemical Corp., Organics Div., 400 N. Michigan Ave., Chicago, Ill. 60611.

Surfactants

A brochure has been released which lists the performance data of nonionic surfactants in water-borne coatings formulations for paints, inks, and adhesives. Depending on specific formulation, these surfactants can perform as wetting agents, dispersants, viscosity stabilizers, or defoamers. In addition, they are nonfoaming or defoaming wetting agents which provide improved coverage on metal surfaces. Copies are available from Air Products and Chemicals, Inc., Acetylenic Chemicals Div., Box 538, Allentown, Pa. 18105.

Pigment Dispersion

Important breakthroughs in mixing, blending, and reacting technology are described in a new brochure detailing Micar®, a continuous mixer-reactor. A new flexibility of design has allowed processing of a wide variety of materials. For more information write Ecar Products, Inc., Park 80 Plaza East, Saddle Brook. N.J. 07662.

Enamels

A 20-page booklet discusses the use of Esterdiol-204 in the preparation of water-borne, oil-free polyesters for thermosetting baking enamels. Nine formulations for enamels and primers are outlined along with outstanding features and major application areas of each formula. The formulations are used for metal decorating, automotive, appliance, coil coating, and primer applications. The booklet details formulating parameters and describes ingredients and procedures for preparation. Physical properties and specifications are tabulated, as are storage and handling procedures. For a copy of booklet F-45629 write Union Carbide Corp., Coatings Materials, Dept. JLS, 270 Park Ave., New York, N.Y. 10017.

Book Review

ULTRAVIOLET LIGHT REDUCED REACTIONS IN POLYMERS

Edited by Santokh S. Labana
American Chemical Society
Washington, D.C.
1976 (495 pages)
$23.00

Reviewed by
Howard S. Bender
Research Laboratories
General Motors Corp.
Warren, Mich. 48090

This work is No. 25 in the American Chemical Society (ACS) Symposium series and contains 29 papers presented at the 169th meeting of the ACS in Philadelphia, Pa., April 8-9, 1975. The papers were published as submitted by the authors and were edited or reviewed by the symposium chairman in order to expedite their publication.

As stated in Dr. Labana's preface, approximately one-half of the papers concern photopolymerization reactions while the rest deal with photodegradation of polymers. Of the papers presented, 17 are from academic laboratories, eight from industrial concerns, and the remainder from government or consulting laboratories. The editor has endeavored to make this an international symposium with more than one-half the papers (15) being authored by workers outside the U.S. with Japan and Canada being well represented.

Although a listing of the subjects covered would be a listing of symposium titles, the theme throughout the book is the use of ultraviolet light to either photopolymerize or photodegradate. Theoretical papers are presented as well as practical ones, for as Dr. Labana has stated, "the need to reduce solvent emissions and to conserve energy in coatings and printing inks has stimulated investigations of the applications of photopolymerization reactions."

This book, although highly specialized, is recommended to those presently conducting or planning to conduct research in this interesting and important field.

Coming Events

FEDERATION MEETINGS

(May 20)—Spring Council Meeting. The Galt House, Louisville, Ky.

(Oct. 26-28)—55th Annual Meeting and 42nd Paint Industries' Show. Astrohall, Houston, Texas. (FSCT, Suite 830, 1315 Walnut St., Philadelphia, Pa. 19107).

SPECIAL SOCIETY MEETINGS

(Apr. 27)—Detroit Society Symposium on "FOCUS '77—Future of Coatings Under Study." Michigan Inn, Southfield, Mich. (J. M. Dentler, 765 Dellwood Dr., Ann Arbor, Mich. 48103).

(May 2)—Philadelphia Society Seminar, "Nonpetroleum-Based Coatings/Raw Materials." Hilton Hotel, Mt. Laurel, N.J. (J. Richard Kiefer, Jr., McCloskey Varnish Co., 7600 State Rd., Philadelphia, Pa. 19136).

(May 5-7)—Pacific Northwest Society Spring Symposium. Thunderbird Motor Inn, Portland, Ore. (John Hatfield, Reliance Universal, Inc., 1660 Cross St., S.E., Salem, Ore. 97302).

(June 3-4)—Kansas City and St. Louis Annual Joint Meeting. Millstone Lodge, Lake of the Ozarks, Mo. (James N. Edwards, Conchemco, Inc., P.O. Box 37, Kansas City, Mo. 64141).

(June 13)—Golden Gate Society Manufacturing Seminar, "Government Agencies' Regulations—Have Reasons." (Louie F. Sanguinetti, Jasco Chemical Corp., 1090 Terra Bella, Mountain View, Calif. 94042).

PAINT RESEARCH INSTITUTE MEETING

(May 16-17)—Paint Research Institute Symposium on Mildew Vulnerability. Battelle Memorial Institute, Columbus, Ohio. (Dr. Raymond R. Myers, Chemistry Dept., Kent State University, Kent, Ohio 44242).

OTHER ORGANIZATIONS

(April 4-6)—Course on Introduction to Polymer Chemistry. International Hotel, New Orleans, La. (Department of Continuing Information, University of New Orleans, New Orleans, La. 70122).

(April 5)—NPCA Product Liability Seminar. Executive West Hotel, Louisville, Ky. (Georgene Savickas, National Paint and Coatings Association, 1500 Rhode Island Ave., N.W., Washington, D.C. 20005).

(April 11-13)—New York University School of Continuing Education Seminar on "Cleaning, Coating, and Finishing Metals." Chicago, Ill. (Heidi E. Kaplan, New York Management Center, Dept. 14NR, 360 Lexington Ave., New York, N.Y. 10017).

(April 15-17)—Western Decorating Products Show. Disneyland Hotel Convention Center, Anaheim, Calif. (National Decorating Products Association, 9334 Dielman Industrial Drive, St. Louis, Mo. 63132).

(April 18-19)—Inter-Society Color Council Annual Meeting. Statler-Hilton Hotel, New York, N.Y. (Dr. Fred W. Billmeyer, Jr., % Department of Chemistry, MRC Room 217, Rensselaer Polytechnic Institute, Troy, N.Y. 12181).

(April 25-26)—Washington Paint Technical Group's 17th Annual Symposium. Marriott Twin Bridges Hotel. (Mildred A. Post, % U.S. Dept. of Commerce, National Bureau of Standards, Washington, D.C. 20234).

(April 25-28)—Society of Plastics Engineers Annual Technical Conference. Queen Elizabeth Hotel, Montreal, Quebec, Canada. (Eugene E. Wilson, SPE, 656 W. Putnam Ave., Greenwich, Ct. 06830).

(Apr. 25-29)—"Filtration Days '77." Conference and Exposition on Filtration Technology. Sheraton Hotel, Valley Forge, Pa. (Filtration Society, P.O. Box 126, Mount Holly Springs, Pa. 17065).

Coming Events (Continued)

(May 8-11)—National Coil Coaters Association Annual Meeting. St. Francis Hotel, San Francisco, Calif. (Jere Lawrence, NCCA, 1900 Arch St., Philadelphia, Pa. 19103).

(May 8-12)—Annual Spring Meeting of American Oil Chemists' Society. Americana Hotel, New York, N.Y. (AOCS, 508 S. Sixth St., Champaign, Ill. 61820).

(May 17-18)—Flat Line Board Finishing Workshop. Radisson Plaza Hotel, Charlotte, N.C. (Association for Finishing Processes of SME, 20501 Ford Rd., Dearborn, Mich. 48128).

(May 19-20)—1977 International Symposium on Flammability and Fire Retardants. Sheraton-Park Hotel, Washington, D.C. (Vijay Mohan Bhatnagar, 209 Dover Rd., Cornwall, Ontario, Canada K6J 1T7).

(May 31-June 3)—5th Symposium on Electrocoating. Budapest, Hungry. (Laszlo Prockl, Scientific Society of Mechanical Engineers, 1372 Budapest P.O.B. 451).

(June 1-3)—Symposium on "Improving Protective Performance of Coatings." North Dakota State University, Fargo, N.D. (Dr. Zeno W. Wicks, Jr., Polymers and Coatings Dept., North Dakota State University, Fargo, N.D. 58102).

(June 5-10)—Short Course on "Polymer Blends, Grafts, and Blocks." Lehigh University, Bethlehem, Pa. (Jone Svirzofsky, Materials Research Center, Coxe Laboratory, Bldg. #32, Lehigh University, Bethlehem, Pa. 18015).

(June 7-9)—Second International Deburring & Surface Conditioning Conference and Exposition. Holiday Inn/Kennedy Convention Complex, Chicago, Ill. (Technical Divisions Dept., Society of Manufacturing Engineers, 20501 Ford Rd., Box 930, Dearborn, Mich. 48128).

(June 16-19)—Oil and Colour Chemists' Biennial Conference. Grand Hotel, Eastbourne, Sussex, England. (The Director & Secretary, Oil and Colour Chemists' Association, Priory House, 967 Harrow Road, Wembley, Middlesex HAO 2SF, England).

(June 26-29)—American Society for Testing and Materials Annual Meeting. Denver, Colo. (ASTM, 1916 Race St., Philadelphia, Pa. 19103).

(July 10-15)—Third Congress of the International Colour Association, "Color 77." Rensselaer Polytechnic Institute, Troy, N.Y. (Dr. Fred W. Billmeyer, Jr., Dept. of Chemistry, Rensselaer Polytechnic Institute, Troy, N.Y. 12181).

(July 14-15)—European Conference on Flammability and Fire Retardants. Sheraton Hotel, Brussels, Belgium. (Vijay Mohan Bhatnagar, 209 Dover Rd., Cornwall, Ontario, Canada K6J 1T7).

(July 18-22)—3rd International Conference in Organic Coatings Technology. Athens, Greece. (Carole Brookshire, University of New York at New Paltz, New Paltz, N.Y. 12561).

(Sept. 14-15)—Symposium on "UV Polymerization and the Coatings Industry," sponsored by Newcastle-upon-Tyne Section of Oil and Colour Chemists' Association. (H. Fuller, Tioxide International Ltd., Carlton Weathering Station, Yarm Back Lane, Stockton-on-Tees, Cleveland TS21 1AX, England).

(Sept. 25-28)—First International Convention of Oil & Colour Chemists' Association of Australia. Canberra, Australia. (Oil & Colour Chemists' Association of Australia, P.O. Box 93 Punchbowl, 2196, Australia).

(Oct. 5-7)—National Coil Coaters Association Fall Technical Meeting. Hyatt Regency O'Hare, Chicago, Ill. (Jere Lawrence, NCCA, 1900 Arch St., Philadelphia, Pa. 19103).

(Oct. 18-20)—"Finishing '77" Conference and Exposition. Cobo Hall, Detroit, Mich. (Jon Grove, Association for Finishing Processes of SME, 20501 Ford Rd., Dearborn, Mich. 48128).

(Nov. 7-10)—Society of Plastics Engineers National Technical Conference on "Safety and Health with Plastics." Regency Inn, Denver, Colo. (Eugene E. Wilson, SPE, 656 W. Putnam Ave., Greenwich, Ct. 06830).

(Nov. 14-16)—14th Annual Meeting of the Society of Engineering Science, Inc. Lehigh University, Bethlehem, Pa. (Dr. George C. Sih, Director, Institute of Fracture and Solid Mechanics, Lehigh University, Bethlehem, Pa. 18015).

(Nov. 18-20)—Annual National Decorating Products Show. McCormick Place, Chicago, Ill. (National Decorating Products Association, 9334 Dielman Industrial Drive, St. Louis, Mo. 63132).

1978

(May 4-6)—Pacific Northwest Society Spring Symposium. Seattle, Wash. (John Hatfield, Reliance Universal, Inc., 1660 Cross St., S.E., Salem, Ore. 97302).

(June 4-9)—XIVth FATIPEC Congress. Budapest, Hungary. (Dr. L. Kovacs, Magyar Kemikusak Egyesulete, H-1368 Budapest Pf. 240, Hungary).

(July 10-13)—World Conference on Future Sources of Organic Raw Materials. Toronto, Canada. (Chemical Institute of Canada, 906-151 Slater St., Ottawa, Ontario, Canada K1P 5H3).

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POLYWET dispersants are non-foaming, anionic polyelectrolytes recommended for dispersing pigments in water in a variety of applications, including: slurry shipment, latex paint, specialty coatings, paper coatings and water treatment systems.

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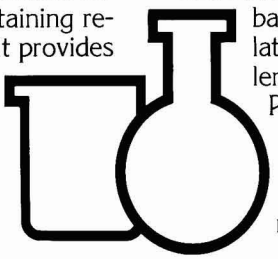

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Or, write to Uniroyal Chemical, E.M.I.C. Bldg., Naugatuck, CT 06770

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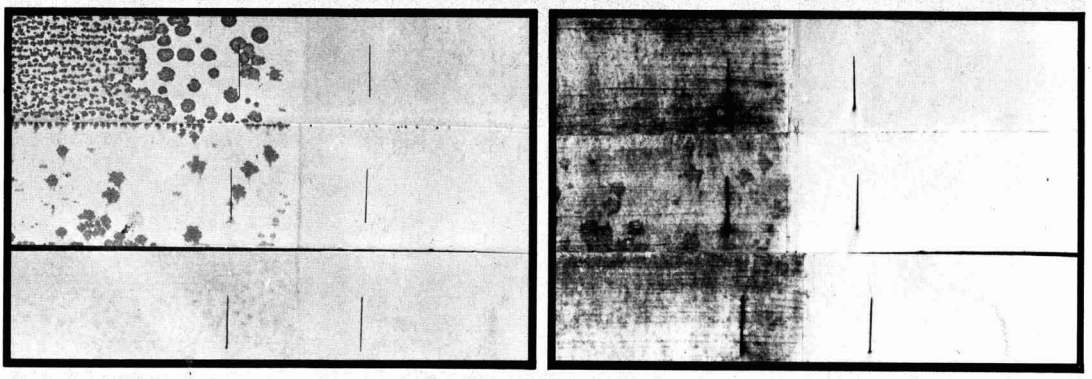
Because it's the proven one.



The photo on the left indicates no flash rusting at the start . . . and to the right, the same panel after nine years of exposure is still free of rust. An extra benefit of Busan® 11-M1 is that it is also a fungicide. For suggested formulations, check with your resin supplier, or Buckman Laboratories.

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