EPA-600/R-98-131
October 1998

DEMONSTRATION OF A NO-VOC/NO-HAP WOOD KITCHEN CABINET COATING SYSTEM

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EPA Contract No. 68-D5-0128 (Option 2)

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Research Triangle Park, NC 27711

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16. ABSTRACT The report gives results of the development and demonstration of a no-VOC (volatile organic compound)/no-HAP (hazardous air pollutant) wood furniture coating system at two cabinet manufacturing plants: one in Portland, OR, and the other in Redwood City, CA. Technology transfer efforts were made by presentations at conferences and workshops and publication in journals. Seven wood kitchen cabinet manufacturers in California's South Coast Basin were surveyed to gain a more in depth understanding of problems faced when switching from solvent- to water-based coatings. Although not under this contract, the report also discusses the adaptability of the coating to metal substrates on chassis components, demonstrated at two large recreational vehicle manufacturers. It also discusses a preliminary analysis of the potential for incorporating epoxidized vegetable oils into new resins.

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ABSTRACT

The United States Environmental Protection Agency has contracted with AeroVironment Environmental Services, Inc. and its subcontractor, Adhesive Coatings Co., to develop and demonstrate a no-VOC (volatile organic compound)/no-HAP (hazardous air pollutant) wood furniture coating system. The overall objective of this contract was to promote the wider utilization of low-to-no-VOC/HAP wood furniture coatings. The results of the basic contract, to demonstrate the application of this coating system to residential wood furniture, have already been published. The objective of Option 2 (Option 1 was not exercised) of this contract was to demonstrate the coating system at one or more kitchen cabinet manufacturing plants and to implement the technology transfer plan to make furniture manufacturers aware of the product's application and performance characteristics.

This no-VOC/no-HAP coating system was demonstrated at cabinet manufacturing plants in Portland, OR, and Redwood City, CA . Technology transfer efforts were made by presentations at conferences and workshops and publication in journals.

A survey of seven wood kitchen cabinet manufacturers in California's South Coast Basin was conducted to gain a more in depth understanding of the problems they faced when switching from solvent- to water-based coatings.

Outside of this contract, the adaptability of the coating to metal substrates on chassis components was demonstrated at two large recreational vehicle manufacturers. Also outside of this contract, preliminary analysis of the potential for incorporating epoxidized vegetable oils into new resins was completed.

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ACKNOWLEDGMENTS

This study was conducted under USEPA Contract 68D50128 (Option 2) by AeroVironment Environmental Services, Inc. The author would like to thank the Adhesive Coatings Co. staff for their technical support, Boden Store Fixtures in Portland, OR, for their participation in the demonstration, and wood kitchen cabinet coaters for sharing their data and concerns with us.

1.0 INTRODUCTION

Under United States Environmental Protection Agency (USEPA) sponsorship, AeroVironment Environmental Services, Inc. and Adhesive Coatings Co. (ADCO) are teamed to develop and demonstrate a no-VOC (volatile organic compound)/no-HAP (hazardous air pollutant) wood furniture/cabinet coating system. This two-part system consists, in general, of an epoxy resin emulsion and an aqueous solution of a reaction product of certain polyamines and urea-formaldehyde ether monomers[1,2,3]. The performance characteristics of this new coating system are excellent in terms of adhesion, drying times, gloss, hardness, mar resistance, level of solvents, and stain resistance[4,5]. In Option 2 of this contract, the coating system has been demonstrated by two cabinet manufacturers. A technology transfer plan was implemented to encourage widespread usage.

A survey of seven kitchen cabinet manufacturers was conducted to gain an understanding of the effort made by the kitchen cabinet industry to change over to water-based coating systems in general.

Two activities germane to the project but not funded by this EPA contract are described in Appendix C of the final report. (1) Results of demonstrations by Sierra Performance Coatings at two recreational vehicle (RV) manufacturers, where the new coating system was evaluated as a rust-inhibiting coating for chassis components. (2) ADCO undertook a preliminary analysis of the potential for incorporating epoxidized vegetable oils into new resins.

2.0 DEMONSTRATION

2.1 Approaches

Many facilities were contacted to find 1 or 2 that would try this no-VOC/no-HAP wood coating. Information sent to the contacted parties included technical data sheets, material safety data sheets (MSDS) and published papers. Then, AVES and ADCO staff made follow-up phone calls and/or visited the facilities who were interested in this system. Wood panels coated with this coating system were also sent to some of the facilities for their examination and testing. The following is a list of facilities contacted.

American Classics Cabinetry
7333 Cold Water Canyon, Bld. No. 38
North Hollywood, CA 91605
(818) 503-0485/(818) 503-0542 (FAX)

Asian Neighborhood Design
1232 Connecticut Street
San Francisco, CA 94017
(415) 648-7070/(415) 648-6303 (FAX)

Barbosa Cabinets
5000 Bailey Ave.
Tracy, CA 95376
(209) 836-2501/(209) 836-0847 (FAX)

Becker Zeyko
1030 Marina Village Pkwy.
Alameda, CA 94501
(510) 865-1616

Boden Store Fixtures
41780 Christy Street
Portland, Oregon 97230
(503) 252-4728/(503) 252-4932 (FAX)

Cal Mode Furniture Mfg. Co.
Culver City, CA
(213) 870-4821/(310) 202-0720 (FAX)

Catalina Furniture
La Mirada, CA 90638
(714) 523-7000

Cervitor Kitchens
10775 Lower Azusa
El Monte, CA 91731
(818) 443-0184/(818) 443-0400 (FAX)

Douglas Furniture Corp.
Redondo Beach, CA 90277
(310) 692-7668/(310) 536-0636 (FAX)

Douglas Furniture of California, Inc.
Redondo Beach, CA 90277
(310) 643-7200

Edgewater Cabinets
P.O. Box 127
Boring, OR 97009
(503)663-1341/(503) 663-2523 (FAX)

Eurodesign Cabinets, Inc.
13428 Benson Ave.
Chino, CA 91710
(909) 590-4300

Fairway Painting
1150 University Drive, Suite 109
Menlo Park, CA 94025
(650) 322-4166

G & H Cabinet, Co.
7660 Densmore
Van Nuys, CA 91406
(818) 786-4141

Gaylan Industries
2106 Glassel
Orange, CA
(714) 282-2284

Gem's Cabinet, Inc.
12201 Magnolia Ave.
Riverside, CA 92503
(909) 371-3530

Houck Industries, Inc.
Tulare, CA 93274
(209) 688-2983

Keller Thomas Woodworks
Redwood City, CA 94063
(415) 369-2468

Kitchen Cabinet Manufacturers Association
1899 Preston White Dr.
Reston, VA 22091-4326
(703) 264-1690

Marge Carson
9056 E. Garvey
Rosemead, CA 91770
(818) 571-1111

Monschein Industries, Inc.
6344 Roselle Ave. Suite 101
Riverbank, CA 95367
(209) 869-4514/(209) 869-1464 (FAX)

Quality Cabinets
515 Big Stone Gap Road
Duncanville, TX 75115
(972) 298-6101/(972) 709-7753 (FAX)

Royal Cabinets
Pomona, CA 91769
(909) 629-8565

Snaidero Intl.
201 W 132nd St.
Los Angeles, CA 90061
(310) 516-8499

South Coast Cabinet
755 Pinefalls Ave.
Walnut, CA 91789
(909) 444-1380

Standard Cabinet Works, Inc
Los Angeles, CA 90086
(213) 749-2111

Texas Cabinet Doors, Inc
4078 Shilling Way
Dallas, TX 75237
(423) 586-7233

Virco Mfg. Group
Torrance, CA 90503
(310) 533-0474

W. L. Rubottom Co., Inc.
320 West Lewis Street
Ventura, CA 93001
(805) 648-6943/(805) 648-7856 (FAX)

Walker Wood Products, Inc.
2872 South Santa Fe Ave.
San Marcos, CA 92069-6099
(619) 727-4700/(619) 727-3022 (FAX)

Wambold Furniture
Simi Valley, CA 93065
(805) 526-5200

Western Construction and Engineering
1535 Chestnut Street
Redwood City, CA 94063
(650) 322-4166

Worthern Enterprises, Inc.
Dba Classic Cabinets
4620 Raley Blvd.

Sacramento, CA 95838
(916) 922-6029/(916) 922-2904 (FAX)

Zelco Cabinet Manufacturing
298 West Robles Ave.
Santa Rosa, CA 95407
(707) 584-1121/(707) 584-5071 (FAX)

2.2 First Demonstration

The first cabinet demonstration was conducted at Boden Store Fixtures, Portland, Oregon, on September 29, 1997. This plant manufactures wood products including cabinets. The purpose of the demonstration was to show that this new no-VOC/no-HAP wood coating system could be used successfully on kitchen cabinets. Product Data Sheets and Material Safety Data Sheets can be found in Appendix B. The following summarizes the demonstration process.

Date:	September 29, 1997
Place:	Boden Store Fixtures 41780 Christy Street Portland, OR 97203
Present:	Robert McCrillis - U.S. Environmental Protection Agency Eddy Huang - AeroVironment Environmental Services, Inc. Gary Effenberger - Boden Store Fixtures James Shannon, Jr. - Adhesive Coatings Co. James Birdsall - Adhesive Coatings Co.
Products used:	New No-VOC/No-HAP Wood Topcoat Gloss (WTC-96-RT4) New No-VOC/No-HAP Wood Topcoat Satin (WTC-96-ISA) New No-VOC/No-HAP Wood Sanding Sealer (WSS-96-25) New No-VOC/No-HAP Stain Base (WST-96-3)

AVES and ADCO worked with Gary Effenberger of Boden Store Fixtures, Portland, Oregon to set up a demonstration on September 29, 1997. During the demonstration, Boden and ADCO staff applied with a rag, the stain base mixed with Boden's pigmentation to meet their color requirements. Sanding sealer was then sprayed on the maple "Coffee Story" cabinet custom made for Star Buck Coffee Stores. This step was performed in the spraying booth. After the sanding sealer was dry enough to be sanded (in about 15 minutes), the wood surface was lightly sanded. The satin top coat was then sprayed onto the cabinet. It took about 20 minutes for the top coat to dry. Stain, sanding sealer, and gloss and satin top coat were also applied to other wood panels including pine, oak, and mahogany. Boden Store Fixtures staff were quite satisfied with the results. They asked for a gallon of clear satin top coat so that they could spray it on their current products without having to worry about matching the color. Boden Store Fixtures staff will try to use existing stains and sealer, then

apply the new top coat on their products. This type of stepwise conversion is much easier for the manufacturer to accept.

2.3 Second Demonstration

There is severe water damage in the Stanford University Main Library Basement due to flooding. Stanford University contracted Fairway Painting (Menlo Park, California) to restore the damaged cabinets including repainting and refinishing. AVES and ADCO staff contacted Fairway Painting and set up the arrangement to use ADCO's no-VOC/no-HAP wood cabinet coatings in the refinishing process.

Demonstration of the new no-VOC/no-HAP wood coating system was conducted at Fairway Painting's offsite shop (Western Construction and Engineering) at Redwood City, California, on March 23, 1998. This shop specializes in painting and refinishing wood products (including cabinets). The purpose of the demonstration was to show that this new wood coating system could be used successfully to finish/refinish cabinets. Product Data Sheets and Material Safety Data Sheets can be found in Appendix B. The following summarizes the demonstration activity.

Date:	March 23, 1998
Place:	Western Construction and Engineering 1535 Chestnut Street Redwood City, CA 94063
Present:	Eddy Huang - AeroVironment Environmental Services, Inc. Harry Finkle - Fairway Painting Norm Biron - Fairway Painting Jim Shannon - Adhesive Coatings Co. Patrick Terrizzi - Adhesive Coatings Co. Bill Durgall - Sierra Performance Coatings (licensed by ADCO to market the new coatings)
Products used:	New No-VOC/No-HAP Wood Topcoat Satin (S-81-03) New No-VOC/No-HAP Wood Sanding Sealer (S-91-03) New No-VOC/No-HAP Stain Base (S-93-03)

During the demonstration, ADCO staff applied the no-VOC stain base mixed with Fairway Painting's pigmentation to meet color requirements. The sanding sealer was then sprayed on the alder cabinet and oak molding pieces. This step was performed in the spraying booth. After the sanding sealer was dry enough to be sanded (in about 12 minutes), the wood surface was lightly sanded. A second coat of sanding sealer was then applied on the cabinet surface to improve its durability. Since the wood surface was filled with the first layer of sanding sealer, it took about 15

minutes for the second layer of sanding sealer to dry. The topcoat was then applied on the cabinet surfaces. (See Figures 1 and 2.) It took about 20 minutes for the topcoat to dry to touch. Stain, sanding sealer, and topcoat were also applied to other wood panels including oak molding. Western Construction and Engineering staff were quite satisfied with the results.

It should be noted that the coatings dried quickly without leaving any milky appearance, in spite of the fact that it was a cold, rainy day and the demonstration took place in an old, drafty warehouse. In fact, dry times were not significantly different from those observed under more favorable weather conditions.

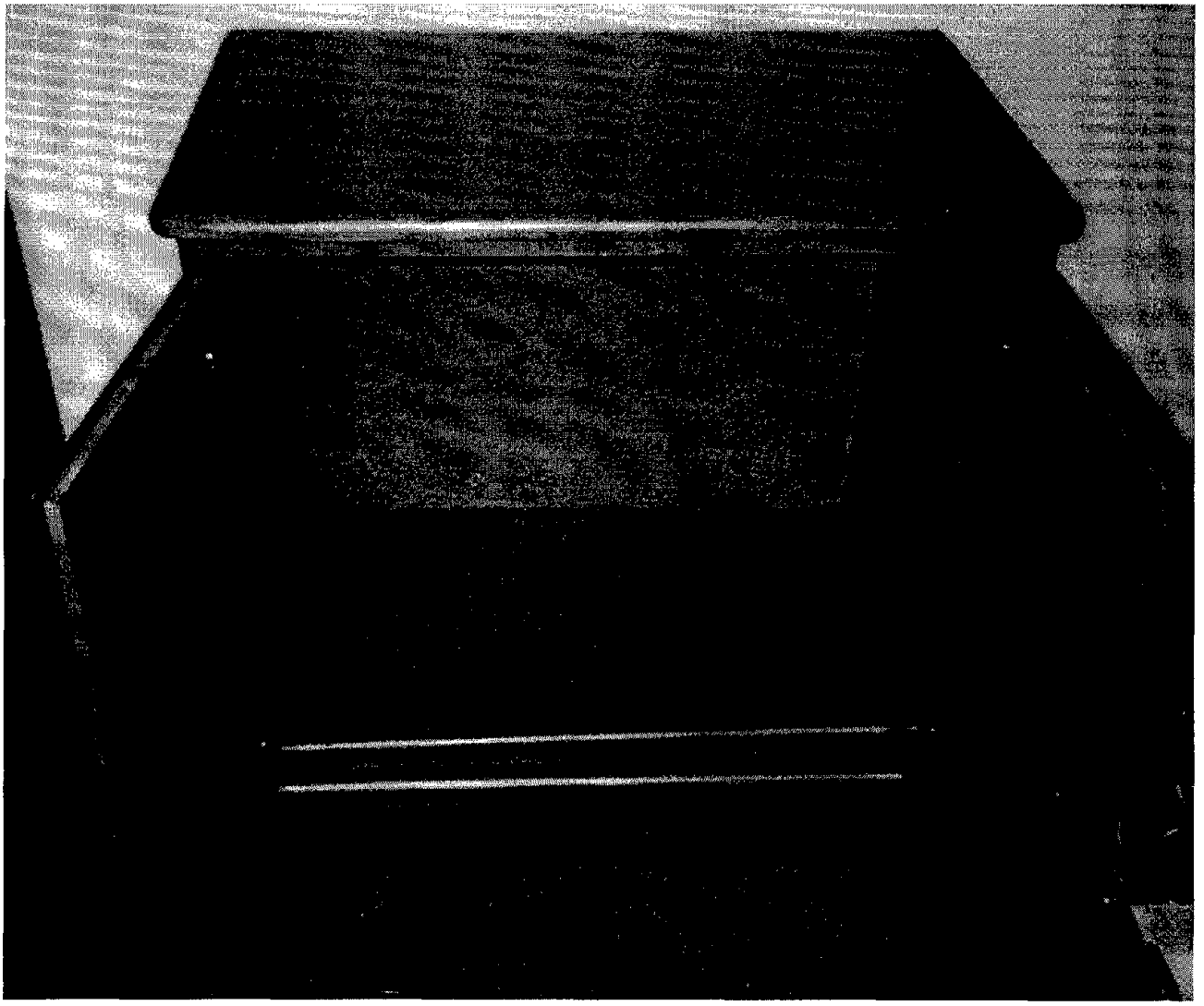

Figure 1. Stanford University library cabinet (doors open) after refinishing with no-VOC/HAP stain, sanding sealer, and satin top coat. Nonparallel sides caused by camera closeup lens distortion.

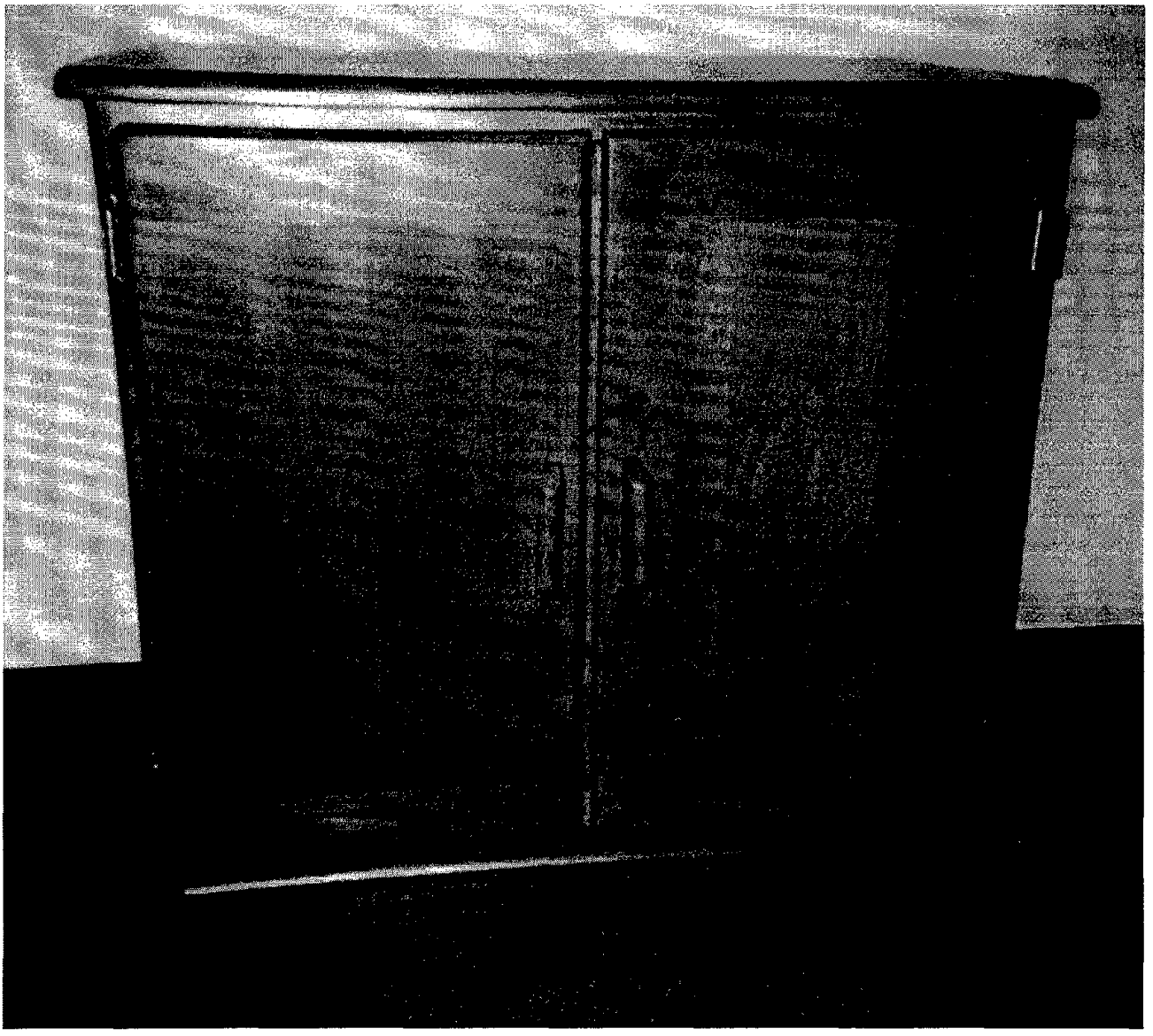

Figure 2. Stanford University library cabinet (doors closed) after refinishing with no-VOC/HAP stain, sanding sealer, and satin top coat. Note that nonparallel sides are due to distortion caused by camera closeup lens.

3.0 TECHNOLOGY TRANSFER

The following is a summary of the technology transfer efforts made by AVES and ADCO staff for this contract.

- An article authored by AVES staff (Eddy W. Huang , Ruiling Guan) and EPA Project Officer (Robert C. McCrillis) and presented at an AWMA Specialty Conference[6] was also published in Coatings World journal[7].

- AVES Staff , Eddy Huang was invited to present "No-VOC Coating Technologies" at the "Pollution Prevention 2000 Conference and Exhibition" held in Southern California Gas Company Energy Resources Center, Downey, CA, August 7, 1997.

- The team prepared and presented new information on no-VOC/no-HAP wood furniture/cabinet coatings at the "New Technologies for Clean Air" symposium from September 29, 1997 through October 1, 1997 in U.C. Irvine, California. This symposium is co-sponsored by the California Air Resources Board (CARB), the California Air Pollution Control Officers Association, the U.S. Environmental Protection Agency, and the California Environmental Dialogue. This was a good opportunity for community outreach and technology transfer.

- AVES and ADCO worked with the EPA Project Officer, Robert C. McCrillis, to present new information on no-VOC/no-HAP wood furniture/cabinet coatings at the "EPA Pollution Prevention/Green Manufacturing Conference" held November 17-19, 1997 in Atlanta, GA. In addition to the new coating's performance characteristics, cost analysis and environmental impact analysis data were also included in the presentation[8]. ADCO staff set up an exhibition booth and displayed wood panels coated with the new stain, sealer, and topcoat. Coating product data sheets and material safety data sheets were displayed on the table and distributed in the exhibition. This was the second occasion for community outreach and technology transfer.

- ADCO finalized a licensing agreement with Sierra Performance Coatings, Inc. to manufacture ADCO's no-VOC coatings; the complete no-VOC/no-HAP wood furniture coating system is now commercially available.

- Eddy Huang was invited as a conference speaker to present new information on no-VOC/no-HAP wood furniture/cabinet coatings at the "Emerging Low-Emission Technologies and Innovative Approaches to Air Pollution Control"symposium on December 5, 1997 at the South Coast Air Quality Management District. In addition to the new coating's performance characteristics, cost analysis and environmental impact analysis data were also included in the presentation. This was the third event of the technology transfer efforts.

4.0 MANUFACTURER FOLLOW-UP PROGRAM

As noted previously, AVES staff contacted many cabinets manufacturers and solicited their participation in production scale demonstrations. In addition, a survey of seven kitchen cabinet manufacturers using a variety of water-based coatings (but not the new coating) was conducted to better understand the problems they faced when switching from solvent-based coatings. The following is a summary of the survey results. Appendix A contains a brief description of the current coatings used by the seven companies.

1. Question: What kind of wood is coated at this facility?
Answers:

Type	Oak	Walnut	Maple
Solid	6	1	4
Veneer	6	1	3
Plywood	4	1	1

2. Question: Is the final product finish satisfactory? Any comments about no-/low-VOC coatings?
Answers:

- We are able to overcome the difficulties when converting to water-based coatings
- Happy with the appearance
- The current water-base coating we use dries as fast as the solvent-based coating
- More time is needed for drying and it takes a lot of storage space
- Milking problem
- Difficulties in achieving film thickness
- Since the current (solvent-based) coating system meets the regulations, we don't want to switch to water-based coating
- Water-base coatings don't pass UV stability test
- Edge soak is an issue when we test water-based coatings
- Can't compete with the quality achieved with the solvent-based coatings
- Positive response in general

3. Question: Are additional steps in your manufacturing process necessary in order to use the no-/low-VOC coatings you've tried?
Answers:
Yes. (5)

4. Question: Will additional employees be required because of the implementation of no-/low-VOC coatings?
Answers:
No. (5)

5. Question: What type of application equipment are you using?
Answers:
HVLP/Air Assisted Airless (5/1)

6. Question: Do you experience any problems cleaning the equipment?
Answers:
Yes/No. As long as you handle it properly. (2/3)

7. Question: Does your coating need to be force dried? Do you have ovens or drying equipment?
Answers:
Yes/No (4[a]/3)

8. Question: Do you have a conveyor?
Answers:
Yes/No (1/5)

[a] 3 Gas Ovens and 1 IR.

5.0 CONCLUSIONS AND RECOMMENDATIONS

1. There are water-based coatings available on the market[9]. Some manufacturers are able to overcome the difficulties associated with water-based coating (such as grain raising, color matching and edge soak) when converting from solvent based coatings.

2. The performance characteristics of this new wood coating are excellent. This water-based coating system drys as fast as many of the solvent-based coating systems and faster than most combination water/solvent coatings.

3. When using this new no-VOC, no-HAP water-based coating, additional finishing steps may required. However, most facility owners do not expect to add additional employees.

4. The keys to successful conversion to new water-based coatings are staff training and technical support from the coating manufacturers. Personnel may need retraining on spraying techniques for water-based wood coating applications[10].

5. As a first step, manufacturers will try to use existing stains and sealer, then apply the no-VOC top coat on their products. This type of stepwise conversion is much easier for the manufacturer to accept.

6. Demonstrations at two cabinet manufacturing facilities showed that the new coating system was adaptable to this type of application. Dry times of 15 - 20 minutes for each coat were typical without use of auxiliary heating, even in humid atmospheric conditions.

7. Independent demonstrations by the coating vendor at two large RV manufacturers showed that the new coating provided excellent corrosion protection on chassis components. The current organic solvent-based coating failed the ASTM salt spray test after 192 hours, whereas the new coating continued on for 1700 hours before showing any sign of failure.

6.0 REFERENCES

1. U.S. Patent No. 4,812,493, "Dual cure rate water-based coating composition," Adhesive Coatings Co., San Mateo, CA, March 14, 1989.

2. U.S. Patent No. 4,906,726, "Water-based coating compositions containing hydroxides and oxides of calcium and strontium and barium," Adhesive Coatings Co., San Mateo, CA, March 6, 1990.

3. Huang, E.W., L. Watkins, and R.C. McCrillis, "Formulating Ultra-Low VOC Wood Furniture Coatings," Modern Paints and Coatings, Vol. 83, No. 12, November 1993, pg. 41-43.

4. Huang, E.W., and R.C. McCrillis, "Developing a No-VOC Wood Topcoat," Modern Paints and Coatings, Vol. 85, No. 7, July 1995, pg. 38-41.

5. Huang, E.W., Development of a No-VOC/No-HAP Wood Furniture Coatings System, EPA-600/R-98-019 (NTIS PB98-127301), U.S. Environmental Protection Agency, National Risk Management Research Laboratory, Research Triangle Park, NC, February 1998.

6. Huang, E.W., R. Guan, and R.C. McCrillis, "Demonstration of No-VOC/No-HAP Wood Furniture Coating System," in Proceedings: Emerging Solutions to VOC and Air Toxics Control, Air & Waste Management Association, February 25-27, 1997, San Diego, CA,

7. Huang, E.W., Ruiling Guan, and R.C. McCrillis, "Demonstration of a No-VOC/No-HAP Wood Furniture Coating System," published in: Coatings World, Vol. 2, No. 6, November/December, 1997, pg. 21-26.

8. McCrillis, R.C., E.W. Huang, and R. Guan, "A No-VOC/No-HAP Wood Furniture Coating System," presented at *EPA Pollution Prevention/Green Manufacturing Conference*, Atlanta, GA, November 17-19, 1997.

9. Huang, E.W. and R.C. McCrillis, "Demonstration of No-VOC Wood Topcoat," presented at the *Low- and No-VOC Coating Technologies 2nd Biennial International Conference*, Durham, NC, March 13-15, 1995.

10. Huang, E.W. and R.C. McCrillis, "Source Reduction of VOC and Hazardous Organic Emissions from Wood Furniture Coatings," in Proceedings: The Emission Inventory: Key to Planning, Permits, Compliance and Reporting, New Orleans, LA, Sept. 4-6, 1996.

APPENDIX A

MANUFACTURER INTERVIEW NOTES (BY TELEPHONE)

Facility A: A Kitchen Cabinet Manufacturer
Comments:

This is a big kitchen cabinet manufacture in southern California. They are looking for a water-based coating with very good UV stability. In addition, for 2-component coatings, they are looking for a special feature; they want to be able to deactivate the mix to prolong the coating shelf life (for example, overnight). Usually, after part A and part B mixed, the remainder of the coating will be wasted if not totally consumed. Therefore, an agent to deactivate the mixed coating will be very useful.

Facility B: A Kitchen Cabinet Manufacturer
Comments:

This facility is using solvent-based coatings. Because the VOC content of the coatings complies with the current rule limits, they do not intend to switch to water-based coating now. However, they foresee the switching several years down the road. They have tested some water-based coatings. Several issues are of concern:

- Drying time
- Grain raising
- Proper cleaning of the gun

Facility C: A Kitchen Cabinet Manufacturer
Comments:

It takes a lot of money to convert to low-VOC coatings. New procedures need to be learned. Because of longer drying time, large space is needed to store the products. The following properties need to be improved:

- Grain raising
- Milking
- Film thickness

There are lots of new products on the market; therefore, it takes a lot of effort to test new coating products.

Facility D: A Kitchen Cabinet Manufacturer
Comments:

This facility is located in San Francisco. Currently they use solvent-based coatings. Solvent-based coatings dry very fast. No heating required.

Facility E: A Kitchen Cabinet Manufacturer
Comments:

This company manufactures high-end kitchen cabinets. They have converted to water-based coatings. They are able to overcome the problems associated with water-based coatings. Grain raising, color matching and edge soak are the concerns when selecting new coatings.

Facility F: A Kitchen Cabinet Manufacturer
Comments:

This company use both solvent-base and water-base coatings. They like the appearance that water-base coatings deliver; they dry fast too. Overall cost of using water-base coating is higher than using solvent-base coating. They are interested in exploring new water-base coatings.

Facility G: A Kitchen Cabinet Manufacturer
Comments:

Water-base coating have very good mar resistance. The concerns of using water-base coatings are:

- Film thickness
- Making repairs
- Matching color
- Milking

In their experience application procedures are more complex for water-base coatings. A step-wise change over to a new coating system is the preferred approach. He thinks that appearance of water-base coating can't compete with solvent-base coating.

APPENDIX B

COATING TECHNICAL DATA SHEETS AND MATERIAL SAFETY DATA SHEETS

APPENDIX B.1

TOP COAT

Sierra

Performance Coatings **Product Data Sheet**

Clear Wood Top Coat

Product Code: WTC-97-2

This two component, high performance, water based wood top coat is a hard, durable, chemical and stain resistant interior wood coating that contains no organic solvents. This wood top coat is designed to be used with the companion Zero VOC Stain and Sanding Sealer for furniture, cabinets and other wood applications.

Very low odor - no solvent smell
Non-flammable
Chemical and stain resistant
Bright, clear finish
Easily washed and cleaned
Surpasses all VOC air quality regulations

SPECIFICATIONS

Color: Clear	Pencil Hardness: 2H
Finish: Gloss & Satin	Intercoat Adhesion: Excellent
Pot Life: 6 hours @ 70°F	KCMA A161.1 1990 Testing
Clean Up: Use warm, soapy water	Detergent & Water Resistance: Pass
Density: 8.85 #/gal (Mixed System)	Edge Test: Pass
Volume Solids: 35%	Hot Cold Check: Pass
Weight Solids: 39%	Stain Resistance: 24 hour exposure
Theor. Coverage @ 2 mils: 270 sq.ft/gal	Coffee
Flash Point: >350 °F	Grape Juice
Shelf Life: > I year	Lemon Juice
Dry Time; @ 77 °T & 50% RK 3 mil film	Orange Juice
To Touch: 30 minutes	Olive Oil
To Recoat: 1 hour	100 Proof Alcohol
Full cure: 1 week	Detergent
VOC: Coating 0 #/gal, 0 grams per liter	Mustard (I hour)
Material 0 #/gal, 0 grams per liter	Pint Sol
Viscosity (Part A & B mixed) @ 25°C	Fantastic
#3 spindle @ 12 rpm: 500 cps	Simple Green
Usage: Part A Part B	Bleach
By Volume 1.0 1.0	Ketchup
By Weight 1.0 1.0	Distilled water

Sierra Performance Coatings, Inc.
2755 Campus Drive, San Mateo, CA 94403 Phone: 415-378-8659 Fax 415-574-3412
For technical assistance, please call: 510-451-2326

MATERIAL SAFETY DATA SHEET

PRODUCT: Wood Top Coat Part A (WTC-97-2)

PART 1 - GENERAL INFORMATION

Manufacturer:
Sierra Performance Coatings, Inc.
2755 Campus Drive
San Mateo, CA 94403
(650)378-8659

NPCA HMIS Rating

Health:	1
Flammability:	0
Reactivity:	0
Personal Protection:	D

Emergency Numbers: 1-800-424-9300 (Chemtrec)

Chemical Family:	Latex Paint
Generic Name:	Water Based Epoxy Paint
DOT Proper Shipping Name:	Water Based Paint, n.o.s.
DOT Hazard Class:	Not Regulated

Revision: 6Date: 10/10/97

PART 2 - Ingredients

Ingredient Name	CAS #	%weight	OSHA(pel)	ACGIH(tlv)
RESILEX™ Epoxy Polymer	025085-99-8	52%	N/A	N/A

PART 3 - PHYSICAL AND CHEMICAL DATA

VOC of Material: 0 grams/liter and 0 #/gal
VOC excluding water: 0 grams/liter and 0 #/gal
Volatile portion: 45 % wt
Specific Gravity: 1.09 @20°C
Solubility in water: Dilutable
Boiling Point: 100°C
pH: 6.5 -7.5
Freezing Point: 0°C
Viscosity: 600.cps
Vapor Pressure: Negligible
Appearance and Odor: Milky White Liquid / mild odor
Conditions and materials to avoid: High temperatures, oxidizing conditions.
Hazardous decomposition products: Acrid smoke, fumes, carbon monoxide/dioxide may be released upon decomposition.

PART 4 - FIRE AND EXPLOSION

Flash Point: > 250°C (Method: ISO 3679)
Autoignition temperature: N/DA
Flammable limits (%volume in air) Lower: N/DA Upper: N/DA
Fire and explosion hazards: Not-flammable
Extinguishing media: Dry chemical, $C0_2$, Water spray, Foam, Water fog.
Special fire-fighting procedures: Do not enter fire area without special protection. Fight fire from safe

distance or protected location. Heat or impurities may increase temperature, build pressure, rupture closed containers spreading fire and increase the risk of burns and injuries. Use water spray/fog for cooling. Notify authorities if liquid enters sewer or public waters.

PART 5 - EMERGENCY AND FIRST AID

Inhalation: If overcome by exposure, remove victim to fresh air immediately. Give oxygen or artificial respiration as needed. Obtain emergency medical attention, prompt action is essential.
Eye Contact: In case of eye contact, immediately flush eyes with clean water for 20 - 30 minutes. Retract eyelids often. Obtain emergency medical attention if pain, blinking, tears, or redness persist.
Skin Contact: Remove contaminated clothing as needed. Wash skin thoroughly with mild soap and water. Flush with lukewarm water for 15 minutes. If sticky, use waterless hand cleaner first.
Ingestion: If large quantity is swallowed, give lukewarm water (1 pint) if victim is completely conscious and alert. Do not induce vomiting, risk of damage to lungs exceeds poisoning risk. Obtain emergency medical attention.
Emergency Medical Treatment: Treat symptomatically.

PART 6 - EFFECTS OF EXPOSURE

Routes of exposure:
Inhalation: This material is not expected to present an inhalation hazard at standard conditions due to its low volatility. However, overexposure to mists/aerosols may cause respiratory tract irritation such as coughing, shortness of breath, and mucus production.
Eye Contact: Potential route. May cause eye irritation. Symptoms may include tearing, blinking, redness and swelling.
Skin absorption: Potential route. Although no data was found for this product, the potential for skin absorption does exist.
Skin Irritation: Potential route. May produce skin irritation. May cause an allergic skin reaction in some - individuals after repeated skin contact.
Ingestion: This material may be a health hazard if ingested in large quantities.
Medical conditions aggravated by exposure: No additional medical information found.

PART 7 - PROTECTIVE EQUIPMENT AND CONTROL MEASURES

Respiratory Protection: If this material is handled under mist forming conditions, use NIOSH/MSHA approved respiratory protection equipment.
Eye Protection: Eye protection such as chemical splash goggles and/or face shield must be worn when possibility exists for eye contact due to splashing or spraying, liquid, airborne particles, or vapor. Contact lenses should not be worn.
Skin Protection: Depending on the conditions for use, protective gloves, apron, boots, head, and face protection should be worn. This equipment should be cleaned after each use.
Engineering Controls: If handling results in mist or aerosol or vapor generation, local exhaust ventilation is recommended.
Other Hygienic Practices: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
Other Work Practices: Use good personal hygiene. Wash hands before eating, drinking, smoking, or using the toilet facilities. Promptly remove soiled clothing and wash thoroughly before reuse. Shower

after work using plenty of soap and water.

PART 8 - REACTIVITY DATA

Stability: Stable
Incompatibility: Strong bases and acids.
Hazardous polymerization: Will not occur.
Hazardous decomposition: Will not occur.

PART 9 - SPILL OR LEAK PROCEDURES

Avoid all personal contact. Take up with absorbent material. Scoop and vacuum up, place in closed container for disposal. Avoid dusting. Flush contaminated area with water. Dispose in accordance with federal, state, and local regulations.

PART 10 - STORAGE AND SPECIAL PRECAUTIONS

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:
Practice caution and personal cleanliness to avoid skin and eye contact. Avoid breathing vapors of heated material.

PART 11 - REGULATORY INFORMATION

TRANSPORTATION
Not Regulated

PART 12 - LABEL INFORMATION

FOR INDUSTRIAL USE ONLY!! Skin contact hazard. Eye and skin irritant.
May cause allergic reaction. Avoid contact with eyes, skin, and clothing. Do not breath vapors or mist.
Wash thoroughly after handling.
Do not swallow. Prevent contact with food, chewing or smoking materials.

FIRST AID

EYES: Immediately flush with plenty of clean water
INHALATION: Remove to fresh air if effects occur. Consult a physician.
SKIN CONTACT: Wash thoroughly with mild soap and flowing water or shower.
INGESTION: Give fluids. Call a physician.
NOTE TO PHYSICIAN: No specific antidote. Supportive care. Treatment based on judgment of physician in response to reaction of the patient.

This MSDS has been prepared in accordance with the requirements of the OSHA Hazard Communication Standard (29 CFR 1200).
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MATERIAL SAFETY DATA SHEET

PRODUCT: WOOD TOP COAT PART B (WTC-97-2)

PART 1 - GENERAL INFORMATION

Manufacturer: .
Adhesive Coatings Co. .
2755 Campus Drive
San Mateo, CA 94403
(415) 571-7947

NPCA HMIS Rating

Health:	1
Flammability:	0
Reactivity:	0
Personal Protection:	D

Emergency Numbers:, 1-800-424-9300 (Chemtrec)

Chemical Family:	Polyamine
Generic Name:	Polyamine curing agent
DOT Proper Shipping Name:	Paint related materials, n.o.s.
DOT Hazard Class	:Not regulated

Revision: 1 Date: 6/18/96

PART 2 - ingredients

Ingredient Name	CAS #	%weight	OSHA(pel)	ACGIH(tlv)
Tetraethyienepentbmine (polyamine)	112-57-2	<1%	N/A	N/A

PART 3 - PHYSICAL AND CHEMICAL DATA

VOC of Material: 0 grams/liter and 0 #/gal
VOC excluding water: 0 grams/fiter and 0 #/gal
Volatile portion: 28.5 % wt
Specific Gravity: 1.8 @20°C
Solubility in water: Dilutable
Boiling Point: 100°C
pH: 11.5
Freezing Point: 0°C
Viscosity: 900 ± 50 cps
Vapor Pressure: Negligible
Appearance and Odor: Amber milky liquid / slight ammonia odor
Conditions and materials to avoid: High temperatures, oxidizing conditions.
Hazardous decomposition products: Acrid smoke, fumes, carbon monoxide/dioxide may be released upon decomposition.

PART 4 - FIRE AND EXPLOSION

Flash Point: > 250°C (Method: ISO 3679)
Autoignition temperature: N/DA
Flammable limits (%volume in air) Lower: N/DA Upper: N/DA
Fire and explosion hazards: Not-flammable
Extinguishing media: Dry chemical, $C0_2$, Water spray, Foam, Water fog.
Special firefighting procedures: Do not enter fire area without special protection. Fight fire from safe distance or protected location. Heat or impurities may increase temperature, build pressure, rupture

closed containers spreading fire and increase the risk of burns and injuries. Use water spray/fog for cooling. Notify authorities if liquid enters sewer or public waters.

PART 5 - EMERGENCY AND FIRST AID

Inhalation: If overcome by exposure, remove victim to fresh air immediately. Give oxygen or artificial respiration as needed. Obtain emergency medical attention, prompt action is essential.
Eye Contact: In case of eye contact, immediately flush eyes with clean water for 20 - 30 minutes. Retract eyelids often. Obtain emergency medical attention if pain, blinking, tears, or redness persist.
Skin Contact: Remove contaminated clothing as needed. Wash skin thoroughly with mild soap and water. Flush with lukewarm water for 15 minutes. If sticky, use waterless hand cleaner first.
Ingestion: If large quantity is swallowed, give lukewarm water (1 l pint) if victim is completely conscious and alert. Do not induce vomiting, risk of damage to lungs exceeds poisoning risk. Obtain emergency medical attention.
Emergency Medical Treatment: Treat symptomatically.

PART 6 - EFFECTS OF EXPOSURE

Routes of exposure:
Inhalation: This material is not expected to present an inhalation hazard at standard conditions due to its low volatility. However, overexposure to mists/aerosols may cause respiratory tract irritation such as coughing, shortness of breath, and mucus production.
Eye Contact: Potential route. May cause eye irritation. Symptoms may include tearing, blinking, redness and swelling.
Skin absorption: Potential route. Although no data was found for this product, the potential for skin absorption does exist.
Skin Irritation: Potential route. May produce skin irritation. May cause an allergic skin reaction in some individuals after repeated skin contact.
Ingestion: This material may be a health hazard if ingested in large quantities.
Medical conditions aggravated by exposure: No additional medical information found.

PART 7 - PROTECTIVE EQUIPMENT AND CONTROL MEASURES

Respiratory Protection: If this material is handled under mist forming conditions, use NIOSH/MSHA approved respiratory protection equipment.
Eye Protection: Eye protection such as chemical splash goggles and/or face shield must be worn when possibility exists for eye contact due to splashing or spraying, liquid, airborne particles, or vapor. Contact lenses should not be worn.
Skin Protection: Depending on the conditions for use, protective gloves, apron, boots, head, and face protection should be worn. This equipment should be cleaned after each use.
Engineering Controls: If handling results in mist or aerosol or vapor generation, local exhaust ventilation is recommended.
Other Hygienic Practices: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
Other Work Practices: Use good personal hygiene. Wash hands before eating, drinking, smoking, or using the toilet facilities. Promptly remove soiled clothing and wash thoroughly before reuse. Shower after work using plenty of soap and water.

PART 8 - REACTIVITY DATA

Stability: Stable
Incompatibility: Strong bases and acids.
Hazardous polymerization: Will not occur.
Hazardous decomposition: Will not occur.

PART 9 - SPILL OR LEAK PROCEDURES

Avoid all personal contact. Take up with absorbent material. Scoop and vacuum up, place in closed container for disposal. Avoid dusting. Flush contaminated area with water. Dispose in accordance with federal, state, and local regulations.

PART 10 - STORAGE AND SPECIAL PRECAUTIONS

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:
Practice caution and personal cleanliness to avoid skin and eye contact. Avoid breathing vapors of heated material.

PART 11 - REGULATORY INFORMATION

TRANSPORTATION
Not regulated
California Proposition 65: NA

PART 12 - LABEL INFORMATION

FOR INDUSTRIAL USE ONLY!! Skin contact hazard. Eye and skin irritant.
May-cause allergic reaction. Avoid contact with eyes, skin, and clothing. Do not breath vapors or mist.
Wash thoroughly after handling.
Do not swallow. Prevent contact with food, chewing or smoking materials.

FIRST AID

EYES: Immediately flush with plenty of clean water
INHALATION: Remove to fresh air if effects occur. Consult a physician.
SKIN CONTACT: Wash thoroughly with mild soap and flowing water or shower.
INGESTION: Give fluids. Call a physician.
NOTE TO PHYSICIAN: No specific antidote. Supportive care. Treatment based on judgment of physician in response to reaction of the patient.

APPENDIX B.2

SANDING SEALER

MATERIAL SAFETY DATA SHEET

PRODUCT: Wood Sanding Sealer, Part 1 (S91-03)

PART 1 - GENERAL INFORMATION

Manufacturer:
Sierra Performance Coatings, Inc.
330 Primrose Road #502
Burlingame, CA 94010
(650) 548-5188

NPCA HMIS Rating
Health: 1
Flammability: 0
Reactivity: 0
Personal Protection: D

Emergency Numbers: 1-800-424-9300 (Chemtrec)

Chemical Family: Latex Paint
Generic Name: Water Based Epoxy Paint
DOT Proper Shipping Name: Water Based Paint, n.o.s.
DOT Hazard Class: Not Regulated
Revision: 6 Date: 10/10/97

PART 2 - Ingredients

Ingredient Name	CAS #	%weight	OSHA(pel)	ACGIH(tlv)
RESILEX™ Epoxy Polymer	025085-99-8	52%	N/A	N/A

PART 3 - PHYSICAL AND CHEMICAL DATA

VOC of Material: 0 grams/liter and 0 #/gal
VOC excluding water: 0 grams/liter and 0 #/gal
Volatile portion: 45 % wt
Specific Gravity: 1.09 @20°C
Solubility in water: Dilutable

Boiling Point: 100°C
pH: 6.5 - 7.5
Freezing Point: 0°C
Viscosity: 600 +/- 200 cps
Vapor Pressure: Negligible

Appearance and Odor: Milky White Liquid / mild odor
Conditions and materials to avoid: High temperatures, oxidizing conditions.
Hazardous decomposition products: Acrid smoke, fumes, carbon monoxide/dioxide may be released upon decomposition.

PART 4 - FIRE AND EXPLOSION

Flash Point: > 250°C (Method: ISO 3679)
Autoignition temperature: N/DA
Flammable limits (%volume in air) Lower: N/DA Upper: N/DA
Fire and explosion hazards: Not-flammable
Extinguishing media: Dry chemical, CO_2, Water spray, Foam, Water fog.
Special fire-fighting procedures: Do not enter fire area without special protection. Fight fire from safe distance or protected location. Heat or impurities may increase temperature, build pressure, rupture closed containers spreading fire and increase the risk of burns and injuries. Use water spray/fog for cooling. Notify authorities if liquid enters sewer or public waters.

PART 5 - EMERGENCY AND FIRST AID

Inhalation: If overcome by exposure, remove victim to fresh air immediately. Give oxygen or artificial respiration as needed. Obtain emergency medical attention, prompt action is essential.
Eye Contact: In case of eye contact, immediately flush eyes with clean water for 20 - 30 minutes. Retract eyelids often. Obtain emergency medical attention if pain, blinking, tears, or redness persist.
Skin Contact: Remove contaminated clothing as needed. Wash skin thoroughly with mild soap and water. Flush with lukewarm water for 15 minutes. If sticky, use waterless hand cleaner first.
Ingestion: If large quantity is swallowed, give lukewarm water (1 pint) if victim is completely conscious and alert. Do not induce vomiting, risk of damage to lungs exceeds poisoning risk. Obtain emergency medical attention.
Emergency Medical Treatment: Treat symptomatically.

PART 6 - EFFECTS OF EXPOSURE

Routes of exposure:
Inhalation: This material is not expected to present an inhalation hazard at standard conditions due to its low volatility. However, overexposure to mists/aerosols may cause respiratory tract irritation such as coughing, shortness of breath, and mucus production.
Eye Contact: Potential route. May cause eye irritation. Symptoms may include tearing, blinking, redness and swelling.
Skin absorption: Potential route. Although no data was found for this product, the potential for skin absorption does exist.
Skin Irritation: Potential route. May produce skin irritation. May cause an allergic skin reaction in some individuals after repeated skin contact.
Ingestion: This material may be a health hazard if ingested in large quantities.
Medical conditions aggravated by exposure: No additional medical information found.

PART 7 - PROTECTIVE EQUIPMENT AND CONTROL MEASURES

Respiratory Protection: If this material is handled under mist forming conditions, use NIOSH/MSHA approved respiratory protection equipment.
Eye Protection: Eye protection such as chemical splash goggles and/or face shield must be worn when

possibility exists for eye contact due to splashing or spraying, liquid, airborne particles, or vapor. Contact lenses should not be worn.

Skin Protection: Depending on the conditions for use, protective gloves, apron, boots, head, and face protection should be worn. This equipment should be cleaned after each use.

Engineering Controls: If handling results in mist or aerosol or vapor generation, local exhaust ventilation is recommended.

Other Hygienic Practices: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

Other Work Practices: Use good personal hygiene. Wash hands before eating, drinking, smoking, or using the toilet facilities. Promptly remove soiled clothing and wash thoroughly before reuse. Shower after work using plenty of soap and water.

PART 8 - REACTIVITY DATA

Stability: Stable

Incompatibility: Strong bases and acids.

Hazardous polymerization: Will not occur.

Hazardous decomposition: Will not occur.

PART 9 - SPILL OR LEAK PROCEDURES

Avoid all personal contact. Take up with absorbent material. Scoop and vacuum up, place in closed container for disposal. Avoid dusting. Flush contaminated area with water. Dispose in accordance with federal, state, and local regulations.

PART 10 - STORAGE AND SPECIAL PRECAUTIONS

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:

Practice caution and personal cleanliness to avoid skin and eye contact. Avoid breathing vapors of heated material.

PART 11 - REGULATORY INFORMATION

TRANSPORTATION

Not Regulated

PART 12 - LABEL INFORMATION

FOR INDUSTRIAL USE ONLY!! Skin contact hazard. Eye and skin irritant.

May cause allergic reaction. Avoid contact with eyes, skin, and clothing. Do not breath vapors or mist. Wash thoroughly after handling. Do not swallow. Prevent contact with food, chewing or smoking materials.

FIRST AID

EYES: Immediately flush with plenty of clean water
INHALATION: Remove to fresh air if effects occur. Consult a physician.
SKIN CONTACT: Wash thoroughly with mild soap and flowing water or shower.
INGESTION: Give fluids. Call a physician.
NOTE TO PHYSICIAN: No specific antidote. Supportive care. Treatment based on judgment of physician in response to reaction of the patient.

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MATERIAL SAFETY DATA SHEET

PRODUCT: WOOD SANDING SEALER - PART 2 (S91-03)

PART 1 - GENERAL INFORMATION

Manufacturer:
Sierra Performance Coatings, Inc.
330 Primrose Road #502
Burlingame, CA 94010
(650) 548-5188

NPCA HMIS Rating

Health:	1
Flammability:	0
Reactivity:	0
Personal Protection:	D

Emergency Numbers: 1-800-424-9300 (Chemtrec)

Chemical Family:	Polyamine /latex blend
Generic Name:	Polyamine curing agent
DOT Proper Shipping Name:	Paint related materials, n.o.s.
DOT Hazard Class:	Not regulated

Revision: 1 Date: 6/18/96

PART 2 - Ingredients

Ingredient Name	CAS #	%weight	OSHA(pel)	ACGIH(tlv)
RESILINK™ B-2003 (polyamine)	170904-70-8	<1.2%	N/A	N/A

PART 3 - PHYSICAL AND CHEMICAL DATA

VOC of Material: 0 grams/liter and 0 #/gal
VOC excluding water: 0 grams/liter and 0 #/gal
Volatile portion: 70 % wt
Specific Gravity: 1.03 @20°C
Solubility in water: Dilutable

Boiling Point: .100°C
pH: 9.5 - 10.0
Freezing Point: 0°C
Viscosity: 900 ± 150 cps
Vapor Pressure: Negligible

Appearance and Odor: Amber milky liquid / slight ammonia odor
Conditions and materials to avoid: High temperatures, oxidizing conditions.
Hazardous decomposition products: Acrid smoke, fumes, carbon monoxide/dioxide may be released upon decomposition.

PART 4 - FIRE AND EXPLOSION

Flash Point: > 250°C (Method: ISO 3679)
Autoignition temperature: N/DA
Flammable limits (%volume in air) Lower: N/DA Upper: N/DA

Fire and explosion hazards: Not-flammable
Extinguishing media: Dry chemical, CO_2, Water spray, Foam, Water fog.
Special firefighting procedures: Do not enter fire area without special protection. Fight fire from safe distance or protected location. Heat or impurities may increase temperature, build pressure, rupture closed containers spreading fire and increase the risk of burns and injuries. Use water spray/fog for cooling. Notify authorities if liquid enters sewer or public waters.

PART 5 - EMERGENCY AND FIRST AID

Inhalation: If overcome by exposure, remove victim to fresh air immediately. Give oxygen or artificial respiration as needed. Obtain emergency medical attention, prompt action is essential.
Eye Contact: In case of eye contact, immediately flush eyes with clean water for 20 - 30 minutes. Retract eyelids often. Obtain emergency medical attention if pain, blinking, tears, or redness persist.
Skin Contact: Remove contaminated clothing as needed. Wash skin thoroughly with mild soap and water. Flush with lukewarm water for 15 minutes. If sticky, use waterless hand cleaner first.
Ingestion: If large quantity is swallowed, give lukewarm water (1 pint) if victim is completely conscious and alert. Do not induce vomiting, risk of damage to lungs exceeds poisoning risk. Obtain emergency medical attention.
Emergency Medical Treatment: Treat symptomatically.

PART 6 - EFFECTS OF EXPOSURE

Routes of exposure:
Inhalation: This material is not expected to present an inhalation hazard at standard conditions due to its low volatility. However, overexposure to mists/aerosols may cause respiratory tract irritation such as coughing, shortness of breath, and mucus production.
Eye Contact: Potential route. May cause eye irritation. Symptoms may include tearing, blinking, redness and swelling.
Skin absorption: Potential route. Although no data was found for this product, the potential for skin absorption does exist.
Skin Irritation: Potential route. May produce skin irritation. May cause an allergic skin reaction in some individuals after repeated skin contact.
Ingestion: This material may be a health hazard if ingested in large quantities.
Medical conditions aggravated by exposure: No additional medical information found.

PART 7 - PROTECTIVE EQUIPMENT AND CONTROL MEASURES

Respiratory Protection: If this material is handled under mist forming conditions, use NIOSH/MSHA approved respiratory protection equipment.
Eye Protection: Eye protection such as chemical splash goggles and/or face shield must be worn when possibility exists for eye contact due to splashing or spraying, liquid, airborne particles, or vapor. Contact lenses should not be worn.
Skin Protection: Depending on the conditions for use, protective gloves, apron, boots, head, and face protection should be worn. This equipment should be cleaned after each use.
Engineering Controls: If handling results in mist or aerosol or vapor generation, local exhaust ventilation

is recommended.
Other Hygienic Practices: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
Other Work Practices: Use good personal hygiene. Wash hands before eating, drinking, smoking, or using the toilet facilities. Promptly remove soiled clothing and wash thoroughly before reuse. Shower after work using plenty of soap and water.

PART 8 - REACTIVITY DATA

Stability: Stable
Incompatibility: Strong bases and acids.
Hazardous polymerization: Will not occur.
Hazardous decomposition: Will not occur.

PART 9 - SPILL OR LEAK PROCEDURES

Avoid all personal contact. Take up with absorbent material. Scoop and vacuum up, place in closed container for disposal. Avoid dusting. Flush contaminated area with water. Dispose in accordance with federal, state, and local regulations.

PART 10 - STORAGE AND SPECIAL PRECAUTIONS

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:
Practice caution and personal cleanliness to avoid skin and eye contact. Avoid breathing vapors of heated material.

PART 11 - REGULATORY INFORMATION

TRANSPORTATION
Not regulated
California Proposition 65: NA

PART 12 - LABEL INFORMATION

FOR INDUSTRIAL USE ONLY!! Skin contact hazard. Eye and skin irritant.
May cause allergic reaction. Avoid contact with eyes, skin, and clothing. Do not breath vapors or mist. Wash thoroughly after handling. Do not swallow. Prevent contact with food, chewing or smoking materials.

FIRST AID

EYES: Immediately flush with plenty of clean water
INHALATION: Remove to fresh air if effects occur. Consult a physician.
SKIN CONTACT: Wash thoroughly with mild soap and flowing water or shower.

INGESTION: Give fluids. Call a physician.
NOTE TO PHYSICIAN: No specific antidote. Supportive care. Treatment based on judgment of physician in response to reaction of the patient.

Some of the information presented and conclusions drawn herein are from sources other than direct test data on the product itself. The information in this MSDS was obtained from sources which we believe are reliable. However, the information is provided without any warranty, express or implied, regarding its correctness. The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage, or expense arising out of or in any way connected with the handling, storage, use, or disposal of the product. This MSDS was prepared and is to be used only for this product. If the product is used as a component in another product, this MSDS information may not be applicable. This MSDS has been prepared in accordance with the requirements of the OSHA Hazard Communication Standard (29 CFR 1200).
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Sierra

Performance Coatings **Product Data Sheet**

Wood Sanding Sealer Product Code: WSS-96-25

This two component epoxy/acrylic, clear sanding sealer is a fast drying sealer that provides a sandable surface for wood finishing that contains no organic solvents. This sanding sealer is designed to be used with the companion Zero VOC Stain and Top Coat.

Very low odor - no solvent smell
Non-flammable
Sandable
Fast Drying
Surpasses all VOC air quality regulations

SPECIFICATIONS

Color: Clear	When used with ADCO Wood Top Coat
Finish: Matte	Intercoat Adhesion: Excellent
Pot Life: 6 hours @ 70°F	KCMA A161.1 1990 Testing
Clean Up: Use warm, soarp water	Detergent & Water Resistance: Pass
Density: 8.7 #/gal (Mixed System)	Edge Test: Pass
Volume Solids: 27. 1 %	Hot Cold Check: Pass
Weight Solids: 30.1%	Stain Resistance: 24 hour exposure
Theor. Coverage @ I mils: 435 sq.ft/gal	Coffee
Flash Point: >3 50 T	Grape Juice
Shelf Life: > 1 year	Lemon Juice
Dry Time: @ 77 °F & 50% RK I mil film	Orange Juice
To Touch: 15 minutes	Olive Oil
To Re-oat: 20 minutes	100 proof alcohol
VOC: Coating 0 #/gal, 0 grams per liter	Detergent
Material 0#/gal, 0 grams per liter	Mustard (I hour)
Viscosity (Part A & B mixed) @ 25°C	Pine Sol
#3 spindle @ 12 rpm: 500 cps	Fantastic
Usage: Part A Part B	Simple Green
By Volume 1.0 4.0	Bleach
By Weight 1.0 4.0	Ketchup
	Distilled water

Sierra Performance Coatings, Inc.

2755 Campus Drive, San Mateo, CA 94403 **Phone: 415-378-8659** Fax: **415-574-3412**

For technical assistance, please call: 510-451-2326

MATERIAL SAFETY DATA SHEET

PRODUCT: Wood Sanding Sealer Part A (WSS-96-25)

PART I - GENERAL INFORMATION

Manufacturer:
Sierra Performance Coatings, Inc.
2755 Campus Drive
San Mateo, CA 94403
(650)378-8659

NPCA HMIS Rating

Health:	1
Flammability:	0
Reactivity:	0
Personal Protection:	D

Emergency Numbers: 1-800-424-9300 (Chemtrec)

Chemical Family:	Latex Paint
Generic Name:	Water Based Epoxy Paint
DOT Proper Shipping Name:	Water Based Paint, n.o.s.
DOT Hazard Class:	Not Regulated

Revision: 6 Date: 10/10/97

PART 2 - Ingredients

Ingredient Name	CAS #	%weight	OSHA(i)el)	ACGIH(tlv)
RESILEX™ Epoxy Polymer	025085-99-8	52%	N/A	N/A

PART 3 - PHYSICAL AND CHEMICAL DATA

VOC of Material: 0 grams/liter and 0 #/gal
VOC excluding water: 0 grams/liter and 0 #/gal
Volatile portion: 45 % wt
Specific Gravity: 1.09 @20°C
Solubility in water: Dilutable

Boiling Point: 100°C
pH: 6.5 - 7.5
Freezing Point: 0°C
Viscosity: 600 cps
Vapor Pressure: Negligible

Appearance and Odor: Milky White Liquid / mild odor
Conditions and materials to avoid: High temperatures, oxidizing conditions.
Hazardous decomposition products: Acrid smoke, furnes, carbon monoxide/dioxide may be released upon decomposition.

PART 4 - FIRE AND EXPLOSION

Flash Point: > 250°C (Method: ISO 3679)
Autoignition temperature: N/DA

Flammable limits (%volume in air) Lower: N/DA Upper: N/DA
Fire and explosion hazards: Not-flammable
Extinguishing media: Dry chemical, $C0_2$, Water spray, Foam, Water fog.
Special fire-fighting procedures: Dc not enter fire irea without special protection. Fight fire from safe distance or protected location. Heat or impurities may increase temperature, build pressire, rupture closed containers spreading fire and increase the risk of burns and injuries. Use water spray1fog for cooling. Notify authorities if liquid enters sewer or public waters.

PART 5 - EMERGENCY AND FIRST AID

Inhalation: If Overcome by exposure, remove victim to fresh air immediately. Give oxygen or artificial respiration as needed. Obtain emergency medical attention, prompt action is essential.
Eye Contact: In case of eye contact, immediately flush eyes with clean water for 20 - 30 minutes. Retract eyelids often. Obtain emergency medical attention if pain, blinking, tears, or redness persist.
Skin Contact: Remove contaminated clothing as needed. Wash skin thoroughly with mild soap and water. Flush with lukewarm water for 15 minutes. If sticky, use waterless hand cleaner first.
Ingestion: If large quantity is swallowed, give lukewarm water (1 pint) if victim is completely conscious and alert. Do not induce vomiting, risk of damage to lungs exceeds poisoning risk. Obtain emergency medical attention.
Emergency Medical Treatment: Treat symptomatically.

PART 6 - EFFECTS OF EXPOSURE

Routes of exposure:
Inhalation: This material is not expected to present an inhalation hazard at standard conditions due to its low volatility. However, overexposure to mists/aerosols may cause respiratory tract irritation such as coughing, shortness of breath, and mucus production.
Eye Contact: Potential route. May cause eye irritation. Symptoms may include tearing, blinking, redness and swelling.
Skin absorption: Potential route. Although no data was found for this product. the potential for skin absorption does exist.
Skin Irritation: Potential route. May produce skin irritation. May cause -.n allergic skin reaction in some individuals after repeated skin contact.
Ingestion: This material may be a health hazard if ingested in large quantities.
Medical conditions aggravated by exposure: No additional medical information found.

PART 7 - PROTECTIVE EQUIPMENT AND CONTROL MEASURES

Respiratory Protection: If this material is handled under mist forming conditions, use NIOSH/MSHA approved respiratory protection equipment.
Eye Protection: Eye protection such as chemical splash goggles and/or face shield must be worn when possibility exists for eye contact due to splashing or spraying, liquid, airborne particles, or vapor. Contact lenses should not be worn.
Skin Protection: Depending on the conditions for use, protective gloves, apron, boots, head, and face

protection should be worn. This equipment should be cleaned after each use.
Engineering Controls: If handling results in mist or aerosol or vapor generation, local exhaust ventilation is recommended.
Other Hygienic Practices: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
Other Work Practices: Use good personal hygiene. Wash hands before eating, drinking, smoking, or using the toilet facilities. Promptly remove soiled clothing and wash thoroughly before reuse. Shower after work using plenty of soap and water.

PART 8 - REACTIVITY DATA

Stability: Stable
Incompatibility: Strong bases and acids.
Hazardous polymerization: Will not occur.
Hazardous decomposition: Will not occur.

PART 9 - SPILL OR -LEAK PROCEDURES

Avoid all personal contact. Take up with absorbent material. Scoop and vacuum up, place in closed container for disposal. Avoid dusting. Flush contaminated area with water. Dispose in accordance with federal, state, and local regulations.

PART 10 - STORAGE AND SPECIAL PRECAUTIONS

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:
Practice caution and personal cleanliness to avoid skin and eye contact. Avoid breathing vapors of heated material.

PART 11 - REGULATORY INFORMATION

TRANSPORTATION
Not Regulated

PART 12 - LABEL INFORMATION

FOR INDUSTRIAL USE ONLY!! Skin contact hazard. Eye and skin irritant.
May cause allergic reaction. Avoid contact with eyes, skin, and clothing. Do not breath vapors or mist. Wash thoroughly after handling.
Do not swallow. Prevent contact with food, chewing or smoking materials.

FIRST AID

EYES: Immediately flush with plenty of clean water
INHALATION: Remove to fresh air if effects occur. Consult a physician.
SKIN CONTACT: Wash thoroughly with mild soap and flowing water or shower.
INGESTION: Give fluids. Call a physician.
NOTE TO PHYSICIAN: No specific antidote. Supportive care. Treatment based on judgment of physician in response to reaction of the
patient.

Some of the information presented and conclusions drawn herein are from sources other than direct test data on the product itself. The information in this MSDS was obtained from sources which we believe are reliable. However, the information is provided without any warranty, express or implied, regarding its correctness. The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage, or expense arising out ofor in any way connected with the handling, storage, use, or disposal of the product. This MSDS was prepared and is to be used only for this product. If the product is used as a component in another product, this MSDS information may not be applicable. This MSDS has been prepared in accordance with the requirements of the OSHA Hazard Communication Standard (29 CFR 1200). C:\SierraMSDS\SPCMEA.msd.doc

MATERIAL SAFETY DATA SHEET

PRODUCT: WOOD SANDING SEALER - PART B (WSS-96-25)

PART 1 - GENERAL INFORMATION

Manufacturer:
Adhesive Coatings Co.
2755 Campus Drive
San Mateo, CA 94403
(415) 571-7947

NPCA HMIS Rating

Health:	1
Flammability:	0
Reactivity:	1
Personal Protection:	D

Emergency Numbers: 1-800-424-9300 (Chemtrec)

Chemical Family:	Polyamine /LATEX BLEND
Generic Name:	Polyamine curing agent
DOT Proper Shipping Name:	Paint related materials, n.o.s.
DOT Hazard Class:	Not regulated

Revision: 1 Date: 6/18/96

PART 2 - Ingredients

Ingredient Name	CAS #	%weight	OSHA(pel)	ACGIH(tlv)
RESILINK- B-2003 (polyamine)	170904-70-8	<1.2%	N/A	N/A

PART 3 - PHYSICAL AND CHEMICAL DATA

VOC of Material: 0 grams/liter and 0 #/gal
VOC excluding water: 0 grams/liter and 0 #/gal
Volatile portion: 70 % wt
Specific Gravity: 1.03 @20°C
Solubility in water: Dilutable

Boiling Point: 100°C
pH: 9.5 - 10.0
Freezing Point: 0°C
Viscosity: 900 ± 50 cps
Vapor Pressure: Negligible

Appearance and Odor: Amber milky liquid / slight ammonia odor
Conditions and materials to avoid: High temperatures, oxidizing conditions.
Hazardous decomposition products: Acrid smoke, fumes, carbon monoxide/dioxide may be released upon decomposition.

PART 4 - FIRE AND EXPLOSION

Flash Point: > 250°C (Method: ISO 3679)
Autoignition temperature: N/DA
Flammable limits (%volume in air) Lower N/DA Upper: N/DA
Fire and explosion hazards: Not-flammable

Extinguishing media: Dry chemical, $C0_2$, Water spray, Foam, Water fog.
Special firefighting procedures: Do not enter fire area without special protection. Fight fire from safe distance or protected location. Heat or impurities may increase temperature, build pressure, rupture closed containers spreading fire and increase the risk of burns and injuries. Use water spray/fog for cooling. Notify authorities if liquid enters sewer or public waters.

PART 5 - EMERGENCY AND FIRST AID

Inhalation: If overcome by exposure, remove victim to fresh air immediately. Give oxygen or artificial respiration as needed. Obtain emergency medical attention, prompt action is essential.
Eye Contact: In case of eye contact, immediately flush eyes with clean water for 20 - 30 minutes. Retract eyelids often. Obtain emergency medical attention if pain, blinking, tears, or redness persist.
Skin Contact: Remove contaminated clothing as needed. Wash skin thoroughly with mild soap and water. Flush with lukewarm water for
15 minutes. If sticky, use waterless hand cleaner first.
Ingestion: If large quantity is swallowed, give lukewarm water (11 pint) if victim is completely conscious and alert. Do not induce vomiting, risk of damage to lungs exceeds poisoning risk. Obtain emergency medical attention.
Emergency Medical Treatment: Treat symptomatically.

PART 6 - EFFECTS OF EXPOSURE

Routes of exposure:
Inhalation: This material is not expected to present an inhalation hazard at standard conditions due to Its low volatility. However, overexposure to mists/aerosols may cause respiratory tract irritation such as coughing, shortness of breath, and mucus production.
Eye Contact: Potential route. May cause eye irritation. Symptoms may include tearing, blinking, redness and swelling.
Skin absorption: Potential route. Although no data was found for this product, the potential for skin absorption does exist.
Skin Irritation: Potential route. May produce skin irritation. May cause an allergic skin reaction in some ;ndividuals after repeated skin contact.
Ingestion: This material may be a health hazard if ingested in large quantities.
Medical conditions aggravated by exposure: No additional medical information found.

PART 7 - PROTECTIVE EQUIPMENT AND CONTROL MEASURES

Respiratory Protection: If this material is handled under mist forming conditions, use NIOSH/MSHA approved respiratory protection equipment.
Eye Protection: Eye protection such as chemical splash goggles and/or face shield must be worn when possibility exists for eye contact due to splashing or spraying, liquid, airborne particles, or vapor. Contact lenses should not be worn.
Skin Protection: Depending on the conditions for use, protective gloves, apron, boots, head, and face protection should be worn. This equipment should be cleaned after each use.

Engineering Controls: If handling results in mist or aerosol or vapor generation, local exhaust ventilation is recommended.
Other Hygienic Practices: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
Other Work Practices: Use good personal hygiene. Wash hands before eating, drinking, smoking, or using the toilet facilities. Promptly
remove soiled clothing and wash thoroughly before reuse. Shower after work using plenty of soap and water.

PART 8 - REACTIVITY DATA

Stability: Stable
Incompatibility- Strong bases and acids.
Hazardous Polymerization: Will not occur.
Hazardous decomposition: Will not occur.

PART 9 - SPILL OR LEAK PROCEDURES

Avoid all personal contact. Take up with absorbent material. Scoop and vacuum up, place in closed container for disposal. Avoid dusting.
Flush contaminated area with water. Dispose in accordance with federal, state, and local regulations.

PART 10 - STORAGE AND SPECIAL PRECAUTIONS

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Practice caution and personal cleanliness to avoid skin and eye contact. Avoid breathing vapors of heated material.

PART 11 - REGULATORY INFORMATION

TRANSPORTATION
Not regulated
California Proposition 65: NA

PART 12 - LABEL INFORMATION

FOR INDUSTRIAL USE ONLY!! Skin contact hazard. Eye and skin irritant.
May, cause allergic reaction. Avoid contact with eyes, skin, and clothing. Do not breath vapors or mist.
Wash thoroughly after handling.
Do not swallow. Prevent contact with food, chewing or smoking materials.

FIRST AID

EYES: Immediately flush with plenty of clean water
INHALATION: Remove to fresh air if effects occur. Consult a physician.
SKIN CONTACT: Wash thoroughly with mild soap and flowing water or shower.
INGESTION: Give fluids. Call a physician.
NOTE TO PHYSICIAN: No specific antidote. Supportive care. Treatment based on judgment of physician in response to reaction of the patient.

Some of the information presented and conclusions drawn herein are from sources other than direct test data on the product itself. The information in this IVISDS was obtained from sources which we believe are reliable. However, the information is provided without any warranty, express or implied, regarding its correctness. The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage, or expense arising out of or in any way connected with the handling, storage, use, or disposal of the product. This MSDS was prepared and is to be used only for this product. If the product is used as a component in another product, this IVISDS information may not be applicable. This MSDS has been prepared in accordance with the requirements of the OSHA Hazard Communication Standard (29 CFR 1200). C:\adco\msds\wss9616b.msd

APPENDIX B.3

STAIN BASE

Sierra

Performance Coatings

Product Data Sheet

Wood Stain Base

Product Code: WST-96-3

This fast drying stain base can be colored with a variety of water dispersed pigments, dyes and tints into a wide variety of hues, colors and stains and contains ag organic solvents. This stain base is designed to be used with the companion Zero VOC Sanding Scaler and Top Coat.

Very low odor - no solvent smell
Non-flammable
Fast drying
Improves corrosion resistance
Surpasses all VOC air quality regulations

SPECIFICATIONS

Color: Clear	VOC: Coating 0 #gal, 0 grams per liter
Finish: Matte	Material 0 #/gal, 0 gram per liter
Pot Life: 6 hours	
Clean Up: Warm, soapy water	Viscosity (Part A & B mixed) @ 25°C
Density: 8.6 #/gal (Mixed system)	#3 spindle @ 12 rpm: 500 cps
Volume Solids: 17.8%	
Weight Solids: 19.8%	
Theor. Coverage @ 1 mils: 285 sq.ft/gal	
Flash Point: > 350 °F	
Shelf Life: > I year	
Dry Time: @ 77°F & 50% RH, 1 mil film	
To Touch: 15 minutes	
To Recoat: 15 minutes	

Sierra Performance Coatings, Inc.

2755 Campus Drive, San Mateo, CA 94403 Phone: 415-378-8659 Fax: 415-574-3412

For technical assistance, please call: 510-451-2326

MATERIAL SAFETY DATA SHEET

PRODUCT: WOOD STAIN BASE (WST-96-3)

PART 1 - GENERAL INFORMATION

Manufacturer:
Adhesive Coatings Co.
2755 Campus Drive
San Mateo, CA 94403
(415) 571-7947

NPCA HMIS Rating

Health:	1
Flammability:	0
Reactivity:	0
Personal Protection:	D

Emergency Numbers: 1-800-424-9300 (Chemtrec)

Chemical Family:	Latex Paint
Generic Name:	Water Based Stain
DOT Proper Shipping Name:	Water Based Paint, n.o.s.
DOT Hazard Class:	Not Regulated

Revision: 1 Date: 6/18/96

PART 2 - Ingredients

Ingredient Name	CAS #	%weight	OSHA(pel)	ACGIH(tlv)
Acrylic Polymer	N/A	15%	N/A	N/A

PART 3 - PHYSICAL AND CHEMICAL DATA

VOC of Material: 0 grams/liter and 0 #/gal
VOC excluding water: 0 grams/liter and 0 #/gal
Boiling Point: 100°C
pH: 6.0 - 7.0
Volatile portion: 80.1 % wt
Freezing Point: 0°C
Specific Gravity: 1.03 @20°C
Viscosity: 500:± 50 cps
Solubility in water: Slight
Vapor Pressure: Negligible
Appearance and Odor: Milky white liquid/mild odor Conditions and materials to avoid: High temperatures, oxidizing conditions. Hazardous decomposition products: Acrid smoke, fumes, carbon monoxide/dioxide may be released upon decomposition.
Stability: Stable

PART 4 - FIRE AND EXPLOSION

Flash Point: > 212°C (Method: ISO 3679)
Autoignition temperature: N/DA
Flammable limits (%volume in air) Lower: N/DA Upper: NIDA
Fire and explosion hazards: Not-flammable
Extinguishing media: Dry chemical,$C0_2$,Water spray, Foam, Water fog.
Special firefighting procedures: Do not enter fire area without special protection. Fight fire from safe distance or protected location. Heat or impurities may increase temperature, build pressure, rupture closed containers spreading fire and increase the risk of burns and injuries. Use water spray/fog for cooling. Notify authorities if liquid enters sewer or public waters.

PART 5 - EMERGENCY AND FIRST AID

Inhalation: If overcome by exposure, remove victim to fresh air immediately. Give oxygen or artificial respiration as needed. Obtain emergency medical attention, prompt action is essential.
Eye Contact: In case of eye contact, immediately flush eyes with clean water for 20 - 30 minutes. Retract eyelids often. Obtain emergency medical attention if pain, blinking, tears, or redness persist.
Skin Contact: Remove contaminated clothing as needed. Wash skin thoroughly with mild soap and water. Flush with lukewarm water for 15 minutes. If sticky, use waterless hand cleaner first.
Ingestion: If large quantity is swallowed, give lukewarm water (1 pint) if victim is completely conscious and alert. Do not induce vomiting, risk of damage to lungs exceeds poisoning risk. Obtain emergency medical attention.
Emergency Medical Treatment: Treat symptomatically.

PART 6 - EFFECTS OF EXPOSURE

Routes of exposure:
Inhalation: This material is not expected to present an inhalation hazard at standard conditions due to its low volatility. However, overexposure to mists/aerosols may cause respiratory tract irritation such as coughing, shortness of breath, and mucus production.
Eye Contact: Potential route. May cause eye irritation. Symptoms may include tearing, blinking, redness and swelling.
Skin absorption: Potential route. Although no data was found for this product, the potential for skin absorption does exist.
Skin Irritation: Potential route. May produce skin irritation. May cause an allergic skin reaction in some individuals after repeated skin contact.
Ingestion: This material may be a health hazard if ingested in large quantities.
Medical conditions aggravated by exposure: No additional medical information found.

PART 7 - PROTECTIVE EQUIPMENT AND CONTROL MEASURES

Respiratory Protection: If this material is handled under mist forming conditions, use NIOSH/MSHA approved respiratory protection equipment.
Eye Protection: Eye protection such as chemical splash goggles and/or face shield must be worn when possibility exists for eye contact due to splashing or spraying, liquid, airborne particles, or vapor. Contact lenses should not be worn.
Skin Protection: Depending on the conditions for use, protective gloves, apron, boots, head, and face protection should be worn. This equipment should be cleaned after each use.
Engineering Controls: If handling results in mist or aerosol or vapor generation, local exhaust ventilation is recommended.
Other Hygienic Practices: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
Other Work Practices: Use good personal hygiene. Wash hands before eating, drinking, smoking, or using the toilet facilities. Promptly remove soiled clothing and wash thoroughly before reuse. Shower after work using plenty of soap and water.

PART 8 - REACTIVITY DATA

Stability: Stable
Incompatibility: Strong bases and acids.
Hazardous polymerization: Will not occur.
Hazardous decomposition: Will not occur.

PART 9 - SPILL OR LEAK PROCEDURES

Avoid all personal contact. Take up with absorbent material. Scoop and vacuum up, place in closed container for disposal. Avoid dusting. Flush contaminated area with water. Dispose in accordance with federal, state, and local regulations.

PART 10 - STORAGE AND SPECIAL PRECAUTIONS

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Practice caution and personal cleanliness to avoid skin and eye contact. Avoid breathing vapors of heated material.

PART 11 - REGULATORY INFORMATION

None required for this product.

PART 12 - LABEL INFORMATION

FOR INDUSTRIAL USE ONLY!! Skin contact hazard. Eye and skin irritant. May cause allergic reaction. Avoid contact with eyes, skin, and clothing. Do not breath vapors or mist. Wash thoroughly

after handling. Do not swallow. Prevent contact with food, chewing or smoking materials.

FIRST AID

Eyes: Immediately flush with plenty of clean water
Inhalation: Remove to fresh air if effects occur. Consult a physician.
Skin contact: Wash thoroughly with mild soap and flowing water or shower.
Ingestion: Give fluids. Call a physician.
NOTE TO PHYSICIAN: No specific antidote. Supportive care. Treatment based on judgment of physician in response to reaction of the patient.

SPILLS

Avoid all personal contact. Take up with absorbent material. Shovel into closed container. Flush contaminated area with water. Dispose of collected materials in accordance with federal, state, and local regulations. Avoid breathing vapors of heated material.

DISCLAIMERS

Some of the information presented and conclusions drawn herein are from sources other than direct test data on the product itself. The information in this MSDS was obtained from sources which we believe are reliable. However, the information is provided without any warranty, express or implied, regarding its correctness. The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage, or expense arising out of or in any way connected with the handling, storage, use, or disposal of the product. This MSDS was prepared and is to be used only for this product. If the product is used as a component in another product, this MSDS information may not be applicable. This MSDS has been prepared in accordance with the requirements of the OSHA Hazard Communication Standard (29 CFR 1200).

MATERIAL SAFETY DATA SHEET

PRODUCT: WOOD STAIN BASE (S93-03)

PART 1 - GENERAL INFORMATION

Manufacturer:
Sierra Performance Coatings, Inc.
330 Primrose Road #502
Burlingame, CA 94010
(650) 548-5188

NPCA HMIS Rating

Health:	1
Flammability:	0
Reactivity:	0
Personal Protection:	D

Emergency Numbers: 1-800-424-9300 (Chemtrec)

Chemical Family:	Latex Paint
Generic Name:	Water Based Stain
DOT Proper Shipping Name:	Water Based Paint, n.o.s.
DOT Hazard Class:	Not Regulated
Revision: 1 Date: 6/18/96	

PART 2 - Ingredients

Ingredient Name	CAS #	%weight	OSHA(pel)	ACGIH(tlv)
Acrylic Polymer	N/A	<15%	N/A	N/A

PART 3 - PHYSICAL AND CHEMICAL DATA

VOC of Material: 0 grams/liter and 0 #/gal
VOC excluding water: 0 grams/liter and 0 #/gal
Volatile portion: 80 % wt
Specific Gravity: 1.03 @20°C
Solubility in water: Slight
Boiling Point: 100°C
pH: 6.0 - 7.0
Freezing Point: 0°C
Viscosity: 200 ± 150 cps
Vapor Pressure: Negligible
Appearance and Odor: Milky white liquid/mild odor
Conditions and materials to avoid: High temperatures, oxidizing conditions.
Hazardous decomposition products: Acrid smoke, fumes, carbon monoxide/dioxide may be released upon decomposition.
Stability: Stable

PART 4 - FIRE AND EXPLOSION

Flash Point: > 212°C (Method: ISO 3679)
Autoignition temperature: N/DA
Flammable limits (%volume in air) Lower: N/DA Upper: N/DA

Fire and explosion hazards: Not-flammable
Extinguishing media: Dry chemical, CO_2, Water spray, Foam, Water fog.
Special firefighting procedures: Do not enter fire area without special protection. Fight fire from safe distance or protected location. Heat or impurities may increase temperature, build pressure, rupture closed containers spreading fire and increase the risk of burns and injuries. Use water spray/fog for cooling. Notify authorities if liquid enters sewer or public waters.

PART 5 - EMERGENCY AND FIRST AID

Inhalation: If overcome by exposure, remove victim to fresh air immediately. Give oxygen or artificial respiration as needed. Obtain emergency medical attention, prompt action is essential.
Eye Contact: In case of eye contact, immediately flush eyes with clean water for 20 - 30 minutes. Retract eyelids often. Obtain emergency medical attention if pain, blinking, tears, or redness persist.
Skin Contact: Remove contaminated clothing as needed. Wash skin thoroughly with mild soap and water. Flush with lukewarm water for 15 minutes. If sticky, use waterless hand cleaner first.
Ingestion: If large quantity is swallowed, give lukewarm water (1 pint) if victim is completely conscious and alert. Do not induce vomiting, risk of damage to lungs exceeds poisoning risk. Obtain emergency medical attention.
Emergency Medical Treatment: Treat symptomatically.

PART 6 - EFFECTS OF EXPOSURE

Routes of exposure:
Inhalation: This material is not expected to present an inhalation hazard at standard conditions due to its low volatility. However, overexposure to mists/aerosols may cause respiratory tract irritation such as coughing, shortness of breath, and mucus production.
Eye Contact: Potential route. May cause eye irritation. Symptoms may include tearing, blinking, redness and swelling.
Skin absorption: Potential route. Although no data was found for this product, the potential for skin absorption does exist.
Skin Irritation: Potential route. May produce skin irritation. May cause an allergic skin reaction in some individuals after repeated skin contact.
Ingestion: This material may be a health hazard if ingested in large quantities.
Medical conditions aggravated by exposure: No additional medical information found.

PART 7 - PROTECTIVE EQUIPMENT AND CONTROL MEASURES

Respiratory Protection: If this material is handled under mist forming conditions, use NIOSH/MSHA approved respiratory protection equipment.
Eye Protection: Eye protection such as chemical splash goggles and/or face shield must be worn when possibility exists for eye contact due to splashing or spraying, liquid, airborne particles, or vapor. Contact lenses should not be worn.
Skin Protection: Depending on the conditions for use, protective gloves, apron, boots, head, and face protection should be worn. This equipment should be cleaned after each use.

Engineering Controls: If handling results in mist or aerosol or vapor generation, local exhaust ventilation is recommended.
Other Hygienic Practices: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
Other Work Practices: Use good personal hygiene. Wash hands before eating, drinking, smoking, or using the toilet facilities. Promptly remove soiled clothing and wash thoroughly before reuse. Shower after work using plenty of soap and water.

PART 8 - REACTIVITY DATA

Stability: Stable
Incompatibility: Strong bases and acids.
Hazardous polymerization: Will not occur.
Hazardous decomposition: Will not occur.

PART 9 - SPILL OR LEAK PROCEDURES

Avoid all personal contact. Take up with absorbent material. Scoop and vacuum up, place in closed container for disposal. Avoid dusting. Flush contaminated area with water. Dispose in accordance with federal, state, and local regulations.

PART 10 - STORAGE AND SPECIAL PRECAUTIONS

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:
Practice caution and personal cleanliness to avoid skin and eye contact. Avoid breathing vapors of heated material.

PART 11 - REGULATORY INFORMATION

None required for this product.

PART 12 - LABEL INFORMATION

FOR INDUSTRIAL USE ONLY!! Skin contact hazard. Eye and skin irritant.
May cause allergic reaction. Avoid contact with eyes, skin, and clothing. Do not breath vapors or mist. Wash thoroughly after handling. Do not swallow. Prevent contact with food, chewing or smoking materials.

FIRST AID

EYES: Immediately flush with plenty of clean water
INHALATION: Remove to fresh air if effects occur. Consult a physician.
SKIN CONTACT: Wash thoroughly with mild soap and flowing water or shower.

INGESTION: Give fluids. Call a physician.
NOTE TO PHYSICIAN: No specific antidote. Supportive care. Treatment based on judgment of physician in response to reaction of the patient.

SPILLS

Avoid all personal contact. Take up with absorbent material. Shovel into closed container. Flush contaminated area with water. Dispose of collected materials in accordance with federal, state, and local regulations. Avoid breathing vapors of heated material.

DISCLAIMERS

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APPENDIX C

CASE STUDIES

APPENDIX C.1

FIELD DEMONSTRATIONS FOR APPLICATION ON METALS

This No-VOC coating technology can formulate coatings that are applied not only on wood products, but also on metals. AVES, working jointly with ADCO, formulated a state of the art metal coating and demonstrated the potential for commercialization of this metal coating system.

Performance features of this new no-VOC industrial maintenance coating are:

- Requires no solvents.
- Delivers hardness with flexibility.
- Versatile—compatible with most lattices.
- Increases toughness/scrub resistance.
- Increases chemical resistance.
- Decreases dry times in slow dry systems.
- Aids in coalescence to allow reduction or elimination of solvents.

Demonstrations of the new metal coating system were conducted at two manufacturing facilities. The purpose of the demonstrations was to show that this new coating system could be used successfully in a commercial metal finishing operation. The following summarizes the demonstration processes.

C.1.1. Demonstrations at Facility A

Facility A manufactures motor homes. The operations at the Riverside facility include wood and metal coatings, metal fabrication, wood and metal cutting, drywall fabrication, and engine mounting. One of metal coatings involves coating of the metal chassis and structural beams of the motor homes. The metal chassis provides the motor home frame on which other components such as wheels and engine are mounted. The structural beams are referred to as Paco beams. The metal Paco beams are mounted on top of the chassis, forming the sides and bottom of the motor home.

Facility A coats the chassis and Paco beams to provide rust protection. The coating operation is conducted inside a large spray booth with a dimension of 48' L. x 22' W. x 12' H. Current coating system used is a compliant coating with a VOC content of 1.2 lb/gal. Approximately, half of a gallon is used for a singe chassis. The coating is applied using a high volume/ low pressure (HVLP) gun. Four 5-HP fans exhaust the coating fumes from the spray booth.

Since the motor home is manufactured using an assembly line process, dry time is a critical parameter. The current coating system dry time is approximately half an hour. Depending on ambient temperature, the dry time for the current compliant coating product could vary

substantially (from 1/2 hour on a dry day to 2 days on high humidity days).

Demonstration, Conducted on January 20, 1998

Representatives of AVES, ADCO, GRACO Equipment Manufacturer, and Butler Compressor & Spray Equipment Co. conducted testing at Facility A on January 20, 1998. Two sets of a regular RV chassis platform and several metal pieces were coated with ADCO's no-VOC metal coatings. The chassis surfaces were dry quickly. However, the Production Supervisor of Facility A suggested that the painting be done by a professional painter, because the testing took too long and the production schedule allowed only 30 minutes per chassis.

Staff took the plant's advise and brought a professional painter from Fairway Painting to Facility A on January 28, 1998. Two sets of a Paco-Beam RV chassis platform were coated. The first set of Paco-Beam RV chassis platform was coated within 40 minutes and consumed 1.5 gallons of coating. The painter changed the air pressure of the spray gun and reduced overspray from the second set of Paco-Beam RV chassis platform. About 1.25 gallons of coating was consumed for the second set of RV chassis. At 65^0F temperature and 78% relative humidity, the coated chassis surface was dry in less than 30 minutes. Facility A staff was satisfied with the demonstration results.

C.1.2. Demonstrations at Facility B

Facility B also manufactures motor homes. The process is very similar to the process at Facility A. Facility B is planning a large expansion, and is thus expressing high interest in a non-VOC coating like the ADCO system.

Currently, Facility B does not coat the whole chassis and Paco beam. Only the metal weld joints on the chassis and Paco are coated using aerosol cans. The joints are coated for rust protection. The coating is conducted outdoors without any confinement. The current coating system used has a VOC content of 2 lb/gal. Facility B indicates that rust protection is a major issue. Another critical parameter is dry time. Half an hour is an acceptable dry time for the coating process.

Demonstration, Conducted on January 12, 1998

Representatives of AVES, ADCO, GRACO Equipment Manufacturer, and Butler Compressor & Spray Equipment Co. conducted testing at Facility B on January 12, 1998. The purposes of this testing were: (1) to test the feasibility of the in-situ mixing spray gun to avoid premixing a two part component coating system, and (2) to coordinate with Facility B personnel to expand the no-VOC metal coating application (both RV chassis and trailer chassis). Two sets of power-structure RV chassis platform were coated with ADCO's no-VOC metal coatings. The first set of power-structure RV chassis platform was slightly overcoated and resulted in dripping. Butler Compressor & Spray Equipment Co. staff changed the tip size of the spray gun and reduced dripping from the second set of power-structure RV chassis platform. About 1 to 1.25 gallons of

coating was consumed for each set of RV chassis. Even if it was a cold day (temperature less than 55^0F outdoors), the coated chassis surfaces were dry in about 30 minutes. After completion of these two sets of power-structure RV chassis platform, the engineering services manager of Facility B asked staff to coat a rusted trailer chassis to see whether this new no-VOC metal coating can be applied to rusted surfaces and protect the surfaces from further corrosion. About 1.5 gallons of coating was used to cover this big trailer chassis. Facility B was satisfied with the demonstration results.

C.1.3. Coating Comparison

Comparison of No-VOC/No-HAP Coating and the Current Compliant Coating

This no-VOC/no-HAP coating and the current compliant coating, (VOC 333 g/l) were sprayed on metal panels and put in a salt spray cabinet using ASTM Method B117 for corrosion resistance testing. The current compliant coating failed after 192 hours (showed cracks and blisters on coating surface) and the no-VOC coating reached 1700 hours before signs of cracking appeared.

APPENDIX C.2

POTENTIAL FORMULATION USING SOY BEAN OIL

For the past five years ADCO has been developing resin systems for industrial paints and coatings that emit no volatile organic compounds (VOCs), and no hazardous air pollutants (HAPs). These systems are based on ADCO's patented technology which utilizes epoxy functional materials emulsified in water, and then reacted to increase the molecular weight and thus create unique resin systems which combine the qualities of high performance with the practical benefits of ease of use, very low odor, and no volatiles other than water. Increasing the molecular weight in such a manner creates resins that are well on their way to forming resin films which are the binders for paints and coatings and which, to a large extent, define the performance characteristics of a finished paint.

The same resin technology can be used to develop a high performance soy polymer (HPSP) that employs epoxidized soybean oils and ADCO's patented epoxy-functional, high molecular weight technology as a resin for paints and coatings. The HPSP can be used with a variety of cross-linking materials including carboxyl, amino and hydroxyl functional resins, as well as conventional driers. When developed these products could make a significant impact on sizable markets offering these advantages: high performance at relatively low cost (up to 30-50% less than competitive paint systems), user friendliness (water-based with no odor), versatility (can be air dry or low bake), and environmental consciousness (utilizing a renewable resource material to replace non-renewable resources as well as eliminating VOC and HAP emitting materials).

These systems differ from the epoxy systems in molecular backbone structure but not in functionality. This research and development work focuses on the homopolymerization and polymer chain extension of commercially available epoxidized soybean oils completed as water emulsions or dispersions. The resultant high molecular weight soybean oil in water has distinct advantages to paint and coating performance and versatility. One advantage is that when a paint is applied fully, about one third to one half of the resin is already polymerized, so the cure time is shortened considerably. This is an important consideration for all resin systems, specifically for soy based paint products which are typically slow curing or require significant heat to give a reasonable cure response. Another advantage would be that, when polymerized in this fashion, the resulting resin usually requires no extra coalescing aids (normally VOCs) that contribute odor and potential health risks allowing a lower odor, safer paint or coating product to be produced. Still another advantage is that, being a water-based system, the paint or coating could be pigmented using conventional dispersing techniques and tinted with commercially available water-based tints for the full color spectrum.