



Project Summary

Development of a No-VOC/No-HAP Wood Furniture Coatings System

Eddy W. Huang

The U.S. Environmental Protection Agency (EPA) has contracted with AeroVironment Environmental Services, Inc. and its subcontractor, Adhesive Coatings Co. (ADCO), to develop and demonstrate a no-VOC (volatile organic compound)/no-HAP (hazardous air pollutant) wood furniture coating system. The objectives of this project are to develop a new wood coating system that is sufficiently mature for demonstration and to develop a technology transfer plan to get the product into public use. The performance characteristics of this new coating system are excellent in terms of adhesion, drying time, gloss, hardness, mar resistance, chemical resistance, and stain resistance.

The VOC contents of the topcoat, sanding sealer, and stain base are less than 10 g/l. The HAP contents of the topcoat, sanding sealer, and stain base are not detected or less than the practical quantification limit. In addition to the field demonstration at a selected wood furniture manufacturing facility, a workshop was held to provide detailed information to wood furniture manufacturers, coating suppliers, corporate users, and regulatory agencies on what is required to change to the new coating system. Topics such as product performance data, application techniques, coating repair procedures, drying time, curing procedures, and spray equipment cleaning techniques were presented.

In parallel with this demonstration project, surveys were conducted with the South Coast Air Quality Management District (SCAQMD) to gain an understanding of the effort required by

the wood furniture industry to change over to waterbased coating systems in general. The survey results were presented in this report including coating performance, consumer acceptance, spray techniques, ease of use, repair procedures, dry times, equipment cleanup, and materials cost. A cost analysis, including costs of materials, capital outlay, and labor, was conducted for this new system. An environmental impact study was included in this project to address emissions benefits, disposal cost saving, and energy conservation based on data gathered during the inplant, full-scale demonstrations.

This Project Summary was developed by EPA's National Risk Management Research Laboratory, Research Triangle Park, NC, to announce key findings of the research project that is fully documented in a separate report of the same title (see Project Report ordering information at back).

Introduction

Under U.S. EPA sponsorship, AeroVironment Environmental Services, Inc. and ADCO are teamed to develop and demonstrate a no-VOC/no-HAP wood furniture 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. The objectives of this project are to develop a new wood coating system that is sufficiently mature for demonstration and to develop a technology transfer plan to get the product into public use. The performance characteristics of this new coating system are excellent in terms of adhe-

sion, drying time, gloss, hardness, mar resistance, level of solvents, and stain resistance.

In parallel with this demonstration project, surveys were conducted with the SCAQMD to gain an understanding of the effort required by the wood furniture industry to change over to waterbased coating systems in general. The survey results are presented in this report: coating acceptance, cost, spray techniques, coating repair procedures, dry times and procedures, spray equipment cleanup, and materials and techniques.

In addition to the research and development work, a cost analysis was performed on furniture finished with the new wood coating system. The analysis considers new product introduction decisions such as realistic material cost, capital outlay requirements, and labor.

The VOC content of the new system (stain, sealer, and topcoat) is less than 10 g/l. This system's performance and properties on finished material compared favorably with other low-VOC waterborne systems. The focus of the follow-on work will be to adapt this new system to other furniture lines. Also, effort will be spent on testing this new system on kitchen cabinets. Extended technology transfer efforts will be required to encourage widespread use of the new coating system. Results and overall findings of this research program are discussed in the final report.

Discussion

The goal of this program is to demonstrate a new no-VOC/no-HAP wood coating system (stain, sanding sealer, and top coat) that will find wide applicability across the wood furniture industry. The efforts are directed at developing a complete wood coating system that exhibits the following attributes:

- Contains no VOCs
- Contains no HAPs

- Is "dry to touch" in 10 minutes or less
- Is "dry to handle" in 15 minutes or less
- Exhibits acceptable hardness
- Exhibits excellent intercoat adhesion with wood top/finishing coat
- Exhibits "sandable" characteristics
- Contains a demonstrated chemical, water stain, and chip resistance comparable to other products for the same general use
- Exhibits an acceptable level of wood discoloration

Demonstration of the new no-VOC/no-HAP wood coating system was conducted at Commercial Casework, Inc. in Fremont, CA, on February 6, 1997. They manufacture finished panels, desks, reception counters, and other office furniture and architectural wood products. The purpose of the demonstration was to show that this new no-VOC/ no-HAP wood coating system could be used successfully in a commercial wood finishing operation.

Traditional coating technologies emit large quantities of pollutants into the air and consume energy in the drying processes. In addition to causing ozone depletion, acid rain formation, water contamination, and other environmental ills, considerable health and safety concerns are created in the workplace. By using this new, promising no-VOC waterbased coating technology, significant air emission reductions, hazardous waste reductions, and energy savings could be achieved without installing add-on controls. As a result, cost savings will be achieved from eliminating VOC control equipment and hazardous waste disposal, and from energy savings. Therefore, commercialization of the proposed technology will provide a cost-effective way to comply with current and

future emissions standards for coating operations imposed by federal, state, and local government agencies.

Conclusions and Recommendations

1. Some waterbased coatings are currently available on the market. However, they work well only in some applications, and cannot be applied across all finishing lines.
2. The physical characteristics of the new wood coatings are excellent. They successfully passed all tests. Laboratory analysis confirmed that this new coating has no VOCs and no HAPs.
3. The keys to successful conversion from solvent- to waterbased coatings are staff training and technical support from the coating manufacturers. Personnel may need retraining on spraying techniques for waterbased wood coating applications.
4. When using waterbased coatings, additional finishing steps, including sanding and force drying, may be required. Increased labor costs may result because of the additional finishing steps.
5. By using this new, promising no-VOC waterbased coating technology, significant air emission reductions, hazardous waste reductions, energy savings, and cost savings could be achieved without installing add-on controls. Therefore, commercialization of the proposed technology will provide a cost-effective way to comply with current and future emissions standards for coating operations imposed by federal, state, and local government agencies.
6. The new coating system should find wide applicability across many segments of the wood furniture industry.

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Robert C. McCrillis is the EPA Project Officer (see below).

The complete report, entitled "Development of a No-VOC/No-HAP Wood Furniture Coatings System," (Order No. PB98-127301; Cost: \$25.00, subject to change) will be available only from:

National Technical Information Service

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The EPA Project Officer can be contacted at:

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