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THE APPLICATION OF POLLUTION PREVENTION TECHNIQUES TO REDUCE INDOOR AIR EMISSIONS FROM ENGINEERED WOOD PRODUCTS

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16. ABSTRACT The report gives results of an investigation of pollution prevention options to reduce indoor emissions from a type of finished engineered wood. Emissions were screened from four types of finished engineered wood: oak-veneered particleboard coated and cured with a heat-curable, acid-catalyzed alkyd-urea sealer and topcoat (PBVST); oak-veneered handboard coated and cured with a stain, and a heat-curable, acid-catalyzed alkyd-urea sealer and topcoat (HBVSST); particleboard overlaid with vinyl (PBVY); and particleboard overlaid with melamine (PBM). Within the scope of the emissions and performance tests of the study, three types of coatings were found to have significantly lower emission factors of summed volatile organic compounds (VOCs) and formaldehyde relative to those for the heat-curable, acid-catalyzed alkyd-urea coatings: a two-component waterborne polyurethane, an ultraviolet (UV)-curable acrylate, and a UV-and-heat-curable multi-functional acrylate-free emulsion. Three types of engineered fiber panels were identified as having significantly lower emission factors of summed VOCs and formaldehyde relative to those for particleboard: medium-density fiberboard made with methylene diisocynate (MDI), a wheatboard panel made with MDI resin, and a panel made from recycled corrugated cardboard. All three fiber panels are in the market place.

17. KEY WORDS AND DOCUMENT ANALYSIS

a. DESCRIPTORS		b. IDENTIFIERS/OPEN ENDED TERMS	c. COSATI Field/Group
Pollution	Volatility	Pollution Prevention	13B 20M
Emission	Formaldehyde	Stationary Sources	14G
Wood Products	Polyurethane Resins	Indoor Air	11L 11I, 11J
Particle Boards	Paperboards	Engineered Wood Products	11G
Sealers	Melamines		11A
Coatings	Acrylates	Volatile Organic Compounds (VOCs)	11C 07C
Organic Compounds			

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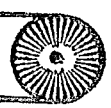

FOREWORD

The U.S. Environmental Protection Agency is charged by Congress with protecting the Nation's land, air, and water resources. Under a mandate of national environmental laws, the Agency strives to formulate and implement actions leading to a compatible balance between human activities and the ability of natural systems to support and nurture life. To meet this mandate, EPA's research program is providing data and technical support for solving environmental problems today and building a science knowledge base necessary to manage our ecological resources wisely, understand how pollutants affect our health, and prevent or reduce environmental risks in the future.

The National Risk Management Research Laboratory is the Agency's center for investigation of technological and management approaches for reducing risks from threats to human health and the environment. The focus of the Laboratory's research program is on methods for the prevention and control of pollution to air, land, water, and subsurface resources; protection of water quality in public water systems; remediation of contaminated sites and groundwater; and prevention and control of indoor air pollution. The goal of this research effort is to catalyze development and implementation of innovative, cost-effective environmental technologies; develop scientific and engineering information needed by EPA to support regulatory and policy decisions; and provide technical support and information transfer to ensure effective implementation of environmental regulations and strategies.

This publication has been produced as part of the Laboratory's strategic long-term research plan. It is published and made available by EPA's Office of Research and Development to assist the user community and to link researchers with their clients.

E. Timothy Oppelt, Director
National Risk Management Research Laboratory

Abstract

The objective of this research was to investigate pollution prevention options to reduce indoor emissions from a type of finished engineered wood. Emissions were screened from four types of finished engineered wood: oak-veneered particleboard coated and cured with a heat curable acid catalyzed alkyd-urea sealer and topcoat (PBVST); oak-veneered hardboard coated and cured with a stain, and a heat curable acid catalyzed alkyd-urea sealer and topcoat (HBVSST); particleboard overlaid with vinyl (PBVY); and particleboard overlaid with melamine (PBM). The PBVST and HBVSST had substantially higher initial emission factors of summed volatile organic compounds (VOCs) relative to those for PBVY and PBM. The PBVST and HBVSST also had higher decay emission factors of formaldehyde relative to the initial emission factors of formaldehyde for PBVY and PBM.

The acid catalyzed alkyd-urea coatings and particleboard were identified as sources of VOCs from the PBVST. A coatings study was conducted to evaluate emissions and performance properties of potentially low-emitting substitutes for the acid catalyzed alkyd-urea coatings. Within the scope of the emissions and performance tests of the study, three types of coatings were found to have significantly lower emission factors of summed VOCs and formaldehyde relative to those for the heat curable acid catalyzed alkyd-urea coatings; these included a two component waterborne polyurethane; a UV curable acrylate; and a UV and heat curable multi-functional acrylate-free emulsion. These coatings also had comparable performance characteristics to the heat curable acid catalyzed alkyd-urea coatings. All three wood coatings are currently available in the market place.

A fiber study was conducted to evaluate emissions of potentially low-emitting engineered fiber panels. Three types of engineered fiber panels were identified as having significantly lower emission factors of summed VOCs and formaldehyde relative to those for particleboard; these included medium density fiberboard made with methylene diisocynate resin (MDI); a wheatboard panel made with MDI resin; and a panel made from recycled corrugated cardboard. All three fiber panels are in the market place and are used to construct a wide variety of interior products.

Table of Contents

Table of Contents (Continued)

Table of Contents (Continued)

Chapter **Page**

List of Figures

List of Figures (Continued)

List of Tables