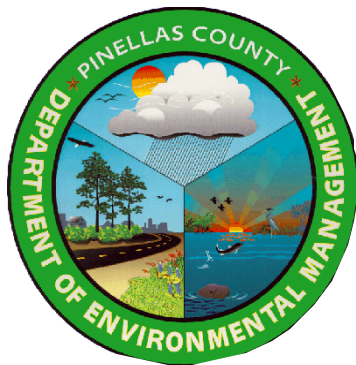


The P2R2 Section was developed to minimize the amount of liquid, solid, and gaseous pollution as well as energy & water consumption within Pinellas County.

If you are interested in the economic & environmental benefits of reducing wastes, please contact the P2R2 Section at (727) 464-4761.

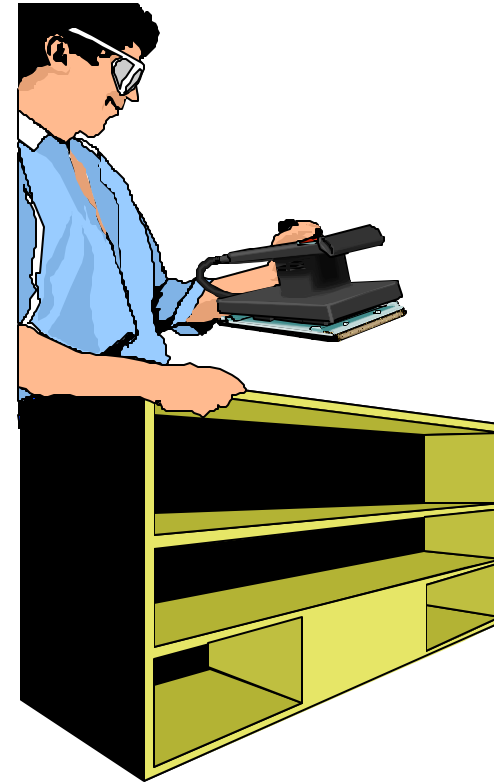
**Pinellas County**  
**Department of Environmental Management**  
**Pollution Prevention and Resource Recovery Section**  
**512 S. Ft. Harrison Ave.**  
**Clearwater, FL 33756**



# Waste Reduction Assistance

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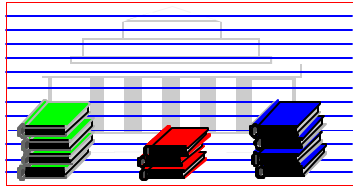
In  
Wood  
Furniture  
Manufacturing  
And Refinishing



Developed by  
Pinellas County Government  
Department of Environmental Management  
Pollution Prevention and Resource Recovery Section



The P2R2 Section has additional resources available for project funding, energy efficiency programs, product/equipment technology, and technical assistance. For additional information, contact our section at (727) 464-4761.



# About This Manual

This manual is designed to assist wood furniture manufacturers and refinishers with waste reduction in operations. Excessive waste is an indicator of inefficient use of raw materials and resources. Through proper education and training, business can minimize the amount of liquid, solid, and gaseous waste in Pinellas County, while improving their economic viability.

Manuals are developed by the Pollution Prevention and Resource Recovery Section of the Pinellas County Department of Environmental Management, a non-regulatory program that provides waste reduction technical assistance. Program staff provide information on new technologies, process modifications, substitute products, and current industry-specific Best Management Practices (BMPs). Staff can assist businesses in their efforts to become more efficient, profitable, and competitive, while complying with regulatory requirements. As a Pinellas County business, no fees are charged for using the Pollution Prevention Program's services. On-site waste reduction assistance is available by contacting program staff at (727)

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## Introduction

The 1990 Clean Air Act Amendments (CAAA) require many furniture manufacturers to reduce emissions of volatile organic compounds (VOCs) and hazardous air pollutants (HAPs). Regulatory requirements could increase operating cost while business competition and the costs to produce goods and services continue to rise on an annual basis. In fact, increased competition demands reducing costs.

Wood furniture manufacturing operations may be subject to 40 CFR 63 Subpart JJ, and must begin keeping records of usage by 12/7/97 if they emitted less than 50 tons/yr of HAPs in 1996. According to the rule, a facility may avoid being subject to any provisions if they can demonstrate through record-keeping that they are an incidental source or an area source. Maintaining records of the total gallons of coating, finishing, gluing, cleaning, and washoff materials used each month are needed to demonstrate area source status.

However, Best Management Practices (BMPs) and new technologies are available that offer manufacturers an opportunity to comply with the regulations and reduce emissions while saving money and improving efficiency. Waste reduction practices can:

- ✗ Reduce the use of raw materials
- ✗ Minimize the expense of waste disposal
- ✗ Reduce the exposure of workers and the general public to hazardous and toxic materials
- ✗ Reduce the threat of product liability
- ✗ Maximize compliance with environmental regulations and requirements



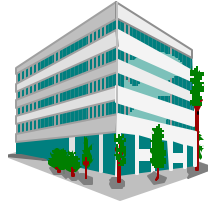
By practicing waste minimization you can improve your bottom line while increasing your business' competitive ability.

## Assistance Centers and Resources

Pinellas County Solid Waste	727-464-7500
Pinellas County Dept. of Environmental Management	
Pollution Prevention & Resource Recovery Section	727-464-4761
Air Quality Division	727-464-4422
Florida Department of Environmental Protection	
Hazardous Waste Compliance Assistance Program	800-741-4337
RCRA Hotline Phone	800-424-9346
Florida Small Business Assistance Program	800-722-7457
Waste Reduction & Technology Transfer (WRATT)	800-476-8686
Southern Waste Information Exchange	800-441-7949
Waste Reduction Resource Center	800-476-8686
Pollution Prevention Information Clearinghouse	
RCRA/Superfund Hotline:	800-424-9346
Recycling Hotline 3873	800-947-



## A Waste Reduction Success Story Pinellas County, FL



A local manufacturer whose main product is laminated commercial office furniture was using a lamination process that required the use of adhesives with a high Volatile Organic Compound (VOC) content. One of the major steps in fabrication of the furniture is the cutting of laminated sheets to match wooden surfaces and then applying an adhesive bond to the sheets and surface. The VOCs contained in the adhesives release to the atmosphere when applied.

The local manufacturer was using over 6000 gallons/yr of adhesives, which resulted in over 15 tons/yr of VOC emissions. At 15 tons/yr, application for a costly Title V Air Permit would be required. The alternative was to investigate ways to reduce the annual VOC emissions below the 8 tons/yr threshold for Title V permits. The major challenge was to identify an adhesive that would meet strength and durability standards with a reduced VOC content.

A partnership of Pollution Prevention agencies was employed to assist the manufacturer with three waste reduction initiatives that reduced their VOC emissions to less than one ton/yr.

The first initiative was to purchase melamine board for use in over 50% of the facility's production. The board is purchased with a lamination-like surface coat already applied, which reduces lamination and adhesive use in half. The second initiative to switch to water-based (extremely low VOC content) adhesives was implemented for 75% of the remaining lamination requirements and a third initiative involved purchasing lamination edging machine that uses a hot melt zero VOC glue to apply the lamination strip to the edge of furniture.

The business' initiatives not only improved the company's bottom line, but contributed to an improved work and community environment. The slightly higher cost factor for the use of water-based adhesives was more than balanced by the reduction in labor costs, improved productivity, and the savings achieved by avoiding a Title V Air Permit.

## Why Should You Consider Waste Minimization and Pollution Prevention?



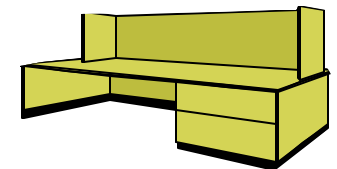
In addition to increased production costs and competitive demands, business liability for employee chemical exposure is a concern. Wood furniture manufacturing/refinishing operations can emit toluene, xylene, methanol, and formaldehyde. Exposure to these and other air toxics during finishing, gluing, and painting operations can cause adverse health effects: eye, nose, throat, and skin irritation; damage to the heart, liver and kidneys; and degenerative reproductive effects.

Pollution prevention is one approach to reducing toxic HAP and solvent VOC emissions, and that is more cost effective than installing control devices.

Waste reduction techniques include:

- ✗ Improved operation and maintenance
- ✗ Use of new technologies
- ✗ Use of substitute chemicals
- ✗ Inventory management
- ✗ Water and chemical conservation
- ✗ Production process modification
- ✗ On-site recovery, recycling, and reuse

## Furniture Manufacturing and Refinishing Operations



Wood furniture manufacturing and refinishing includes kitchen cabinets, household & office furniture, veneer or plywood, and particle board. Typical operations involve finishing, gluing, cleaning, and washoff operations. Washoff is the process by which a cured coating is removed due to the product not meeting specification.

Common finishing materials include stains, basecoats, washcoats, glazes, fillers, sealers, highlights, enamels, and topcoats. During finishing, paste or diluted paste fillers may be required to level open grained and closed grained surfaces. Stains are applied to penetrate the wood and produce a desired color. Some stains are solvent borne such as penetrating oil and alcohol, while other stains are water borne. Sealers and transparent films are either shellacs, varnishes, or lacquers. Shellac is a natural resin which is combined with a solvent such as alcohol. Varnishes, slow drying coatings, are typically polyurethane. Solvents found in varnishes include turpentine, varnalene, and xylol. Solvents used in lacquers include acetone and ethyl alcohol. Thinners used in lacquers include toluene, benzene and xylene.

Major types of glue adhesives in the wood products industry include hot melts, polyvinyl acetates (PVA), ureaformaldehyde (UF) resins, and contact adhesives. Adhesives are used to apply finished components.

### Do You Generate Hazardous Wastes?

Did you know that wood furniture manufacturing generates several hazardous wastes that could be reduced by waste minimization practices? Hazardous waste is defined as any solid, liquid, or contained gaseous by-product that may pose a threat to human health or the environment if not managed properly. Typical wastes generated in the wood refinishing industry include solvent cleaning waste, coating waste and paint stripping waste. Hazardous wastes are currently regulated by federal, state, and local public health and environmental protection agencies. A waste may be considered hazardous if it exhibits any of the following characteristics: ignitability, reactivity, corrosivity, or toxicity.



#### Ignitable

Easily combustible or flammable, if they have a flashpoint of less than 140 F or an alcohol content of 24% or more, they are hazardous wastes. Some paints, solvents and degreasers are ignitable.



#### Corrosive

Corrosive wastes corrode metals or burn the skin. Corrosives have a pH of 2 or

washed off, and the reason for the washoff. These practices will minimize HAP and volatile organic compound emissions

- ✘ Keep records of solvent use to help identify areas of excess usage



identify

### Operation and Maintenance

- ✘ Check equipment daily for proper set-up and needed adjustments to minimize waste
- ✘ Perform regular inspections of application performance
- ✘ Perform preventative maintenance for all fluid transfer and application equipment
- ✘ Position workpiece to minimize overspray and make spraying as comfortable as possible for the operator
- ✘ Optimize spray patten and technique to work piece size, shape, and orientation
- ✘ Minimize dripping by allowing sufficient drying time
- ✘ Cover all containers containing solvents or solvent-laden rags
- ✘ Reuse dirty cleanup and washoff solvent for non-critical uses wherever possible, and recycle solvents when too contaminated to reuse
- ✘ Reuse cleaning solvents for the same resin by allowing the solids to settle
- ✘ Recover and reuse paints and stains. Filter if necessary.
- ✘ Recycle thinner
- ✘ Flush equipment first with old solvent, then fresh solvent
- ✘ Keep washoff tanks covered when not in use and increase drain time on pieces to minimize solvent dragout
- ✘ Use self-contained recycling gun washer equipment
- ✘ Schedule colors from light to dark to minimize required cleanings.
- ✘ Develop a written plan to reduce waste that identifies facility plans for minimizing air emissions, hazardous waste, solid waste, water pollutant releases and worker exposure to hazardous chemicals.



into a closed container, use self-closing funnels when adding waste, and cover all containers associated with cleaning when not in use

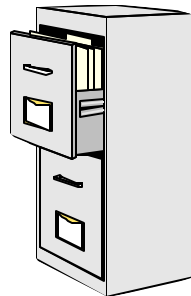


Labels

Label containers as hazardous or non-hazardous and include federal waste code numbers, waste accumulation start date, and your business name and address.

Inspections and Recordkeeping

- ✘ Inspect containers at least once a week and keep a written inspection log
- ✘ Keep inspection records for 3 years
- ✘ Keep manifests and shipping receipts for 3 years
- ✘ Keep lab test records for 3 years
- ✘ Keep land disposal restriction forms for 5 years



Training

- ✘ Train all employees to identify, reduce, and properly handle wastes
- ✘ Train new employees before they handle hazardous wastes
- ✘ Train employees to use solvents, finishes and other chemicals correctly and efficiently to minimize raw product usage
- ✘ Provide annual training to operators on proper application, cleanup, equipment setup and adjustment to minimize coating usage and overspray, and proper management of cleanup wastes
- ✘ Keep employee training records



Inventory

- ✘ Inventory hazardous material handled on-site
- ✘ Inventory the amount of solvent used for cleaning and washoff, the number of times a piece of equipment is



lower or 12.5 or higher. Rust removers are considered corrosive.

Reactive

Reactive wastes are unstable and react quickly or violently with water or other materials. Bleaches, cyanides, and oxidizers are considered reactive.



Toxic

Toxic wastes contain certain heavy metals (chromium, lead, etc.) or toxic organic chemicals. Some parts cleaners are classified as toxic.

Hazardous waste can be identified by reading Material Safety Data Sheets (MSDS) and product labels. Talk to product suppliers and manufacturers about chemical characteristics. A facility waste assessment will assist you to identify waste contaminants and their characteristics. The following table identifies wood manufacturing/refinishing operations and potential wastes generated:

Process/	Material Used	Typical Ingredients	Associated
Wood Cleaning/	Petroleum, lye	Petroleum distillates,	Ignitable, toxic,
Refinishing/ Stripping	Removing chemicals (paint, varnish, enamel, shellac)	Acetone, toluene, petroleum distillate %, methanol, methylene chloride, alcohols, ketones, oxygenated solvents, paint	Ignitable, toxic, paint, solvent
Staining	Stains	Mineral spirits, alcohol	Ignitable, toxic,
Finishing	Varnish, shellac, polyurethane, lacquers, wood treatments, drying	Denatured alcohols, resins, shellac, petroleum distillates, toluene diisocyanate, oxalic acid,	Ignitable, toxic, paint, solvent, solvent still bottoms, solvent-
Gluing	Adhesives	Trichloroethylene, tetrachloroethylene,	Ignitable, toxic, solvents, air
Brush/ Spray Gun Cleaning	Paint thinners, enamel, reducers, varnish removers, shellac removers,	Acetone, toluene, petroleum distillates, methanol, methylene chloride, isopropanol, mineral spirits,	Ignitable, toxic, solvents, solvent still bottoms

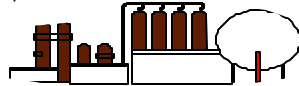
Not all wood furniture manufacturing and refinishing operations produce hazardous waste. If however, you use solvents, flammable or combustible liquids, ignitable paints containing flammable solvents, or other materials containing toxic chemicals, the resulting waste may be hazardous. The Code of Federal Regulations, 40 CFR Part 261 lists hazardous wastes.

## How Can You Minimize Your Operational Wastes?



Excessive wastes in operations may indicate inefficient use of raw materials, equaling increased production costs. Implementing pollution prevention and waste minimization practices may improve your operational efficiency. Practices include production process modifications; improved housekeeping and operation/maintenance procedures; and

prudent waste hazardous materials handling.



### Product/Process Modifications

Chemical Substitution - To minimize the use of hazardous chemicals, substitute.

- ⌘ Replace chemicals that are known or probable carcinogens in cleaning solvents with less hazardous/toxic substitutes
- ⌘ Substitute water-based coatings and adhesives for solvent-based where feasible
- ⌘ Substitute hazardous finishes with less hazardous products
- ⌘ Consider using mechanical stripping methods, such as heat guns instead of stripping chemicals
- ⌘ Eliminate or reduce solvent usage wherever feasible
- ⌘ Use heat instead of solvent to reduce coating viscosity
- ⌘ Use a multi-purpose solvent to minimize the separate hazardous waste streams

Common VOC's found in cleaners are trichloroethane, methyl ethyl ketone, methylene chloride and acetone. If your facility is unable

use cleaners that have a lower VOC content of less than 950 grams per liter of material.

Equipment Substitution/Modifications - Proper application equipment can minimize raw material losses while reducing air pollutant emissions. Potential waste-minimizing equipment includes:

- a. Electrostatic application
- b. Flow coat
- c. Dip coat
- d. High-volume, low pressure (HVLP) spray
- e. Paint brush
- f. Hand roller
- g. Roller coater



Cleaning Processes - VOC emissions can occur during cleaning processes through evaporation. Cleaning systems that totally enclose the equipment or flush the part in a controlled manner may reduce air emissions and wastes. If hand cleaning, wipe clean using 16 ozs. or smaller spray bottles to reduce material waste and emissions due to evaporation.

### Housekeeping Practices

#### Container Use, Storage, and Labeling

- ⌘ Place hazardous waste in properly labeled, closed containers compatible with the waste material
- ⌘ Date each container when waste accumulation begins
- ⌘ Routine inspections of containers will help to prevent leaks, ruptures, and accumulation of rainwater on tops of drums
- ⌘ If a container leaks, transfer the waste to a new container
- ⌘ Separate wastes and use approved containers
- ⌘ Maintain adequate aisle space between container rows to allow inspections for leaks and damage
- ⌘ Be aware of allowable time limits for storage
- ⌘ Store ignitable and reactive wastes at least 50 feet inside property boundaries
- ⌘ To prevent evaporation and air emissions, collect cleaning solvent

