

4.10.1 Wood Products Industry: Wood Finishing

Case Study #1

BUSINESS: Madison Pre-hung Doors & Pre-finishing; Oregon, Wisconsin
WASTE ORIGIN: Wood Finishing
WASTE TYPES: Volatile Organic Compounds (VOC) Air Emissions and Solid Wastes, Petroleum Solvent-based Finishes and Stains, Waste Solvent-based Cleaners, and Waste Paint Filters

COMPANY BACKGROUND

Madison Pre-hung Doors & Pre-finishing is an owner-operated small business with 28 employees. It finishes doors, wood trim, and moldings for builders and commercial distributors.

MOTIVATION

The company needed to comply with OSHA and 1990 Clean Air Act Amendments requirements for VOC emissions.

STRATEGIES

Find water-based material substitutes that were readily available through commercial suppliers.

ORIGINAL PROCESS

The company generated 115 tons/year of evaporated VOC air emissions from solvents. A VOC after-burner (thermal oxidizer) was needed to stay in compliance with air regulations. Solid waste was landfilled. Unused solvent was removed by a hazardous waste management company and recycled.

NEW PROCESS

Water-based finishes were substituted for the solvent-based finishes in the manual application and the automated spray application operations. VOCs have been reduced to less than six tons per year, while production has nearly doubled. Wastewater is removed and discharged into the local publicly-owned treatment works (POTW). A new curtain-coating system eliminates overspray and recycles excess finish. The company also is using non-toxic, biodegradable hydraulic fluid and recycling cardboard.

RESULTS

Waste Reduction

Annual VOC air emissions were reduced from 115 tons to 6 tons.

Economics

Capital Cost:

Approximately \$6,000 for five new spray guns.

Operating/Maintenance Savings:

No significant new O&M costs.

Eliminated waste solvent disposal costs.

Eliminated costs associated with operation and maintenance of VOC after-burner.
Reduced annual insurance premium costs by \$8,000 (by reducing VOC fire risk), while increasing policy coverage by \$350,000.

Payback Period: Not available.

HEALTH & SAFETY BENEFITS

Fire hazard has been drastically reduced. The work environment has improved; employee exposure to hazardous/flammable materials has been reduced. Employees are no longer required to wear safety equipment.

TECHNOLOGY TRANSFER

Water-based finishes can be readily adopted for use by others doing wood finishing.

PROBLEMS

Water-based finishes require more labor (extra sanding and more coats of finish) due to some grain raising. To achieve comparable finish quality to that of solvent-based finishes, the company worked with its paint supplier to design a production process to address this problem.

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Case Study #2

BUSINESS: Gerry Wood Products; Suring, Wisconsin
WASTE ORIGIN: Furniture Production
WASTE TYPES: Lacquer Coating, Volatile Organic Compounds (VOCs), and Wax Coating Overspray

COMPANY BACKGROUND

Gerry Wood Products manufactures wooden children's furniture and expansion safety gates.

MOTIVATION

Reduce VOC air emissions and associated special air supply and exhaust requirements, and meet and exceed environmental regulatory compliance standards. Reduce hazardous waste disposal costs.

STRATEGIES

Switch to a formulated wax coating process instead of solvent-thinned lacquer coating without a large capital investment.

ORIGINAL PROCESS

Wood parts were finished by a tumbling process using premixed lacquer. The percentage of VOC air emissions were high, and daily clean up generated hazardous wastes. Special air supply and exhaust was required to remove VOCs.

NEW PROCESS

The new formulated wax coating used in the tumbling finishing is a granular solid with no known hazards, and does not produce VOC emissions.

RESULTS

Waste Reduction

VOC air emissions reduced by 44,800 pounds/year.

Hazardous wastes from daily clean up reduced by 5,000 pounds/year.

Economics

Savings: Over \$200,000/year.

Capital Cost: Information not available.

Operating/Maintenance Cost: Information not available.

Payback Period: Information not available.

HEALTH & SAFETY BENEFITS

VOCs used for finishing can be eye and skin irritants, are suspected carcinogens, may cause internal organ or respiratory system problems, and are typically highly flammable liquids.

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Case Study #3

BUSINESS: The Shuttery of Nanik; Wausau, Wisconsin
WASTE ORIGIN: Wood Shutter Manufacturing
WASTE TYPES: Volatile Organic Compounds (VOCs) and Solvent-based Coatings

COMPANY BACKGROUND

The Shuttery produces handcrafted, custom interior wood shutters with 65 employees.

MOTIVATION

Improve worker health and safety for spray painters and nearby workers in the finishing department. Reduce regulatory burden over VOC emissions. Eliminate the need for a flammable material storage area.

STRATEGIES

Convert from solvent-based coatings to waterborne coatings while producing a higher quality wood finish.

ORIGINAL PROCESS

The original coating process consisted of sanding, priming, sanding, and top coating the wood components with solvent-based coatings.

NEW PROCESS

The waterborne coatings are in full production use for all standard coatings, except when specialized high-performance coatings are required. These new coatings are more scratch-resistant and cover twice as much area/gallon of coating.

RESULTS

Waste Reduction

VOC emissions were cut from 5.97 tons/month in 1992 to 0.5 tons/month in 1995. Hazardous waste volume was reduced from 1,100 pounds/month in 1992 to less than 220 pounds/month in 1995. Coating throughput dropped from 2,026 gallons/month in 1992 to 408 gallons/month in 1995.

Economics

Savings: \$32,600 for first year (eliminated regulatory costs), increased labor costs to maintain equipment.

Payback Period: Approximately 8½ years based on above savings projections.

HEALTH & SAFETY BENEFITS

VOCs typically used for finishing can be skin and eye irritants, are suspected carcinogens, may cause internal organ or respiratory system problems, and are typically highly flammable liquids.

TECHNOLOGY TRANSFER

The waterborne coating are commercially available, but the Shuttery's coatings have been modified slightly to meet specific coating performance criteria. Other wood finishers could switch to waterborne coatings if their finishing process allow for sanding in between the first and second coat of primer. However, the wood substrate must have structural integrity to avoid distortion, especially for thin wood profiles.

PROBLEMS

Grain raising and atmosphere-sensitive coatings were problems in the conversion, but were managed by training paint technicians to identify the exact problem and react appropriately.