OKLAHOMA
DEPARTMENT OF ENVIRONMENTAL QUALITY

POLLUTION PREVENTION & WASTE REDUCTION FOR WOOD FURNITURE MANUFACTURERS

THOUGHTS ABOUT POLLUTION PREVENTION & WASTE REDUCTION

The term "pollution prevention" often called P2, embraces the many beneficial practices associated with waste reduction, recycling, and material substitution. The waste or misuse of resources, *i.*e., manpower, materials, or energy, causes most environmental pollution. Material substitution reduces the environmental impact of resource waste, but generally does not affect the amount of waste generated.

The readily quantified monetary benefits derived from waste reduction and recycling projects generally justify their implementation. They always pay out the capital investment required, although sometimes at an economically impractical rate. Conversely, the environmental cost savings accruing from use of less toxic materials usually cannot be quantified so readily. This results in less toxic materials being used; generally as a response to regulatory mandate. Significantly, the NESHAP for wood furniture manufacturing operations relies heavily upon compelled material substitution to accomplish its goals.

Wastes are generated for the same fundamental reasons at every plant that spray coats furniture. The NESHAP requires wood furniture manufacturers to implement work practices in 11 of these areas. Existing P2 literature explains the desirability of implementing these mandated practices. Appendix 1 lists a few documents that discuss these P2 practices.

This handout reviews some less well documented, non-mandated, P2 opportunities. Undoubtedly, other P2 practices exist because wood furniture manufacturing processes vary so extensively. Phil Crosby, a "quality" guru, once said, "A company's product always looks exactly like what its management wants." *Paraphrased for the purposes of this discussion his statement means, how much gets done about every waste generating situation relates directly to how much attention the management gives it.*

SOME WASTE REDUCTION PRACTICES TO CONSIDER

An Overriding Principle: Reduce Waste, Don't Make Any!

Use the minimum amount of resources needed to get a job done right the first time.

Waste Data — Collection, Reporting and Use

Waste measures an operation's overall *efficiency*, the difference between resources *used* and the **minimum** resources *needed* to do a job. Yet, waste statistics kept by industry rarely compare current resource consumption to the minimum amount theoretically required. Instead, they compare current with past consumption, a comparison that fails to show the true extent of waste generation because the past includes all ongoing waste generating mistakes.

Waste statistics should compare resource use to the minimum amount needed. They also should focus efforts on determining why waste is generated, alert you to all out-of-control situations, and give assurance that waste generation is being kept under control.

Assume your shop applied a multi-component finish consisting of stain, washcoat, sealer, glaze, and topcoat to 200 bookcases. You made what seemed to be a lot of waste. The plant accountant reports total waste to be X% of purchased materials, Y% higher than budget. Does knowing those statistics lead you to any specific remedial action?

To get more useful data, set a "Use Target" based on an item's minimum theoretical use. Don't try setting targets on everything. Start with a few specific large dollar material items. If a "Use Target" can't be calculated, estimate one. Estimates for materials are easier to make than those for manpower and energy, but as your skill in making these estimates increases, you should make manpower and energy estimates, too. Most operating personnel will continuously reduce waste when given a target and means for measuring their performance against that target.

"Use Targets" sometimes must be adjusted for known process inefficiency. For example, adjust spray coating "Use Targets" for expected coating transfer efficiency. Management should estimate every manufactured article's spray transfer efficiency based on its size, shape, open area, etc. Start with articles representing a high percentage of total production. Some day you may be able to estimate everything.

For example, you could categorize articles as shown in Table 1. Then, determine **the minimum amount of coating needed to cover the article** based on the article's size and shape and the coating thickness desired. With the help of operators, collect data on the actual amount of coating material used to "finish" each article.

TABLE - Transfer Efficiency, %

	Large, > 2 sq. ft.	Medium, > 1 sq. ft.	Small, <1 sq. ft.
Flat Solid Wood	65	45	20
Narrow Edged Parts	50	25	10
Round Parts	20	10	5

Generally, the collected data quickly identifies what's "normal," how much variation exists in the "normal" value, and where "actual" and "theoretical" may need to be reconciled. The reconciliation often discloses opportunities for improvement. Once established, "normal" actual consumption values can be used to provide day-to-day validation of ongoing system control or to support the need for additional attention, operator training, etc. In most circumstances, an ongoing, day-to-day data review, coupled with action based on that review, results in the "normal" value improving.

Assign Reasons — Tie Each Increment of Waste Generated to A Reason

Many manufacturing facilities already know THE PROBLEMS causing their waste. They may even know how much waste is generated during a day and all the myriad reasons for its being generated. But, few can accurately assess how much came from where. Therefore, only a few can accurately associate waste costs with the problem(s) causing the waste and properly direct corrective actions.

A "complete" waste record assigns a reason for the waste's generation and estimates how much was generated. Most finishing operation waste comes from two basic sources — EXCESS MATERIALS - using more than needed to do a job right the first time - and CLEANUP wastes. In turn, the waste generated by each of these sources can be divided into those elements best controlled by OPERATORS and MANAGEMENT.

Table 2 shows allocation of an undoubtedly incomplete listing of control responsibilities. It should be evident some control responsibilities overlap, but operators can deliver control only when management provides them with a target plus the means to measure and do something about their performance with respect to that target.

Prepare and Use Formal Standards 

Quality standards help reduce waste by assuring delivery of consistent product quality. A finished product returned for credit or replacement due to a manufacturing defect, or a product that doesn't sell because of poor quality represent the most expensive wastes a furniture manufacturing company produces.

The furniture marketplace tends to classify a product's quality as:

Low-end: often sold as "some assembly required" (economical, if not cheap)
Medium-end: fair quality, by far the widest category (average price)
High-end: very good quality, the best (expensive by most standards)

Furniture manufacturing operations, particularly finishing, require a high level of craftsmanship. Acceptable finishes can be achieved with as few as two steps, while superior or custom finishes can require two or three ***dozen*** steps.

Furniture finished to call attention to the quality or grain of the wood requires the manufacturer to consider the species, quality of the wood, and the finish. In the case of "high-end" furniture this level of craftsmanship is an "art."

	EXCESS MATERIALS	CLEANUP
MANAGEMENT CONTROLLED	Training Operators coat bad parts Bad spraying technique Pressure too high/low Material & article quality Obsolete coatings. Wood grain too coarse/fine Wood too dry/wet Coating too hot/cold Coating dries too fast/slow Spraying equipment: Gages broken/inoperable Regulators broken Tips too big/small Worn out tips Leaks Equipment maintenance Filters plugged Booth fan drive slipping Article complexity Coating quality variation: Viscosity too high/low Dry rate too fast/slow Finish room conditions Cleanliness Temperature too hot/cold	Training Excessive thinner use Coating inventory control Ordered too much/too little Obsolete coatings Production scheduling Short duration runs
OPERATOR CONTROLLED *If you think the three biggest waste problems are due to PEOPLE, PEOPLE & PEOPLE, you'll find the best solution is TRAINING, TRAINING, & more TRAINING.*	Coating viscosity Spray gun settings Spray gun cleanliness Spraying technique: Overlap too much/too little. Gun speed too fast/too slow. Gun too close/ too far. Gun not triggered. Gun being arced. Article coverage Used improper coating Booth cleanliness	Too much coating mixed. Excessive thinner use. Waste segregation.

Regardless of the "end" to which a manufacturer's products may be directed, success in the marketplace requires the delivery of **consistent** product quality. In turn, **quality standards** represent the key to product consistency. Typically, a minimal list of items requiring quality standards includes:

Lumber grade
Drying and conditioning
Humidity control in storage building
Defect cutting
Machining (sizing and turning)
Surface preparation (sanding and cleaning)
Sealing and drying
Wash coating or staining
Final sanding
Top coating

Simply stated, a **quality standard** provides a means for assuring that a raw material, a part, a sub-assembly or a process is totally acceptable for use in making the product and that the finished product will be totally acceptable to the customer. Make quality standards a formal part of the manufacturing process.

Publications

A Guide to the Wood Furniture CTG and NESHAP. US EPA. Contact EPA's Control Technology Center Hotline (919/541-0800)

Pollution Prevention Options in Wood Furniture Manufacturing, A Bibliographic Report, U.S. EPA, Office of Pollution Prevention and Toxics, February 1992. (EPA/560/8-92/001C)

Sector Notebook Project, Profile of the Wood Furniture and Fixtures Industr*y,* US EPA, Office of Compliance, September 1995. (EPA/310-R-95-003)
http://es.inel.gov/comply/sector/index.html#wood

Pollution Prevention Options in Wood furniture Manufacturing, a Bibliographic Report.
US EPA. EPA/560/8-92/001C.

Trade Associations

American Furniture Manufacturing Association (AFMA)
P. O. Box HP-7
High Point, NC 27261
Phone: (910) 884-5000 Fax: (910) 884-5303

Business and Institutional Furniture Manufacturing Association (BIFMA)
2680 Horizon Drive S. E., Suite A-1
Grand Rapids, MI 49546
Phone: (616) 285-3963 Fax: (616) 285-3765

Futon Association International (FAI)
P. O. Box 6548
Chico, CA 95927-6548
Phone: (916) 534-7833 or (800) 327-3262 Fax: (916) 534-7875

Grands Rapids Area Furniture Manufacturers Association (GRAFMA)
4362 Cascade Road, SE, Suite 113
Grand Rapids, MI 49506
Phone: (616) 942-6225 Fax: (616) 942-1730

International Home Furnishings Marketing Association (IHFMA)
P. O. Box 5687
High Point, NC 27262
Phone: (910) 889-0203 Fax: (910) 889-7460

International Wholesale Furniture Association (IWFA)
P. O. Box 2482
164 S. Main Street, Suite 404
High Point, NC 27261
Phone: (910) 884-1566

Kitchen Cabinet Manufacturing Association
1899 Preston White Drive
Reston, VA 22091-1690
Phone: (703) 264-1690

National Paint and Coatings Association
1500 Rhode Island Avenue, NW
Washington, DC 20005
Phone: (202) 462-6272

Loans and Other Assistance

Small Business Administration*
800-827-5722

* Offices are located in every state.

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