4.2.2.5 Flat Wood Interior Panel Coating

4.2.2.5.1 Process Description[1]

Finished flat wood construction products are interior panels made of hardwood plywoods (natural and lauan), particle board, and hardboard.

Fewer than 25 percent of the manufacturers of such flat wood products coat the products in their plants, and in some of the plants that do coat, only a small percentage of total production is coated. At present, most coating is done by toll coaters who receive panels from manufacturers and undercoat or finish them according to customer specifications and product requirements.

Some of the layers and coatings that can be factory-applied to flat woods are filler, sealer, groove coat, primer, stain, basecoat, ink, and topcoat. Solvents used in organic base flat wood coatings are usually component mixtures, including methyl ethyl ketone, methyl isobutyl ketone, toluene, xylene, butyl acetates, propanol, ethanol, butanol, naphtha, methanol, amyl acetate, mineral spirits, SoCal I and II, glycols, and glycol ethers. Those most often used in waterborne coatings are glycol, glycol ethers, propanol, and butanol.

Various forms of roll coating are the preferred techniques for applying coatings to flat woods. Coatings used for surface cover can be applied with a direct roller coater, and reverse roll coaters are generally used to apply fillers, forcing the filler into panel cracks and voids. Precision coating and printing (usually with offset gravure grain printers) are also forms of roll coating, and several types of curtain coating may be employed, also (usually for topcoat application). Various spray techniques and brush coating may be used, too.

Printed interior panelings are produced from plywoods with hardwood surfaces (primarily lauan) and from various wood composition panels, including hardboard and particle board. Finishing techniques are used to cover the original surface and to produce various decorative effects. Figure 4.2.2.5-1 is a flow diagram showing some, but not all, typical production line variations for printed interior paneling.

Groove coatings, applied in different ways and at different points in the coating procedure, are usually pigmented low resin solids reduced with water before use, therefore yielding few, if any, emissions. Fillers, usually applied by reverse roll coating, may be of various formulations: (l) polyester (which is ultraviolet cured) (2) water base, (3) lacquer base, (4) polyurethane, and (5) alkyd urea base. Water base fillers are in common use on printed paneling lines.

Sealers may be of water or solvent base, usually applied by airless spray or direct roll coating, respectively. Basecoats, which are usually direct roll coated, generally are of lacquer, synthetic, vinyl modified alkyd urea, catalyzed vinyl, or water base.

Inks are applied by an offset gravure printing operation similar to direct roll coating. Most lauan printing inks are pigments dispersed in alkyd resin, with some nitrocellulose added for better wipe and printability. Water base inks have a good future for clarity, cost, and environmental reasons. After printing, a board goes through 1 or 2 direct or precision roll coaters for application of the clear protective topcoat. Some topcoats are synthetic, prepared from solvent soluble alkyd or polyester resins, urea formaldehyde cross linkings, resins, and solvents.

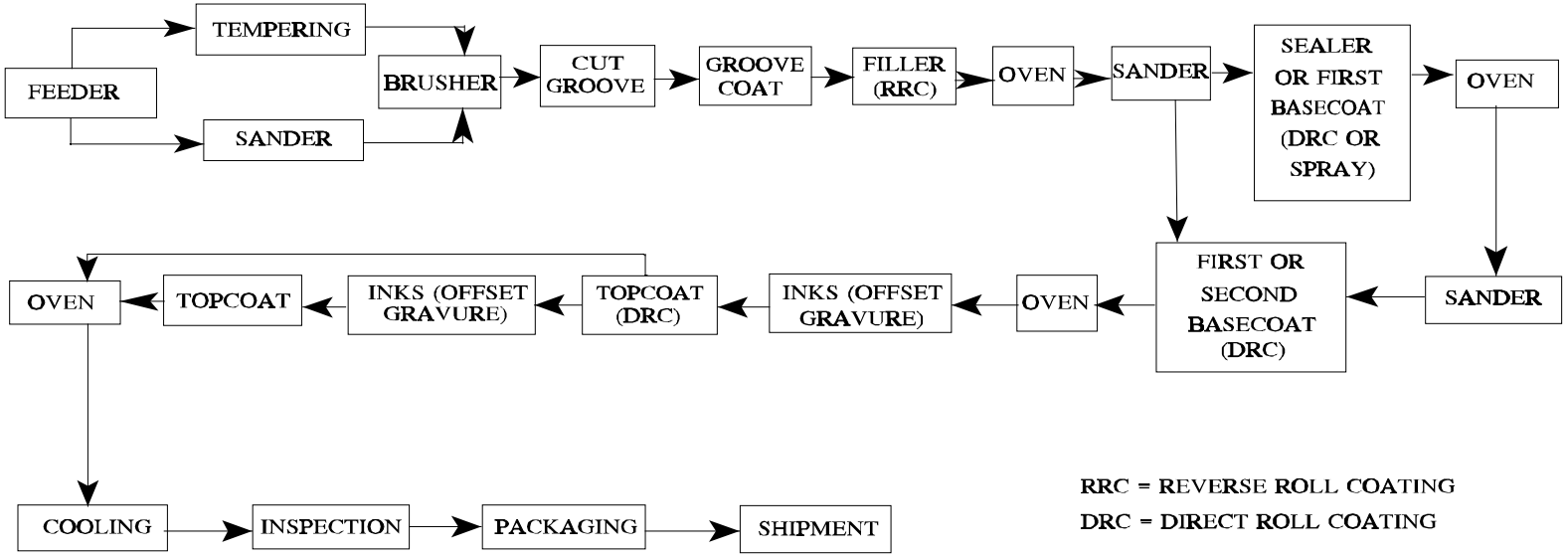

Figure 4.2.2.5-1. Flat wood interior panel coating line emission points.

Natural hardwood plywood panels are coated with transparent or clear finishes to enhance and protect their face ply of hardwood veneer. Typical production lines are similar to those for printed interior paneling, except that a primer sealer is applied to the filled panel, usually by direct roll coating. The panel is then embossed and "valley printed" to give a "distressed" or antique appearance. No basecoat is required. A sealer is also applied after printing but before application of the topcoat, which may be curtain coated, although direct roll coating remains the usual technique.

4.2.2.5.2 Emissions And Controls[1-2]

Emissions of volatile organic compounds (VOC) at flat wood coating plants occur primarily from reverse roll coating of filler, direct roll coating of sealer and basecoat, printing of wood grain patterns, direct roll or curtain coating of topcoat(s), and oven drying after 1 or more of those operations (see Figure 4.2.2.5-1). All solvent used and not recovered can be considered potential emissions. Emissions can be calculated from the factors in Table 4.2.2.1-1 if the coating use is known. Emissions for interior printed panels can be estimated from the factors in Table 4.2.2.5-1, if the area of coated panels is known.

Waterborne coatings are increasingly used to reduce emissions. They can be applied to almost all flat wood except redwood and, possibly, cedar. The major use of waterborne flat wood coatings is in the filler and basecoat applied to printed interior paneling. Limited use has been made of waterborne materials for inks, groove coats, and topcoats with printed paneling, and for inks and groove coats with natural hardwood panels.

Ultraviolet curing systems are applicable to clear or semitransparent fillers, topcoats on particle board coating lines, and specialty coating operations. Polyester, acrylic, urethane, and alkyd coatings can be cured by this method.

Afterburners can be used to control VOC emissions from baking ovens, and there would seem to be ample recovered heat to use. Extremely few flat wood coating operations have afterburners as add-on controls, though, despite the fact that they are a viable control option for reducing emissions where product requirements restrict the use of other control techniques.

Carbon adsorption is technically feasible, especially for specific applications (e. g., redwood surface treatment), but the use of multicomponent solvents and different coating formulations in several steps along the coating line has thus far precluded its use to control flat wood coating emissions and to reclaim solvents. The use of low solvent coatings to fill pores and to seal wood has been demonstrated.

Table 4.2.2.5-1 (Metric And English Units). VOC EMISSION FACTORS FOR INTERIOR PRINTED PANELS[a]

EMISSION FACTOR RATING: B

Paint Category	Coverage[b]				Uncontrolled VOC Emissions					
	liter/100 m^2		gal/1000 ft^2		kg/100 m^2 Coated			lb/1000 ft^2 Coated		
	Water-borne	Conven-tional	Water-borne	Conven-tional	Water-borne	Conven-tional	Ultra-violet[c]	Water-borne	Conven-tional	Ultra-violet[c]
Filler	6.5	6.9	1.6	1.7	0.3	3.0	Neg	0.6	6.1	Neg
Sealer	1.4	1.2	0.35	0.3	0.2	0.5	0	0.4	1.1	0
Basecoat	2.6	3.2	3.2	0.65	0.8	0.2	0.24	0.5	5.0	0.5
Ink	0.4	0.4	0.1	0.1	0.1	0.3	0.10	0.2	0.6	0.2
Topcoat	2.6	2.8	0.65	0.7	0.4	1.8	Neg	0.8	3.7	Neg
Total	13.5	14.5	3.4	3.6	1.2	8.0	0.4	2.5	16.5	0.8

[a] Reference 1. Organics are all nonmethane. Neg = negligible.

[b] Reference 3. From Abitibi Corp., Cucamonga, CA. Adjustments between water and conventional paints made using typical nonvolatiles content.

[c] UV line uses no sealer, uses waterborne basecoat and ink. Total adjusted to cover potential emissions from UV coatings.

References For Section 4.2.2.5

1. *Control Of Volatile Organic Emissions From Existing Stationary Sources, Volume VII: Factory Surface Coating Of Flat Wood Interior Paneling*, EPA-450/2-78-032, U. S. Environmental Protection Agency, Research Triangle Park, NC, June 1978.

2. *Air Pollution Control Technology Applicable To 26 Sources Of Volatile Organic Compounds*, Office Of Air Quality Planning And Standards, U. S. Environmental Protection Agency, Research Triangle Park, NC, May 27, 1977. Unpublished.

3. *Products Finishing*, *41*(6A):4-54, March 1977.