Wood Preserving

Industry Description and Practices

Wood preserving involves imparting protective properties to wood to guard against weathering and attack by pests. Three main types of preservatives are used: water based (for example, sodium phenylphenoxide, benzalconium chloride, guazatin, and copper chrome arsenate); organic solvent based (for example, pentachlorophenol and such substitutes as propiconazol, tebuconazol, lindane, permethrin, triazoles, tributyltin compounds, and copper and zinc naphthenates); borates; and tar oils (such as creosote). *Note that some of the preservatives mentioned here (for example, lindane, tributyltin, and pentachlorophenol) are banned in some countries and are not to be used.*

The preservatives are applied to the surface of wood by pressure impregnation, with a pressure range of 800 kilopascals (kPa) to 1,400 kPa; by deluging (mechanical application by flooding or spraying), by dipping or immersion; and by thermal processing (immersion in a hot bath of preservative). Application of vacuum helps to improve the effectiveness of the process and to recover some of the chemicals used. Pesticides are applied using appropriate protective clothing, including gloves, aprons, overalls, and inhalation protection.

Waste Characteristics

Any or all of the substances used in wood preserving, such as preservatives and solvents, can be found in the drips and the surface runoff streams. Air emissions of solvents and other volatile organics result from the surface treatment steps, drying of the treated wood, and storage and transfer of chemicals. Soil contamination may result from the drippage and surface runoff, and this may happen near the process areas and the treated wood storage areas. Some of the major pollutants present in drips, surface runoff, and contaminated soil include polynuclear aromatic hydrocarbons, pentachlorophenol, pesticides, dioxins, chrome, copper, and arsenic.

Pollution Prevention and Control

Wood preserving involves different combinations of a wide variety of processes, and there are many opportunities to improve on the traditional practices in the industry. The following improvements should be implemented where feasible.

- Do not use pentachlorophenol, lindane, tributyltin, or copper chrome arsenate (or its derivatives).
- Give preference to pressurized treatment processes to minimize both wastage of raw materials and the release of toxics that may be present.
- Minimize drippage by effective removal of extra preservative from the wood surface by mechanical shaking until no drippage is noticeable. Provide sufficient holding time after preservative application to minimize free liquid.
- Recycle collected drips after treatment, if necessary.
- Heat treated wood when water-based preservatives are used.
- Use concrete pads for the wood treatment area and intermediate storage areas to ensure proper collection of drippage. Treated wood should be sent for storage only after drippage has completely stopped.
- Minimize surface runon by diversion of stormwater away from the process areas.
- Cover process areas and collect surface runoff for recycling and treatment. Where water-based preservatives are used, prevent freshly

treated wood from coming into contact with rainwater.
- Sites should be selected that are not prone to flooding or adjacent to water intake points or valuable groundwater resources.
- Preservatives and other hazardous substances should be stored safely, preferably under a roof with a spill collection system.
- Proper labels should be applied, and used packaging should be returned to the supplier for reuse or sent for other acceptable uses or destruction.

Target Pollution Loads

Minimize contamination of surface runoff and soil. Have a closed system for managing liquids to avoid the discharge of liquid effluents.

Treatment Technologies

Air Emissions

Exhaust streams should be treated, using carbon filters that allow the reuse of solvents, to reduce volatile organic compounds (VOCs) to acceptable levels before venting to the atmosphere. Where VOC recovery is not feasible, destruction is carried out in combustion devices or bio-oxidation systems.

Liquid Effluents

The main treatment process is recycling of collected drips and surface runoff after evaporation. Other processes include detoxification (using ultraviolet oxidation) and precipitation or stabilization of heavy metals.

Solid and Hazardous Wastes

Contaminated soil may contain heavy metals and toxic organics and should normally be managed as hazardous waste. Treatment methods include incineration of toxic organics and stabilization of heavy metals.

Emissions Guidelines

Emissions levels for the design and operation of each project must be established through the environmental assessment (EA) process on the basis of country legislation and the *Pollution Prevention and Abatement Handbook*, as applied to local conditions. The emissions levels selected must be justified in the EA and acceptable to the World Bank Group.

The guidelines given below present emissions levels normally acceptable to the World Bank Group in making decisions regarding provision of World Bank Group assistance. Any deviations from these levels must be described in the World Bank Group project documentation. The emissions levels given here can be consistently achieved by well-designed, well-operated, and well-maintained pollution control systems.

The guidelines are expressed as concentrations to facilitate monitoring. Dilution of air emissions or effluents to achieve these guidelines is unacceptable.

All of the maximum levels should be achieved for at least 95% of the time that the plant or unit is operating, to be calculated as a proportion of annual operating hours.

Air Emissions

The maximum air emission level from wood impregnation areas for VOC is 20 milligrams per normal cubic meter (mg / Nm^3).

Liquid Effluents

Wood-preserving plants should use closed systems, where feasible, or should attain the effluent levels presented in Table 1.

Sludges

Wherever possible, generation of sludges and contaminated soil should be minimized. Contaminated soil and sludges must be treated, stabilized, and disposed of in an approved, secure landfill. The levels of toxics in the leachate should be the same as for liquid effluents.

Ambient Noise

Noise abatement measures should achieve either the levels given below or a maximum increase in background levels of 3 decibels (measured on the A scale) [dB(A)]. Measurements are to be taken

Table 1. Effluents (Including Surface Runoff) from the Wood-Preserving Industry
(milligrams per liter, except for pH)

Parameter	*Maximum value*
pH	6–9
TSS	50
COD	150
Oil and grease	10
Phenol	0.5
Arsenic	0.1
Chromium	
Hexavalent	0.1
Total	0.5
Copper	0.5
Fluorides	20
Polynuclear aromatic hydrocarbons (PAHs), such as benzo(a)pyrene (each)	0.05
Dioxins/furans (total)	0.0005
Pesticides (each)	0.05

Note: Effluent requirements are for direct discharge to surface waters.

at noise receptors located outside the project property boundary.

	Maximum allowable log equivalent (hourly measurements), in dB(A)	
Receptor	*Day (07:00–22:00)*	*Night (22:00–07:00)*
Residential, institutional, educational	55	45
Industrial, commercial	70	70

Monitoring and Reporting

Daily monitoring of the parameters listed in this document, except for metals, should be carried out to provide an indication of overall treatment reliability. Metals should be sampled at least monthly. More frequent sampling may be required for certain batches and during wet weather conditions.

Monitoring data should be analyzed and reviewed at regular intervals and compared with the operating standards so that any necessary corrective actions can be taken. Records of monitoring results should be kept in an acceptable format. The results should be reported to the responsible authorities and relevant parties, as required.

Key Issues

The key production and control practices that will lead to compliance with emissions guidelines can be summarized as follows:

- Do not use pentachlorophenol, lindane, tributyltin, copper chrome arsenate, or other preservatives that are considered toxic and for which less toxic alternatives are available for wood treatment systems.
- Use pressurized treatment processes.
- Heat treated wood when water-based preservatives are used.
- Minimize drippage carryover by ensuring that drippage has completely stopped before removing the treated wood from the process area. Collect and recycle drip solutions, and put in place total recycle systems for liquids and effluents.
- Use concrete pads for the wood treatment and intermediate storage areas.
- Divert stormwater away from process areas. Collect and treat surface runoff.
- Recycle solvent vapors, where feasible; otherwise, they should be destroyed in a combustion device or in a bio-oxidation system.
- Manage contaminated soil and sludges as hazardous wastes.

Sources

United States. 1990. "Wood Preserving; Identification and Listing of Hazardous Waste: Final Rule." *Federal Register, vol.* 55, no. 235, December 6.

World Bank. 1995. "Industrial Pollution Prevention and Abatement: Wood Preserving Industry." Draft Technical Background Document. Environment Department, Washington, D.C.