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Purchasing for Pollution Prevention

Mercury-Containing Lamps and EPA's Toxicity Characteristic Leaching Procedure (TCLP)

What makes waste hazardous?

Many products are classified as hazardous waste when they are disposed of at the end of their useful life. These products contain materials that are corrosive, flammable, or toxic. Some of the toxic chemicals that qualify products as hazardous, such as lead and mercury, are persistent and bioaccumulative, meaning they remain in the environment indefinitely and accumulate in and harm living things. When products containing these toxic compounds are disposed of in landfills, the toxic chemicals can leach into underground drinking water supplies.[1]

When does a product qualify as hazardous waste?

The US Environmental Protection Agency (EPA) has identified 40 toxic chemicals that can cause harm when products containing them are disposed of in landfills and the chemicals leach out. In order to determine the potential of specific wastes in a landfill to leach dangerous concentrations of toxic chemicals into groundwater, the EPA developed a protocol known as the toxicity characteristic leaching procedure (TCLP). Products containing one or more of the listed toxins are assessed using the TCLP to estimate how much of their toxic contents would be released into landfill leachate under ordinary conditions. If the amount of a particular chemical released under test conditions exceeds regulatory limits, the waste qualifies as hazardous and must be handled according to regulations governing hazardous waste, such as handling by certified disposal agents and recycling or disposal in specially designated landfills and incinerators. Products that do not leach toxic materials at levels exceeding regulatory limits are termed TCLP-compliant. [2]

What are the shortcomings of the TCLP?

The purpose of the TCLP is to simulate the "mobility" (leaching) of substances under very particular conditions in a typical landfill. The EPA uses this procedure to determine whether certain toxic substances are likely to move from a landfill into groundwater. The procedure does not, however, recreate actual landfill conditions, which vary widely. Nor does it simulate incineration, which can release product contents directly into the air. Finally, the TCLP does not provide any insight into the potential dangers posed by exposure to toxic chemical-containing products during use.

Do mercury-containing lamps qualify as hazardous waste?

Energy-efficient lamps, such as high-intensity discharge (HID), compact fluorescent, and standard fluorescent lamps, rely on mercury. Some lamps contain very little mercury. For instance, a compact fluorescent can contain as little as 1.4 milligrams. In contrast, HID stadium lamps used in outdoor sports venues can contain 225 milligrams or more.[3] Linear fluorescent lamps can contain as little as 1.4 milligrams of mercury in smaller models, but up to 60 milligrams of mercury in others.[4] Mercury vaporizes readily at room temperature, and depending on many factors, may present an exposure hazard if a lamp breaks indoors.

[1] US Environmental Protection Agency, *RCRA Orientation Manual, Section III: RCRA Subtitle C – Managing Hazardous Waste,* Chapter 1, Hazardous Waste Identification, III-23, http://www.epa.gov/epaoswer/general/orientat/rom31.pdf.

[2] Ibid.

[3] Personal communication, Paul Walitsky, Manager, Environmental Affairs, Philips, April 1, 2003.

[4] Ibid., February 20, 2003; Bob Horner, Product Group Manager, Sylvania, March 3, 2003; Joe Howley, Environmental Marketing Manager, GE Lighting, February 24, 2003.

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Many lamps pass the TCLP assessment, meaning the mercury they contain does not leach sufficiently under the specific conditions of the test to qualify them as hazardous waste. It should be noted, however, that these lamps may contain devices and chemical additives that reduce mercury leaching rates during the TCLP procedure, but may or may not prevent leaching over long periods under real landfill conditions. More important, although these lamps are often referred to as "low mercury," they may contain as much mercury as lamps that fail the TCLP. Thus, lamps not classified as hazardous waste are more accurately termed "TCLP compliant" than "low mercury." For more information on the amounts of mercury contained in fluorescent lamps, see INFORM's fact sheet "The Lowdown on Mercury in Fluorescent Lamps" at http://www.informinc.org/fact_P3fluorescentlamps.php.

Where Does the Mercury Go During Lamp Use?

A fluorescent lamp requires only 50 to 55 micrograms of mercury to run. The rest of the mercury in the lamp is a reserve, to be drawn on as mercury becomes bound to the glass and other materials inside the lamp during use.[5] A representative of Philips Lighting Company told INFORM that Philips is able to add less mercury to some of its lamp models than other manufacturers because it uses an aluminum oxide coating that keeps the mercury from binding to the glass.[6]

Can TCLP-compliant lamps be disposed in the regular trash?

Although it is legal in many states to dispose of TCLP-compliant lamps as nonhazardous waste, this practice sends mercury to landfills or, worse, to municipal waste incinerators, and thus contributes to mercury pollution. Each year, an estimated 0.3 to 4 tons of mercury are released directly into the environment from mercury-containing lamps that enter the solid waste stream in the US.[7] In addition, one study indicates that mercury in landfills may be transformed into methyl mercury, the form that accumulates in living organisms, before being released to the environment, thus increasing the toxicity potential of such releases.[8] In order to reduce the quantity of non-TCLP-compliant consumer products sent to disposal facilities, the EPA has designated some of these items — including many mercury-containing lamps — as "universal waste," thus eliminating the requirement that certain hazardous waste handling procedures be used during the recycling of these products.[9]

California's Restrictions on Mercury Lamp Disposal

California has adopted tougher standards than the federal government on the disposal of mercury-added devices. At this time, almost all mercury-added lamps must be either recycled or managed as hazardous waste under the state's Universal Waste Rule. Beginning in 2004, all mercury-containing lamps will have to be recycled or managed as hazardous waste in California, with exemptions for households and certain small-quantity generators. These exemptions will end in February 2006.[10]

Conclusion

The TCLP status of fluorescent lamps is not necessarily the best indicator of their potential environmental and health impacts. Consumers who wish to reduce the impact of their lamps on the environment will (1) select lamps that contain the lowest mercury content available for their particular use, and (2) recycle all lamps at end of life, regardless of their TCLP status.

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[5] Sylvania, "The Use of Mercury in Efficient Electric Lamps - An Update," http://www.sylvania.com/press/03132001.html; personal communication, Steve McGuire, Environmental Affairs Associate, Philips, April 22, 2003.

[6] Personal communication, Steve McGuire.

[7] US Environmental Protection Agency, *Mercury Report to Congress*, http://www.epa.gov/oar/mercury.html; US Environmental Protection Agency, *Mercury Emissions From the Disposal of Fluorescent Lamps*, 1998, http://www.epa.gov/epaoswer/hazwaste/id/merc-emi/merc-pgs/emmrpt.pdf; National Electronic Manufacturers Association, *Environmental Impact Analysis: Spent Mercury-Containing Lamps*, 2000, http://www.nema.org/papers/enviimpact.doc; Michael Aucott *et al.*, "Release of Mercury from Broken Fluorescent Bulbs," *Journal of the Air & Waste Management Association*, Vol. 53, February 2003.

[8] S.E.Lindberg *et al.*, "Technical Note: Methylated Mercury Species In Municipal Waste Landfill Gas Sampled In Florida, USA," Atmospheric Environment 35(2001), 4011-4015.

[9] US Environmental Protection Agency, "Some Used Lamps Are Universal Wastes," fact sheet, EPA530-F-99-024, July 1999, http://www.epa.gov/epaoswer/hazwaste/id/merc-emi/merc-pgs/fs_lamps.pdf.

[10] Department of Toxic Substances Control, "Managing Universal Waste in California," June 2003, http://www.dtsc.ca.gov/PublicationsForms/HWM_FS_UWR.pdf.

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