

Materials engineering

Profession



Mercury is a common element that is found naturally in a free state or mixed in ores. Because mercury is very dense, expands and contracts evenly with temperature changes, and has high electrical conductivity, it has been used in thousands of industrial, agricultural, medical, and household applications. Major uses of mercury include dental amalgams, tilt switches, thermometers, lamps, pigments, batteries, reagents, barometers, manometers, and hydrometers. It also may be present in rocks or released during volcanic activity. (Ross & Associates, 1994)

Mercury can enter the environment from a number of paths. For example, if a mercury-containing item is thrown into the garbage, the mercury may be released into the atmosphere from landfill vapors or, or the mercury may vaporize if the trash is incinerated. If mercury is flushed through a wastewater system, the mercury will likely adhere to the wastewater sludge, where it has the potential to volatilize and be deposited elsewhere. Mercury can enter the atmosphere through these various means because it evaporates easily. It can travel through the atmosphere in a vaporized state. (Ross & Associates, 1994)

Once mercury is deposited into lakes and streams, bacteria convert some of the mercury into an organic form called methylmercury. This is the form of mercury that humans and other animals ingest when they eat some types fish. Methylmercury is particularly dangerous because it bioaccumulates in the environment. Bioaccumulation occurs when the methylmercury in fish tissue concentrates as larger fish eat smaller fish. (U. S. EPA, 1994)

Methylmercury interferes with the nervous system of human body and can result in a decreased ability to walk, talk, see, and hear. In extreme examples, high levels of methylmercury consumption have resulted in coma or death. Many animals that eat fish also accumulate methylmercury. Mercury can interfere with an animal's ability to reproduce, and lead to weight loss, or early death. (Ross & Associates, 1994)

Instruments containing mercury on campus

Thermometers

Description: Thermometers include fever thermometers for home and medical use, laboratory thermometers, and industrial thermometers.

How to Identify: The bulbs of thermometers containing mercury are usually silver in color. Types of mercury thermometers on campus include:

Laboratory and weather thermometers.

Amount of Mercury: typical fever thermometers contain about 0.5 grams of mercury each, while laboratory thermometers contain up to 3 grams of mercury.

Pollution Prevention Options: Mercury-free alternatives are digital, aneroid, and alcohol thermometers, and for most applications they are as accurate as mercury thermometers. Digital thermometers tend to last longer, however, because they are less likely to break.

Safe Handling: Mercury thermometers are easily broken when not handled carefully. If the break occurs, use two pieces of paper or two razor blades to scoop it up from a smooth surface. An eyedropper or a mercury vacuum can
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also be used. Mercury spill kits are available from safety equipment supply companies for large mercury spills. (U. S. EPA, 1994)

Safe Disposal: Save old or broken thermometers in an air-tight container. Homeowners can use local household hazardous waste collection programs for disposal. Businesses should deliver their thermometers to a consolidation site or arrange for a transporter to take them. Contact your county or state environmental office or solid waste office for services available in your area. Also, save the invoices that track your waste that include the following information: date of shipment, amount of waste, location from where waste is shipped, and destination of shipment.

Thermostats

Description: Mercury-containing thermostats use mercury tilt switches.

How to Identify: Most thermostats, other than electric thermostats, contain mercury. To determine if a thermostat contains mercury, remove the front plate. Mercury-containing thermostats contain one or more small mercury switches. Thermostats are generally mounted on walls and easily found. (U. S. EPA, 1994)

Amount of Mercury: About 3 grams of mercury are in each mercury tilt switch. Most thermostats have one switch; some have two, and up to six switches are possible.

Pollution Prevention Options: Programmable electronic thermostats are mercury free, and they are more energy-efficient than the mercury model.

Look for programmable electronic thermostats that have the Energy Star label.

Safe Removal: Remove the entire thermostat using a screwdriver and a pair of wire-cutters and store safely. Don't remove the switches from the thermostat, or dismantle the thermostat.

Safe Disposal: Store the entire thermostat in a marked container until it can be sent for proper disposal. In many states, the Thermostat Recycling Corporation operates a recycling program utilizing heating, ventilation and air conditioning (HVAC) wholesalers; eventually this program will be in operation nation-wide. The wholesalers consolidate thermostats from contractors and send them to recyclers; only whole thermostats are accepted. (U. S. EPA, 1995)

Switches

Description: Mercury is contained in temperature-sensitive switches and mechanical tilt switches. Mercury tilt switches are small tubes with electrical contacts at one end of the tube. As the tube tilts, the mercury collects at the lower end, providing a conductive path to complete the circuit. When the switch is tilted back, the circuit is broken.

How to Identify: A mercury tilt switch is usually present when no switch is visible. They are used in thermostats, silent light switches, and clothes washer lids.

Amount of Mercury: About 3.5 grams of mercury are contained in a small electrical switch. Industrial switches may contain up to 8 pounds of mercury.

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Pollution Prevention Option: Alternatives to mercury switches include hard-contact switches and solid-state switches.

Safe Removal: Remove switches from appliances very carefully so as not to release any mercury into the environment.

Safe Disposal:

Store mercury switches in a suitable leak proof, closeable containers. A five gallon plastic bucket with a lid may work.

Each container must be labeled " Mercury Switches for Recycling."

Be careful to keep the switches from breaking and releasing mercury into the environment.

If breakage occurs, you must immediately take steps to contain and clean up the spill.

Take switches to a consolidation site or arrange with a transporter to take them.

Contact your county or state environmental office/ solid waste office for services in your area.

Keep records of the mercury switches you have recycled, including copies of invoices containing information on the date of shipment, number of switches, and location. (U. S. EPA, 1994)

Manometers, Barometers, and Hydrometers

Description: Manometers and barometers are used for measuring air pressure. Hydrometers are used to measure density of liquid.

How to Identify: All these devices will have a gauge for reading air pressure.

Pollution Prevention Options: The Replacements of mercury containing Manometers are battery operated digital units and vacuum gauges. Battery operated digital units are extremely sensitive.

Safe Removal: To safely remove the manometer or barometer, remove the entire device from the machine it is attached to.

Safe Disposal: Put the entire unit into an airtight, labeled container and ship it to a mercury recycling plant.

Sphygmomanometers

Description: Sphygmomanometers are used to measure blood pressure.

How to Identify: Usually, they are installed on walls and placed on tables in hospitals.

Pollution Prevention Options: The replacement for mercury sphygmomanometers includes electric vacuum gauges, aneroid monitors, and automated devices.

Recycling/Disposal: Develop a protocol for the preparation of mercury sphygmomanometers for recycling or disposal that is consistent with U. S. Environmental Protection Agency, state and local regulations, and pertinent standards. Contact your hazardous waste management coordinator

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for details about packaging, labeling and transporting that are specific to your facility. A suggested protocol might include the following instructions:

Place the sphygmomanometer in a clear plastic bag and seal the bag. Do not use a red bag biohazard bag.

Mark the bag: " Contains Mercury."

Place the bag in a plastic basin to contain any spills during transport to the designated hazardous waste collection point.

Batteries

Description: Mercury zinc, carbon zinc, silver oxide, and zinc air contain mercury. Mercury is used to protect cathode from oxidation.

Pollution Prevention Options: Most consumers dry-cell batteries contain no added mercury. The best way to reduce mercury is recycling. (U. S. EPA, 1994)

References

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