



State of Oregon
Department of
Environmental
Quality

State of Oregon Department of Environmental Quality

Mercury Minimization Plan Review Checklist

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Purpose

- Assist DEQ staff in review of MMPs,
- Increase consistency among reviews, and
- Provide a format for documenting reviews

Review Information

1	Name of facility			
2	NPDES Permit No.			
3	Type of facility	<input type="checkbox"/> New <input type="checkbox"/> Existing	<input type="checkbox"/> Major <input type="checkbox"/> Minor	<input type="checkbox"/> Municipal <input type="checkbox"/> Industrial
4	Name/Phone of reviewer			
5	MMP submittal date			
6	Date of review			

Mercury Minimization Plan Review

Item	Present?	Comments
Required For All Facilities		
7	Facility information, including date and responsible party name and signature <input type="checkbox"/> Yes <input type="checkbox"/> No	
8	Inventory of potential sources (must be updated at least every 5 years) <input type="checkbox"/> Yes <input type="checkbox"/> No	
9	Implementation plan for mercury management and reduction measures for (at least) the next 5 years <input type="checkbox"/> Yes <input type="checkbox"/> No	
Required For All Renewals. Included if Applicable for New MMPs		
10	Description of changes (if any) to the facility, collection system, industrial uses or source water supply (Domestic only) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
11	Description of changes (if any) to the facility, such as changes to processes or materials used (Industrial only) <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
12	Mercury data for effluent and other (if any) monitoring <input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	

Item		Present?	Comments
13	Annual average effluent concentrations and mass loads for biosolids (domestic only)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
14	Annual average biosolids concentrations and mass loads (domestic only)	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
15	Summary of mercury reduction activities implemented during (at least) the last five years	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A	
Optional (MMP actions should generally increase at each renewal)			
17	BMP requirements or limits for industrial and commercial sources of mercury to the collection system (domestic only)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
18	Inspections of or outreach to specific sectors, such as dentist offices (domestic only)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
19	Laboratory housekeeping, use and disposal practices (domestic only)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
20	Public education (domestic only)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
21	BMPs that reduce mercury	<input type="checkbox"/> Yes <input type="checkbox"/> No	
22	Material substitution	<input type="checkbox"/> Yes <input type="checkbox"/> No	
23	Material recovery	<input type="checkbox"/> Yes <input type="checkbox"/> No	
24	Spill control and collection	<input type="checkbox"/> Yes <input type="checkbox"/> No	
25	Waste recycling (collection of mercury-containing items)	<input type="checkbox"/> Yes <input type="checkbox"/> No	
26	Process modifications	<input type="checkbox"/> Yes <input type="checkbox"/> No	
27	Employee education	<input type="checkbox"/> Yes <input type="checkbox"/> No	
28	Additional monitoring (for example, to investigate current or potential sources of mercury)	<input type="checkbox"/> Yes <input type="checkbox"/> No	

Instructions

Overview

- Mercury Minimization Plans (MMPs) can vary widely from “very simple” to “complex”, depending upon the type of facility (such as industrial, small domestic or large domestic) and mercury source potential. The minimization practices should focus on sources and wastes that originate with and are under the reasonable control of a facility, and not on the pollutants in the rainwater or source water. Furthermore, sources of methylmercury or conditions that may lead to the formation of methylmercury should be prioritized over the removal of total mercury. The permittee will develop the MMP and submit to DEQ for review. DEQ will use the MMP checklist to review the MMP. DEQ requires that the permittee use the DEQ MMP template in writing their MMP. However, with DEQ approval, a different format may be used. MMPs that do not use the template will require closer scrutiny by DEQ to ensure that they contain all the required components. Goals of the MMP may include:
- Reduction or elimination of potential sources of methylmercury and total mercury within the production process (industrial facilities) or collection area (wastewater treatment plants),
- Improved public and business awareness of mercury issues,
- Reduction in the transfer of mercury from effluent to the watershed or airshed via biosolids, and
- Quantification of the effectiveness of the Mercury Minimization Plan to eliminate or reduce the mass load of mercury in the discharge.

At a minimum, Mercury Minimization Plans must include:

- Name and signature of party responsible for developing or reviewing the plan
- Plan submittal date
- Identification and evaluation of current and potential mercury (both methyl mercury and total mercury) sources (for domestic facilities this includes industrial, commercial, and residential sources)
- An implementation plan that includes specific methods for reducing mercury

In addition, MMP updates must include:

- Changes (if any) that may affect mercury, such as changes to operations, treatment, and chemicals used
- Mercury sample results for samples collected during the past five years
- Annual average effluent mercury concentrations and mass loads
- Annual average biosolids concentrations and mass loads (domestic facilities only)
- Summary of mercury reduction activities implemented during (at least) the past five years

Specific actions will vary between permittees. The first MMP a permittee submits may be small. But it is DEQ’s expectation that MMPs will expand and MMP actions will increase with each renewal. The checklist provides broad categories to address potential actions.

Facility Information

Verify that information in this section is complete and correct.

Mercury Sources

- Some common uses for mercury are to conduct electricity, measure temperature and pressure, act as a biocide, preservative, and disinfectant, as well as a catalyst for reactions. Within industry, there are all possible types of mercury products installed in distribution boxes, electrical surrounding equipment, boiler rooms, sumps, machinery, measuring instruments, and so on.
- The permittee should conduct an inventory of potential sources of mercury by reviewing existing information sources and, if applicable, sampling at various points within the collection system. See *Section 4.3.3 of the Reasonable Potential Analysis IMD¹* for more information on developing and conducting a source investigation. DEQ determined that the industrial categories of timber products; paper products; chemical products; glass, clay, cement, concrete, gypsum products; primary metal industries; fabricated metal products; and electronic instruments have potential for mercury in discharge. These categories correspond to SICs 24xx, 26xx, 28xx, 32xx, 33xx, 34xx, and 36xx. Table 1 lists manufacturing processes that may use mercury. Table 2 lists many of the likely sources of non-process mercury often found at industrial facilities. 0 provides additional details on most of these items. Table 3 lists many of the likely sources of non-industrial, mercury pollution for collections systems and facilities. Finally, the MMP should also consider any naturally occurring sources of mercury such as mine tailings or volcanic soils.

Table 1. Manufacturing processes that use or generate mercury

- | | |
|--------------------------------------|---|
| • Chlorine production (Chlor-alkali) | • Emissions treatment (wet pack scrubbers) |
| • Portland cement | • Municipal waste combustors |
| • Mining – such as gold mining | • Hospital, medical and infectious waste incinerators |
| • Caustic soda production | • Hazardous waste |
| • Sulfuric acid production | |

¹ Internal Management Directive, Reasonable Potential Analysis Process for Toxic Pollutants Version 3.1, Feb. 12, 2012.

Table 2. Potential sources of mercury in industrial facilities

- Automobiles and other vehicles
- Abs breaking systems*
- Switches
- Hood lighting*
- Trunk lighting*
- Collision sensors
- Acceleration sensors for air bags and seatbelts
- Tilt switches
- Heated car rear windows
- Batteries and battery chargers
- Alkaline-manganese batteries
- Zinc-carbon batteries with mercury added
- Button cell mercuric-oxide batteries
- Battery chargers
- Bilge pumps
- Boilers
- Cathode ray tubes
- Central clocks and time clocks
- Circuit breakers
- Cosmetics
- Dishwashers and parts washers (electrical switches)
- Door bells
- Drains and waste pipes (residual mercury from previous operations)
- Dyes and pigments
- Electrical distribution boxes
- Electronics, liquid crystal displays (such as in cameras and camcorders) and circuit boards
- Float switches and level meters
- Flow meters
- Heating, ventilation and air conditioning equipment (HVAC)
- Central air conditioning units and heating plants
- Gas ovens – flame sensor contains mercury
- Electric ovens – heat sensor contains mercury
- Interlock switches
- Laboratory reagents
- Lamps
- Neon lights
- High intensity discharge (HID)
- Mercury vapor lights
- Fluorescent lamps
- Metal halide lamps
- High pressure sodium lamps
- Ultraviolet lamps
- Lifts for disabled
- Measuring and control instruments
- Microwave Ovens
- Paint Additives (suspended in 1991)*
- Pesticides*
- Pharmaceuticals
- Preservatives for human and animal medical products, such as vaccines
- “Rubber” flooring (the type frequently used in gyms and sports facilities in the 1970s)*
- Signal alarms
- Skylifts (leveling)
- Solvents
- Sprinkler Systems (Old)*
- Sump Pumps

- Freezers and refrigerators (automatic lights)*
- Fungicides*
- Gauges (such as manometers, barometers, and vacuum gauges)
- Switches (tilt switches, volumeters, time switches, landing switches)
- Thermometers
- Thermostats
- Transformers (gas-operated relays)

*Mercury is no longer added, but may be found in older materials and goods.

Table 3. Consumer and commercial products that may contain mercury

- Antiques
- Batteries
- Dental amalgam
- Compact fluorescent lights and other fluorescent light bulbs
- Necklaces and other jewelry
- Paint
- Skin-lightening creams
- Switches and relays
- Thermometers
- Thermostats
- Thimerosal in vaccines

Implementation Plan

- This section describes the wide variety of actions that may be taken to reduce mercury concentrations. The checklist includes general categories of actions in the “optional” section. The implementation plan must include specific actions such as:
 - Potential mercury-reduction activities
 - Policy measures that could be enacted by a municipality to reduce or eliminate mercury
 - Municipal activities designed to encourage businesses and residents to reduce mercury
 - Activities that municipal and industrial dischargers can implement internally to reduce mercury
- The plan should be tailored to the size of the facility, availability of resources, and the types of mercury sources that may be contributing to mercury in the facility’s effluent. Smaller publicly owned treatment works may not need as intensive a plan for mercury reduction and monitoring. For example, the city of Holly, Michigan’s plan mainly consists of a program that offers homeowners new mercury-free thermometers in exchange for mercury thermometers, as well as collecting and disposing other mercury-containing equipment from homeowners and businesses. In contrast, Superior, Wisconsin’s Mercury MMP includes activities involving homeowners, auto shops, camps, dental offices, fluorescent bulb recycling, mercury-free schools, thermostat recycling, and various methods of outreach.
- In some cases, there may be opportunities to coordinate MMP development with a permittee’s Pretreatment Program. Major publicly owned treatment works with a pretreatment program are currently required to evaluate discharges by significant industrial users and if needed, establish local limits and monitor for a suite of metals, including mercury. In some cases, DEQ may require (per 40 CFR 403.5 (c)(2)) a publicly owned treatment work to develop a pretreatment program and local limits to address mercury. Some publicly owned treatment works may select to voluntarily develop a pretreatment program and develop local limits as a measure to ensure their compliance with their NPDES permit and biosolids disposal requirements. The local limits may be structured in a manner to allocate available pollutant loadings to specific industrial dischargers. Mercury data and information gathered from the pretreatment program should be included as part of the MMP. The pretreatment program may

serve as a principal element of the MMP, although other sources outside of the industrial scope of the pretreatment program must still be addressed.

- Table 4 presents examples of potential activities by sector. Table 5 provides another look at activities that may be completed for different sectors. These actions range from various pollution reduction efforts (such as switching to less toxic source materials or community education efforts to reduce pollutants from entering a wastewater treatment facility) to installing more effective treatment technologies.
- This section also should describe any methods that the permittee may use to engage specific individuals and businesses who would be implementing activities described in the plan, such as schools, HVAC stores, dentists, and others. Activities could include workshops, mailings, public service announcements, partnerships, websites, and more.

Table 4. Potential mercury reduction activities and applicability to different sectors

Activity	Type of permittee		Applicable to the Following Sectors						
	Muni	Industrial	General	HVAC	Dental Facilities	Medical Facilities	Construction	Schools and Colleges	POTWs
Ban disposal of mercury-containing products	X								
Establish local limits or BMP requirements	X		X	X	X	X	X	X	X
Mercury collection and recycling events	X		X	X		X		X	
Establish a mercury-collection center	X								
Internal mercury inventories	X	X	X	X	X	X		X	X
Replace mercury-containing products with non-mercury containing products	X	X	X	X	X	X		X	X
Education regarding mercury spill cleanup and risks of mercury exposure	X	X	X	X	X	X	X	X	X
Mail BMP literature	X			X	X	X	X	X	
Outreach activities, such as: Promoting mercury recycling events. Displays at community events Public service announcements Establish a mercury website.	X		X						
Onsite visits to verify BMP implementation and identify mercury containing devices	X		X	X		X	X	X	
Evaluation of wastes hauled to POTWs and/or landfills	X								X
Influent and effluent monitoring	X	X							X
<ul style="list-style-type: none"> Identification and evaluations of conditions (such as anaerobic conditions) that contribute to the methylation of elemental mercury 	X	X							X

Table 5. Example mercury reduction measures for various sectors (from EPA’s “Mercury Pollutant Minimization Program Guidance”)

Sector	Activity	Performance Measure	Goal
Medical – hospitals, clinics, nursing homes, veterinarians	<ul style="list-style-type: none"> • Mail American Hospital Association (AHA) best management practices (BMP) literature • Workshops • Onsite visits • BMP requirements • Permits 	<ul style="list-style-type: none"> • Date/content of mailing • Participation/Reduction • Progress, quantity recycled • Adoption/implementation 	Mercury-free wherever practicable. Spill management.
Dental Clinics	<ul style="list-style-type: none"> • Mail appropriate BMP literature • Meetings with dentists • Onsite visits • Survey(s) • Adherence to American Dental Association’s (ADA’s) BMPs (voluntary or mandatory) • Mercury recycling (voluntary or mandatory) • Adoption of removal equipment meeting ISO standards (voluntary or mandatory) • Permits 	<ul style="list-style-type: none"> • Date/content • Participation • Adoption /implementation • Quantity recycled • Adoption/implementation (Note: Certain facilities do not use or generate mercury, some measures may not apply) 	Capture and recycle mercury used or generated. Minimize mercury discharges.
Schools – secondary	<ul style="list-style-type: none"> • Mail BMP literature • Workshops • Onsite visits • Permits 	<ul style="list-style-type: none"> • Date/content • Participation • Reduction progress • Quantity of mercury recycled 	Mercury free wherever practicable. Spill management.
Schools – Colleges/Technical, laboratories	<ul style="list-style-type: none"> • See Medical and School Sectors 	<ul style="list-style-type: none"> • See Medical and School Sectors 	See Medical and School Sectors
Other industries and businesses with potential for mercury contributions	<ul style="list-style-type: none"> • Mail chemical/equipment literature • Onsite visit during pretreatment inspection • Application of local limits and/or require BMPs for IUs • Require PMPs in IU permits 	<ul style="list-style-type: none"> • Reduction progress • Quantity recycled 	Phase out of mercury containing devices and chemicals. Spill management.
General Public	<ul style="list-style-type: none"> • Promote mercury clean sweeps • Displays at community events • Public service announcements • Outreach at schools • Establish local mercury website 	<ul style="list-style-type: none"> • Date/contents • Quantity of mercury recycled • Website hits 	Reduced use of mercury containing products. Recycling of mercury products. Spill management.

Policy measures

- Municipalities may enact ordinances or policies that would require businesses and residents to implement mercury reduction activities. Such ordinances could include:
- Ban improper disposal of mercury-containing products,
- Establish BMP requirements for construction and other activities to reduce erosion, or
- Adopt zoning ordinances with requirements for reducing impervious surfaces.

Activities to encourage mercury reduction

- The MMP for municipal dischargers should include activities designed to encourage recycling and removing mercury-containing instruments from homes and businesses (see Table 2 and Table 3 for typical mercury-containing devices). Types of businesses that may be targeted include dental offices (due to mercury amalgam²), laboratories at secondary schools and colleges, medical offices and hospitals, HVAC wholesalers and retailers, electronics supply and manufacturing and other industries that discharge into the municipality's sewer system. The industrial categories of timber products; paper products; chemical products; glass, clay, cement, concrete, gypsum products; primary metal industries; fabricated metal products; and electronic instruments were determined by DEQ to have potential for mercury in discharge. These categories correspond to SICs 24xx, 26xx, 28xx, 32xx, 33xx, 34xx, and 36xx. Examples of activities include:
- Promoting and coordinating events to collect mercury-containing devices;
- Conducting inspections on proper use, maintenance, and disposal of amalgam separators;
- Providing mercury-recycling containers for light bulb or battery collection;
- Establishing a mercury collection center;
- Publishing a website on mercury risks and mercury minimization;
- Conducting outreach to organizations that typically have mercury-containing devices, including education on cleanup procedures, spill prevention, and the risk of mercury exposure;
- Encouraging exchange of mercury-containing devices for non-mercury containing devices (for example, providing non-mercury thermostats at cost);
- Mailing BMP literature to facilities that typically have mercury-containing devices;
- Conducting onsite visits to businesses, schools, hospitals, and construction sites to perform education, verify BMP implementation and identify mercury containing devices; and
- Encouraging businesses to conduct inventories of mercury-containing devices.

Activities to implement internally

- Some activities are more applicable to internal operations. For example, both POTWs and industrial dischargers should conduct an internal inventory of mercury-containing devices and identify ways to eliminate or minimize the use of such devices. In addition, monitoring of

² Oregon AND FEDERAL legislation already requires amalgam separators for any dental offices that use amalgam. However, municipalities may wish to have an inspection program or outreach program to dental offices to ensure that amalgam separators are properly used and maintained.

influent, effluent, biosolids (as already required), and the collection system should be included as part of the plan, as appropriate.

- Changes that may affect mercury
- MMP renewals must describe changes that may impact mercury concentrations.

Mercury Monitoring

- MMP renewals must include, at a minimum, monitoring data collected during the previous permit cycle. This must include:
 - Influent and effluent mercury concentrations and mass loads (such as discharge, monitoring reports, and priority pollutant scans),
 - Biosolids mercury concentrations and mass loads,
 - Pretreatment monitoring data, and
 - Mercury measurements at other locations (if any).

If data has been collected prior to submitting a first time MMP, at a minimum, data collected during the previous five years must be included.

Previous Mercury Reduction Activities

- MMP renewals must include a description of previous mercury reduction activities, with emphasis on the preceding permit cycle. When applicable, this section should include information about the amount of mercury that has been recycled or removed from the effluent stream and environment.
- First time MMPs may include a description of previous mercury reduction activities, if applicable.

Appendix A: Source Details

Automobiles and other vehicles

- Vehicle trunk and hood light switches often contain mercury. If the light goes on when the lid is partially up, or if the bulb housing is mounted at an angle to the hood, a mercury switch is probably being used. Collision sensors may contain mercury. A variety of manufacturing processes use relays to control power to heater or pumps. Relays that contain mercury switches activate airbags, anti-lock brakes (primarily found in four-wheel drive vehicles), some seat belt systems, and some automatically adjusting suspension systems. Some agricultural equipment, military vehicles, mass transit vehicles, and fire hook and ladder equipment also contain mercury switches.

Batteries and battery chargers

- Mercury containing batteries provide a compact and precise voltage source to power metering electronics. Mercuric oxide (mercury zinc) batteries and button batteries are the only batteries made in the United States that may contain added mercury. Mercuric oxide batteries offer a reliable and constant rate of power discharge and are made in a wide variety of sizes intended for use in electronic devices. New equipment models generally require zinc air batteries. The shelf life of mercuric oxide batteries is up to ten years.

Bilge pumps

- The float switches within the bilge pump may contain mercury.

Boilers

- Small boiler rooms often contain tube thermometers and other thermometers. Oil level gauges for remote measurements are also common.

Cathode ray tubes

- Mercury is contained within the fluorescent tubes that provide the source of light in the Liquid Crystal Displays (LCD). Mercury is used the LCD backlights.
- No mercury is required in CRT fabrication. Although the quantities of mercury are not large, they cannot be discounted given the toxicity of mercury to both human health and the environment.

Combustion sources

- Combustion sources include utility boilers, medical waste incinerators, municipal waste combustors, commercial/industrial boilers, hazardous waste combustors, residential boilers, wood combustion, sewage sludge incinerators and crematories. Mercury emissions from these sources (excluding wood-fired residential heaters) account for an estimated 125 Mg/yr (138 tons/yr) or 87 percent of the mercury emissions generated annually in the United States.

Cosmetics

- Historically mercury has been added to cosmetics as a skin-whitening additive. Today, the use of mercury compounds as cosmetic preservative ingredients is limited to eye area cosmetics at concentrations not exceeding 65 parts per million of mercury calculated as the metal (about 100 ppm or 0.01% phenylmercuric acetate or nitrate) and provided no other effective and safe preservative is available for use. Mercury compounds are readily absorbed through the skin on topical application and have the tendency to accumulate in the body. They may cause allergic reactions, skin irritation or neurotoxic manifestations.

Dishwashers and parts washers (electrical switches)

- Temperature gauges and various mercury-containing switches are installed in dishwashers and in industrial parts washers.

Drains and old waste pipes

- In dental surgeries and other premises where mercury is used, amalgam and metallic mercury may have collected in waste pipes, leaching mercury into the sewer system.

Dyes and pigments

- Mercury sulfide has been incorporated into organic pigments used to make paints and inks. The mercury is primarily found in the red (vermilion) color family.

Electrical distribution boxes and electric installations

- Mercury is often found in relays located in distribution boxes in buildings, such as for regulating stair lights.

Electronics

- Liquid crystal displays (such as in cameras and camcorders) may contain mercury. Printed circuit cards in electrical components in machinery and equipment can contain mercury. Companies specializing in dismantling electronic equipment should handle this in an environmentally safe way.

Float switches and level meters

- Float switches are used in factories, sewage plants and sump pumps to maintain a given level of liquid. The float switch is a round or cylindrical float with a switch attached to it. The switch keeps the circuit closed until the float reaches a certain height. Then the mercury slides down, opening the circuit and shutting off the pump.

Flow meters

- Flow meters are used for measuring liquid (water, sewage or product) flow. Some flow meters contain large quantities of mercury - 5 kilograms and more.

Freezers and refrigerators

- Freezers and refrigeration equipment may have mercury switches in the internal lid light within the light socket. If a chest freezer has a light in the cover and no visible mechanical switch, then it contains a mercury switch. This device senses when the lid is raised and turns on the light.

Fungicides

- At one time mercury chloride was one of the active ingredients used in fungicide chemicals.

Gauges: manometers, barometers, and vacuum gauges

- Many barometers and vacuum gauges found in machinery contain mercury. Liquid mercury in the gauges responds to air pressure in a precise way that can be read on a calibrated scale. Several mercury-free alternatives are available.
- Some operate on the same principle as mercury gauges but use mercury-free liquids in the tube.
- Needle or bourdon gauges operate under a vacuum with a needle indicator. Electronic gauges can be used to measure pressure, but they must be calibrated with a mercury manometer. Equipment manufacturers recommend that service technicians use a needle or digital gauge to test the systems they are servicing, but that they calibrate the gauges they use in the field with a mercury manometer kept at their shop.
- Mercury manometers occasionally need servicing to maintain their accuracy, and elemental mercury often remains as a waste. If the manometer is hard to read because of dirt and moisture in the tube, the mercury needs to be removed and replaced.

Heating, ventilation and air conditioning equipment (HVAC)

- Manometers, thermostats, thermometers, relays, and so on may contain mercury.
- Flame sensors in furnaces may contain mercury. The metal flame sensor consists of a metal bulb and thin tube attached to a gas-control valve. The mercury is contained inside the tube and expands or contracts to open and shut the valve.
- Gas meters installed before 1961 contain a mercury regulator attached to the gas meter.
- Many electric and gas appliances (such as ranges, ovens, clothes dryers, water heaters, furnaces, and space heaters) have pilot lights that use mercury-containing heat or flame sensors.
- Large housing estates and industrial areas often have a central heating plant with mercury-containing flue-gas meters, tube thermometers, thermostats, pressure switches, oil level gauges, flow meters, and so on.

Interlock switches

- Mercury switches consist of a mercury-filled tube with electrodes at each end. When the tube is tilted the mercury flows to either end cutting off the circuit on one end while opening it on the other side. They often function as on/off switches.

Industrial chemicals

- Caustic Soda
- The majority of sodium hydroxide (caustic soda) is commercially produced through electrolytic cell processing. The balance is produced through chemical processes. The electrolytic cells used to make the caustic soda contain mercury.

Laboratory reagents

- Mercury is used as a preservative in laboratory reagents and related chemicals. In laboratories, hospitals, and schools mercury has been used as a reagent for different analyses, as well as in thermometers and other measuring instruments.

Lamps

- Fluorescent and HID lighting is an excellent business and environmental choice because they can use up to 50 percent less electricity than incandescent lighting. However, used fluorescent lamps, mercury vapor lamps, metal halide lamps, high pressure sodium lamps, and neon lamps must be managed properly because they contain mercury. Some HID lamps may also be hazardous due to lead content, primarily due to the use of lead solder.
- Disposal Options for Mercury Containing Lamps:
- Businesses should manage and dispose of mercury-containing lamps as universal wastes, for which the regulatory requirements are much simpler than hazardous wastes.
- Mark the lamp storage area with the words "Fluorescent lamps for recycling". Do not break or crush lamps because mercury may be released. If lamps are accidentally broken, store them in a sealed container. Pick up spilled powder and add it to the sealed container. Arrange with a lamp transporter to pick them up.

Lifts for disabled

- Various electrical switches contained in the lift mechanism contain mercury.

Measuring and control instruments

- A number of types of machinery and equipment can contain mercury. Examples include level indicators in skylifts and mobile ladders, industrial welding equipment, forestry machinery, gas-operated relays in transformers and manufacturing machinery.
- Mercury switches are found in a variety of items ranging from chest freezers to sump pumps. Mercury-containing tilt switches are found in or under the lids of clothes washers and chest

freezers. They stop the spin cycle or turn on a light. They are also found in motion sensitive and position-sensitive safety switches in clothes irons and space heaters. If a mechanical switch is not visible in these items, a mercury switch is probably being used. Float switches are commonly used in sump pumps and bilge pumps to turn the equipment on and off when the water is at a certain level. These switch devices are often visible.

Paint additives

- Mercury sulfide has been incorporated into organic pigments used to make paints and inks. The mercury is primarily found in the red (vermilion) color family. (Suspended in 1991)

Pesticides

- Methyl mercury is a key ingredient in pesticides and fungicides used to treat grains and seeds.

Pharmaceuticals

- Mercury is used as a preservative for human and animal medical products (for example, vaccines).

Rubber flooring

- The type frequently used in gyms and sport facilities in the 1970's. Rubber flooring installed in gymnasiums during the early 1970s contained a mercury catalyst (3M Brand Tartan Track, and other brands).

Sumps and tanks

- In low-lying areas in buildings, for example, you may find pumping equipment regulating the water level with sender level switches that can contain mercury. Tanks and cisterns can also have switches containing mercury.

Switches – Tilt switches, volumeters, time switches, landing switches

- 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. Reed switches are small circuit controls that are used in electronic devices. Their electronic contacts are wetted with mercury to provide an instantaneous circuit when the switch is closed and then an instantaneous current interruption when the circuit is broken.

Skylifts

- Skylifts may have level indicators or switches that contain mercury.

Sprinkler systems (old)

- Many of the pressure gauges on these older systems contain mercury.

Thermometers

- In a mercury or alcohol thermometer, the liquid expands as it is heated and contracts when it is cooled, so the length of the liquid column is longer or shorter depending on the temperature.

Thermostats

- Mercury-containing thermostat probes may be found in several types of gas-fired appliances that have pilot lights, such as ranges, ovens, clothes dryers, water heaters, furnaces, or space heaters. The metal probe consists of a metal bulb and thin tube, referred to as an ampoule, attached to a gas-control valve. The mercury is inside the tube and expands or contracts to open and shut the valve. Although non-mercury thermostat probes have been used in these appliances, you should treat all probes as though they contain mercury, unless you know that they do not.
- Mercury thermostat probes, also known as flame sensors or gas safety valves, are most commonly present as part of the safety valve that prevents gas flow if the pilot light is not lit. In this application the bulb of the thermostat probe projects into or near the pilot light. These are commonly present in gas ovens and may be present in any other appliance with a pilot light. A mercury thermostat probe may also be present as part of the main temperature-controlling gas valve. In this application, the probe is in the air or water that is being heated and is not directly in contact with any flame. These are typically found in older ovens, clothes dryers, water heaters, and space heaters.
- Mercury-containing tilt switches have been used in thermostats in homes and offices for more than 40 years. They provide accurate and reliable temperature control, require little or no maintenance, and do not require a power source. However, each switch contains approximately 3 grams of mercury.
- Mercury-free thermostats are available. Electronic thermostats, for example, provide many of the same features as mercury thermostats.

Transformers

- Mercury arc rectifiers within electrical transformers operate based on an arc between a pool of mercury and a metal anode that only allows current to pass in one direction. Multiple anodes are typically used, fed from a multiple-phase transformer, the arc jumping from the cathode pool to each anode in sequence. There may be three, six or even twelve transformer phases, each feeding one anode.