

IMERC Fact Sheet

Mercury Use in Measuring Devices

Last Update: January 2010

“Mercury Use in Measuring Devices” summarizes the use of mercury in devices that conduct some form of measurement, including barometers, thermometers, manometers, blood pressure cuffs, and others. This Fact Sheet covers measuring devices that contain mercury; the total amount of mercury in all products that were sold as new in the U.S. in 2001, 2004, and 2007; companies that have phased-out the products’ manufacture and sale; and non-mercury alternative devices.

The information in this Fact Sheet is based on data submitted to the state members of the Interstate Mercury Education and Reduction Clearinghouse (IMERC)¹ including Connecticut, Louisiana, Maine, Massachusetts, New Hampshire, New York, Rhode Island, and Vermont. The data is available online through the IMERC Mercury-Added Products Database.²

A number of important caveats must be considered when reviewing the data summarized in this Fact Sheet:

- The information may not represent the entire universe of mercury-containing measuring devices sold in the U.S. The IMERC-member states continuously receive new information from mercury-added product manufacturers, and the data presented in this Fact Sheet may underestimate the total amount of mercury sold in this product category.
- The information summarizes mercury use in measuring devices sold nationwide since 2001. It does not include mercury-added measuring devices sold prior to January 1, 2001 or exported outside of the U.S.
- Reported data includes only mercury that is used in the product, and does not include mercury emitted during mining, manufacturing, or other points in the products’ life cycle.

Types of Mercury Measuring Devices

As the only metal that is liquid at room temperature, mercury expands and contracts evenly with temperature and pressure changes. These characteristics have made mercury useful in devices used for measuring temperature and pressure, including the following:

¹ IMERC: <http://www.newmoa.org/prevention/mercury/imerc/about.cfm>

² Mercury-Added Products Database: <http://www.newmoa.org/prevention/mercury/imerc/notification/index.cfm>

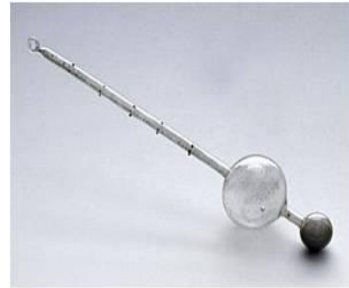
- **Barometers** measure atmospheric pressure. Mercury barometers consist of a glass tube that is closed at one end, with a mercury-filled reservoir at the base. Often, one end of the tube is open to the atmosphere so that the elemental mercury is exposed to air. The mercury rises and falls with changes in atmospheric pressure.



Close-up of a Mercury-Filled Barometer
Source: NEWMOA

- **Flow Meters** measure the flow of gas, water, air, and steam. They are often used in water treatment, sewage plants, power stations, and other industrial applications. Some industrial settings may still have mercury flow meters in use; however, research indicates that new flow meters are manufactured without mercury. Non-mercury flow meters include digital and ball-actuated flow meters.

- **Hydrometers** measure the specific gravity of liquids. Mercury was often used in hydrometers as a weight but research indicates that mercury hydrometers are no longer manufactured and sold as new. However, schools and laboratories may still have mercury hydrometers in use. Non-mercury hydrometers that contain lead ballast as a weight are now used. For more information, go to: www.newmoa.org/prevention/mercury/projects/legacy/measdev.cfm#h



Mercury Bulb Hydrometer
Source: NEWMOA

- **Manometers** measure the difference in gas pressure. Mercury manometers are generally U-shaped glass or plastic tubes containing elemental mercury with one end of the tube closed and the other open to the atmosphere. The difference in the levels of mercury in each side of the tube indicates the pressure of the gas being measured. Manometers are frequently used to measure air pressure within air ducts or compressed air lines.



Mercury Dairy Manometer
Source: Cuoco & Cormier Engineering

- **Pyrometers** measure the temperature of extremely hot materials and are primarily used in foundry applications. Mercury is contained in the temperature-sensing device. There still may be mercury pyrometers in use; however, research indicates that mercury pyrometers are no longer manufactured and sold as new. New non-mercury pyrometers are either digital or optical.

- **Psychrometers and Hygrometers** are instruments used for measuring humidity. They contain two mercury thermometers - a “dry bulb,” or ordinary thermometer, and a “wet bulb” thermometer, which is kept constantly wet. A sling psychrometer is a psychrometer encased in a swiveling mechanism that is swung around rapidly to record an accurate reading for relative humidity. These devices function similarly but the names differ due to the applications in which they are used. In each device, the humidity is determined by comparing the difference in the temperatures shown by the two thermometers.



Mercury Sling Psychrometer
Source: Wikipedia

- **Sphygmomanometers** are a type of mercury manometer that is used for measuring blood pressure. Sphygmomanometers measure both maximum arterial pressure, when the heart beats and sends blood through the arteries, and minimum pressure, when the heart relaxes and fills with blood again. Mercury is contained inside a plastic or glass tube.



Portable Sphygmomanometer
Source: NEWMOA



Wall-mounted Sphygmomanometer
Source: Sargent-Welch



Mobile Sphygmomanometer
Source: Sargent-Welch

- **Strain Gauges** measure forearm blood flow, or arterial inflow, using a technique called strain gauge plethysmography. Mercury is contained in a fine rubber tube, which is placed around the forearm. The gauge measures the increase in forearm circumference as pressure is applied. These products are not common, and only one manufacturer has informed the IMERC-member states that they manufacture mercury strain gauges. Therefore, these products are included in the “other” category in Table 2 on page 5.
- **Thermohydrometers** are a specific type of hydrometer that contains a mercury thermometer for measuring the temperature of liquids. These products are not common, and only one manufacturer has notified the IMERC-member states that they manufacture mercury thermohydrometers. Therefore, these products are included in the “other” category in Table 2 on page 5.

- **Thermometers** measure temperature. Mercury thermometers contain mercury encased in a thin plastic or glass tube. The mercury level rises and falls with changes in the temperature. Thermometers are used in a variety of industrial, laboratory, and commercial applications.



Mercury Lab Thermometers
Source: Sargent-Welch

Table 1 presents the average amount of mercury in each type of measuring device that is still manufactured and sold as new in the U.S. Manufacturers, importers, and distributors of mercury-added products report the amount of mercury used as an exact number or as a range.

Table 1: Amount of Mercury in Measuring Devices	
Component or Product	Amount of Mercury in Individual Component or Product (grams)
Flow meters	Up to 5,000 (up to 175 ounces or more)
Barometers	400 – 620 (up to ~ 22 ounces)
Sphygmomanometers	50 – 140 (up to ~ 5 ounces)
Manometers	30 – 75 (up to ~ 2.5 ounces)
Pyrometers	5 – 10 (less than 0.5 ounces)
Hygrometers/Psychrometers	3 – 7 (less than 0.5 ounces)
Thermometers	0.5 – 50 (up to ~ 2 ounces)
Hydrometers	Less than 1 (less than 0.25 ounces)

Note: 1 gram of mercury = 0.035 ounces.

Mercury Use in Measuring Devices

Table 2 presents the total amount of mercury in measuring devices sold in the U.S. during calendar years 2001, 2004, and 2007.³

Table 2: Total Mercury in Measuring Devices Sold in the U.S. (pounds)			
Product	Total Mercury 2001	Total Mercury 2004	Total Mercury 2007
Barometers	353	234	0
Manometers	1,936	2,545	0*
Sphygmomanometers	4,305	2,219	1,657
Thermometers	3,634	1,089	598
Psychrometers/Other Measuring Equipment	4	3	2
TOTAL	10,232 (~ 5.1 tons)	6,090 (~ 3 tons)	2,257 (~ 1.1 tons)

* It is important to note that although no mercury-added manometers were sold in the U.S. in 2007, one company continues to manufacture and sell manometer glass tubing without supplying elemental mercury with the product. It is unknown if the persons that purchase this manometer tubing are filling it with elemental mercury or substituting the mercury with another liquid.

[Note: 453.6 grams = 1 pound; All numbers are rounded to the nearest whole number.]

Approximately five tons of mercury contained in measuring devices was sold in 2001. This amount decreased by 2.1 tons to 3 tons in 2004, a decline of approximately 41 percent. In 2007, 1.1 tons of mercury contained in measuring devices was sold in the U.S., a decline of approximately 64 percent from 2004. Overall, from 2001 to 2007, mercury use in measuring devices decreased significantly by a total of approximately 4 tons (7,975 pounds), or 78 percent.

Since 2001, many states have passed legislation banning the use and sale of mercury-added thermometers and other measuring devices. As more state laws go into effect, mercury use in this product category will likely continue to decline.

³ The data cited in this report is from a NEWMOA Power Point Presentation entitled, *Trends in Mercury Use in Products: Analysis of the IMERC Mercury-added Products Database*, presented at the “2009 Mercury Science & Policy Conference with a Special Focus on the Great Lakes & Northeast Regions,” on November 17, 2009: http://www.newmoa.org/prevention/mercury/conferences/sciandpolicy/presentations/Wienert_Session3B.pdf. Additional background information on these products can be found in the NEWMOA report, *Trends in Mercury Use in Products: Summary of the IMERC Mercury-added Products Database*, June 2008 at: <http://www.newmoa.org/prevention/mercury/imerc/factsheets/mercuryinproducts.pdf>.

Phase-Outs & Bans on the Sale of Mercury Measuring Devices

The following IMERC-member states currently have restrictions on the sale and/or distribution of mercury-containing thermometers and other measuring devices: California, Connecticut, Illinois, Louisiana, Maine, Massachusetts, Minnesota, New Hampshire, New Jersey, New York, Rhode Island, Vermont, and Washington. Additional states that restrict the sale of one or more types of mercury-added measuring devices (including mercury fever thermometers) include: Indiana, Michigan, Maryland, Ohio, and Oregon.⁴

In response to these mercury product bans and phase-outs, many companies have ceased manufacturing mercury containing measuring devices and/or stopped selling these products to these states. The following is a list of companies and measuring device products that have reportedly been eliminated from the U.S. market since 2001:

Princo Instruments, Inc. reported to IMERC-member states that they phased-out the manufacture of their mercury thermometers in 2002. They completed a company-wide phase-out of all products containing mercury, including barometers, manometers, and psychrometers by 2007.

Cooper-Atkins Corp. reported to IMERC-member states that they phased-out the manufacture of their mercury thermometers (e.g., maximum holding thermometers) in July 2003.

Miljoco Corp. reported to IMERC-member states that they phased-out production of their mercury-containing industrial thermometers in 2003.

Motion Pro reported to IMERC-member states that they no longer sell mercury manometers.

Anderson Instruments reported to IMERC-member states that they phased-out the manufacture of their mercury thermometers in January 2006.

Meriam Process Technologies reported to IMERC-member states that they phased-out the manufacturer of their mercury manometers and replacement tubes in 2006.

Brooklyn Thermometer Company reported to IMERC-member states that they went out of business in November 2007. Therefore, their mercury-containing “precision thermometers” are no longer manufactured or sold in the U.S.

Taylor Precision Products reported to IMERC-member states that they phased-out mercury in their consumer thermometers in 2007. They are currently working to replace their high-volume, commercial mercury thermometers with a non-mercury alternative.

Lux Products Corp. reported to the IMERC-member states in 2007 that they have stopped the sale and distribution of their mercury-added products, including their mercury thermometers to all of the IMERC-member states with product phase-outs and sales bans in accordance with the effective dates of such bans.

⁴ State Mercury-Added Product Ban Guidance: <http://www.newmoa.org/prevention/mercury/imerc/productban.cfm>

Luxtel LLC reported to the IMERC-member states that they phased-out the manufacture of their Type I and Type II mercury-added timers (classified in the “other measuring devices” category) in September 2007 and June 2008, respectively.

Non-Mercury Alternatives

There are non-mercury alternatives that may be suitable for replacing the traditional mercury-added measuring devices. Many factors should be considered when switching to a non-mercury measuring device, including the relative costs, availability, and product effectiveness.

Table 3 lists the non-mercury alternatives to common measuring devices.

Table 3: Alternatives to Mercury Measuring Devices	
Component or Product	Non-Mercury Alternative(s)
Barometer	Aneroid, digital, eco-celli liquid-gas silicon
Flow Meter	Digital, ball-actuated
Hydrometer	Lead ballast hydrometers
Hygrometer	Spirit-filled glass bulb, digital, aneroid
Manometer	U-shaped tubes using any colored liquid, digital
Pyrometer	Optical, digital
Psychrometer	Spirit-filled glass bulb, digital
Sphygmomanometer	Aneroid, digital
Thermometer	Alcohol or mineral spirit-filled glass bulb, digital

Research indicates that many mercury-added measuring devices, including flow meters, hydrometers, hygrometers, psychrometers, and pyrometers, are no longer manufactured or sold in the U.S. These products are considered “legacy products” as they are no longer manufactured or sold as a new product in commerce in the U.S., but may still be used, re-sold as a used product, or stored in a home or business. For more information on these and other “legacy” measuring devices, go to: www.newmoa.org/prevention/mercury/projects/legacy/measdev.cfm.

For more information about the non-mercury alternatives for measuring devices found in schools, go to: www.newmoa.org/prevention/mercury/schools/MercuryAlternativesReport.pdf.