

## IMERC Fact Sheet

### Mercury Use in Switches & Relays

This Fact Sheet summarizes the use of mercury in switches and relays sold as individual components and within final products, such as automobiles, space heaters, or pumps. It includes the total amount of mercury in all products that were sold in the U.S. in 2001, 2004, 2007, and 2010.

The information in the Fact Sheet is based on data submitted to the state members of the [Interstate Mercury Education and Reduction Clearinghouse \(IMERC\)](#) 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](#).

#### Mercury-added Switches & Relays

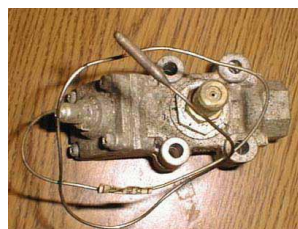
**Switches** are products or devices that open or close an electrical circuit, or a liquid or gas valve. Mercury-added switches include float switches, actuated by a change in liquid levels; tilt switches, actuated by a change in the switch position; pressure switches, actuated by a change in pressure; and temperature switches and flame sensors, actuated by a change in temperature. Mercury switches are used in a variety of consumer, commercial, and industrial products, including appliances, space heaters, ovens, air handling units, security systems, leveling devices, and pumps.



Float Switch (from a sump pump)



Tilt Switch (from a washing machine)



Flame Sensor (from a gas range)

Photographs Source: Vermont Agency of Natural Resources

**Relays** are products or devices that open or close electrical contacts to control the operation of other devices in the same or another electrical circuit. Relays are often used to turn on and off large current loads by supplying relatively small currents to a control circuit. Mercury-added relays include mercury displacement relays, mercury wetted reed relays, and mercury contact relays. Relays have been used in telecommunication circuit boards, commercial/industrial electric ranges, and other cooking equipment.



Mercury Displacement Relay  
Photo Source: MDI



Mercury Wetted Relay  
Photo Source: Adlake



Mercury Contact Relay  
Photo Source: Durakool

### Amount of Mercury in Switches & Relays

Table 1 illustrates that the amount of mercury used in individual switches and relays varies widely. A mercury tilt switch, for example, can have anywhere from 50 milligrams to nearly 5 grams (5,000 milligrams) of mercury, while an individual float switch may contain anywhere from 100 milligrams to 67 grams (67,000 milligrams) of mercury.

The amount of mercury used in individual relays varies even more, from more than 10 milligrams to up to 153 grams (153,000 milligrams) – a ten-thousand fold difference. Mercury relays and relay controls are often sold as “units” containing anywhere from several to up to 32 relays per unit. The total amounts of mercury in relay units can range from less than 100 milligrams to over 400 grams (400,000 milligrams). The total amounts of mercury in relay control units can range from 2 to 10 grams.

Table 1 presents the average amount of mercury in switches and relays that are still manufactured and sold as new in the U.S. Manufacturers, importers, and distributors of mercury-added products report to the IMERC-member states on the amount of mercury used as an exact number or as a range.

<b>Table 1: Amount of Mercury in Switches &amp; Relays</b>	
<b>Component or Product</b>	<b>Amount of Mercury in Individual Component or Product (grams)</b>
Flame Sensors	>1
Float Switches	0.1 – 70 (up to ~ 2.5 ounces)
Tilt Switches	0.05 – 5
Relays	0.005 – >1

[Note: 1 gram of mercury = 0.035 ounces. All numbers are rounded to the nearest whole number.]

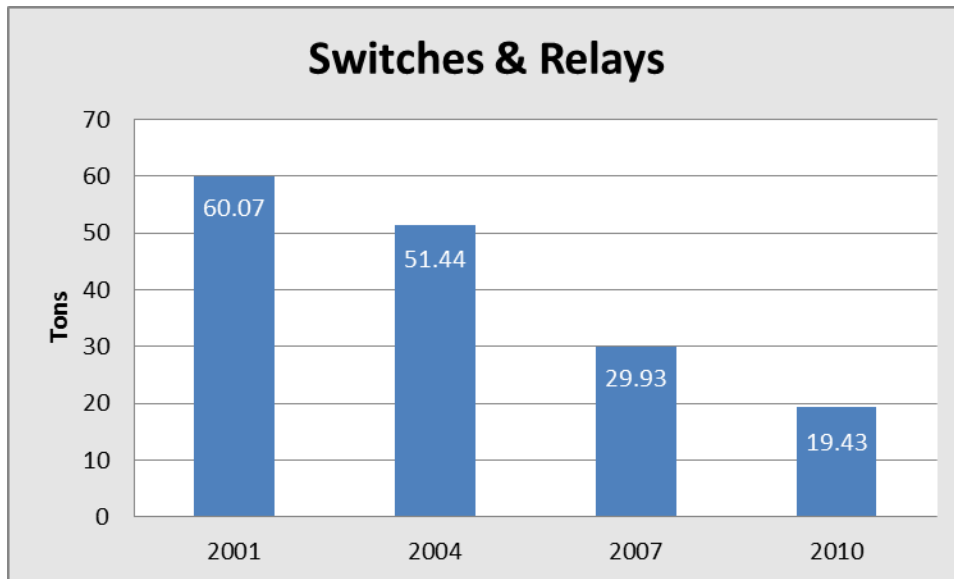
## Total Amount of Mercury in Switches & Relays

Table 2 presents the total amount of mercury contained in mercury-added switches and relays sold in the U.S. in the years 2001, 2004, 2007, and 2010.<sup>1</sup> This total includes switches and relays sold individually or as components in other products. Forty-nine manufacturers have submitted Mercury-added Product Notification Forms that cover mercury switches and relays to the IMERC-member states.

<b>Table 2: Total Mercury Sold in Switches &amp; Relays (pounds)</b>			
<b>2001</b>	<b>2004</b>	<b>2007</b>	<b>2010</b>
120,131 (60.07 tons)	102,877 (51.44 tons)	59,866 (29.93 tons)	38,869 (19.43 tons)

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

Mercury use in switches and relays sold in the U.S. during 2001 was approximately 60.07 tons, which decreased to slightly more than 19.43 tons in 2010 – representing a decline of approximately 68 percent. Slightly more mercury was used in switches than in relays during all of the reporting years. The data also indicates that the largest amount of mercury reported was used in tilt switches, followed by float switches (used in pumps and pump systems).



<sup>1</sup> More detailed information on the 2001 and 2004 data can be found in the report, *Trends in Mercury Use in Products: Summary of the IMERC Mercury-added Products Database*, June 2008.

([www.newmoa.org/prevention/mercury/imerc/pubs/reports.cfm](http://www.newmoa.org/prevention/mercury/imerc/pubs/reports.cfm))

The 2007 data is taken from a NEWMOA presentation, *Trends in Mercury Use in Products: Analysis of the IMERC Mercury-added Products Database*, November 17, 2009.

([www.newmoa.org/prevention/mercury/conferences/sciandpolicy/presentations/Wienert\\_Session3B.pdf](http://www.newmoa.org/prevention/mercury/conferences/sciandpolicy/presentations/Wienert_Session3B.pdf))

Since 2001, many states have passed legislation restricting the sale of mercury-added switches and relays. As more state requirements go into effect, mercury use in this product category will likely continue to decline.

It is important to note that IMERC considers the 2010 data presented in this Fast Sheet to be “unofficial”. This is because (with limited exceptions), all of the IMERC Notification States (i.e., CT, LA, ME, MA, NH, NY, RI, and VT) have banned the sale of mercury-added products in this category since 2010, and therefore, cannot technically review and approve the submissions. Companies submitted data to IMERC in 2011, but it is not included in the online Mercury-added Products Database. IMERC’s members will not collect 2013 data for this product category. The state agencies consider the overall reduction in mercury use in new switches and relays (and anticipated continuous decline) to be an example of the success that has resulted from their mercury education and reduction efforts.

### Phase-Outs & Bans on the Sale of Mercury Switches & Relays

The following IMERC-member states currently have [restrictions on the sale and/or distribution of mercury-added switches/relays](#), individually or as a component in another product (e.g., those used in automobiles such as convenience light and anti-lock brake system switches, as well as those used in gas ranges/stoves, generally referred to as diostats, flame sensors, or safety valves): California, Connecticut, Illinois, Louisiana, Maine, Massachusetts, Minnesota, New Hampshire, New York, North Carolina, Rhode Island, Vermont, and Washington. Additional states that restrict the sale of one or more types of mercury-added switches or relays include: Iowa, Oregon, and Wisconsin.

In response to these mercury product bans and phase-outs, many companies have ceased manufacturing mercury switches and relays and/or stopped selling products that contain these devices in these states or nationwide. As of the 2010 reporting period, the following companies have reportedly eliminated the types<sup>2</sup> of mercury-added switches or relays in their products sold in the U.S. market:

- Applied Materials Inc. – relays
- ASCO Power Technologies – other
- Biotrack, Ltd. – tilt switch
- BJM Corp. – float switch
- Blodgett Oven Corp. – relay/safety valve
- Bombardier Recreational Products Inc. – tilt switch
- Franklin Electric-Water Transfer Systems – float switch
- GE Appliances – safety valve
- Gorman-Rupp Company – float switch
- Hill-Rom – other
- Honeywell International – other
- Joslyn Clark Controls, LLC – other

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<sup>2</sup> The term “other” is used below because manufacturers sometimes group together different types of switches when reporting total mercury use and it is difficult to truly identify mercury use by type of switch. Some other common switches categories as “other” include reed switches and vibration switches.

- Magnetrol International, Inc. – other
- Maxon Corp. – other
- Maytag Appliance – safety valve
- Pitco Frialator – relay
- Rule Industries – float switch
- Sullair Corp. – other
- The Toro Company – other
- Whirlpool Corporation – safety valve

In addition, automobile manufacturers and recreational vehicle manufacturers phased-out the use of mercury switches and relays in their products years ago. Many automobile manufacturers previously used mercury in convenience light switches and anti-lock brake system (ABS) switches. Recreational vehicles used to include gas cooking ranges with oven safety valves/flame sensors that contained mercury in the trailers.

### Non-Mercury Alternatives

There are numerous non-mercury alternatives to switches and relays suitable for use in various products and applications. Many factors should be considered when switching to a non-mercury component, including the relative costs, availability, and product effectiveness.

Table 3 lists the non-mercury alternatives to mercury-added switches and relays.

<b>Table 3: Alternatives to Mercury-Added Switches &amp; Relays</b>	
<b>Component or Product</b>	<b>Non-Mercury Alternative(s)</b>
Float switch	Mechanical, magnetic dry reed, optical, conductivity, metallic ball, sonic or ultrasonic, pressure transmitter, alloy, thermal, and capacitance float switches
Tilt switch	Metallic ball, electrolytic, mechanical, solid-state, and capacitance tilt switches; potentiometers
Pressure switch	Mechanical or solid-state switches
Temperature switch	
Mercury displacement relay	Dry magnetic reed, electro-mechanical, and solid-state relays; silicon controlled rectifiers
Mercury wetted reed relay	
Mercury contact relay	
Flame sensor	Electronic ignition systems

For more information on non-mercury alternatives for switches and relays, see: <http://sustainableproduction.org/downloads/An%20Investigation%20Hg.pdf>

## Data Caveats

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 switches and relays 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 thermostats sold nationwide since 2001. It does not include products 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.