

# IMERC Fact Sheet

## Mercury Use in Switches and Relays

Last Update: September 2008

“Mercury Use in Switches and Relays” summarizes the use of mercury in switches and relays sold as individual components and within final products, such as automobiles, space heaters, or pumps. This Fact Sheet covers all of the types of switches and relays that contain mercury in the individual devices; the total amount of mercury in all of the devices that were sold as new in the U.S. in 2001 and 2004; 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)<sup>1</sup> 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.<sup>2</sup>

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 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 switches and relays sold nationwide since 2001. It does not include mercury-added switches and relays 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.

### 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.

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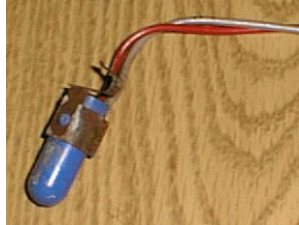
<sup>1</sup> IMERC: <http://www.newmoa.org/prevention/mercury/imerc/about.cfm>

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

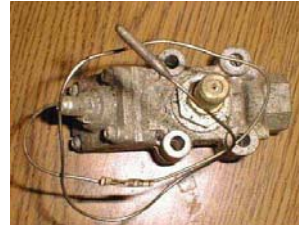
Mercury switches are used in a variety of consumer, commercial, and industrial products, including appliances, space heaters, ovens, air handling units, security systems, leveling devices, and pumps.



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 are 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 shows 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), while 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 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.

### 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 and 2004. This total includes switches and relays sold individually or as components in other products. Additional information can be found in the report, *Trends in Mercury Use in Products: Summary of the IMERC Mercury-added Products Database*, June 2008.<sup>3</sup>

<b>Table 2: Total Mercury Sold in Switches &amp; Relays (pounds)</b>		
<b>Switches/Relays</b>	<b>2001 Total Mercury</b>	<b>2004 Total Mercury</b>
Tilt Switches	14,085	7,145
Float Switches	12,726	13,878
Flame Sensors	4,963	2,363
Other Switches (e.g., reed switches, vibration switches)	42,205	41,576
Relays	45,681	37,200
<b>TOTAL</b>	<b>119,660 (59.8 tons)</b>	<b>102,162 (51.1 tons)</b>

Note: 1 gram = 0.002205 pounds.

<sup>3</sup> Trends in Mercury Use in Products: Summary of the IMERC Mercury-Added Products Database: <http://www.newmoa.org/prevention/mercury/imerc/pubs/reports.cfm>

Approximately 60 tons of mercury was used in switches and relays sold during 2001, which decreased to 51 tons in 2004. Slightly more mercury was used in switches than in relays during the two reporting years. Although the information presented in Table 2 suggests that mercury-added tilt switches represented the largest use of mercury in 2001 as compared with other types of mercury-added switches and relays, manufacturers sometimes group together different types of switches when reporting total mercury use (i.e., the category for “Other Switches”). Therefore, truly ranking mercury use by type of switch is difficult. Nevertheless, the data shown in Table 2 indicates that mercury-added float switches (used in pumps and pump systems) constituted the largest use of mercury in switches in 2004.

Overall use of mercury in switches and relays decreased approximately 14.5 percent between 2001 and 2004. Tilt switches and flame sensors decreased most dramatically, each by approximately 50 percent. This decline can be attributed to the availability of new non-mercury technologies and to the various statutes restricting the sale of certain mercury-added products sold in the U.S., including switches and relays.

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

### Phase-Outs & Bans on the Sale of Mercury Switches and 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: California, Connecticut, Illinois, Louisiana, Maine, Massachusetts (phase-out effective May 1, 2009), Minnesota, New Hampshire, New York, Rhode Island, and Vermont. Additional states, including Oregon and Washington, specifically ban the sale of new automobiles that contain mercury-added switches (e.g., convenience light switches, anti-lock brake system switches).<sup>4</sup> 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.

The following is a list of companies and mercury-added switches or relays that have reportedly been eliminated from the U.S. market since 2001:

Watlow Winona Inc. reported to the IMERC-member states that they phased-out the manufacture, sale, and distribution of their mercury displacement relays in May 2003.

Sullair Corporation reported to the IMERC-member states that they phased-out the manufacture and sale of their mercury-added switches in October/November 2003.

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<sup>4</sup> State Mercury-Added Product Ban Guidance:

<http://www.newmoa.org/prevention/mercury/imerc/productban.cfm>

State Mercury-Added Phase-Out Guidance:

<http://www.newmoa.org/prevention/mercury/imerc/phaseoutinfo.cfm>

Joslyn Clark Controls, LLC reported to the IMERC-member states that they phased-out the manufacture and sale of their mercury-added switch that is used in fire pump controls in 2003.

Gorman-Rupp reported to the IMERC-member states that they ceased the manufacture of mercury float switches for use in their sewage lift systems beginning in 2003. Mercury-free float switches are now available through the company as of 2005.

Biotrack Ltd. reported to the IMERC-member states that they phased-out the manufacture and sale of their mercury-added oscillator tilt switch in 2004.

Signal Systems International reported to the IMERC-member states in 2005 that they stopped the sale and distribution of their mercury-added switches to Connecticut, in conjunction with Connecticut's mercury product ban, which was effective on July 1, 2004. Since the original correspondence, however, many of the other IMERC-member state's mercury product phase-out laws and sales bans have gone into effect, including, California, Maine, Vermont, Illinois, and New York. Massachusetts' law becomes effective May 1, 2009. Signal Systems International has yet to confirm that they have stopped sales of their mercury-added switches to these states.

Lennox International Inc. reported to the IMERC-member states that they phased-out the sale and distribution of their mercury-added commercial control switch used in a power exhaust option. The company replaced this switch with a non-mercury alternative in November 2005.

BJM Pumps reported to the IMERC-member states that they phased-out the manufacture and sale of their mercury-added float switch in 2006. The company now offers a non-mercury mechanical ball float.

Maxon Corp. reported to the IMERC-member states that they phased-out their mercury-added pressure switches in 2006.

Rule Industries (also known as ITT Industries) reported to the IMERC-member states that they phased-out the manufacture and sale of their marine pump float switches in 2006.

See Appendix A for information about all of the manufacturers, distributors, and importers that have reportedly phased-out the use of mercury switches or relays in their products since 2001. These products, including recreational vehicles, ovens, and pumps, previously contained a mercury-added switch or relay as a component.

### 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>

## Appendix A

<b>Phase-Out of Mercury Switches &amp; Relays Used as a Component in Products</b>			
<b>Company</b>	<b>Product Category</b>	<b>Mercury Component</b>	<b>Date of Phase-Out</b>
Aero Coach, Inc.	Recreational vehicles	Oven pilot valve	March 2004
Agilent Technologies	Measuring devices and chemical analyzer	Relays	December 2004
Ameri-Camp	Trailers and fifth wheels	Oven pilot valve	2005
Atwood Mobile Products, Inc.	Recreational vehicles	Oven pilot valve	2004
Bombardier Recreational Products	Personal watercraft	Rollover shut-off switch	2005
Carrier Commercial Refrigeration	Cooking equipment	Relays	2005 (No sales to CT)
Carriage, Inc.	Recreational vehicles	Oven pilot valve	2005
Cequent Electrical Products (also known as Tekonsha Engineering)	Electric brake controls	Tilt switch	2002
Coachmen Recreational Vehicles	Recreational vehicles	Thermostat	2004
		Safety valve	
		Sensing unit	
Company A	Space heater	Tilt switch	December 2002
DaimlerChrysler Corp.	Anti-lock braking systems (ABS)	Inertia switch	2002
Dutchmen Manufacturing Inc.	Recreational vehicles	Shut-off Valve	March 2004
Electrolux Home Products North America, Inc.	Gas ranges	Safety valve	2007
Elster Electricity (formerly ABB)	Circuit board	Tilt switch	December 2002
	Electricity meters	Switches	2005
Fleetwood Enterprise	Recreational vehicles	Oven pilot valve	2004
Ford Motor Company	Automobiles	Convenience light switch	2001
Forest River, Inc.	Recreational vehicles	Oven pilot valve	2004
Four Winds International, Inc.	Recreational vehicles	Hydraulic leveling device switch	2003
		Oven pilot valve	2005
General Motors Corp.	Automobiles	Convenience light switch	January 2003
Georgie Boy Manufacturing	Motor homes	Safety valve	2004
Gulf Stream Coach, Inc.	Recreational Vehicles	Switches	2005
Heat-Timer Corp.	HVAC control system	Switch	2007
Hill-Rom	Hospital bed	Tilt switch	July 2004

Hopkins Manufacturing Corp.	Trailer braking systems	Inertia switch	2003
International Truck & Engine Corp.	Trucks	Tilt switches for hood and door	January 2003
Keystone RV Company	Recreational vehicles	Oven pilot valve	January 2006
Lancaster Pump	Pumps	Float switch	2004
Lance Camper Mfg. Corp.	Camper	Oven pilot valve	2004
Lazy Daze, Inc.	Motor homes	Oven pilot valve	2004
Maytag Appliance	Ovens	Gas supply valve	2006
Monaco Coach Corporation	Leveling jack sensor	Switches	2004
	TV antenna		
	Satellite antenna		
Newmar Corp.	Recreational Vehicles	Gas flow switch	2004
PACCAR Inc.	Trucks	Switches	2002
Pitco Frialator	Cooking equipment	Electric relay	2004
Play-Mor Trailers, Inc.	Recreational Vehicles	Flame sensor	2004
Skyline Corp.	Recreational Vehicles	Oven pilot valve	2004
Suburban Mfg. Co.	Recreational Vehicles	Oven pilot valve	2005
Sunline Coach	Recreational Vehicles	Switches	2004
SunnyBrook RV, Inc.	Recreational Vehicles	Oven pilot valve	2004
Thor America, Inc.	Recreational Vehicles	Oven pilot valve	2004
Tiffin Motor Homes, Inc.	Recreational Vehicles	Level sensing switch	2002
		Oven pilot valve	2004
Volvo Trucks No. America, Inc.	Trucks	Roll over switch and hood tilt switch	2002
Whirlpool Corporation	Range	Safety switch	2005
Winnebago Industry, Inc.	Recreational Vehicles	Level sensing switch	2002
		Oven pilot valve	2005
Zoeller Pump Co., LLC	Pumps	Control switch	2005 (No sales to CT)