

IMERC Fact Sheet

Mercury Use in Gas & Electric Cooking Ranges & Other Cooking Equipment

This Fact Sheet summarizes the use of mercury in cooking equipment. It includes the total amount of mercury in all products that were sold in the U.S. in 2001, 2004, and 2007. Since that time, almost all manufacturers have phased-out the use of mercury-added components in cooking equipment. Available data on mercury-added replacement items for cooking ranges sold after 2007 is included in IMERC's [Mercury Use in Switches & Relays](#) Fact Sheet.

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 Components in Cooking Ranges

Mercury-added components are used in three types of cooking ranges: gas, gas-electric, and electric. Gas ranges typically contain only one mercury-added component, a mercury flame sensor, or gas shut-off valve. Gas-electric and electric ranges contain fluorescent bulbs for backlighting. Gas-electric ranges may also contain a mercury flame switch, which acts similarly to a flame sensor. Commercial electric ranges may contain mercury relays. Each of these components is described below.

Flame sensors, also called automatic gas shut-off valves, are used as safety devices in gas ranges and other appliances. A flame sensor stops the flow of gas if the open flame does not produce heat, such as when the pilot light is out or the product is malfunctioning. Mercury is contained within the bulb of the sensor, and the heat from the pilot light vaporizes and expands the mercury, causing the gas valve to open. Today's household gas-electric ranges do not require a flame sensor because an electrical current controls the pilot light. For more information about mercury use in gas and electric ranges, go to:

www.newmoa.org/prevention/mercury/projects/legacy/appliances.cfm#go



Mercury Flame Sensor; Photo Source: Vermont Department of Environmental Conservation

Fluorescent bulbs provide backlighting for the appliances' control panels. Mercury in the bulb vaporizes, producing ultraviolet energy that passes through phosphor coatings to produce visible light. See IMERC's [Mercury Use in Lighting](#) Fact Sheet for more information about how fluorescent lighting works.



Examples of Fluorescent Lighting in Gas Ranges
Photo Source: Vermont Department of Environmental Conservation

Relays are electrically controlled devices that allow electrical current flowing through one circuit to switch the current on and off in a second circuit. Relays are often used to switch large current loads by supplying relatively small currents to a control circuit. There are two general families of relays: electro-mechanical and semiconductor.

Mercury displacement relays are one type of electro-mechanical relay used in cooking equipment; they use metallic plunger devices containing magnetic shells or sleeves to displace mercury. When power is off, the mercury level is below the electrode tip of the plunger and no current path exists between the insulated center electrode and the mercury pool. When power is applied, the pull of the magnetic field draws the plunger down into the mercury pool and the plunger centers itself within the current path. When power is shut off, the buoyancy force of the mercury causes the plunger, which is lighter than the mercury, to resume its original position. The mercury level then drops, breaking the current path through the center electrode and mercury pool.

Other mercury relays (e.g., mercury contactor and gas safety valve) are used in industrial and commercial electric convection ovens and conveyer ovens where high temperatures in the oven make the use of standard mercury flame sensors or thermocouples impractical. See IMERC's [Mercury Use in Switches & Relays](#) Fact Sheet for more information on mercury relays.



Mercury Gas Safety Valve
Photo Source: Blodgett



Mercury Relay for an Oven
Photo Source: Garland

Table 1 presents the amount of mercury in each of the three components that are used in gas, gas-electric, and electric ranges, as reported to the IMERC-member states. The Table covers the

amount of mercury in flame sensors, fluorescent lamps, and relays that are used in cooking ranges and not for other uses.

Table 1: Amount of Mercury in Cooking Ranges		
Mercury Component	Amount of Mercury in Individual Component (mg)	Number of Components in Each Product
Flame sensor	> 1,000	1
Fluorescent lamp	> 5 – 10	1
	> 10 – 50	1
Relay	> 1,000	1

In addition to the mercury-added components commonly used in gas, gas-electric, and electric cooking ranges, other types of cooking equipment may contain a mercury component, such as a mercury switch or relay. Some examples of mercury-containing cooking equipment that have been reported to the IMERC-member states include barbecue grills, fryers, hot plates, griddles, and rotisseries.

Mercury Use in Flame Sensors

Mercury flame sensors may be sold individually or as a component of another product (e.g., ranges). Seven companies have reported to the IMERC-member states that they have manufactured cooking equipment products containing mercury-added flame sensors during one or more of the reporting years. Table 2 presents the total amount of mercury in flame sensors sold in the U.S. during calendar years 2001, 2004, and 2007.¹

Table 2: Total Mercury Sold in Flame Sensors (pounds)			
Product/Component	2001	2004	2007
Flame Sensors	4,963 (2.5 tons)	2,363 (1.2 tons)	1,970 (1.0 tons)

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

Table 2 shows that 2.5 tons of mercury was used in flame sensors in 2001 and 1.2 tons in 2004, which reflects a decline of more than 50 percent. In 2007, mercury use in flame sensors further decreased to slightly less than 1 ton, or additional 17 percent from 2004. Overall, mercury use in flame sensors has declined approximately 60 percent since 2001.

¹ The data cited in this Fact Sheet 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>.

Many states have passed legislation restricting the sale of mercury-added switches and relays, including flame sensors, individually or as a component in a larger product (i.e., gas ranges). If more of these state laws go into effect, mercury use in this product category will likely continue to decline.

Phase-Outs & Product Bans on the Sale of Mercury Components Found in Cooking Equipment

The following IMERC-member states currently have [restrictions on the sale and/or distribution of mercury-added switches and relays, including flame sensors](#), individually or as a component in another product: California, Connecticut, Illinois, Louisiana, Maine, Massachusetts, Minnesota, New Hampshire, New York, Rhode Island, and Vermont. In response to these mercury product bans and phase-outs, many companies have ceased manufacturing mercury flame sensors and/or stopped selling products that contain these devices in these states.

Some manufacturers of cooking equipment continue to manufacture and sell products containing mercury-added components (including switches and relays). These manufactures have applied for and been granted a phase-out exemption from one or more of the IMERC-member states, thereby allowing them to continue to sell products containing a mercury switch or relay (e.g., flame sensor) for a specified period of time after the effective phase-out date. The exception is California, which strictly prohibits the sale of mercury-containing flame sensors (also known as diostats) and does not allow manufacturers to apply for a phase-out exemption for this product – this restriction is referred to as a sales ban.

The following is a list of companies and mercury-added cooking equipment products that have reportedly been eliminated by the manufacturers from the U.S. market since 2001:

- Burner Systems International, Inc. (formally Harper-Wyman and Appliance Controls)
- Electrolux Home Products, Inc.
- Maytag
- Pitco Frialator, Inc.
- Whirlpool

Gas ovens containing mercury-added flame sensors were once commonly used in recreational vehicles (RVs), trailers, and campers. In 2004 and 2005, these manufacturers reported to the IMERC-member states that they no longer sell products with mercury-containing cooking equipment.

Disposal and Recycling of Mercury-Containing Cooking Ranges

Although new gas and electric ranges, and other cooking equipment are transitioning to mercury-free, there may be many that are still being used and/or stored in homes or businesses. Used gas and electric ranges that contain mercury components are subject to waste disposal restrictions.

Large appliances, including gas ovens, are considered "white goods" and require special handling and disposal. Because white goods have market value as scrap metal, they can be recycled and reused as long as the hazardous components are removed. Persons should contact

their state and/or local environmental departments to verify solid waste disposal regulations, especially those pertaining to mercury-containing components and devices. They can also check with their local municipality to find out about the specific recycling and disposal options for white goods.

Local appliance recyclers and scrap metal yards may collect white goods for scrap metal recycling purposes. A qualified service technician can safely remove the mercury flame sensor from the gas range before shredding the larger unit. The mercury device can then be sent to a recycler for reclamation. Fluorescent lamps and other mercury components (e.g., relays) must also be removed from gas and electric ranges and other cooking equipment prior to disposal and/or recycling.

For more information about the proper removal of mercury components from gas or electric cooking ranges, including dismantling instructions, photographs, and/or diagrams, see:

- [Association of Home Appliance Manufacturers \(AHAM\)](#)
- [California Department of Toxic Substances and Control \(DTSC\)](#)
- [Maine Department of Environmental Protection \(ME DEP\)](#)
- [Massachusetts Department of Environmental Protection \(MassDEP\) and Franklin County Solid Waste District](#)
- [Vermont Department of Environmental Conservation \(VT DEC\) and Chittenden Solid Waste District](#)

Non-Mercury Alternatives

An example of a non-mercury alternative for replacing the mercury flame sensor in gas ranges is the electronic ignition system. Using an electronic ignition system in gas appliances eliminates the need for a standing pilot light. In most cases, the electronic ignition system is a cost effective and functional replacement for the mercury flame sensor. However, because electricity must be present in order to light the appliance and ensure the safe and controlled flow of gas to the appliance, this alternative would not be suitable for remote areas where electricity is intermittent or unavailable.

The piezoelectric spark ignition system is another example of a non-mercury alternative that eliminates the need for a standing pilot light and hence, the mercury flame sensor. Piezoelectric spark ignition systems are used in camp stoves, gas grills, and lighters. This system does not rely on an electrical grid but works by using a spring-loaded hammer that, when activated by a push-button or knob, strikes a crystal of piezoelectric material (e.g., quartz). When the crystal is struck, it produces an electrical discharge and ignites the gas.

Non-mercury thermocouples are another viable alternative for many applications. The thermocouple consists of two dissimilar metals joined together at one end, which create an electrical voltage when heated. In appliances with pilot lights, the thermocouple sits in the pilot flame and uses the heat of the pilot light to generate electricity. The electricity runs to an electromagnetic valve and holds it open, allowing gas to flow as long as the pilot remains lit – if the flame goes out, the thermocouple cools and the electrical current stops, closing the valve and

shutting off the supply of gas. This type of thermocouple is now used in place of the mercury flame sensors for gas ovens found in most recreational vehicles or other stand-alone applications.

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 mercury-containing cooking equipment 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 cooking equipment sold nationwide since 2001. It does not include mercury amalgam 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.
- This Fact Sheet focuses on mercury use in flame sensors used in cooking equipment. It does not include mercury use data for fluorescent lamps used in cooking ranges; these fluorescent lamps are covered in IMERC's [Mercury Use in Lighting](#) Fact Sheet. It also does not include mercury use data for mercury relays used in cooking equipment; all uses of mercury relays are covered in IMERC's [Mercury Use in Switches and Relays](#) Fact Sheet.