Mercury Utilization:

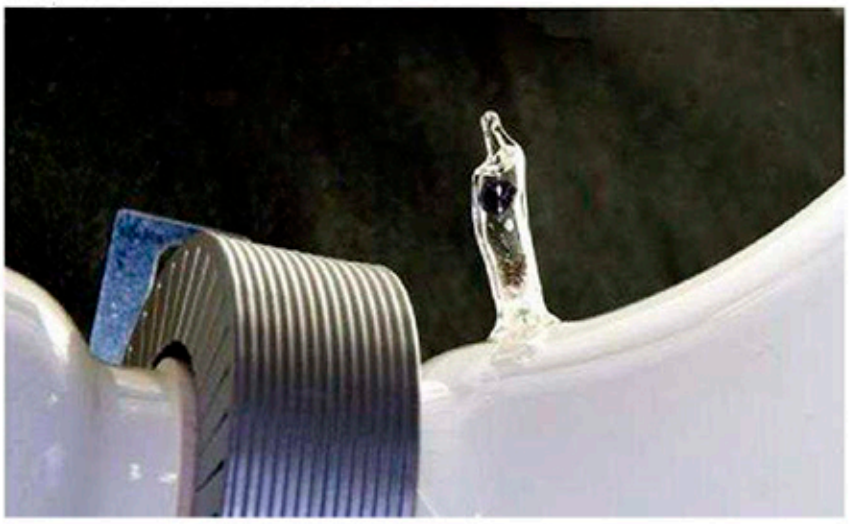
Almost all modern high output light sources depend on using mercury inside the lamps for operation. When considering the environmental impact of the mercury in lighting, we must take three factors into consideration:

- The type of mercury (solid or liquid) which is present in the lamps,
- The amount of mercury present in a particular type of lamp, and
- The lifespan of the lamp which will determine the amount of mercury used per hour of operation.

Liquid mercury, which is the most common form of mercury used in lighting, represents the greatest hazard. If a lamp is broken, the liquid mercury can find its way into cracks in concrete flooring, the fibers of carpets, or into spaces in other floor coverings. Over time, the mercury will evaporate into the atmosphere causing a local "hot spot" of low level contamination. The more liquid mercury present in a lamp, the longer the resulting contamination will last.

> *"If the total amount of mercury contained in a typical fluorescent tube (approximately 20 milligrams), were to mix completely and evenly in a body of water, it would be enough to contaminate around 20,000 litres of water beyond Health Canada limits for safe drinking water (0.001 milligrams of mercury per litre of water per day)"*
>
> -ENVIRONMENT CANADA

Mercury can be compounded with other metals, into a solid form called an amalgam - this is the type of the mercury used in induction lamps. It is similar to the once widely used dental amalgam in tooth fillings. The solid form of mercury poses much less of an environmental problem than liquid mercury. The amalgam form of mercury is also less of a health hazard as it is not as readily absorbed into the skin (than the liquid form) should one come into contact with the almagam - it has low "bio-availability". The small slug or pellet of amalgam can easily be recovered (always wear disposable gloves) in case of induction lamp breakage and therefore can be disposed of properly with little or no risk of creating a locally contaminated area. The solid mercury amalgam is also simpler to recover for recycling at end of lamp life.



A pellet (or slug) of Mercury amalgam can be seen in the glass "filltube" of a typical round induction lamp. The silver object at the bottom left side of the picture is one of the external inductors.

Photo by L. Michael Roberts

The amount of mercury by lamp type and manufacturer varies as shown in this table:

Comparison of Mercury Utilization for Typical Commercial Light Sources

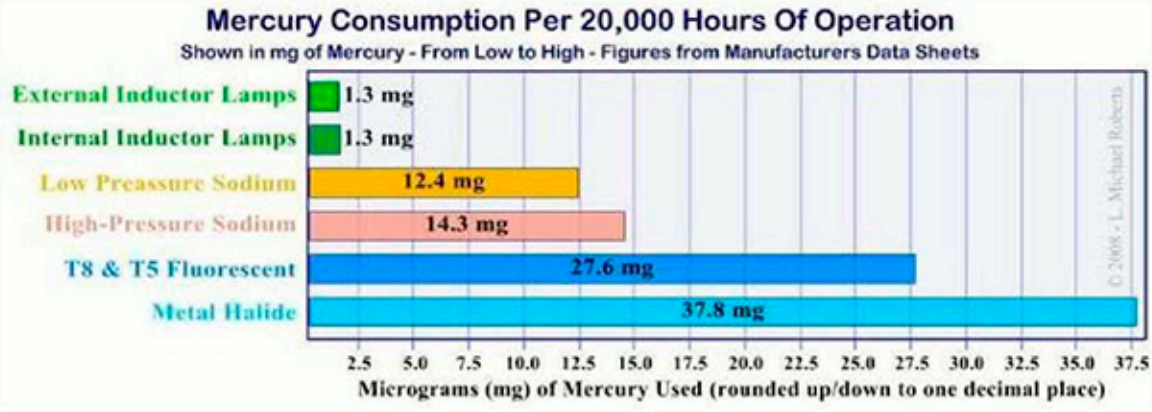
Lamp Type	Low Pressure Sodium (SOX)	High Pressure Sodium (HPS)	Metal Halide	48" Fluorescent Tube	Induction Lamps
Average Mercury (Hg) Content (in Micrograms [mg]*)	GE SOX: 6~8 Phillips SOX: 12~16	Osram HPS: 13~20 Sylvania HPS: 12~15	GE : 11~30 Phillips: 12~15	Sylvania: 40~43 Phillips low Hg: 10~12	Miser: 6.4 mg
Mercury use per 20,000 hours #	12.4 mg Hg	14.3 mg Hg	37.8 mg Hg	27.6 mg Hg	1.3 mg Hg

Notes: * Mercury content taken from manufacturers data sheets and http://www.informinc.org/fact_P3mercury_lamps.php then adjusted as if comparing 100W lamps.

The usage figure is calculated from average Mercury content and average lifespan figures given above [rounded up/down to one decimal place]

As we can see from table 4, induction lamps use the least amount of mercury of any lamp technology, when considered based on both initial quantity and amount used per 20,000 hours of lamp life. Induction lamps are therefore much more environmentally friendly since they use very little mercury over their lifespan. Further, the mercury is in solid amalgam form reducing contamination in the case of accidental breakage and making recovery for recycling simpler.

The chart below puts this information into visual form for the most common types of industrial, commercial and retail lighting technologies.



Environmental Facts Relating to Mercury and Lightbulb Recycling

- *Each year, an estimated 600 million fluorescent lamps are disposed of in U.S. landfills amounting to 30,000 pounds of mercury waste.*
- *In 1992, mercury-containing lamps were added to the United States' Environmental Protection Agency's (EPA) list of hazardous substances. (the EPA's regulatory threshold of 2mg./litre is usually exceeded by mercury containing lamps).*
- *The mercury from one fluorescent bulb can pollute 6,000 gallons of water beyond safe levels for driniking.*

"Mercury Study Report to Congress" - US Environmental Protection Agency (EPA); December 1997

Recycling Considerations:

As mentioned above, induction lamps require much less resources, in terms of the raw materials for manufacturing, than other lamp technologies considering the long lifespan of the lamps, and the number of replacement lamps required by competing technologies.

Further, induction lamps are simpler and cheaper to recycle. The solid mercury amalgam is easily removed and can be recycled with less chance of environmental contamination. The external and internal inductors can be removed (for metal recovery) leaving a glass envelope free of metal parts which takes less energy to recycle. Competing lamp technologies have a significant amount of metal embedded in the lamp envelopes, thus higher temperatures and more energy must be expended to recycle the components.