Capturing mercury emissions

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For 40 years, a site in New York was used to reclaim mercury from batteries and other materials. Located beside a tributary of the Hudson River, the site slowly contaminated the surrounding area for decades, threatening the health of the more than 100,000 people who lived within just three miles. In 1999, the U.S. Environmental Protection Agency took over the cleanup of the site—one of many Superfund sites across the U.S. contaminated with toxic mercury.

Mercury is a naturally occurring element that is found in the environment and exists in several forms, including elemental mercury and mercury compounds. Classified as a neurotoxin, a chemical that is destructive to the nervous system, mercury can impair brain development in infants and small children and cause severe neurological damage in adults. Mercury is also harmful to wildlife and the environment because it can travel long distances in the air to soil and bodies of water, then travel up the food chain, contaminating as it does so.

As a naturally occurring element, mercury can be found in numerous places and within many materials. Natural sources of mercury in the atmosphere include volcanoes and geological deposits. Rocks, water and soils also naturally contain small amounts of mercury, and some mineral deposits and thermal springs contain higher concentrations of the element.

More commonly though, mercury cycles in the environment as a result of human activities, and the environmental cycle of mercury presents threats both to human health and the earth. Most mercury in the atmosphere is elemental mercury vapor, which can circulate in the air for up to a year and thus can be widely dispersed and transported thousands of miles from the source of the emissions. Once released, mercury eventually settles into bodies of water or into the earth, where it can be washed into lakes, rivers and streams. After it is deposited, mercury can be converted into methylmercury, a highly toxic form of the element that builds up in the gills of fish. The larger the fish, the more mercury it absorbs, leading states to release advisories on the consumption of fish and seafood.

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Human activities and industries add a substantial amount of mercury to the atmosphere. Mercury is emitted from some coal-fired power plants, cement manufacturing plants, burning hazardous wastes, breaking products that contain mercury and the improper treatment or disposal of mercury-contaminated wastes. Generating low concentrations of mercury vapor, coal-burning power plants are the largest human-caused source of mercury emissions in the U.S., accounting for more than 50 percent of the mercury released into the air.

In addition, industrial processes that use mercury, waste generators and mineral mining operations all contribute to mercury pollution. Poor management of emissions or leakage can result in concentrations of mercury in the soil that are well above the regulatory limits. In 2007, the EPA reported that mercury

was a "contaminant of concern" at nearly 300 Superfund sites across the country. As a result, the EPA and other organizations around the globe have tightened regulations on emissions of hazardous chemicals, such as mercury.

Exposure to mercury can have devastating effects on the human nervous system and damage the brain, heart, kidneys, lungs and immune system. To combat the threat of mercury exposure, the EPA has established and tightened regulations on mercury emissions over the past 20 years.

The Mercury Export Ban Act of 2008 (MEBA) prohibits the export of elemental mercury from the U.S. This prohibition is designed to limit the availability of elemental mercury in the global market. The European Union established a similar ban on the exportation of mercury and mercury compounds in 2007.

The Clean Air Mercury Rule, which the EPA issued in 2005, created "performance standards and established permanent, declining caps on mercury emissions" (U.S. EPA, 2005). This regulation marks the first time that the EPA has regulated mercury emissions from coal-fired power plants. The goal of the Clean Air Mercury Rule is to reduce utility emissions of mercury from 48 tons per year to 15 tons per year, a 70 percent reduction.

In May 2011, the EPA proposed the National Emission Standard for Hazardous Air Pollutants (NESHAP). This regulation was created to reduce toxic air pollutant emissions, such as mercury, from coal-fired and oil-fired electricity generating utilities. In the past 15 years, many states have also established regulations limiting mercury emissions from coal-fired power plants. Between 1999 and 2009, emissions decreased by almost 27 percent.

Another contributor to mercury emissions is the cement industry. Cement manufacturing is an energy-intensive process that grinds and heats a mixture of raw materials—such as limestone, clay, sand and iron ore—in a rotary kiln. The product of this process is known as "clinker" and is used to make cement, which is then mixed with aggregate and water to create concrete.

A variety of pollutants, including mercury, are released from the burning of fuels and heating of the raw materials used to make cement. The EPA aims to reduce the harmful air pollution from the cement industry through regulations that depend on current technology to limit the emissions of toxic air pollutants such as mercury. The newest mercury regulations from the EPA are designed to limit emissions from cement kilns to 55 pounds per million tons of clinker.

The EPA requires that mercury-contaminated waste be treated to remove or stabilize the toxic metal and keep it from leaching into the soil and groundwater. Mercury can be treated and removed from many materials, including soil, sediment, sludge and other industrial wastes.

Fortunately, mercury can be cost-effectively removed from soil before it has a chance to negatively impact human health and the environment. Mercury can be removed from contaminated substrates through the use of a process known as thermal desorption. In this process, intense heat is applied to the material to volatize the mercury without damaging the material itself. In a thermal desorption unit, the contaminated soil is heated and the mercury is vaporized. A gas or vacuum system then transports the vaporized mercury and water to an air-emission treatment system.

Worldwide Recycling Equipment Sales, LLC (WWR) in Moberly, Missouri, is uniquely positioned to aid those in the industry in the removal of mercury and mercury products from contaminated materials. Through our Vulcan® Systems, WWR has developed technology that is able to remove mercury from substrates on a continuous basis. This custom-designed and manufactured thermal equipment includes vapor recovery for the collection of vaporized mercury and has been demonstrated on both a pilot plant and a commercial basis. WWR is capable of designing systems to remove mercury from any industrial powders, such as activated carbon, fluorescent lamp powder, sludges and soil contaminated with mercury and mercury compounds.

Vulcan® Systems custom-designs and manufactures drying, calcining and thermal desorption equipment. Each system is custom-built to suit the client's specific needs. Our services include setup, commissioning, training and maintenance support services over the lifetime of your project.

Through the use of thermal desorption and vapor recovery, mercury can be removed from soil, preventing substantial damage to human health and the environment. Vulcan® Systems can provide the equipment necessary to cost-effectively remove toxic mercury from contaminated substrates, resulting in a cleaner, healthier environment.

For more information on Vulcan® Systems, visit our website, www.getavulcan.com, or contact Worldwide Recycling Equipment Sales, LLC at (660) 263-7575 or wwrequip@wwrequip.com.