CASE STUDY

Mercury Assessment >> Portsmouth Naval Shipyard

Why Should Your Facility Be Concerned About Mercury?

- Mercury contamination is a serious environmental and public health problem. Elemental mercury can be transformed in the environment to methyl mercury which is a toxic and persistent pollutant and exposure to it may lead to irreversible neurological effects. About 60,000 children born each year in the United States might be at risk for adverse neurological effects from in-utero exposure to methyl mercury, primarily due to their mothers eating fish during pregnancy.
- Across New England, more than 80 percent of the inland waters have fish too polluted with mercury to eat and all the New England states have issued health advisories limiting consumption of certain freshwater fish.
- Mercury possesses the properties of both a liquid and a metal, and is an added component of many products including fluorescent lamps and certain types of thermometers, electrical switches, and measuring devices.
- Mercury can volatilize at room temperature enabling it to constantly circulate in the air, water, and soil. When spilled mercury is poured down the drain or a mercury- containing item is thrown into the trash, it doesn't disappear. The mercury enters the circulation in the environment after it passes through the waste incinerator, landfill or wastewater treatment plant.

Introduction

The project team consisting of federal and interstate representatives visited Portsmouth Naval Shipyard to identify the sources and uses of mercury-added products at the Shipyard and to research efforts the Shipyard has undertaken to reduce or eliminate their reliance on mercury. The project team met with the Shipyard's Environmental Manager, the Pollution Prevention Program Coordinator, the Mercury Coordinator and other Shipyard staff members. The Team utilized a mercury management questionnaire to facilitate discussion of past and current mercury use at the Shipyard. The Team also determined the locations at the Shipyard that were most likely to use mercury-added products. During the assessment the project team visited the following buildings: Building 72 (power plant), Building 155 (pipe shop), Building 240 (metrology calibration laboratory), Building 20 (materials testing laboratory), Building 300 (tool and machine shop), Building 240 (electrical shop), Building 136 (Defense Reutilization Marketing Office (DRMO)), Building 337 (hazardous material receiving and storage facility), Building H-10 (dental clinic) and Building 357 (hazardous waste storage facility). This case study presents the results of this mercury site assessment and recommendations for additional mercury reduction and controls at the Shipyard. Attachment A outlines the measures undertaken by the Shipyard to address the recommendations.

Facility Overview

Overall, awareness of mercury at the Shipyard is high. Portsmouth Naval Shipyard repairs and refurbishes nuclear submarines. Contact with mercury can weaken non-ferrous metals and alloys which can have catastrophic consequences in the submarine environment. Therefore, the Navy has had a longstanding Mercury Control Program to identify possible sources of mercury and reduce their possible contact with the submarines and equipment that is used on-board. The Shipyard contains many areas and buildings designated as Mercury Exclusion Areas.

The Shipyard consists of office buildings, laboratories, a power plant, medical and dental clinics, limited residential housing, and a DRMO that serves the northeast region. Other buildings contain various functions necessary to repair Naval Ships such as pipe repair work, sheet metal work, and electrical repair. The Shipyard receives its water and wastewater services from the local municipal system. The Shipyard has five wastewater discharges, and each has an NPDES permit.

Mercury Reduction Efforts and Current Inventory

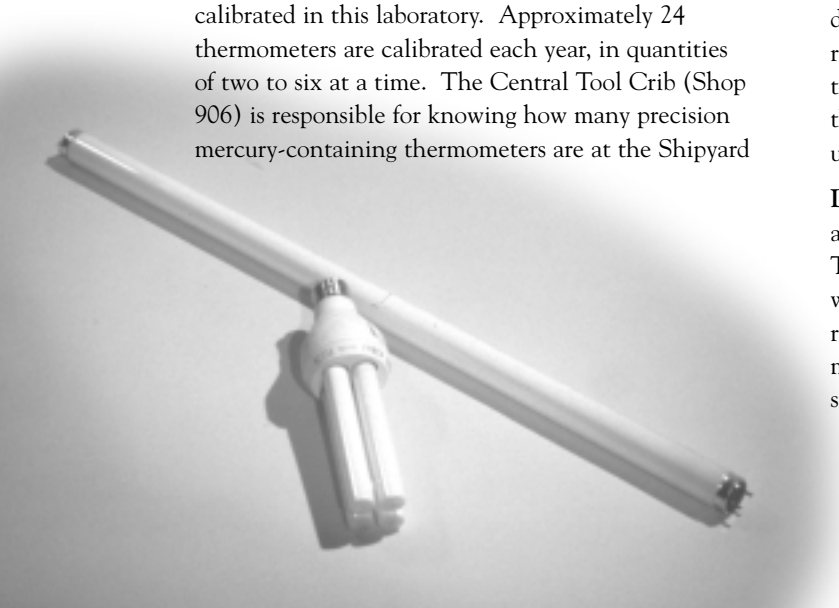
The Shipyard has undertaken extensive mercury reduction and control activities. The Shipyard has a written Process Instruction for Mercury Control.[1] The process instruction covers the purchase, use, storage, cleanup and disposal of mercury and mercury-containing materials and components. All new employees receive general environmental awareness training that includes information specific to mercury hazards and management of fluorescent lamps.[2] In addition, employees who utilize mercury and those on the Mercury Spill Team receive detailed mercury-specific training annually.

The Shipyard conducted an annual Shipyard-wide mercury inventory from 1958 to 1996. This practice was discontinued after the 1996 inventory because it was found to be burdensome, costly or already covered under other regulation by the NAVSEA Cumbersome Work Practice Panel. Information about mercury-containing devices in specific buildings is outlined below.

Power Plant Mercury-containing devices, such as flowmeters, pumps, thermometers have all been removed from the plant. The only mercury noted was in the thermostat in the plant office, and the fluorescent bulbs.

Pipe Shop The pipe shop is a Mercury Exclusion Area. However, the mercury team and the Shipyard's Environmental Department learned that the new portable stainless steel waste oil collection tank has a mercury float switch for overflow detection. There are nine of these collection tanks at various locations at the Shipyard. The shop reported that they are looking into changing out the mercury switch for a non-mercury switch.

Metrology Calibration Laboratory All precision mercury-containing thermometers at the Shipyard are calibrated in this laboratory. Approximately 24 thermometers are calibrated each year, in quantities of two to six at a time. The Central Tool Crib (Shop 906) is responsible for knowing how many precision mercury-containing thermometers are at the Shipyard and to whom they are assigned. The thermometers are mainly used by the chemistry laboratory (Building 20). Mercury thermometers are stored in a mercury locker prior to calibration and before shipping to the user to protect them from breakage.



Materials Testing Laboratory The materials testing laboratory does not have any elemental mercury. However, they have precision mercury-containing thermometers and a quantity of mercuric nitrate standard that contains 100 parts-per-million of mercury. These are kept in a mercury storage locker. There is no inventory, or sign in/out system to keep track of how many thermometers the laboratory has or who has them at any given time because the Process Instruction no longer requires inventories (see the discussion above in Mercury Reduction Efforts and Current Inventory introduction). An optical emissions monitor contains a mercury lamp to keep it aligned properly.

Tool and Machine Shop The tool and machine shop has a mercury thermostat on the wall in the office that is not connected for use. The shop has three double-door lockers filled with miscellaneous mercury-containing devices, such as mercury vapor tubes, mercury relays, and various sizes of fluorescent bulbs. There is no inventory of locker contents, or system to keep track of where devices are used at the Shipyard when they are removed. Shop workers report that they keep all these mercury devices because they never know when one will be required to repair a necessary piece of equipment. However, the shop has no way to know whether the equipment for which they are keeping spare parts is at the Shipyard any longer.

Defense Reutilization Marketing Office (DRMO) The DRMO does not knowingly accept anything that contains a hazardous waste. However, personnel at the Shipyard report that any mercury-containing devices that are operable are turned into DRMO for resale. DRMO reports that they do not physically take custody of hazardous material. DRMO processes the necessary paperwork and tries to find a buyer for used products.

Dental Clinic The dental clinic uses self-contained amalgam capsules and has traps on their rinse drains The traps are emptied each day and traps are changed weekly. The collected mercury is accumulated for recycling. The clinic has mercury thermostats and a mercury thermometer to monitor temperature in their sterilizer. The thermometer is not Teflon-coated.

Hazardous Waste Storage Facility The hazardous waste storage facility opened in August 1996 and is state-of-the-art. The facility has a special mercury decontamination room that has not been used in the last few years. The facility sends approximately 17,000 pounds of fluorescent bulbs out for recycling each year. The facility also handles some mercury batteries and, approximately twice a year, a 30 gallon drum of mercuric/silver nitrate that is produced from the submarine refurbishing activities.

Procurement and Disposal Procedures

There are two ways to purchase a hazardous chemical at the Shipyard: the Job Material List (JML) and the Credit Card program. Credit card use is limited to purchases under $2,500. The JML is for purchases valued at greater than $2,500. The Shipyard has a screening policy written into its Hazardous Material Control and Management Instruction. Any new hazardous chemical that has not been used at the Shipyard in the past must be approved by both the environmental and OSHA divisions before it can be ordered. Once a chemical is approved it is listed on the Shipyard's Authorized Use List (AUL) and can be reordered without specific approval. In addition, NAVSEA maintains a list of mercury containing products and processes that are authorized for use in mercury exclusion areas and for installation in the submarines.[3] All such items must be appropriately identified and labeled.

The Shipyard has a program to purchase environmentally friendly products. The Shipyard's focus on mercury includes a standard "mercury clause" that is inserted into purchasing contracts for items coming in contact with submarine hardware or supplies. The clause requires that "Mercury or mercury containing compounds shall not be intentionally added or come in direct contact with hardware or supplies under this contract." The Shipyard's Pollution Prevention Plan has a list of Targeted Chemicals that are designated for pollution prevention efforts which includes mercury and mercury compounds. This designation is considered during the AUL approval process.

Once ordered and delivered to the Hazardous Materials Receiving and Storage Facility, the Shipyard uses an electronic bar code system to identify and track OSHA-defined hazardous chemicals. Mercury containing hazardous chemicals are tracked under this system. The Shipyard maintains a list of all the mercury containing materials that are at the Shipyard.

However, the tracking system is not designed to track mercury in manufactured products, such as thermometers and thermostats. The Shipyard has established a system to consolidate unused materials and promote their reuse at the Shipyard. The system reduces the potential for material to exceed its shelf-life and become a waste. The system also reduces the need for satellite hazardous waste storage areas and coordinators. The system includes pick-up and delivery options to encourage participation.

The Shipyard has undertaken extensive mercury reduction and control activities. The Shipyard has a written Process Instruction for Mercury Control.

Waste mercury items that cannot be reused, including mercury-added manufactured items, are labeled and brought to the individual Hazardous Waste Accumulation Areas where they are then shipped to the Hazardous Waste Storage Facility. Mercury-added manufactured products that remain operable are not handled as hazardous waste and are turned into the DRMO. All batteries are collected and handled as a hazardous waste. The Shipyard has contracted out fluorescent bulb management services and they are collected and managed as a hazardous waste. The contract mandates that the bulbs be recycled.

Recommendations

The project team offers these recommendations for consideration:

- Establish an inventory of thermometers at the Materials Testing Laboratory and a sign-in/sign-out system to keep track of how many thermometers are at the laboratory and who has them at any given time
- Establish an inventory of the mercury-containing items at the Tool and Machine Shop and a sign-out system to keep track of where the items are used at the Shipyard. Determine if the various

machinery for which the Tool and Machine Shop is keeping spare parts currently exists at the Shipyard and properly dispose of all spare parts for which there is no possible need.

- Determine the location of all mercury-containing manufactured products, such as thermostats, and replace them with digital alternatives wherever feasible. Remove and recycle or dispose of any used items. All remaining mercury-containing manufactured products should be clearly labeled, inventoried, and tracked. Wherever feasible, these items should be encapsulated to prevent the release of mercury if they are accidentally broken.
- Include mercury-added manufactured products such as switches, thermostats, and thermometers in the hazardous materials procurement system so their purchase and use at the Shipyard is minimized and tracked.
- Change-out the mercury float switches for non-mercury switches in the portable stainless steel waste oil collection tanks. Place a mercury identification label on the tanks that continue to have mercury switches.
- Replace all mercury-containing thermometers with non-mercury alternatives. Where replacement is not feasible, all essential mercury-containing thermometers should be Teflon-coated to protect against the release of mercury from accidental breakage.
- Mercury traps on dental clinic drains only collect large particles of mercury. Amalgam separators are available that can remove both the solid and suspended mercury from the rinse drains. The dental clinic should evaluate installation of these devices.

Project Team

Anne Fenn, Jeri Weiss and Captain Dongha Yi, EPA Region I; Terri Goldberg and Jennifer Griffith, Northeast Waste Management Officials' Association (NEWMOA)

Contacts for More Information

Mercury

Connecticut: Tom Metzner
(860) 424-3242 or tom.metzner@po.state.ct.us

Maine: Ann Pistell
(207) 287-7853 or ann.e.pistell@state.me.us

Massachusetts: Judy Shope

New Hampshire: Stephanie D'Agostino
(603) 271-6398 or sdagostino@des.state.nh.us

Rhode Island: Ron Gagnon
(401) 222-6822 or rgagnon@dem.state.ri.us

Vermont: Environmental Assistance Division
(802) 241-3589 or (800) 932-7100

EPA Region I: Jeri Weiss
(617) 918-1568 or weiss.jeri@epa.gov

NEWMOA: Terri Goldberg
(617) 367-8558, ext.303 or tgoldberg@newmoa.org

Federal Facilities Assistance

EPA Region I: Anne Fenn
Federal Facilities Program Manager
(617) 918-1805 or fenn.anne@epa.gov

Recyclers/Collectors of Mercury-Containing Products

www.epa.gov/region01/steward/neeat/mercury/disposal.html

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1 A copy of the Process Instruction for Mercury Control can be obtained by contacting Jennifer Griffith at NEWMOA at (617) 367-8558 or jgriffith@newmoa.org.

2 Example mercury training bulletins on are available on NEWMOA's website: www.newmoa.org.

3 The list is included as Enclosure 1.10.1.1 in the Process Instruction for Mercury Control and is also available on NEWMOA's website: www.newmoa.org.

Attachment A

Facility Response to EPA Visit and Recommendations

As a result of the Mercury Assessment, Portsmouth Naval Shipyard has undertaken several efforts to implement the recommendations made in the case study. The following measures have been completed or are planned:

- The Materials Testing Laboratory conducted a comprehensive inventory of mercury thermometers. 35 percent of the original inventory has been disposed of as a hazardous waste. Some ASTM test procedures now permit the use of digital thermometers, so the laboratory should be able to reduce the number of thermometers to six (an 80 percent reduction from April 2000). Teflon coated mercury thermometers will replace the remaining thermometers when they come due for calibration.
- The Tool and Machine Shop established an inventory of the mercury containing items in storage. Approximately one-third of the items observed in April 2000 have been removed for disposal. The remaining items have confirmed uses.
- The mercury thermometer at the dental clinic has been replaced with a non-mercury thermometer.
- The Shipyard has contacted a manufacturer of mercury removal systems for the dental clinic wastewater. Drop-in replacements for the current mercury traps at the chairs are not available. The Environmental Division has established a request to have a mercury removal system placed in the basement of Building H-10 (dental clinic) to collect mercury that goes through the mercury traps at the chairs.
- For demolition and renovation projects, the standard contract specification language currently specifies that mercury containing lamps must be handled as a hazardous waste. The Shipyard plans broaden the scope of the specification to include other mercury containing items such as thermostats.
- The Shipyard plans to specify the use of low mercury fluorescent bulbs when relamping or renovating.
- The Shipyard is studying potential new requirements for design contractors that would prohibit specifying mercury-containing items, such as thermostats.