Executive Summary October 25, 2002

An Investigation of Alternatives to Mercury Containing Products

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[For a copy of the full report (81 pp.) contact John James, Maine Department of Environmental Protection at (207) 287-7866 or john.james@state.me.us.]

The Maine Department of Environmental Protection (DEP) will issue a report on January 1, 2003 that will include a comprehensive strategy to reduce the mercury content of products. To assist in gathering of information for this report, the Maine DEP commissioned the Lowell Center for Sustainable Production of the University of Massachusetts to conduct a study of alternatives to mercury containing products.

Mercury's chemical and physical properties have been applied to meet the requirements of thousands of products and applications including: dental amalgams, scientific instruments, electrical components, batteries, lamps, and medical devices. These mercury containing products are widely used in residential, commercial, industrial, military, marine, and medical environments.

Mercury from these products can be released to the environment during various stages of the product life cycle including production, transportation, manufacturing, use, and disposal. Once released, the mercury can transform to organic forms, and can readily disperse in the environment through the air, soil, and water. Mercury is persistent in the environment, and also accumulates in concentration as it biomagnifies within the food chain. Mercury is highly toxic to humans; exposure can damage kidneys and the central nervous system. The fetus is particularly sensitive to mercury's toxic effects. Mercury also has adverse effects on wildlife including early death, weight loss, and reproductive issues.

In February 2002, the Interstate Mercury Education and Reduction Clearinghouse (IMERC) was formed under the auspices of the Northeast Waste Management Officials' Association (NEWMOA). IMERC is an umbrella organization designed to assist the eight northeast states in their implementation of mercury reduction laws and programs aimed at getting mercury out of consumer products, the waste stream, and the environment.

The LCSP study included a review of the mercury product notification data submitted by manufacturers to IMERC. The notification data included a description of mercury added components, number of components, amount of mercury per unit, amount of mercury in total domestic sales, and purpose of mercury in the product. At the time of the review, this included seventy-six manufacturers reporting 390 mercury containing products. The LCSP study also included discussions with mercury product experts, discussions with manufacturers of mercury products, review of responses to a May 1, 2002 State of Maine letter to mercury product manufacturers (see Appendix 4), review of published mercury product studies, and review of pertinent data available on the internet.

Since there are thousands of products that contain mercury, a prioritization effort was needed to focus on a core set of products that could then undergo further detailed study. The criteria for this prioritization included: amount of mercury released to the environment, amount of mercury contained within the product, total amount of mercury reported for all product sales; product coverage by current regulation, and the availability of mercury-free alternatives. Products and components

were reviewed as part of the prioritization process. Components are typically sold to original equipment manufacturers to be incorporated within a product. For example, the mercury tilt switch is a component that is incorporated in automobiles, vending machines, cranes, wheelchairs, and numerous other products.

The priority products selected for further detailed study included sphygmomanometers, gastrointestinal tubes, manometers, non-fever thermometers, barometers, hygrometers, psychrometers, hydrometers, flow meters, pyrometers, and thermostats (industrial and manufacturing only). The priority components selected for further detailed study included float switches, tilt switches, pressure switches, temperature switches, displacement relays, wetted reed relays, mercury contact relays, and flame sensors.

After the priority products and components were selected, detailed research and analysis was then conducted. The findings from this research include:

- Description of how the mercury product/component operates
- Typical applications of the mercury product/component
- Mercury-free alternatives available
- Cost range for the mercury product/component and mercury free alternatives
- Advantages and disadvantages of the mercury products/components and their mercury free alternatives
- Manufacturer information for mercury free alternatives
- Summary of findings for each mercury product/component

In general, cost competitive mercury-free alternatives were identified that meet the functionality requirements for most priority mercury products. Therefore, these products could be targets for mercury reduction efforts. The two products where alternative replacements cannot be recommended are the gastrointestinal tubes and industrial thermostats. (emphasis added)

For the following components there are cost competitive mercury free alternatives available for new products and applications: flame sensors, float switches, tilt switches, temperature switches, and pressure switches. However, mercury free relays can cover most, but not all, combinations of design parameters for new relay products or applications. (emphasis added)

Certain retrofit situations for mercury switches and relays exist where the mercury-free alternative is not cost competitive. Efforts to reduce the sale of mercury switches and relays for retrofitting existing products or applications should take this into consideration.

There are many opportunities for substituting mercury free alternatives for mercury containing products and components. Many alternatives are not simple drop-in substitutions. Although a mercury free alternative may ultimately achieve the same desired functionality, such as providing an accurate measure of blood pressure or sensing a flame, there are often design considerations or different techniques or practices that must be first learned and communicated.

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