

**APPENDIX 2A:**

**LARGEST STATIONARY SOURCE CATEGORIES FOR Pb IN  
THE 2002 NEI**

## Appendix 2A. Largest Stationary Source Categories for Pb in the 2002 NEI.

### **Boilers and Process Heaters**

Materials including coal, oil, natural gas (or, at times, other substances such as wood and petroleum coke) are burned in boilers and process heaters to produce steam. With regard to boilers, the steam is used to produce electricity or provide heat, while process heaters are used in industrial processes. Lead is present naturally in the fuel and is emitted to air following combustion. The extent of emissions depends on the concentration of Pb in the fuel, the quantity of fuel burned, and PM control devices applied.

Industrial, commercial and institutional boilers and process heaters are used at a wide variety of facilities (e.g., refineries, chemical and manufacturing plants, etc), as well as in a "stand alone" mode to provide heat for large building complexes. Consequently, there are thousands of these sources throughout the country, generally located in urban areas, and they range widely in size. Most coal-fired industrial boilers emit about 0.06 tpy, with the larger ones emitting about 0.07 tpy due to the use of high efficiency particulate matter (PM) control devices (ERG, 2002a). [

Among utility boilers, coal-fired boilers have the highest Pb emissions, oil-fired utility plants emit somewhat lower amounts, and gas-fired plants emit very low levels of Pb (USEPA, 1998). There are approximately 1,300 coal-fired electric utility boilers in the U.S. ranging in size from 25 to approximately 1,400 MWe. Based on emission factor calculations, a 325 MWe coal-fired boiler would be expected to emit approximately 0.021 tpy Pb, based on the use of an electrostatic precipitator for PM control (USEPA, 1998). Although there are exceptions, coal-fired utility boilers tend to be located in non-urban areas.

### **Iron and Steel Foundries**

Iron and steel foundries melt scrap, ingot, and other forms of iron and steel and pour the molten metal into molds for particular products. While located in 44 of the lower 48 states (in both cities and rural areas), the 650 existing foundries in the U.S., are most heavily concentrated in the Midwest (IN, IL, OH, MI, WI, and MN) - roughly 40% of foundries with almost 60% of U.S. production (USEPA, 2002a). Most are iron foundries operated by manufacturers of automobiles and large industrial equipment and their suppliers. The largest Pb emission sources at iron foundries are large furnaces, emissions from which generally range from about 0.3 to 3 tpy (generally released at heights of 25-30 feet), depending on the throughput of the furnace, the type and operating characteristics of the emission control system, and the Pb content in the metal charged to the furnace. Regulations promulgated in 2004 are projected to yield emissions reductions of approximately 25 tpy for this category (USEPA, 2004b).

### **Hazardous Waste Incineration/ Combustion Facilities**

Hazardous waste combustors include hazardous waste incinerators, as well as boilers and industrial furnaces that burn hazardous waste for energy or material recovery (e.g., production of halogen acid from the combustion of chlorine-bearing materials). Industrial furnaces burning hazardous waste include cement kilns, lightweight aggregate kilns, and hydrochloric acid production furnaces. Lead is a trace contaminant in the hazardous waste, fossil fuels, and raw materials used in the combustors. In 2005, there were nearly 270 hazardous waste combustor sources in operation in the United States (70 FR at 59530), with approximately 40 percent of them in the states of Texas and Louisiana. As a result of emissions standards promulgated in 2005, EPA estimates that cumulative Pb emissions from hazardous waste combustors will be reduced to approximately 4.0 tons per year by the compliance date in 2008 (USEPA, 2005), a 95% reduction from 1990 levels.

### **Primary Lead Smelting**

At primary Pb smelters, Pb-bearing ore concentrates are smelted to produce Pb metal. Lead is emitted from primary Pb smelters as process emissions, process fugitive emissions, and fugitive dust emissions (CD, p. 2-21). U.S. EPA promulgated a national emissions standard in 1999 for this category which includes an emissions limit for Pb (U.S. EPA 1999a). In the 1990s, there were three operating primary Pb smelters in the U.S.: one in Montana and two in Missouri, emitting an estimated total of about 260 tpy Pb. In 2002, there were two in operation (estimated emissions shown in Table A-1); one of the two had less than 1 tpy Pb emissions. As of 2004, there was only one operating primary Pb smelter in the U.S.,

located in Missouri with estimated total emissions of about 28 tpy in year 2005 (CD, p. 2-20). Thus, total Pb emissions from this category have decreased about 90% since 1990.

#### **Secondary Lead Smelting**

Secondary Pb smelters are recycling facilities that use blast, rotary, reverberatory, and/or electric furnaces to recover Pb metal from Pb-bearing scrap materials, primarily Pb-acid batteries. This category does not include remelters and refiners or primary Pb smelters. At secondary Pb smelters, Pb may be emitted from process emissions, process fugitive emissions and fugitive dust emissions from wind or mechanically induced entrainment of dust from stockpile and plant yards and roadways. In 1995, U.S. EPA promulgated a national emissions standard for this category which includes an emissions limit for Pb (USEPA, 1995). In 2002, there were 15 secondary smelters operating in 11 states, most of which are in the eastern half of the U.S. Estimates of total emissions (process and fugitive) for individual facilities as of 2002 range between 1 and 4 tpy, with one facility having total lead emissions of about 12 tpy (USEPA, 2007a; EC/R, 2006). Total Pb emissions (tpy) for this category decreased about 60% from 1990 to 2002.

#### **Military Installations**

This source category includes sources that are military facilities. The types of sources contributing to Pb emissions from this category include, among others, rocket and engine test facilities, ammunition manufacturing, weapons testing, waste combustion and boilers. While there are over 300 military facilities in the NEI, only 10% emit over 0.1 tpy of Pb and only 3% emit over 1 tpy. The two largest facilities (listed in Table A-4) are a missile ammunition production plant and a weapons testing facility and these two facilities account for over 75% of the category emissions.

#### **Mining**

This category includes various mining facilities that extract ore from the earth containing Pb, zinc, copper and/or other non-ferrous metals (such as gold and silver), and/or non-metallic minerals such as talc and coal. This category does not include the smelting or refining of the metals and minerals. These facilities produce ore concentrates (such as Pb, zinc, and copper concentrates) that are transported to other facilities where further processes, such as smelting and refining take place. The 2002 NEI indicates that there are 3 mining facilities in the U.S. emitting greater than 0.5 tpy Pb, one of which emits more than 5 tpy. This facility is in Missouri and produces Pb, zinc, and copper concentrates that are shipped to customers for further processing.

#### **Integrated Iron & Steel Manufacturing**

Integrated iron and steel manufacturing includes facilities engaged in the production of steel from iron ore. The processes include sinter plants, blast furnaces that produce iron, and basic oxygen process furnaces that produce steel, as well as several ancillary processes including hot metal transfer, desulfurization, slag skimming, and ladle metallurgy. There are currently 17 facilities in this source category each of whom emit from 2 to 8 tpy of Pb. Stack heights range from 30 - 50 feet. The facilities are located in 9 states, mostly in the Midwest (USEPA, 2003a). EPA promulgated a national emissions standard in 2003 for this category which includes an emissions limit for PM (as a surrogate for metal HAP, including Pb) (USEPA, 2003b).

#### **Municipal Waste Combustors: Small & Large**

Municipal waste combustors (MWCs) incinerate municipal or municipal-type solid waste. The amount of municipal waste incinerated (about 14% of U.S. municipal waste) has remained stable over the past decade. The amount of Pb emitted from municipal waste combustors depends on the amount of Pb in the refuse, with typical sources including paper, inks, cans and other metal scrap and plastics (CD, pp. 2-35 to 2-36). As of 2005, MACT standards were completed for all existing and new municipal waste incineration units, resulting in nationwide Pb emissions of less than 10 tons per year, roughly a 97% reduction since 1990. There are currently 66 large MWC plants and 26 small MWC plants operating nationally, with individual large MWC plants projected to emit less than 0.1 tpy Pb, and small MWC plants less than 0.02 tpy Pb (ERG, 2002b,c; Stevenson, 2002). However, there are a few MWC facilities that emit about 2 tons per year.

#### **Pressed and Blown Glass and Glassware Manufacturing**

This category includes manufacturers of flat glass, glass containers, and other pressed and blown glass and glassware, with Pb emitted primarily from the pressed and blown glass industry sector. Some container plants also make a leaded-glass product, but this is not typical of container glass plants. Lead

may also be added to flat glass for use in microwaves and flat-screen TVs. Emissions from individual facilities may range from a few pounds per year up to several tons per year depending on Pb content of their glass and the level of control. Furnace stacks for these facilities are typically of the order of 35-60 feet high. As of 2005, about 22 tons of Pb is emitted from glass manufacturing annually in the U.S. Glass plants are located in 35 States (RTI, 2006). U.S. EPA is currently developing an emissions regulation for this category, scheduled for promulgation in December 2007.

#### **Electric Arc Furnace Steelmaking**

In the steelmaking process that uses an electric arc furnace (EAF), the primary raw material is scrap metal, which is melted and refined using electric energy. Since scrap metal is used instead of molten iron, there are no cokemaking or ironmaking operations associated with steel production that use an EAF. There are currently 141 EAFs at 93 facilities, with estimated total nationwide Pb and Pb compound emissions of approximately 80 tons, and the average per facility is approximately 0.75 tpy. Stack heights range from heights of 30 - 50 feet. The facilities are located in 32 states; mostly in the northeast and Midwest, with ninety percent of the facilities located in urban areas. This information is drawn from multiple sources (Lehigh, 1982; Calspan, 1977; RTI, 2005). U.S. EPA is developing a hazardous air pollutant (HAP) emissions regulation for this category, scheduled for promulgation in December 2007.

#### **Lead Acid Battery Manufacturing**

The Pb acid battery manufacturing category includes establishments primarily engaged in manufacturing storage batteries from Pb alloy ingots and Pb oxide. The Pb oxide may be prepared by the battery manufacturer or may be purchased from a supplier. There has been a general decline in number of facilities, with 58 facilities currently in operation (data obtained from the Battery Council International (BCI)). The estimated range of facility-specific Pb and Pb compound emissions is from  $1 \times 10^{-5}$  to just below 10 tpy, with an average of about 0.5 tpy. The facilities are located in urban and rural areas of 23 states and Puerto Rico (2002 NEI).

#### **Primary Copper Smelting**

This source category includes all industries which refine copper concentrate from mined ore to anode grade copper, using pyrometallic processes. Seven primary copper smelters are currently operating in the U.S. Six of these seven smelters use conventional smelter technology which includes batch converter furnaces for the conversion of matte grade copper to blister copper, while the seventh uses a continuous flash furnace. Two of the three largest smelters are located in AZ, and the third is in Utah. The largest facility emitted an estimated 12.8 tons Pb in 2002, while emissions for the other two large facilities are estimated to be between 0.1 to 5 tpy. No other source in this category emits more than 0.1 tpy. In 2002, U.S. EPA promulgated a national emissions standard, including limits for PM (as a surrogate for metal HAP, including Pb), for this category (USEPA, 2002c).

#### **Portland Cement Manufacturing**

Portland cement manufacturing is an energy intensive process in which cement is made by grinding and heating a mixture of raw materials such as limestone, clay, sand, and iron ore in a rotary kiln (a large furnace fueled by coal, oil, gas, coke and/or various waste materials such as tires). Lead, a trace contaminant both of the raw materials and some fuel materials (e.g., coal, tires), is emitted with particulate material from the kiln stacks, which range in height from approximately 10 meters to more than 100 meters. Relatively smaller Pb emissions occur from grinding, cooling, and materials handling steps in the manufacturing process. These facilities are generally located in areas with limestone deposits and in rural areas or near small towns. The largest numbers of facilities are in Pennsylvania and California, although a significant percentage of facilities are in the Midwest. As of 2004, there were 107 Portland cement plants in the U.S. (O'Hare, 2006), with all but three reporting less than 1 tpy of Pb emissions. The highest estimated Pb emissions for a facility in the 2002 NEI is 5.4 tpy. In 1999, U.S. EPA promulgated a national emissions standard, including a limit for PM (as a surrogate for metal HAP, including Pb), for this category (USEPA, 1999b).

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