

**State of California
AIR RESOURCES BOARD**

**2014 Report on Air Emissions from Facilities Burning
Waste Tires in California**

July 2014

Table of Contents

| | |
|------------------------------------|---|
| Executive Summary | 1 |
| Introduction | 3 |
| Facility Information..... | 3 |
| Criteria Pollutant Emissions | 6 |
| Toxic Pollutant Emissions | 6 |
| Conclusions | 7 |
| References | 8 |

“The energy challenge facing California is real. Every Californian needs to take immediate action to reduce energy consumption. For a list of simple ways you can reduce demand and cut your energy costs, see our website at www.arb.ca.gov”

Executive Summary

This report summarizes pollutant emissions from facilities in California that burned waste tires as a supplemental fuel in 2012, the most recent year for which complete data are available. The report has been prepared pursuant to section 42889.4 of the California Public Resources Code.

Twelve facilities in the state of California are permitted to burn waste tires in combination with coal, coke, or biomass. Of these, four cement plants burned 8.5 million tires as a supplemental fuel in 2012. These data were compiled from local air districts that have jurisdiction to grant air quality permits, and establish, track, and enforce emissions limits.

Emissions data reported are from the combustion devices (kilns and boilers) where waste tires were actually burned. It does not include emissions from other processes such as internal combustion engines, process heaters, etc. The following table summarizes the total emissions from kilns and boilers at the four facilities where waste tires were burned in 2012. Tires make up between 9 and 39 percent of the total fuel burned. Because tires are burned with other fuels, the emissions are for the whole combined-fuel process (e.g., coal, coke and tires), not just the waste tire portion.

Criteria and toxic pollutant emissions from devices which burn tire-derived fuel in 2012

| Criteria Pollutants | |
|--|---|
| Total Organic Gases | 74 tons/year |
| Reactive Organic Gases | 61 tons/year |
| Oxides of Nitrogen | 5,274 tons/year |
| Oxides of Sulfur | 534 tons/year |
| Carbon Monoxide | 3,677 tons/year |
| Total Particulate Matter | 274 tons/year |
| Particulate Matter ≤ 10 micrometers | 226 tons/year |
| Particulate Matter ≤ 2.5 micrometers | 129 tons/year |
| Toxic Pollutants | |
| Acetaldehyde | 50 pounds/year |
| Benzene | 63 pounds/year |
| Formaldehyde | 176 pounds/year |
| Hydrogen Chloride | 5,810 pounds/year (2.9 tons/year) |
| Total Metals | 60 pounds/year |
| Total Polycyclic Aromatic Hydrocarbons | 7 pounds/year |
| Hexavalent Chromium | 5,937 milligrams/year (5.9 grams/year) |
| Dioxins | 6 milligrams/year |
| Furans | 6 milligrams/year |

Introduction

Pursuant to section 42889.4 of the California Public Resources Code, since 2002, the Air Resources Board (ARB) has published a report summarizing criteria and toxic air pollutant emissions generated from facilities that burn waste tires as a supplemental fuel. Specifically, this section requires the following:

If facilities are permitted to burn tires in the previous calendar year, the State Air Resources Board, in conjunction with air pollution control districts and air quality management districts, shall post on its Web site, updated on or before July 1 of the subsequent year, information summarizing the types and quantities of air emissions, if any, from those facilities.

Waste tires are defined in section 42807 of the Public Resources Code as follows:

“Waste tire” means a tire that is no longer mounted on a vehicle and is no longer suitable for use as a vehicle tire due to wear, damage, or deviation from the manufacturer’s original specifications. A waste tire includes a repairable tire, scrap tire, altered waste tire, and a used tire that is not organized for inspection and resale by size in a rack or a stack in accordance with Section 42806.5, but does not include a tire derived product or crumb rubber.

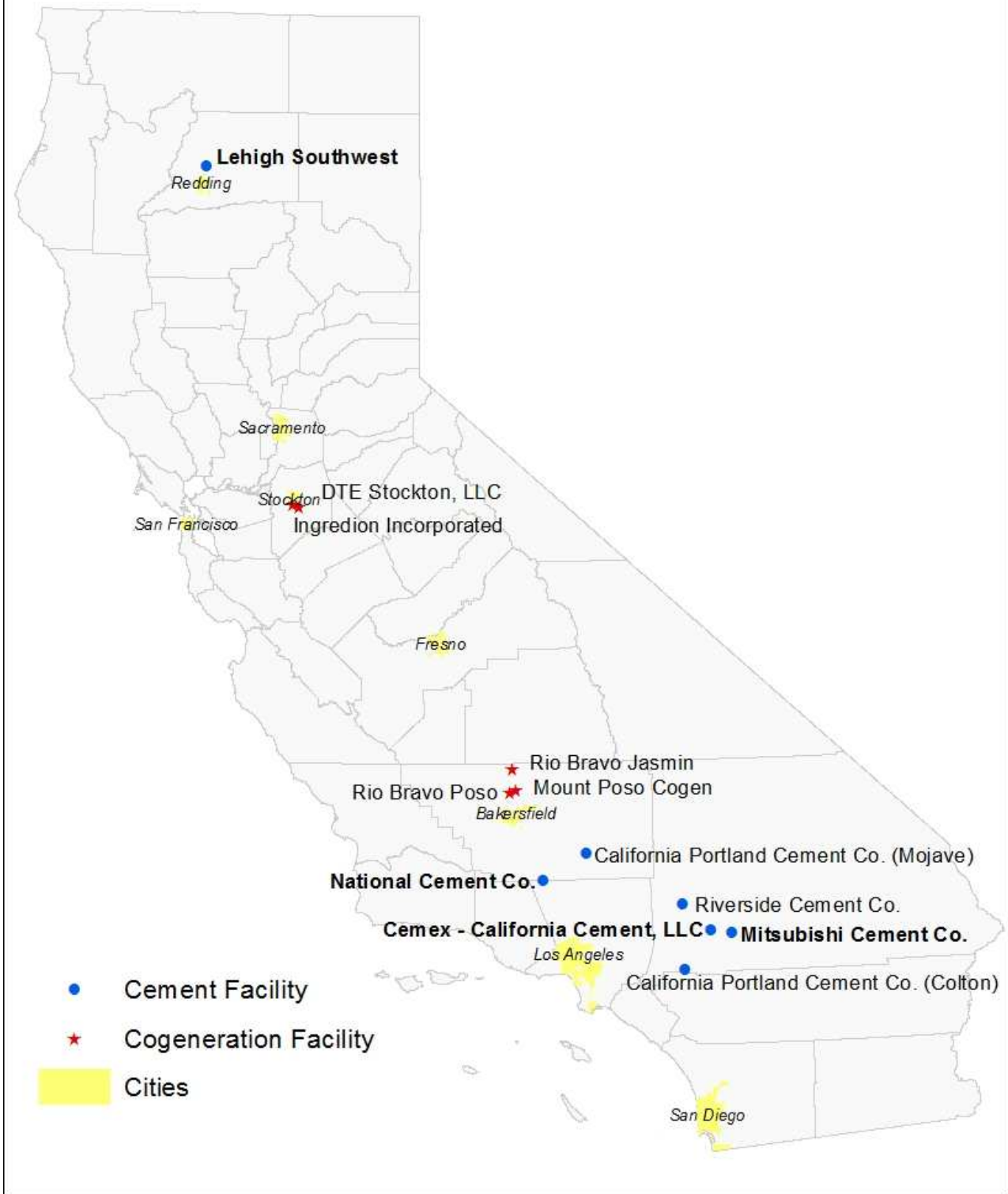
Tires have a heating value of approximately 13,000 to 15,000 British Thermal Units (BTUs) per pound, roughly the same as a superior quality coal. In California, waste tires are used as tire-derived fuel in two applications: cement kilns that often burn coal or coke, and cogeneration facilities producing electric power, generally from biomass.

This report summarizes the emissions from the combustion processes (kilns and boilers) where tires were actually burned, rather than the total facility emissions. A more comprehensive emissions inventory for all the operations at each facility is available on the website www.arb.ca.gov/app/emsinv/facinfo/facinfo.php.

Facility Information

Twelve facilities in the State are permitted to burn tire-derived fuel. Figure 1 shows the names and location of these facilities. Of these, four facilities, all cement plants, reported burning tires as a supplemental fuel in 2012. These facilities are bolded in Figure 1.

Figure 1. Permitted Tire Burning Facilities



In 2012, about 8.5 million waste tires were burned by these facilities. In all of these facilities, the tires were burned in combination with coal, coke, or biomass. Table 1 displays the number of tires burned at facilities in 2012, along with the percentage of tires used as part of the total fuel mix.

Table 1. Number of tires burned and percentage of tires in total fuel burned by facilities permitted to burn waste tires in 2012

| Air District | Facility Name And Location | Tires Burned in 2012 | Total Fuel (Tons) | Tires in Fuel (%) |
|--|---|-----------------------------|--------------------------|--------------------------|
| South Coast | California Portland Cement Company Colton, CA | 0 | -- | 0 |
| Eastern Kern | California Portland Cement Company Mojave, CA | 0 | -- | 0 |
| Mojave Desert | Cemex – California Cement, LLC Apple Valley, CA | 1.9 million | 217,741 | 9 |
| Shasta County | Lehigh Southwest Redding, CA | 0.9 million | 39,276 | 22 |
| Mojave Desert | Mitsubishi Cement Company Lucerne Valley, CA | 2.2 million | 201,118 | 11 |
| Eastern Kern | National Cement Company Lebec, CA | 3.5 million | 89,365 | 39 |
| Mojave Desert | Riverside Cement Company Oro Grande, CA | 0 | -- | 0 |
| San Joaquin Valley | Mount Poso Cogeneration Company Bakersfield, CA | 0 | -- | 0 |
| San Joaquin Valley | DTE Stockton, LLC Stockton, CA | 0 | -- | 0 |
| San Joaquin Valley | Rio Bravo Jasmin Bakersfield, CA | 0 | -- | 0 |
| San Joaquin Valley | Rio Bravo Poso Bakersfield, CA | 0 | -- | 0 |
| San Joaquin Valley | Ingredion Incorporated Stockton, CA | 0 | -- | 0 |
| Total Tires Burned ⁽¹⁾ | | 8.5 million | | |

⁽¹⁾ Total may differ from the sum of tires burned at individual facilities due to rounding.

As shown in Table 1, the percentage of tires burned as part of the total fuel mix ranged from 9 to 39 percent. The number of tires burned and total weight were reported by the facility operators to the local air districts. Under State law, local air districts are responsible for granting air quality permits, establishing and enforcing emissions limits, and tracking facility emissions.

Criteria Pollutant Emissions

Table 2 summarizes the criteria pollutant emissions from the cement kilns or boilers where tires were part of the fuel mix burned in 2012. The data were reported by the local air districts to ARB's California Emissions Inventory Database and Reporting System (CEIDARS). The pollutants reported below are total organic gases (TOG), reactive organic gases (ROG), oxides of nitrogen (NOx), oxides of sulfur (SOx), carbon monoxide (CO), total particulate matter (PM), particulate matter 10 micrometers or less in diameter (PM₁₀), and particulate matter 2.5 micrometers or less in diameter (PM_{2.5}).

Table 2. Criteria pollutant emissions from kilns and boilers where tire-derived fuel was burned in 2012 (tons per year)

| | TOG | ROG | NOx | SOx | CO | PM | PM ₁₀ | PM _{2.5} |
|-----------------------------|-----------|-----------|--------------|------------|--------------|------------|------------------|-------------------|
| Cement Facilities | | | | | | | | |
| Cemex – California Cement | 3 | 3 | 1,971 | 52 | 237 | 163 | 120 | 60 |
| Lehigh Southwest | 14 | 11 | 460 | 20 | 723 | 47 | 46 | 29 |
| Mitsubishi Cement | 42 | 35 | 1,957 | 448 | 953 | 52 | 48 | 32 |
| National Cement | 15 | 13 | 885 | 14 | 1,765 | 13 | 12 | 8 |
| Total ⁽¹⁾ | 74 | 61 | 5,274 | 534 | 3,677 | 274 | 226 | 129 |

⁽¹⁾ Total may differ from the sum of individual facility emissions due to rounding.

Because tires are burned in combination with other fuels, the data represent emissions from the whole combined-fuel process (e.g., coal and tires), not just the tire-derived fuel portion. As shown in Table 1, tires make up between 9 to 39 percent of total fuel burned.

Toxic Pollutant Emissions

Table 3 summarizes the estimated toxic air pollutant emissions from the cement kilns and boilers where tires were part of the fuel mix burned in 2012. In most cases, the toxic emission estimates are reported in pounds per year. However, due to the comparatively lower emission rates of hexavalent chromium, dioxins and furans, the estimates for these substances are reported in units of milligrams per year.

Table 3. Estimated toxic pollutant emissions from kilns and boilers where tire-derived fuel was burned in 2012

| | Acetaldehyde | Benzene | Formaldehyde | Hydrogen Chloride | Total Metals | Total PAHs ⁽²⁾ | Hexavalent Chromium | Dioxins | Furans |
|-----------------------------|-----------------|-----------|--------------|-------------------|--------------|---------------------------|---------------------|----------|----------|
| | Pounds per year | | | | | | Milligrams per year | | |
| Cement Facilities | | | | | | | | | |
| Cemex – California Cement | 20 | 25 | 70 | 2,310 | 24 | 3 | 2,361 | 2 | 2 |
| Lehigh Southwest | 4 | 5 | 13 | 417 | 4 | 1 | 426 | <1 | <1 |
| Mitsubishi Cement | 18 | 23 | 65 | 2,134 | 22 | 3 | 2,181 | 2 | 2 |
| National Cement | 8 | 10 | 29 | 948 | 10 | 1 | 969 | 1 | 1 |
| Total ⁽¹⁾ | 50 | 63 | 176 | 5,810 | 60 | 7 | 5,937 | 6 | 6 |

⁽¹⁾ Total may differ from the sum of individual facility emissions due to rounding.

⁽²⁾ Polycyclic Aromatic Hydrocarbons

The estimated emissions in Table 3 are based on source tests in which tires were burned in combination with other fuels. As such, the data represent emissions from the whole combined-fuel process (e.g., coal and tires), not just the tire-derived fuel portion. Cement plant emission factors were derived from a source test at Mitsubishi Cement. When cogeneration facilities report the burning of tires, emissions are calculated using emission factors based on a source test at Stockton Cogeneration (now Ingredion Incorporated).

Conclusions

Of twelve facilities permitted to burn waste tires in California, four burned tires as a supplemental fuel in 2012. These facilities burned approximately 8.5 million waste tires in combination with coal, coke, or biomass. As is typical for combustion sources, the bulk of emissions for the combined fuel were criteria pollutants, particularly NO_x and CO, with comparatively lower SO_x, PM₁₀, PM_{2.5}, TOG and ROG. As mentioned previously, emission values in this report represent total emissions only from devices which burned tires.

References

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