

**State of California
AIR RESOURCES BOARD**

**2013 Report on Air Emissions from Facilities Burning
Waste Tires in California**

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“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 2011, 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 and one cogeneration facility burned 7.1 million tires as a supplemental fuel in 2011. 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 five facilities where waste tires were burned in 2011. Tires make up between 3 and 34 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 where waste tires were burned as a supplemental fuel in 2011

Criteria Pollutants	
Total Organic Gases	71 tons/year
Reactive Organic Gases	46 tons/year
Oxides of Nitrogen	4,784 tons/year
Oxides of Sulfur	580 tons/year
Carbon Monoxide	3,349 tons/year
Total Particulate Matter	233 tons/year
Particulate Matter ≤ 10 micrometers	183 tons/year
Particulate Matter ≤ 2.5 micrometers	121 tons/year
Toxic Pollutants	
Acetaldehyde	73 pounds/year
Benzene	70 pounds/year
Formaldehyde	280 pounds/year
Hydrogen Chloride	47,286 pounds/year (23.6 tons/year)
Total Metals	316 pounds/year
Total Polycyclic Aromatic Hydrocarbons	7 pounds/year
Hexavalent Chromium	43,765 milligrams/year (43.8 grams/year)
Dioxins	39 milligrams/year
Furans	53 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 our website at 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, five facilities reported burning tires as a supplemental fuel in 2011 and are bolded in Figure 1. Four facilities are cement plants and one is a cogeneration facility.

Figure 1. Permitted Tire Burning Facilities



About 7.1 million waste tires were reported as burned by these facilities in 2011. In all of these facilities, the tires were burned in combination with coal, coke, or biomass, usually in a mixture that contained less than twenty percent waste tires. Table 1 displays the number of tires burned at facilities in 2011, along with the percentage of tires used as part of the total fuel mix.

Table1. Number of tires burned and percentage of tires in total fuel burned in 2011 by facilities permitted to burn waste tires

Air District	And Location	in 2011	(Tons)	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	1.7 million	205,249	8
Shasta County	Lehigh Southwest Redding, CA	0.7 million	35,066	19
Mojave Desert	Mitsubishi Cement Company Lucerne Valley, CA	1.5 million	160,261	10
Eastern Kern	National Cement Company Lebec, CA	2.7 million	77,566	34
Mojave Desert	Riverside Cement Company Oro Grande, CA	0	--	0
San Joaquin Valley	Mount Poso Cogeneration Company Bakersfield, CA	0	--	0
San Joaquin Valley	Port of Stockton District Energy 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	Air Products Mfg. Corp. (formerly Stockton Cogeneration Co.) Stockton, CA	0.5 million	208,974	3
Total Tires Burned ⁽¹⁾		7.1 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 3 to 34 percent. The number of tires burned and total weight were reported by the facility operators to the local air districts. Under State law, the 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 2011. 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 waste tires were burned as a supplemental fuel in 2011 (tons per year)

	TOG	ROG	NOx	SOx	CO	PM	PM ₁₀	PM _{2.5}
Cement Facilities								
Cemex – California Cement	9	7	1,771	136	441	120	82	43
Lehigh Southwest	5	4	390	25	723	38	38	24
Mitsubishi Cement	43	30	1,827	320	639	48	46	45
National Cement	6	5	705	5	1,429	13	12	8
Total Cement Facilities	63	46	4,693	486	3,231	220	178	119
Cogeneration Facility								
Air Products Mfg. Corp.	8	0	91	94	118	13	5	2
Grand Total ⁽¹⁾	71	46	4,784	580	3,349	233	183	121

⁽¹⁾ Grand 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 3 to 34 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 2011. 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 waste tires were burned as a supplemental fuel in 2011

	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	19	24	66	2,178	23	3	2,226	2	2
Lehigh Southwest	3	4	11	372	4	<1	380	<1	<1
Mitsubishi Cement	15	19	52	1,701	18	2	1,738	2	2
National Cement	7	9	25	823	9	1	841	1	1
Total Cement Facilities	43	55	154	5,074	53	6	5,185	5	5
Cogeneration Facility									
Air Products Mfg. Corp.	30	15	126	42,213	263	1	38,580	34	48
Grand Total ⁽¹⁾	73	70	280	47,286	316	7	43,765	39	53

⁽¹⁾ Grand 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. Emission factors for cogeneration facilities are based on a source test at Stockton Cogeneration (now Air Products Mfg. Corp.).

As shown in Table 3, toxic emissions from the Air Products Mfg. Corp. facility were generally higher than those from the cement plants even though the facility had comparable total fuel usage to the cement plants and a lower number of tires burned (see Table 1). This is likely because the Air Products Mfg. Corp. reported a higher percentage of coal used in the fuel mix.

Conclusions

Of twelve facilities permitted to burn waste tires in California, five burned tires as a supplemental fuel in 2011. These facilities burned approximately 7.1 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. Toxic pollutant emissions appear higher for the cogeneration facility than the cement plants even though the number of tires burned and criteria pollutant emissions are generally lower. This is likely due to a higher percentage of coal used in the fuel mix at the cogeneration facility. As mentioned previously, emission values in this report represent total emissions only from devices which burned tires.

References

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