

**State of California
AIR RESOURCES BOARD**

**2012 Report on Air Emissions from Facilities Burning
Waste Tires in California**

August 2012

Table of Contents

Executive Summary	1
Introduction	3
Facility Information.....	3
Criteria Pollutant Emissions	6
Toxic Pollutant Emissions	6
Conclusions	8
References	9

“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 2010, 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.

Thirteen 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 7.2 million tires as a supplemental fuel in 2010. 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 2010. 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 2010

Criteria Pollutants	
Total Organic Gases	127 tons/year
Reactive Organic Gases	87 tons/year
Oxides of Nitrogen	5,558 tons/year
Oxides of Sulfur	584 tons/year
Carbon Monoxide	4,222 tons/year
Total Particulate Matter	241 tons/year
Particulate Matter ≤ 10 micrometers	190 tons/year
Toxic Pollutants	
Acetaldehyde	69 pounds/year
Benzene	65 pounds/year
Formaldehyde	266 pounds/year
Hydrogen Chloride	46,131 pounds/year (23.1 tons/year)
Total Metals	308 pounds/year
Total Polycyclic Aromatic Hydrocarbons	7 pounds/year
Hexavalent Chromium	42,667 milligrams/year (21.3 grams/year)
Dioxins	39 milligrams/year
Furans	52 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.

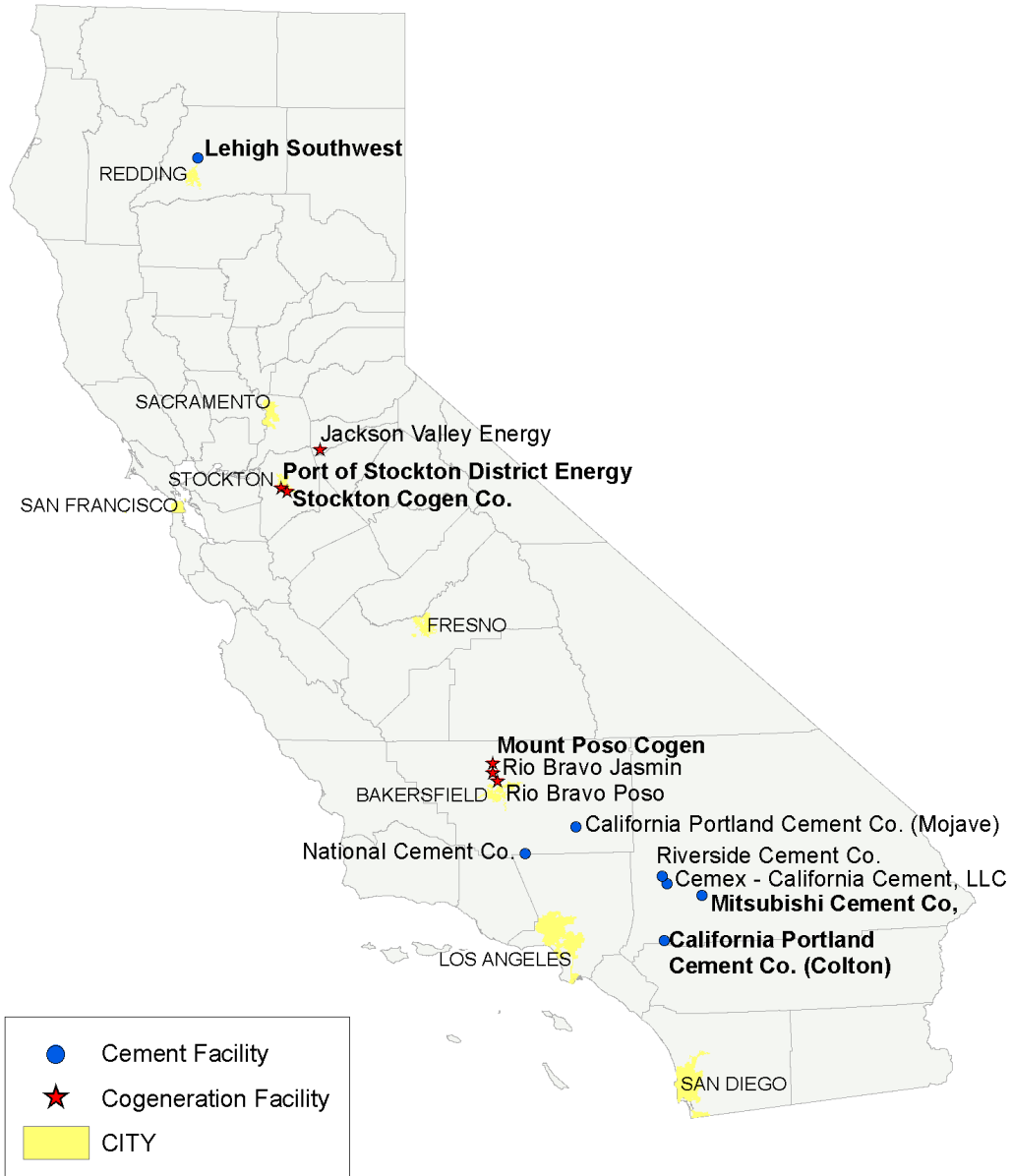
Tires have a heating value of approximately 13,000 to 15,000 British Thermal Units (BTUs) per pound, roughly the same as a superior quality coal. In California, waste tires are used as tire-derived fuel in two applications: cement kilns that often burn coal or coke, and cogeneration facilities producing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

Thirteen 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 2010. Four facilities are cement plants and one is a cogeneration facility.

Figure 1.
Permitted Tire Burning Facilities



6/30/05
Tire Burning.mxd

About 7.2 million waste tires were reported as burned by these facilities in 2010. 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 2010, 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 2010 by facilities permitted to burn waste tires

Air District	And Location	in 2010	(Tons)	Fuel (%)
South Coast	California Portland Cement Company Colton, CA	0	0	0
Kern County	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	0.6 million	29,982	20
Mojave Valley	Mitsubishi Cement Company Lucerne Valley, CA	2.0 million	146,230	14
Kern County	National Cement Company Lebec, CA	2.0 million	60,004	33
Mojave Desert	Riverside Cement Company Oro Grande, CA	0	--	0
San Joaquin Valley	Jackson Valley Energy Partners Ione, CA	0	--	0
San Joaquin Valley	Mount Poso Cogeneration Company Bakersfield, CA	0	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	Stockton Cogeneration Company Stockton, CA	0.9 million	205,180	4
Total Tires Burned ⁽¹⁾		7.2 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 4 to 33 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 2010. 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), and particulate matter 10 micrometers or less in diameter (PM₁₀).

Table 2. Criteria pollutant emissions from kilns and boilers where waste tires were burned as a supplemental fuel in 2010 (tons per year)

	TOG	ROG	NOx	SOx	CO	PM	PM ₁₀
Cement Facilities							
Cemex – California Cement	9	9	2,036	5	627	135	94
Lehigh Southwest	7	6	299	29	522	28	27
Mitsubishi Cement	72	50	1,879	449	457	46	44
National Cement	25	21	1,259	5	2,572	24	22
Total Cement Facilities	113	86	5,473	488	4,178	233	187
Cogeneration Facility							
Stockton Cogeneration	14	1	85	96	44	7	3
Grand Total ⁽¹⁾	127	87	5,558	584	4,222	240	190

⁽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 4 to 33 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 2010. Toxic emission estimates are reported in pounds per year except for hexavalent chromium, dioxins and furans which are reported in milligrams per year.

Table 3. Estimated toxic pollutant emissions from kilns and boilers where waste tires were burned as a supplemental fuel in 2010

	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	3	10	318	3	<1	325	<1	<1
Mitsubishi Cement	13	17	47	1,552	16	2	1,586	2	2
National Cement	5	7	19	637	7	1	651	1	1
Total Cement Facilities	40	51	142	4,685	49	6	4,788	5	5
Cogeneration Facility									
Stockton Cogeneration	29	14	124	41,446	259	1	37,879	34	47
Grand Total ⁽¹⁾	69	65	266	46,131	308	7	42,667	39	52

⁽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.

As shown in Table 3, toxic emissions from the Stockton Cogeneration 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). The Stockton Cogeneration facility reported total fuel composition that included more coal, “other fuels,” and “scraps.” The more diverse fuel composition and combustion temperatures typical at cogeneration facilities are likely related to the relatively higher toxic pollutant emissions.

Conclusions

Of thirteen facilities permitted to burn waste tires in California, five burned tires as a supplemental fuel in 2010. These facilities burned approximately 7.2 million waste tires in combination with coal, coke, or biomass. As is typical for combustion sources, the bulk of emissions for the combined fuel was criteria pollutants, particularly NO_x and CO, with comparatively lower SO_x, PM₁₀, 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 the differing fuel composition typical of cogeneration facilities. As mentioned previously, emission values in this report represent total emissions only from devices which burned tires.

References

1. Coal, Coke, and Tires burned process rates and activity data. Excel file provided by Donal Jonio, Shasta County AQMD, January 21, 2011.
2. Coal, Coke, and Tires burned process rates and activity data. Excel file provided by Chris Anderson, Mojave Desert and Antelope Valley County AQMD, June 4, 2012.
3. Coal, Coke, and Tires burned process rates and activity data. Excel file provided by Glen Stephens, Kern County APCD, April 25, 2012.
4. Coal, Coke, and Tires burned process rates and activity data. Excel file provided by Brant Botill, San Joaquin Valley APCD, June 7, 2012.
5. Year 2010 Criteria Pollutants Data: Extracted from CEIDARS database. Report Run date: June 4, 2012.
6. 2010 Reports on Air Emissions from Facilities Burning Waste Tires in California, State of California Air Resources Board: June, 2012