

**State of California
AIR RESOURCES BOARD**

**2003 Report to the California Legislature on
Emissions From Tire Burning in the State**

California Environmental Protection Agency



Air Resources Board

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Emissions From Tire Burning in the State**

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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 Web-site at www.arb.ca.gov.”

Executive Summary

We have prepared this report, titled “2003 Report to the California Legislature on Emissions from Tire Burning in the State,” pursuant to section 42889.4 of the California Public Resources Code. This section requires the Air Resources Board, in cooperation with the local air districts, to annually report the statewide emissions from tire burning during the previous year. This report uses the most recent data available, the 2001 emissions from facilities in California burning waste tires. The emissions data was provided by local air pollution control districts (local districts). Under State law, the local districts are responsible for establishing and enforcing emissions limits, granting air quality permits, and tracking facility emissions.

Over 30 million tires are discarded each year in California. Eleven facilities in California are permitted to burn waste tires in combination with coal and, in some cases, biomass fuel (as is the case with Jackson Valley Energy). However, only four of these facilities actually burned tires during 2001. Another facility, Modesto Energy (a.k.a. The Westley Tire Facility), has a suspended permit to burn due to their failure to pay renewal fees. About 5.4 million tires were burned in these facilities in 2001. This represents approximately 20 percent of the total number of tires discarded annually in California.

The total emissions from these four facilities are shown below.

Pollutant	Tons/Year	Pounds/Year	Milligrams/Year
<i>Criteria Pollutants</i>			
Total Organic Gases	32		
Reactive Organic Gases	15		
Oxides of Nitrogen	3,610		
Oxides of Sulfur	604		
Carbon Monoxide	2,660		
Total Particulate Matter	197		
Particulate Matter (<10 Microns)	137		
<i>Toxic Pollutants</i>			
Acetaldehyde		69	
Benzene		60	
Formaldehyde		268	
Hydrogen Chloride		53,930	
Total Metals		351	
Total Polycyclic Aromatic Hydrocarbons		6	
Hexavalent Chromium			49,970
Dioxins			44
Furans			60

2003 Report to the California Legislature on Emissions from Tire Burning in the State

Introduction

State law requires the Air Resources Board (ARB), in cooperation with the local air pollution control districts (local districts), to annually report the statewide emissions from tire burning during the previous year (section 42889.4 of the California Public Resources Code (PRC)). The ARB has provided the report, titled "2003 Report to the California Legislature on Emissions From Tire Burning in the State," to comply with this requirement. The report shows the 2001 year-end total of the emissions from the facilities in California that burn waste tires.

Nationally, over 300 million tires are discarded each year. California has more registered vehicles than any other state, generating over 30 million reusable and waste tires each year, accounting for about 10 percent of this national total. In addition, an estimated two million waste tires are stockpiled throughout the state, posing a possible health and safety risk (through fire and other vectors) to the public.

Waste tires are defined in California Code of Regulations (CCR), section 42807 (Waste Tire) 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 (PRC § 42805.5), scrap tire (PRC § 42805.6), and altered waste tire (PRC § 42801.5), but does not include a tire derived product (PRC § 42805.7), crumb rubber (PRC § 42801.7), or a used tire that is organized for inspection and resale by size in a rack or a stack in accordance with Section 42806.5.

These waste tires are either landfilled, stockpiled in tire dumps, exported, burned for energy, used in whole tire applications, processed into useable products, or illegally dumped. Only about 20 percent of these waste tires in California are burned for energy. Tires are a high heating value fuel having approximately 13,000 to 15,000 BTU¹ per pound, roughly the same as a superior quality coal.

In California during 2001, only four facilities burned waste tires as a supplemental fuel. Three of these facilities are cement companies, burning these tires in their cement kilns. The remaining facility is a cogeneration company using these tires to produce electricity. In all of these facilities the tires are burned in combination with coal fuel, usually in a 10 percent tire to 90 percent coal mixture. When burned in the controlled environment

¹ British Thermal Unit.

in the kilns and boilers of the facilities permitted to burn them, the emissions are much less than what would result from the simple open burning of these tires.

Facility Descriptions

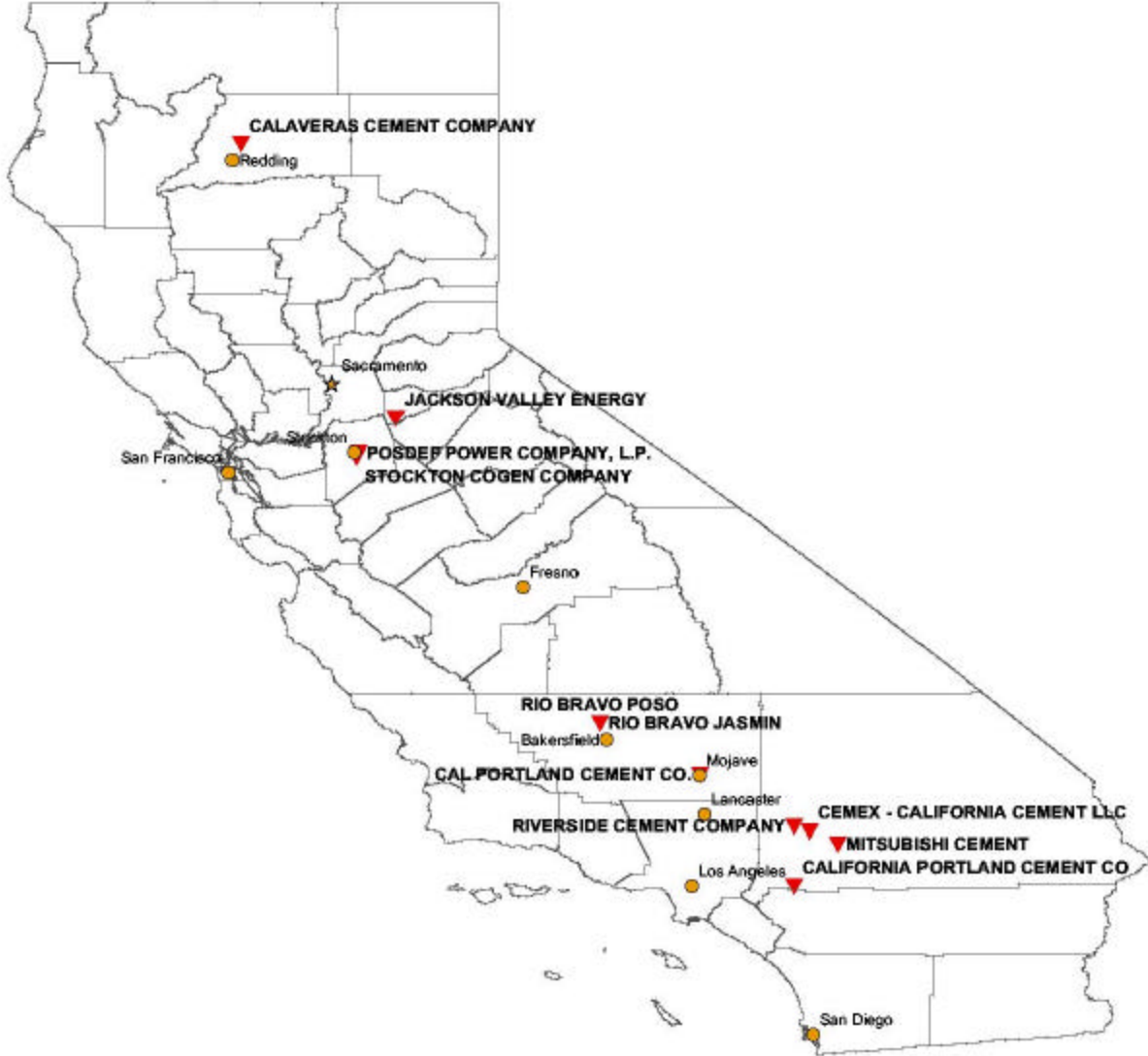
The facilities included in this report, and listed in Table 1, are all of those permitted to burn tires as a supplemental fuel (as a supplement with coal for all facilities thus far). Figure 1 shows a map of California with the facility locations indicated. Not all of these permitted facilities actually burned tires in 2001. Some of them cannot burn tires until their equipment has been properly modified to accommodate the tire fuel (as initial testing revealed), while others cannot secure stable, long term contracts from waste tire suppliers.

Table 1: Tire Burning Facility Information (2001)

Facility Name	Facility Address	Tires Burned in 2001
<i>Cement Facilities</i>		
California Portland Cement Company (Colton)	695 South Rancho Avenue Colton, California 92324	1.3 million tires (11,945 tons of tires)
California Portland Cement Company (Mojave)	9350 Oak Creek Road Mojave, California 93502	None
Cemex – California Cement, LLC	25220 Black Mountain Quarry Road Apple Valley, California 92307	None
Lehigh Southwest (formerly Calaveras Cement Company)	15390 Wonderland Boulevard Redding, California 96003	1.4 million tires (13,075 tons of tires)
Mitsubishi Cement Company	5808 State Highway 18 Lucerne Valley, California 92356	1.8 million tires (16,342 tons of tires)
Riverside Cement Company	19409 National Trails Highway Oro Grande, California 92368	None
<i>Cogeneration Facilities</i>		
Jackson Valley Energy Partners	4655 Coal Mine Road Ione, California 95640	None
Port of Stockton District Energy Facility	2526 West Washington Street Stockton, California 95203	None
Rio Bravo Jasmin	11258 Porterville Highway Bakersfield, California 93308	None
Rio Bravo Poso	16608 Porterville Highway Bakersfield, California 93308	None
Stockton Cogeneration Company	1010 Zephyr Street Stockton, California 95206	1.2 million tires (10,774 tons of tires)
Total Tires Burned in 2001		5.6 million tires (52,136 tons of tires)

Figure 1

Permitted Tire Burning Facilities



These facilities are grouped into two categories: Cement Facilities and Cogeneration Facilities.

Cement Facilities

California Portland Cement Company, Cemex – California Cement, LLC, Lehigh Southwest (formerly Calaveras Cement Company), Mitsubishi Cement Company, and Riverside Cement Company fall under the Cement Facilities category.

Cement facilities produce cement which when mixed with water and crushed stone, poured and allowed to set, forms concrete. The process for cement production requires the use of large ovens, called kilns, to heat various ingredients into the final cement product, called clinker. Kilns are large cylinders that tilt downward slightly, and rotate, allowing the raw materials used in cement production to pass down the kiln by force of gravity. These kilns are heated which provides the needed energy to convert the raw materials into finished cement product. All six of these facilities use coal as the primary means to heat some or all of their kilns. These coal fired kilns are those in which waste tires can be burned.

Tires are used in place of coal because they have higher heat energy by weight and kilns can (in some cases) charge a tipping fee of \$0.40 per tire that is lower than the tipping fee at landfills. The steel belts in the tires also offer a source of iron ore needed in the cement making process.

Cogeneration Facilities

Jackson Valley Energy Partners, Port of Stockton District Energy Facility, Rio Bravo Jasmin, Rio Bravo Poso, and Stockton Cogeneration Company fall under the Cogeneration Facilities category.

These facilities burn coal in boilers to produce steam, which in turn is used to power a steam turbine and produce electricity. Some of this electricity may be used by the facility while the rest is sold to the power grid for general use. The boilers burning this coal are usually well controlled when compared to other coal burning units, and thus emissions of pollutants are greatly diminished. However, even at these lower controlled levels, NO_x part per million (ppm) levels for coal boilers are around 62 ppm. A natural gas fired boiler with the same level of control can get as low as 12 ppm NO_x. So these controlled, coal fired boilers are still about five times dirtier than the cleaner natural gas fired units. The same is true when considering toxic emissions, as coal burning generates greater toxic emissions than does the burning of natural gas.

Only Jackson Valley Energy Partners of the five permitted cogeneration facilities above does not currently have the higher level of emission control found on the units at the other four facilities. However, this facility is not currently able to produce electricity at all, as their boiler unit is in need of repair.

Tires are burned in conjunction with the coal, as is the case with the cement kilns. However, the steel belts in the tires must be removed in a pre-processing step to avoid fouling the equipment. Unlike the situation in cement manufacturing, the steel in the tires has no use in the production of electrical power, and only serves to hinder it.

Criteria Pollutant Emissions

Table 2 shows the emissions from those facilities that burned tires in 2001. The facility emissions presented in Table 2 only include emissions of the individual boilers and/or cement kilns burning tires at each facility. The emissions data comes from the California Emissions Inventory Database and Reporting System (CEIDARS), which is updated each year by the local districts. 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 of less than 10 microns in diameter (PM10).

Table 2: 2001 Criteria Pollutant Emissions from Tire Burning Facilities (Tons/Year)

Facility Name	TOG	ROG	NOx	SOx	CO	PM	PM10
<i>Cement Facilities</i>							
California Portland Cement (Colton)	2	1	1,200	77	110	31	29
Lehigh Southwest	13	10	600	7	1,900	69	64
Mitsubishi Cement	7	4	1,700	300	570	75	42
Total Cement Facilities	22	15	3,500	384	2,580	175	135
<i>Cogeneration Facilities</i>							
Stockton Cogeneration	10	0	110	220	80	22	2
Total Cogen. Facilities	10	0	110	220	80	22	2
Grand Total	32	15	3,610	604	2,660	197	137

Toxic Pollutant Emissions

Table 3 shows the toxics emissions from only the process units that are burning tires at each facility for 2001. That is, the summaries do not include other toxic emissions that may have been emitted at the facility but are not associated with the burning of tires. If no process units at a facility burned tires in 2001, the facility is not included in this table. This toxics data is based on two facility source tests obtained from the local air districts, one from Stockton Cogeneration and the other from Mitsubishi Cement. The toxic emissions listed for California Portland Cement (Colton) and Lehigh Southwest are based on the Mitsubishi Cement combined fuel (ninety percent coal and ten percent tires) source test for toxic emissions. The individual process rates for these facilities were applied to the Mitsubishi Cement derived emission factors to obtain their toxic emissions. Note the toxic emissions are for the whole combined fuel process, not just the tire fuel portion. The local districts have determined through the "AB 2588 Toxics Hot Spots Program" that the burning of this ten percent tires to ninety percent coal fuel mixture in these facilities does not significantly increase the overall health risk the facility poses to the local public. Reported emissions are in pounds/year as opposed to the criteria pollutants that are in tons/year. Additionally, due to the low emissions mass of hexavalent chromium, dioxins and furans, these are reported in Table 4 and are reported in milligrams/year.

Table 3: 2001 Toxics Emissions from Tire Burning Facilities (Pounds/Year)

Facility Name	Acetaldehyde	Benzene	Formaldehyde	Hydrogen Chloride	Total Metals	Total PAHs*
<i>Cement Facilities</i>						
California Portland Cement (Colton)	7	10	26	870	9	1
Lehigh Southwest	7	9	26	860	9	1
Mitsubishi Cement	19	24	66	2,200	23	3
Total Cement Facilities	33	43	118	3,930	41	5
<i>Cogeneration Facilities</i>						
Stockton Cogeneration	36	17	150	50,000	310	1
Total Cogen. Facilities	36	17	150	50,000	310	1
Grand Total	69	60	268	53,930	351	6

*(Polycyclic Aromatic Hydrocarbons-PAHs)

Table 4: 2001 Toxics Emissions from Tire Burning Facilities (Milligrams/Year)

Facility Name	Hexavalent Chromium	Dioxins	Furans
<i>Cement Facilities</i>			
California Portland Cement (Colton)	890	1	1
Lehigh Southwest	880	1	1
Mitsubishi Cement	2,200	2	2
Total Cement Facilities	3,970	4	4
<i>Cogeneration Facilities</i>			
Stockton Cogeneration	46,000	40	56
Total Cogen. Facilities	46,000	40	56
Grand Total	49,970	44	60

Conclusion

Eleven facilities are permitted to burn tires in California. Only four of these facilities burned tires in 2001. The tires were burned as a supplemental fuel, usually in 10 percent tire to 90 percent coal mixture. About 5.6 million tires were burned in this manner by these facilities in 2001, which amounts to about 20 percent of the total number of waste tires being discarded in California every year. In total, the facilities burning tires in 2001 emitted 3,610 tons per year of oxides of nitrogen, 2,660 tons per year of carbon monoxide, 197 tons per year of particulate matter, and 15 tons per year of reactive organic gases from those units burning tires and coal. In general, tires and coal emit the same levels of criteria emissions when burned, being similar type fuels. These facilities also emitted toxic air pollutants from the same units burning the tire/coal fuel mixture, including acetaldehyde, benzene, dioxins, formaldehyde, furans, hexavalent chromium, other heavy metals, and polycyclic aromatic hydrocarbons. The local air districts have required risk assessments for the use of tires as supplemental fuel at these facilities. Based on these analyses, the districts have determined that the levels of toxics emitted from these units when they burn the 10 percent tire and 90 percent coal fuel mixture do not constitute a significant increase in the health risk of the exposed public.