

FACT SHEET – Cement Kiln

What is the purpose of a cement kiln?

A kiln is a device, including any associated preheater or precalciner devices, that produces clinker by heating limestone and other materials for subsequent production of portland cement. In the kiln the raw mix is transformed into clinker through complex chemical reactions and physical processes. The most commonly used kiln fuels are coal, natural gas, and occasionally oil. The use of supplemental fuels such as waste solvents, scrap tires, and petroleum coke has expanded in recent years.

What Pollutants are emitted?

HAP metals (arsenic, cadmium, chromium, lead, manganese, mercury, nickel, selenium), dioxins/furans, organic HAPs (acetaldehyde, benzene, chlorobenzene, formaldehyde, hexane, naphthalene, phenol, polycyclic organic matter, styrene, toluene, xylene), sulfur dioxide and nitrogen oxides

How are Emissions Characterized?

Depending on the type of process used, the exhaust gas from the kiln and clinker cooler may be combined and exhausted from a single main stack. Finely divided particles of raw mix, calcined kiln feed, clinker dust, and volatile constituents (e.g., potassium sulfate) get entrained in the exiting gas stream, due to turbulence in the kiln from the rotary action, and from the use of finely ground feed material. This entrained particulate matter, known as “cement kiln dust” (CKD) is removed from the gas stream by some type of air pollution control device.

The alkali bypass gas streams are kiln gases that have not contacted the incoming feed material (they are drawn out of the kiln prior to contact with the precalciner and preheater sections). These kiln gases are cooled by air or water to condense the volatile constituents to fine particles. The solid particles, containing the undesirable volatile constituents, are removed from the gas stream and thus the process by fabric filters and ESPs. They may be discharged to the atmosphere through a separate stack. In other process arrangements the treated alkali bypass gases are combined with the main kiln exhaust gases and are discharged through a common stack. It is expected that the same HAPs found in the main kiln stack are found in the alkali bypass stack.

What are the Equipment Control Options?

Dust from the kiln is often collected and recycled into the kiln as part of the raw feed. PM emissions are typically controlled by fabric filters (reverse air, pulsejet, or pulse plenum) or electrostatic precipitators (ESPs). Common control measures for the kiln exhaust are reverse air fabric filters with an air-to-cloth ratio of 0.41:1 $\text{m}^3 \text{min}^{-1} \text{m}^{-2}$ (1.5:1 acfm/ft^2) and ESP with a net surface collection area of 1,140 to 1,620 $\text{m}^2/1,000 \text{m}^3$ (350 to 500 $\text{ft}^2/1,000 \text{ft}^3$). These systems are reported to achieve outlet PM loadings of 45 mg m^{-3} (0.02 gr/acf).