Scrap tires, if not properly managed, can create an environmental nuisance and eyesore. What’s more, they can constitute an environmental hazard if they burn in an uncontrolled manner, such as in a field or landfill.

However, by utilizing cement kilns’ controlled combustion environment, scrap tires can be an environmentally-sound source of energy in the manufacture of cement.
Like fossil fuels such as coal, oil, and natural gas, tires contain hydrocarbons. Pound for pound, tires have more fuel value than coal. Hundreds of millions of used tires are generated annually in the United States. By simply disposing of these tires, we miss an important recycling opportunity: the chance to recover their energy and conserve our resources of fossil fuels.

Cement making is an ideal process for recovering this energy. The intense heat of the kiln ensures complete destruction of the tires. There is no smoke or visible emissions from the tires. In fact, the use of tires as fuel can actually reduce certain emissions.

An Alternative to Traditional Fossil Fuels

The Rubber Manufacturers Association (RMA) has estimated that 58 million scrap tires were used as fuel in Portland cement plants in 2005 out of the 299 million tires produced that year (RMA 2006). The United States Environmental Protection Agency (USEPA) states that tire-derived fuel (TDF) contains about the same amount of energy as oil and 25% more energy than coal (USEPA 2007a). This means that each ton of TDF used by a Portland cement plant has the potential to replace 1.25 tons of coal, and has the impacts of coal mining, processing, and transporting are avoided. In energy terms, the cement industry consumed 12.6 trillion BTUs of coal in 2006 which is approximately 3.6% of all the non-electrical energy required by the manufacturing process (PCA 2007a). TDF Use is Increasing

The number of cement plants utilizing scrap tires as a supplemental fuel has risen dramatically over the last 19 years. Figure 1 shows the increase in Portland cement plants utilizing TDF (PCA 1999, 2002, and 2007a). As of 2006, state and local environmental agencies have approved the use of TDF for 48 plants in 21 states (Table 1).
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Additional U.S. plants have expressed interest in obtaining a permit or have received a permit but have not begun utilizing scrap tires as a fuel. The delay in utilizing TDF may be due to equipment limitations at the cement plant, regional TDF availability, state regulatory agency review, and local community discussions. Figure 2 shows the locations of all the facilities currently utilizing in TDF.

Beneficial Effects

The environmental benefits of utilizing scrap tires as a supplemental fuel in the portland cement manufacturing process are multifold. When whole tires are combusted in cement kilns, the steel belting becomes a component of the clinker, replacing some or all of the iron required by the manufacturing process.

In 2008, PCA member companies completed a study on the impact of TDF firing on cement kiln air emissions. The study’s data set included emission tests from 31 of the cement plants presently firing TDF. Dioxin/furan emission test results indicated that kilns firing TDF had emissions approximately one-third of those kilns firing conventional fuels – this difference was statistically significant. Emissions of particulate matter (PM) from TDF-Firing kilns were 35% less than the levels reported for kilns firing conventional fuels (not statistically significant due to the low PM emissions reported for essentially all cement plants). Nitrogen oxides, metals, and sulfur dioxide emissions from TDF-firing kilns also exhibited lower levels than those from conventional fuel kilns. The emission values for carbon monoxide and total hydrocarbons were slightly higher in TDF versus non-TDF firing kilns.

However, none of the differences in the emission data sets between TDF versus non-TDF firing kilns for sulfur dioxides, nitrogen oxides, total hydrocarbons, carbon monoxide, and metals were statistically significant. Separate studies conducted by governmental agencies and engineering consulting firms have also indicated that TDF firing either reduces or does not significantly affect emissions of various contaminants from cement kilns (PCA 2008).
TIRE-DERIVED FUEL

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References


