

USE OF ALTERNATIVE FUELS IN THE CEMENT INDUSTRY

Cement kilns offer very favorable conditions for incinerating waste fuels. High temperatures, long residence times, an oxidizing atmosphere and alkaline environment, ash absorption by clinker, and high thermal inertia all favor the use of Alternative Fuels in a cement kiln.

There are many benefits tied to the use of alternative fuels in cement kilns; nonetheless, the challenges connected with their application require careful evaluation.

What are Alternative Fuels?

Alternative fuels are non-traditional fuels that have calorific value and can be used as substitutes for conventional fuels such as coal, petroleum coke, oil and natural gas in clinker manufacturing. Typically, alternative fuels are waste or byproducts from industrial, agricultural and other processes. Traditionally, they are managed through landfills, treatment or incineration and come in liquid or solid form.

Liquid Alternative Fuels include solvents, mineral waste oil from used lubricants, vegetable oil and various organic liquids. Solid Waste Fuels come in different forms: used tires, pre-treated industrial and municipal waste, sewage sludge and domestic waste, Refuse Derived fuels (RDF) from pulp, paper and cardboard residues; non-recyclable plastics; Packaging and Textile industry, biomass such as animal feed, contaminated wood and wood chips, waste wood, rice husk, sawdust and sewage sludge, and used carpets.



RDF FUEL USED BY A CEMENT PLANT

Advantages of using Alternative Fuels

The main advantages of using Alternative Fuels in the Cement Industry are economic and environmental.

Cement producers strive to reduce their production costs. Fuel accounts for 20 to 25% of the production cost of cement and one viable option is the use of alternative fuels at a much lower cost than conventional fossil fuels.

The use of waste fuels reduces the carbon footprint that results from using fossil fuels and therefore the overall environmental impact of cement manufacturing operations. It also extends the supply of fossil fuels and is a safe way of absorbing waste which otherwise would present a waste disposal problem.

The favorable conditions in a cement kiln completely destroy the organic constituents and the inorganic constituents combine with the raw materials in the kiln and exit the kiln as part of the cement clinker without generating solid residues. Free lime in cement clinker acts as a good absorbent of hazardous elements. The cement kiln therefore is a natural incinerator that has a safe thermal environment for the use of alternative fuels.

Use of alternative fuels in the cement kilns hence helps resolve air pollution problems by eliminating additional emissions which would have resulted from the incinerators while destroying the wastes.

Challenges & Limitations

Consistency of the chemistry and continuous availability are two major considerations in the use of Alternative Fuels. All alternative and derived fuels are generated at sources outside the control of cement manufacturers. Therefore, there are always some limitations on the availability of consistent quality alternative fuels in adequate quantities.

The suitability of Alternative Fuels for use in the cement manufacturing process, effects on plant operation, product and environment need to be studied and established before the alternative fuel is selected.

The composition of the Alternative Fuel and its availability will determine the extent to which it can be used.

Invariably, all alternative fuels require pretreatment prior to introducing them in the kiln or precalciner. Processing an Alternative Fuel may involve significant capital investment. Modifications to the existing plant equipment and the creation of new infrastructure for the intended use of the alternative fuel will be required. For instance, feeding whole tires requires a complex system and considerable space for implementation. In addition, converting from the use of conventional fuels to alternative fuels will call for adjustments to operating parameters, raw mix design, etc.

A. Safety

Safety aspects related to alternative fuels depend on the type of fuel. Safety related issues mainly include handling and storage of fuels that emanate odors or are hazardous wastes. The selection of appropriate feeding points depending on the characteristics of the alternative fuel is also a safety consideration.

B. Emissions and Environmental considerations

The use of hazardous waste as an alternative fuel in cement kilns is regulated by local environmental regulations for the incineration of waste.

Emissions of air polluting compounds need to be addressed while considering use of alternative fuels in the cement manufacturing process. Emissions of Carbon monoxide, Sulphur dioxide, Nitrogen oxides, Hydrogen chloride, heavy metals such as mercury, lead and cadmium, Dioxins and Furans are major concerns. They are to be controlled below prevailing emission norms irrespective of the fact that whether the manufacturing process uses traditional fuels or alternative fuels. However, this can be achieved with controlled inputs, optimized and stable operation and if required with the installation of a kiln gas by-pass system.

Cement kilns fired with conventional fossil fuel or with alternative fuels of all types can meet stipulated emission limit.

C. What PEC Consulting can do

- Evaluate the suitability of Alternative Fuels.
- Evaluate the impact on the environment and develop concepts for mitigation measures.
- Recommend modifications to the existing kiln system for adaptation to the Alternative Fuel.
- Develop the CapEx and arrangement drawings.
- If the project is viable, PEC Consulting can subsequently develop the engineering for handling, processing and firing of the fuels into the kiln.