



The Cement Sector and climate change mitigation



The CO₂ emissions are the main contribution of the cement industry to climate change. It is estimated that about 5% of anthropogenic emissions that reach the atmosphere are produced by this sector.

There are two main sources of the cement greenhouse gases emissions:

- **Use of fossil fuels:** the cement industry kiln's use petroleum coke as the main fuel, which has one of the highest greenhouse gas emission factor (100t CO₂ for 1t petroleum coke used). The 40% of the cement greenhouse gases emissions are generated in this stage.

- **Decarbonisation process:** in the CaCO₃ firing process a lot of CO₂ is released to the atmosphere. It represents almost the 60% of the remaining cement greenhouse gases emissions and between the 20-30% of the production costs, because of the high energetic consumption it represents.

There are 3 possible greenhouse gases emissions reduction opportunities:

1. Improving energy efficiency: about the 30% of the greenhouse gases emissions can be reduced.

2. Using a better quality clinker or changing the amount of CaCO₃ in the raw materials, used in the decarbonisation process.

3. Using alternative fuels: the most used is the biomass (sewage's sludges, olive's pits, almonds and rice shells, pruning remainders, etc.).

Strategies for reducing emissions

- Improving energy efficiency of production process.
- Minimize emissions from decarbonization of raw material.
- Improving use of fuel: for lower emissions or alternative fuels.

Proposal of mitigation alternatives of gas emissions with greenhouse effect in the cement sector

DECARBONISATION

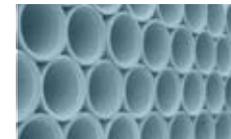
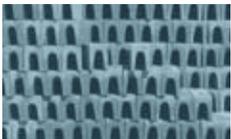
- Measures:
 - Use of mineral additions to the partial replacement of clinker: ashes from carbon thermal power stations, slags from the kilns, industrial puzzolans, industrial plaster, etc.
 - Using recycled industrial by-products as secondary raw materials: pyrite ash, paper sludge's, foundry sands or demolition wastes.
- Benefits:
 - Reducing the amount of raw material needed.
 - Reducing the cooking temperature.
 - Minimizing the decarbonisation process.
 - Reducing energy consumption.
 - Reducing the emissions levels.
 - No alteration of product quality.

USING ALTERNATIVE FUELS

- Measures:
 - Biomass: their greenhouse gases emissions are considered neutral due to their biogenic origin. The most used biomass by-products are: sewage's sludges, olive's pits, almonds and rice shells, pruning remainders, etc.
 - The cement production process allows the use of different fossil fuels, but the natural gas is the one that generates less greenhouse gases emissions per unit provided.
 - There are other alternative fuels made from the mixture of biomass with other materials containing carbon. The most widely used materials containing carbon are: solid waste, tires, industrial waste, etc.
- Benefits:
 - Total or partial fossil fuels replacement.
 - Reducing CO₂ emissions.
 - Incineration under proper control parameters, reducing the human health or environmental harmful emissions.
 - Hazardous substances elimination.
 - Waste recovery.
 - Economic management relaxation.
- Disadvantages:
 - All the alternative fuels that contain carbon are not exempted from greenhouse gases emissions.
 - The chemical composition of some alternative fuels can vary and it is very difficult to determine. It is therefore necessary real-time monitoring of the flue gas to establish a security protocol in case of emergencies and to ensure the environmental and human health.

IMPROVING ENERGY EFFICIENCY

- Measures:
 - Promote the pre-heating systems, by the furnace exit gases recirculation.
 - Reduce the furnaces temperature losses, caused by:
 - Radiation: using higher refractive power materials.
 - Air leaks: plugging and eliminating unnecessary furnace openings.
 - Promote the use of higher capacity furnaces.
 - Promote the use of swinging grill in cooling systems.
 - Monitoring the cooking process.
 - Promote the use of rolling in grinding systems
- Benefits:
 - Energy efficiency applied measures can reduce up to the 30% the furnaces greenhouse gases emissions.



Case study: ALBOX (Spain) (Source: Fundación Entorno)

The Spanish cement industry produced more than 29 million tons of CO₂ in 2005, because of this high greenhouse gases emissions level a big effort has been made to reduce it.

The first intervention that was made was the implementation of the best available technologies (BATs) in the cement industry sector. This favoured the old equipment replacement for greater energy efficiency ones. However, it is necessary to investigate for other options to reduce greenhouse gases emissions.

GENERAL MEASURES TO REDUCE EMISSIONS

The company implemented these three measures:

- Using decarbonised raw materials in the clinker production.
- Using biomass and other alternative fuels.
- Reducing the proportion of clinker used by adding minerals to the mixture.

RESULTS

The three strategies applied have different emission reduction potential.

The most successful one was the use of alternative fuels. The Holcim Group decide to install an alternative fuels preparation in Albox (Almería) plant. The plant has two distinct production lines:

- 1- preparation of the liquid replacement fuel,
- 2- preparation of solid fuel;

these two types of fuel are mixed in precise proportions to achieve maximum combustion efficiency in the cement plants.

Since the Albox plant opening in late 2003, it has produced 65,000t of sawdust and prevented the release of 60,000t of CO₂ into the atmosphere.