

Cement: A brief Overview

In 2012 the global consumption of cement was 3736 million tons

The rising rate of consumption is roughly 5% annually

China accounts for nearly 60% of global cement consumption



Impact of Cement on the Environment

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Energy Use In Cement Production

Cement is the most energy intensive of all manufacturing industries

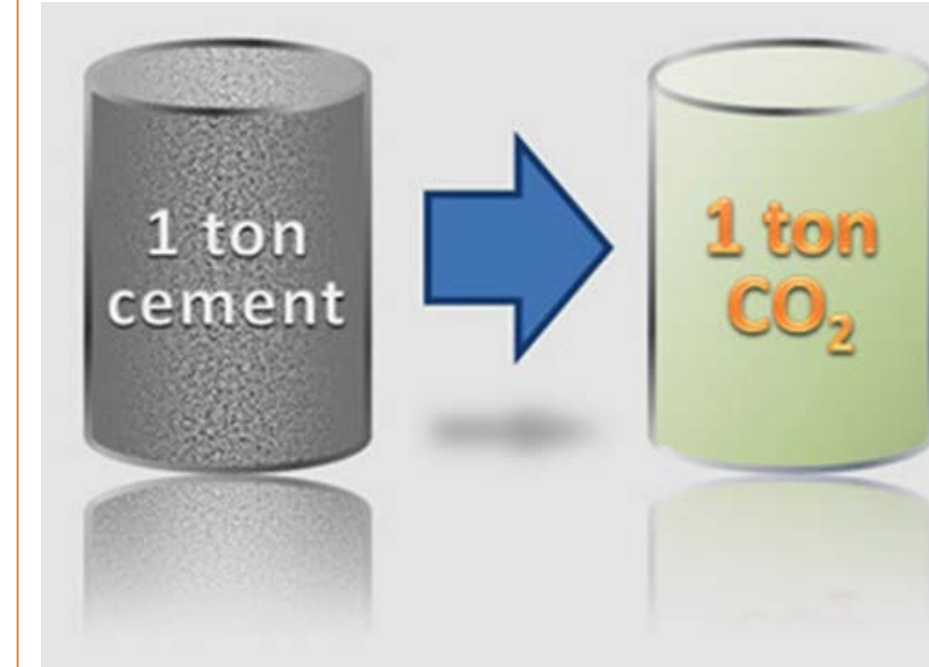
equivalent to burning 400 pounds of coal

Producing 1 ton of cement requires 4.7 Billion BTUs of energy

Cement production accounts for %5 of the world's energy consumption

The heating of the kiln accounts for 40% of cement emissions

Indirect emissions are produced by burning fossil fuels to heat the kiln



Environmental Impacts

Use of stream banks and shoreline for waste disposal

Contamination of surface and ground waters

Total disruption and modification of landscapes
Changes, irrevocably, to underground and surface drainage

Reduced populations of wildlife do to habitat loss

Cement Making Process

1. Stone is first reduced to 5in sized rocks, then into 3/4in pebbles
2. Raw materials (limestone, shells, clay, slate, etc) are ground to a powder and blended
3. Burning changes raw mix into cement clinker (**calcination**)
4. Clinker with gypsum is ground into Portland cement and shipped

Annual energy use and CO₂ emissions associated with cement and concrete production

	On-site Energy		CO ₂ emissions	
	10 ⁶ kJouls	%	10 ⁶ tonne	%
Raw materials - Quarrying and crushing				
Cement Materials	3,817	0.7%	0.36	0.3%
Concrete Materials	14,287	2.6%	1.28	1.2%
Cement manufacturing				
Raw Grinding	8,346	1.5%	1.50	1.4%
Kiln: fuels	410,464	74.0%	38.47	36.8%
Reactions			48.35	46.3%
Finish Milling	24,057	4.3%	4.32	4.1%
Concrete Production				
Blending, Mixing	31,444	5.7%	5.65	5.4%
Transportation	61,933	11.2%	4.53	4.3%
Total	554,409	100%	104.50	100%

Source: Energy and Emission Reduction Opportunities from the Cement Industry, US Department of Energy



Cement Factory

Calcination

Occurs when limestone is broken down into calcium oxide

Calcination is carried out in furnaces, which require fossil fuels to heat and maintain temperature

Only 56% of the heat supplied to a kiln is used for calcination
- 46% is lost due to inefficiency

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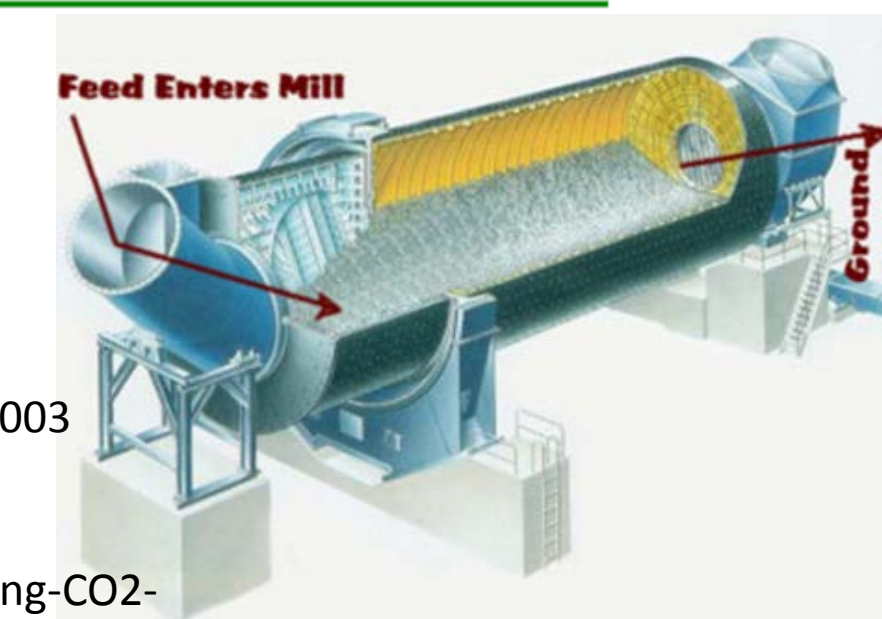
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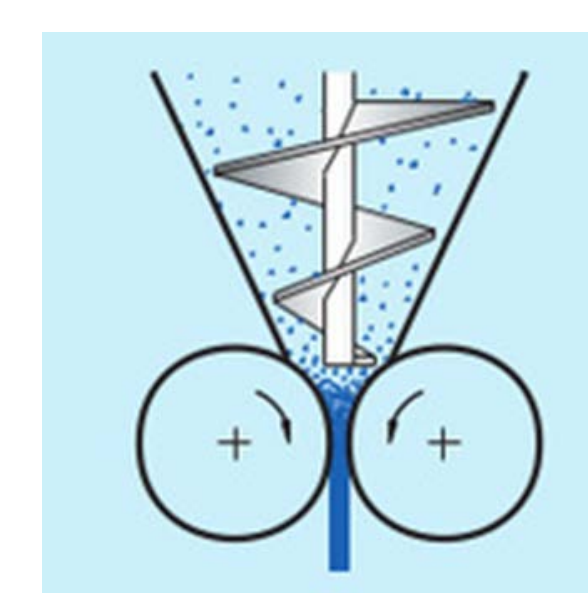
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VS.



Opportunities & Alternatives

Production Process-

Rolling grinders can be used instead of ball grinders which reduces energy use by 50% in production process

Recirculation of gases burned in the kiln can increase energy efficacy by 10%

Alternatives-

Magnesium Cement- sets and hardens by taking carbon dioxide out of the wet cement mixture making it "carbon negative"

