

Cement Plants

- 4 Step Production Line:
 - Mine the Limestone: Cement plants usually located near quarries to lower transportation costs.
 - Cement Kiln: Limestone is mixed with sand to produce Kiln Mix -> sent to kilns along with coal (heating is facilitated by the coal). Kiln Mix is heated at 2,700 degrees F -> clinker mix
 - Clinker Mix is then mixed with gypsum in a cylinder filled with steel balls which grind mix into a fine powder -> Final Cement Product
- Associated Air Pollution:
 - From retrieving Raw Materials
 - Particulate Matter
 - Mercury in the Limestone and Fly Ash -> by product of generating electricity by coal.
 - From Kiln Combustion
 - CO₂ – 2nd largest CO₂ emitter behind electricity generation
 - Hydrocarbons – combine with NO_x to form ozone and smog
 - NO_x – precursor to ozone
 - So₂ – Acid rain
 - Particulate matter - Haze
 - Clinker Pollution
 - Heavy Metals = Nickel, Zinc and Lead found in non-negligible concentrations. These elements tend to bioaccumulate and can be released from the soil by acid rain. Severe health effects
- Relative News;
 - “EPA Clamps down on Cement Plant Pollution”
http://www.usatoday.com/news/nation/environment/2010-08-10-mercury10_ST_N.htm
 - Mercury emissions reduced by 92%, Particulate matter reduced by 92%, sulfur dioxide reduced by 78%
 - “Holcim Portland Cement Plant goes Solar in Colorado”
<http://www.aggregeresearch.com/articles/18340/Holcim-Portland-cement-plant-goes-solar-in-Colorado.aspx>
 - owned by the Swiss based international cement company
 - 156,000 kilowatt-hours of electricity per year
 - “Cemex to pay \$2M for pollution controls”
<http://www.aggregeresearch.com/articles/21470/Cemex-to-pay-2M-for-pollution-controls.aspx>
 - 1.4 million dollars for violating the Clean Air Act and 2 million dollars for pollution controls

- Pollution Controls:
 - Electrostatic Precipitator: ionizes contaminated air so that the charge particles are displaced = High Efficiency
 - Used after the roller mill and the cement kiln production. Usually spray towers are used in order to moisten the particulate matter to increase efficiency
 - Baghouse Filters: polluted air is filtered through the bags with a clean air chamber near the top. High pressure air is used to separate the particulates, whatever is collected by the bags is recycled back into production.
 - In-situ Monitoring Devices: Basically used to measure emissions of hydrocarbons, sulfur dioxide and nitrogen oxides. Depending on the reading the operator can adjust temperature or flow of production so that emissions are decreased.
 - Selective Non-catalytic Reduction: Ammonia is added to the boiler to reduce NO_x concentrations without a catalyst. The reaction reduces NO_x to Nitrogen Gas.