APPENDIX 9

Flue Gas Desulphurisation

USING LIME FOR FLUE GAS SCRUBBING

A PROVEN SOLUTION!

LIME MEETS THE ENVIRONMENTAL CHALLENGE: Air pollution control is an essential element of manufacturing and lime can play a key role. Lime is used to remove acidic gases, particularly sulfur dioxide(SO_2) and hydrogen chloride (HCl), from flue gases. Lime is more reactive than limestone, and requires less capital equipment. SO_2 removal efficiencies using lime scrubbers range from 95 to 99 percent (at electric generating plants). HCl removal efficiencies using lime range from 95 to 99 percent (at municipal waste-to-energy plants).

There are two main methods for the removal of acidic gases: dry scrubbing and wet scrubbing. Both methods are used for cleaning flue gases from the combustion of coal toproduce electric power. Dry scrubbing is used at municipal waste-to-energy plants and other industrial facilities, primarily for HCl control. Lime is used in both dry and wet scrubbing systems.

***DRY* LIME SCRUBBING:** In dry scrubbing, lime is injected directly into flue gas to remove SO_2 and HCl. There are two major dry processes: "dry injection" systems inject dry hydrated lime into the flue gas duct and "spray dryers" inject an atomized lime slurry intoa separate vessel.

A spray dryer is typicallyshaped like a silo, with a cylindrical top and a cone bottom. Hot flue gas flows into the top. Lime slurry is sprayed through an atomizer (e.g., nozzles) into the cylinder near the top, where it absorbs SO_2 and HCl. The water in the lime slurry is thenevaporated by the hot gas. The scrubbed flue gas flows out the bottom of the cylindrical section through a horizontal duct. The dried lime and its reaction products fall to the bottom of the cone and are removed. The flue gas then flows to a particulate control device (e.g., a baghouse) to remove the remainder of the lime and reaction products.

Both methods yield a dry final product, collected in particulate control devices. At electric generating plants, dry scrubbing is used primarily for low-sulfur fuels. At municipal waste-to-energy plants, dry scrubbing is used for removal of SO_2 and HCl. Dry scrubbing is also used at other industrial facilities for HCl control. Dry scrubbing methods have improved significantly in recent years, resulting in excellent removal efficiencies.

***WET* LIME SCRUBBING:** In wet scrubbing, lime is added to water and the resulting slurry is sprayed into a scrubber tower. The gas to be cleaned enters the bottom of this cylinder and flows upward through the shower of lime slurry. The sulfur dioxide is absorbed into the spray and then precipitated as wet calcium sulfite. The sulfite can be converted to gypsum, a salable by-product. Wet scrubbing is used primarily for high sulfur fuels and some low-sulfur fuels where high efficiency sulfur dioxide removal is required. Wet scrubbing is a primary use for magnesium-enhanced lime (containing 3-8% magnesium oxide), which provides high alkalinity that increases SO_2 removal capacity and reduces scaling potential.