Elessent™
MECS® TECHNOLOGIES

CASE STUDY NO. 51
DYNAWAVE® TECHNOLOGIES

STEEL MILL SO_2 REDUCTION IN AUSTRALIA

THE DYNAWAVE® APPLICATION

A DynaWave® scrubbing system was installed at a steel production plant in Australia during 2007 to control SO_2 emissions. Sulfur dioxide emissions from sinter operations are collected using activated carbon. The carbon must be regenerated periodically to maintain efficiency. During regeneration of the carbon, a gas stream of highly concentrated SO_2 is produced.

The DynaWave® system collects the sulfur dioxide from the regenerator off-gas and produces a gypsum byproduct utilizing limestone as the scrubbing reagent.

The limestone reagent is utilized directly in the scrubbing liquid. The system also includes oxidation within the scrubbing vessel to produce gypsum, which is filtered to less than 15% moisture content.

PROCESS PARAMETERS: QUICK FACTS	
Inlet gasflow	-1,780 Am3/h (1,050 a cfm)
Inlet temperature	~80°C (176°F)
Reagent	Limestone
Inlet SO_2 concentration	~20% v/v (200,000 ppm)
Removal efficiency	~90%

THE DYNAWAVE® TECHNOLOGY

Traditional wet scrubbing doctrine has been that gas streams with high sulfur dioxide concentrations cannot be efficiently scrubbed using calcium-based reagents. These applications have traditionally utilized dual alkali processes to take advantage of the sodium-based chemistry and the lower-cost calcium-based reagent. MECS, Inc. (MECS) technologies has successfully implemented the DynaWave® technology to efficiently remove highly concentrated sulfur dioxide from a flue gas stream using limestone as the scrubbing reagent. The MECS-designed DynaWave® system utilizes froth zone technology. Flue gas enters the system at the top of the inlet barrel and flows downward. The scrubbing liquid is injected upward in the inlet barrel countercurrent to the incoming flue gas. At the point that the flue gas and scrubbing liquid meet, the froth zone is formed. The froth zone is a very intense mass and energy transfer region. It is here that the flue gas is quenched and the sulfur dioxide is transferred from the flue gas to the liquid. Since only a limited amount of sulfur dioxide can be dissolved in water, a reagent is added to react with the sulfur dioxide. In this project, the reagent chosen was limestone.

Limestone will react with the sulfur dioxide according to the following reaction:

$$SO_2 + CaCO_3 \rightarrow CaSO_3 + CO_2$$

This reaction occurs in the aqueous phase. Limestone, however, is only slightly soluble in water.

This means that the dissolution of limestone into the water is the rate-limiting step in the overall conversion of sulfur dioxide to gypsum.

$$CaCO_3 + \tfrac{1}{2}O_2 + CaCO_3 \rightarrow CaSO_4$$

The in-situ oxidation system eliminates the need for a separate oxidation vessel. It also prevents scale formation within the scrubbing vessel.

The final product from the scrubbing system is a gypsum product with moisture content less than 15%. The average plant availability has been greater than 99% since startup. This project has successfully demonstrated that the DynaWave® wet gas scrubber can utilize limestone to efficiently clean concentrated sulfur dioxide gas streams.

DynaWave® technology advantages:

- Smaller diameter, lower height and smaller overall footprint compared to typical spray towers
- Very high SO_2 removal efficiencies obtained while using fairly unreactive reagent (limestone)
- Large open-bore nozzles, piping and vessel design that prevent plugging
- The use of specific materials to limit erosion in this highly abrasive application
- Costs and scrubber footprint are minimized due to multiple functions performed in a single vessel
- Simplicity in operation–low operator attention required and high reliability

DYNAWAVE® SYSTEM

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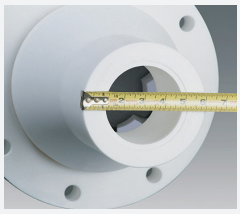
TYPICAL DYNAWAVE® REVERSE JET SCRUBBER



Reverse jet nozzle

See how it works. View the video on the MECS website at: MECS.ElessentCT.com

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