

DYNAWAVE® CASE STUDY NO. 51

STEEL MILL SO₂ REDUCTION IN AUSTRALIA

Application

A DynaWave® scrubbing system was installed at a steel production plant in Australia during 2007 to control SO₂ 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 SO₂ 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 acfm)

INLET TEMPERATURE ~ 80 °C (176 °F)

REAGENT LIMESTONE

INLET SO₂ CONCENTRATION ~ 20% v/v (200,000 ppm)

REMOVAL EFFICIENCY ~ 90%

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® 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® 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. *Continued...*



DynaWave® Advantages:

- Smaller diameter, lower height, smaller overall footprint compared to typical spray towers
- Very high SO₂ removal efficiencies obtained while using fairly unreactive reagent (*limestone*)
- The use of large open nozzles, piping and vessel design which avoid 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

MECS®
DYNAWAVE®

Learn more at www.mecsglobal.com

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DynaWave® Technology continued...

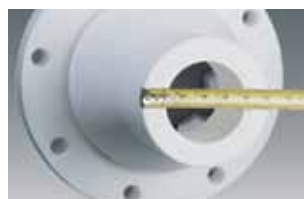
Since only a limited amount of sulfur dioxide can be dissolved in water, a reagent is added to react with the sulfur dioxide. In this project, the reagent chosen was limestone. Limestone will react with the sulfur dioxide according to the following reaction:



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.

MECS® solved this limitation utilizing the unique advantages of the DynaWave® Wet Gas Scrubber. The DynaWave® utilizes the reverse jet technology to create a Froth Zone. The reverse jet is capable of a very high rate of liquid renewal within the reaction zone of the scrubber. By utilizing the ability of the reverse jet to provide a high rate of liquid renewal, the limited dissolution rate of limestone is overcome. The DynaWave® operates at a very high Liquid to Gas ratio and enables the scrubbing system to utilize limestone directly in the scrubber as the reagent.

The DynaWave® can utilize limestone directly in the scrubbing zone due to the unique nozzles utilized. These nozzles have a large open orifice. This large orifice allows the nozzles to operate without plugging even when the liquid contains a high solids content. The DynaWave® can operate efficiently and continuously with greater than 20% suspended solids. This has a large advantage over dual alkali designs in that regeneration of the reagent is not required.



REVERSE JET NOZZLE



www.mecsglobal.com

MECS Headquarters

Chesterfield, Missouri 63017 USA
Tel: +1-314-275 5700
northamerica@mecsglobal.com

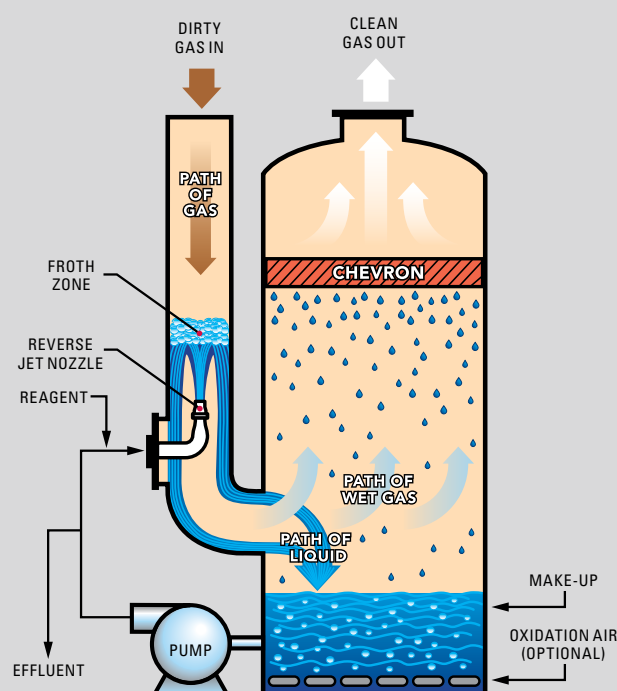
This project also required that a gypsum product be produced. An in-situ oxidation system was designed to convert the calcium sulfite to calcium sulfate according to the following reaction:



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 a 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.

TYPICAL DYNAWAVE® REVERSE JET SCRUBBER



SEE HOW IT WORKS! Visit our web site and watch the video: www.dynawavescrubber.com