General Information

Circulating fluid bed and moving bed dry scrubber technologies, which utilize a dry sorbent (typically Ca(OH)2) to reduce SO2 emissions in a flue gas stream in a dedicated reaction chamber, are categorized as dry scrubbers.

In the circulating fluid bed (CFB) dry scrubber process; hydrated lime is injected directly in the CFB reactor. Water is also injected into the bed to obtain an operation close to the adiabatic saturation temperature. The process achieves SO2 removal efficiency of 93-97% at a Ca/Smolar ratio of 1.2-1.5. Flue gas enters the CFB reactor at the bottom, then flows vertically upwards through a venturi section and enters an upper cylindrical vessel. The height of the vessel is designed to accommodate the mass of bed-material required to achieve the desired residence time of about three seconds. All external inputs of recirculating material, fresh sorbent and gas humidifying water are introduced to the gas on the diverging wall of the venturi. The process is easy to maintain and operate because it does not require high maintenance mechanical equipment such as abrasion resistant slurry pumps, water atomizers or sludge dewatering devices as spray dryers or wet scrubbers require. The process can achieve >95% SO2 removal efficiency.

Execution

For facilities under 50 MW and non-coal fired boiler applications, Dustex performs project execution independently utilizing in-house engineering and fabrication capabilities.

Experience the Dustex Advantage

Dustex Corporation
100 Chastain Center Blvd Suite 195
Kennesaw, Georgia 30144
T: 770-429-5575 | F: 770-429-5556
dustex.com | mail@dustex.com

Dustex

When the dust settles...
the choice is clear

Fluid Bed Scrubbers

Features and Benefits

Reliability:

- Low maintenance burden to plant
- Proven technology
- Simple fluid bed design with no rotating parts
- Uses a conservative approach to saturation minimizing potential condensation
- Cross flow multiple compartment baghouse

Lower Capital Cost:

- Simple, compact design usually conducive to existing facility limited plant area
- Suitable for retrofit application at existing plants
- Minimum controls are required

Cost Effective:

- Simultaneously removes SO2, SO3, HCL, HF, mercury and other heavy metals
- Independent control of lime and water
- Can be modularized, minimizing field installation labor and time

Lower Operating Costs than Spray Dryer or Wet Scrubber Technology:

- Lower stoichiometry results in lime costs savings and disposal of reaction products
- Elimination of all large atomizer motors and compressors lowers total power consumption
- Water, acceptable even at low quality, is added independently from the lime
- Waste products can be land filled as nonhazardous
- Can operate continuously over a wide range of loads due to flue gas recirculation loop

Fuel and Process Flexibility:

- Capable of handling over 5 lb/MM Btu inlet SO2 loading while maintaining 95-97% removal efficiencyis typical as well as non coal fired boiler process scrubbing such as Boric acid in glass production
- Allows flexibility in fuel purchases as the scrubber is capable of achieving emissions levels across a wide range of inlet SO2 concentrations with very minimal system adjustment

Fluid Bed Scrubber

The Dry Circulating Fluid Bed Scrubber is available for capacities up to 600 MW per system with approximately 300 MW per train, reactor vessel / baghouse combination and is ideally suited for coals with sulfur contents below 3.2%. For plants larger than 300 MW, multiple reactor vessels are utilized.

The operating premise of the technology is to bring together high levels of solid recirculation, finely atomized water, hydrated lime and flue gas within a circular fluid bed reactor. Lime products and finely atomized water are injected independently into the fluid bed reactor to lower flue gas temperature and enhance absorption capacity. The fluid bed material is comprised of solids, including calcium hydroxide, fly ash from the combustion process, and solid reaction products from the flue gas particulate collection device. Upon leaving the fluid bed reactor, the solid particles are separated from the flue gas in a fabric filter baghouse and recycled back to the reactor. Due to the reduced flue gas temperature and the high solids content in the system, mercury is also removed in the process.

Dry Scrubbers

With the Dustex DDSP system, particles of an alkaline sorbent are injected into a flue gas, producing a dry solid by-product. In dry FGD scrubbing, the flue gas leaving the absorber is not saturated. Dry scrubbers generally involve simple designs, as well as low capital and maintenance costs. Dry scrubbers are increasingly being recognized as an important part of a multi-pollutant control program particularly in recent history.

Generally, the fate of absorbent in dry FGD is characterized as either once-through or regenerable. Dry scrubber systems can be grouped into three categories: spray dryers, circulating spray dryers and dry injection systems. All these systems offer multi-pollutant control opportunities by combining acid gas, SO2, particulate control and air toxics, including mercury. Reviewing the characterization is important to define the differences in technology.

Spray Dryer

In a spray dryer, a slurry of alkaline reagent, typically lime or sodium based, is atomized into the hot flue gas to absorb the pollutants. The resulting dry material, including fly ash, is collected in a downstream particulate control device, typically an electrostatic precipitator or fabric filter. In some cases, a portion of the dry material is recycled into the lime slurry mixture. Oxidation of the mixture results in a gypsum by-product that can be sold. A lime spray dryer can typically be installed on industrial and utility boilers, and on municipal and hazardous waste incinerators. Spray dryers commonly are designed for SO2 removal efficiencies of 70-95%.

Circulating Dry Scrubber

A circulating dry scrubber uses an entrained fluidized bed reactor for contacting the reagent, usually hydrated lime, with sulfur dioxide and particulate laden flue gas. The intensive gassolid mixing that occurs in the reactor promotes the reaction of sulfur oxides in the flue gas with the dry lime particles. The mixture of reaction products (calcium sulfite/sulfate), unreacted lime, and fly ash is carried to a downstream particulate collector (baghouse) that is separated from the gas stream. Part of the dry waste product is removed for disposal, but most of the waste product is mixed with fresh calcium hydroxide for use in the reactor and reinjected into the reactor. Water spray is introduced into the fluidized bed separately to enhance performance (for maximum SO2 capture with minimum lime utilization) by optimizing the surface moisture content of the lime. Circulating dry scrubbers such as the Dustex DDSP system and the Babcock Power "TurboSorb" system can and have provided removal efficiencies of more than 90%.

Dry Injection Systems

Dry injection systems involve the injection of a dry sorbent (normally lime or limestone) into the flue gas in the upper reaches of the boiler, or in the ductwork following the boiler. Sulfur oxides react directly with the dry sorbent, which are collected in a downstream particulate control device. Because a separate scrubber vessel is not needed, capital costs are minimized. Low capital costs are partially offset by lower reagent utilization, which result in higher operating costs for equivalent SO2 removal rates. Dry injection systems are generally applied when lower removal efficiencies are required, or on small plants where the capital cost for other scrubber types may not be justified. Dry injection systems typically have removal efficiencies ranging from 50-70%.