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SO_2 (Sulfur Dioxide) Air Pollution Control – Acid Rain Prevention
Wet Scrubber Design Using Q-PAC®

Process Description

When sulfur compounds are burned, most of the sulfur is converted to SO_2. Typical examples are coal fired electric power plants, burning of high sulfur diesel or fuel oil, etc. The SO_2 that is formed needs to be removed from the process off gas. If not removed, acid rain downwind of the combustion process will result. The US EPA's Phase II regulations intended to further reduce SO_2 emissions (www.epa.gov/airmarkets/arp/overview.html) took effect in 2000. These regulations apply to all power generating stations of 25 megawatt and greater capacity.

SO_2 Emission Control – Packed Bed Wet Scrubber

A very efficient and cost effective method to limit SO_2 air emissions is wet scrubbing. Common design parameters are: L = 6 ~ 12 gpm/ft^2 and G = 2500 ~ 3000 lb/hr · ft^2

Using a typical example of an air stream of 25,000 scfm (42,500 m^3/hr) at 150 ºF (66 ºC), the design of the scrubber would be:

Diameter = 7 ft (2100 mm)
Inlet CO_2 = 44,000 ppm_v
Inlet SO_2 = 300 ppm_v
Recirculation Rate = 350 gpm (79 m^3/hr)
Blowdown Rate ~ 4 gpm (1 m^3/hr)
Total Dissovled Solids in Blowdown ~ 5%
Scrubbing Liquor = water + caustic (NaOH)
Makeup Caustic Strength = 50%
Sump pH ~ 7
Packing = 8 ft (2440 mm) ***Q-PAC***
Q-PAC Pressure Drop = 1.9 in WC (4.7 mbar)
Mist Capture = 1.5 ft (460 mm) ***#2 NUPAC***
#2 NUPAC Pressure Drop = 0.7 in WC (1.8 mbar)
SO_2 Scrubbing Efficiency = 98%+
Chemical Losses to CO_2 Absorption = 0
Theoretical Caustic Consumption = 9 gal/hr (34 Liter/hr)

Q-PAC®
USA Patent #5,458,817

Operational Notes

The sump should be initially be filled with about 4% NaOH solution. pH will be high at first, but gradually come down as SO_2 is absorbed. When the pH falls to ~6, caustic should be added to raise the pH by a few tenths of a unit. At low pH the scrubber will remove SO_2 and other strong acid gases, but not waste NaOH by absorbing CO_2. Combustion exhaust may contain 1~6% CO_2 by volume. The pH won't change very fast, because a sodium bisulfite / sulfite buffer solution is formed in the water. Blowdown rate is usually adjusted to maintain of 2~5% TDS. This can be done automatically by using a conductivity probe in the sump to monitor the byproduct salt content. When sulfur compounds are burned, most of the S is converted to SO_2, but depending on conditions there may also be a small amount of SO_3. SO_3 reacts with water vapor to form an aerosol of sulfuric acid droplets, most of which are too fine to be removed by a packed scrubber.

Please consult with Lantec Products regarding the design requirements of your specific project. No warranty is given or implied with this design example. All designs that are reviewed by Lantec Products will carry a full performance warranty.

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