



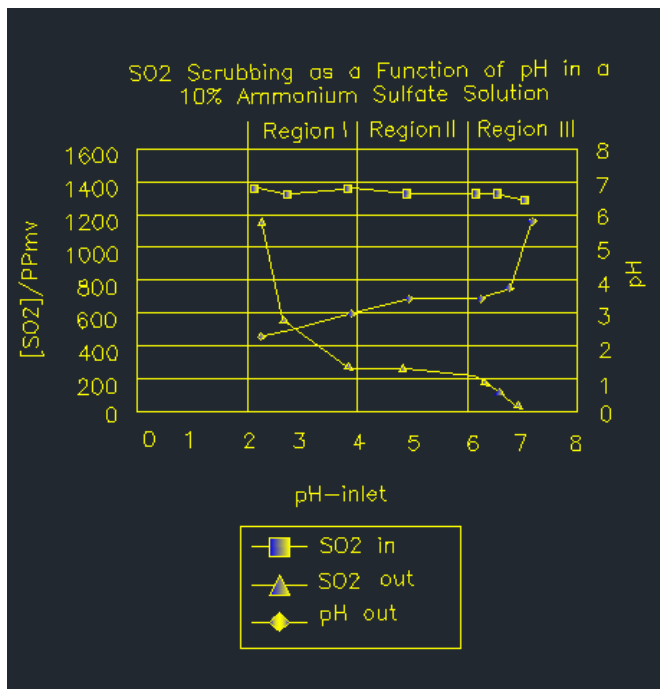
pH in Ammonia Scrubbing

Industry: Fertilizer
Product: pH

Introduction:

A process and apparatus for removing SO₂ from a gas stream having the steps of scrubbing the SO₂ with an ammonia scrubbing solution and removing any aerosols generated by the scrubbing in a wet electrostatic precipitator. The scrubbing solution is maintained at a pH between 6 and 8 to increase the speed of absorption of SO₂, to increase the ratio of sulfite to bisulfite which also facilitates the oxidation of SO₂, and to avoid the need to use exotic, corrosion resistant alloys. Ammonium sulfate, a valuable fertilizer, can be withdrawn from the scrubbing solution.

to economically remove SO₂ from flue gas streams before it enters the atmosphere.



The pH of the ammonium sulfate solution should be kept between about four and six. This range is the result of a compromise between competing factors. On one hand, ammonium sulfate solution is capable of absorbing SO₂ more rapidly when its pH is higher. The ability to absorb SO₂ better implies that the size of the scrubbing tower can be smaller, thus saving capital costs. In addition, the liquid to gas (“L/G”) ratio can be smaller, meaning less liquid will be required and operating costs will be lower.

On the other hand, higher pH levels are also associated with the release of free ammonia from solution, often termed “ammonia slip.” In addition to incurring an economic loss because of lost ammonia, free ammonia in the scrubbed flue gas reacts with uncaptured sulfur dioxide and trioxide to create an ammonium sulfate/bisulfite aerosol that is visible as a blue or white plume in the stack discharge, leading to secondary pollution problems. Controlling the amount of free ammonia in the desulfurization process is in part a function of the ammonia vapor pressure, which results from a combination of pH and levels of unoxidized ammonium sulfite that remain in the absence of sufficient oxygen. Therefore, high pH values and high levels of unoxidized ammonium sulfite promote ammonia slip.

Process background:

Fossil fuels are burned in many industrial processes. Electric power producers, for example, burn large quantities of coal, oil, and natural gas. Sulfur dioxide (“SO₂”) is one of the unwanted byproducts of burning any type of fossil fuel. It is known to cause acid rain, and to have serious negative health effects on people, animals, and plants. A great deal of research has been done to find a way

Typical Process Example:

* Name of Application / Process : Ammonia Scrubbing
 * Location of Sensor mounting (location name) : Tail Gas Scrubber Complex
 * Operating Temp / Max.Temp : 75 to 80 deg C
 * Operating Press / Max. Press : 2 to 2.5 Kg/Cm2
 * Type of Installation : On Pipe (Direct mounting) / Flow through Chamber (By pass mounting) /
 * Process Composition :
 Liquid: Scrub Acid, P2O5:105 ppm, AN (Ammonical Nitrogen):1326 ppm, UN(Urea Nitrogen):22 ppm, TN(Total Nitrogen):1348 ppm, Florine:116 ppm.

Typical problems:

Frequent cleaning, glass can be eaten away as the temperature and chemical attack glass

Remedies:

Use of high temperature special sensor

Yokogawa Solutions:

SC25 sensor from Yokogawa is the perfect sensor for this application. High temperature sensor SC25 because of its design can serve purpose.

Sensor: SC25V series

SC25V



Features SC25V

External titanium Liquid Earth
 Pt1000 integration in pH compartment giving highly accurate temperature compensation
 CIP and Steam cleaning possible
 Large internal KCl volume giving the sensor a longer life time

- SC25V-ALP25 for chemically harsh applications and high temperatures

Cable:

WU10-V-S series

Retractable fitting: PR10 series

On-line measurements always present extra challenges compared to at-line measurements, for example, when maintenance needs to be done. Applications like this where the sensors have to be removed without interruptions or shut-downs the PR10 is especially suitable. Without any special tools the PR10 can be retracted safely from the process up to 5 bar.



For ease of use optional flush ports are available. In the retracted position the sensor can be kept moist, cleaned or even calibrated. This can all be done without process interruption or disassembly of the armature.

4 wire pH converter: PH450 series



Type: 4 wire type

Features

- Easy touchscreen operation
- Trending display up to 2 weeks

Alternately:

2 wire pH transmitter: FLXA202/FLXA21



Type: 2 wire type

Features

- Dual sensor measurement on 2-wire type analyzer;

Tangible benefit: Better life of sensor, improve end product quality.