Application Note

Continuous Ammonia monitoring in DeNOx Processes

Emissions from combustion processes contain gases which are harmful to the environment. Some of these gases include Nitric Oxides (NOx). For environmental reasons the reduction of NOx emissions is very important and is regulated by government in many countries.

A common method used to reduce emissions of NOx is the injection of NH_3 or Urea. Controlling and monitoring the NH_3 concentration is important to optimize the NOx reduction efficiency, and to minimize NH_3 emissions.

PROCESS:

In power plants NOx reduction, referred to as DeNOx, is typically achieved by selective catalytic reduction (SCR) or selective non-catalytic reduction (SNCR). Ammonia is injected into the gas flow to react with NO to form H2O and N2. The excess ammonia (NH3) in the off gas is called NH3 slip. Ammonia is typically measured after the injection point (1) downstream from the catalysts (SCR). It's important that the measurement be accurate, fast and reliable.

Since ammonia is considered to be toxic, the emission to air is also measured in the stack (2). High sensitivity and high reliability are required.

TYPICAL PROCESS DATA

NH3 concentration 0-15 ppm (SCR), 0-50ppm (SNCR)
H2O content 10 –30%
Temperature 200-400 °C
Pressure atmospheric
Optical path length 1-6 meter

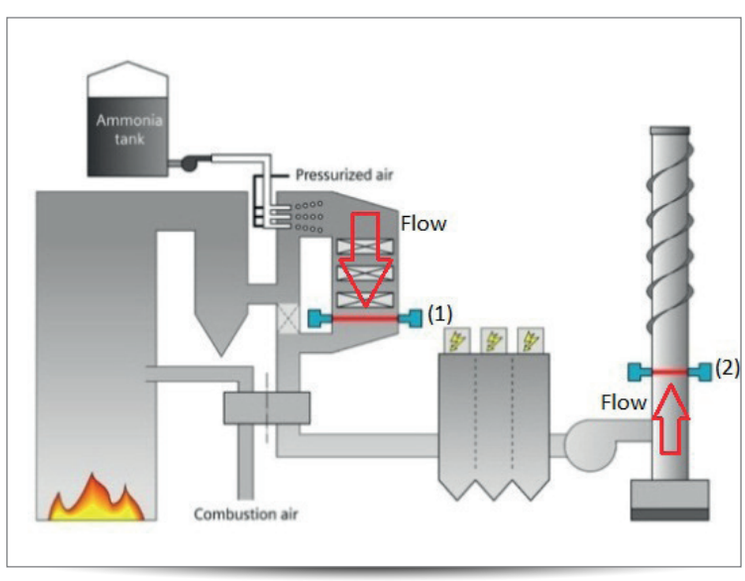

Fig 1: NH3 measurement points (1) and (2) in a typical DeNOx process

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MOTIVATION:

The accurate measurement of Ammonia slip and emissions to the atmosphere are of concern for the operators of DeNOx process due to the following reasons:

- Reduce the NOx emission to air
- Control/monitoring the injection of NH3
- Measure the NH3 slip to optimize the function of the SCR/SNCR systems and the NOx reduction process
- Minimize the NH3 slip to reduce maintenance due to the deposition, plugging and potential corrosion.
- Excessive NH3 slip can impact ammonia absorption in the fly ash. Fly ash can be used in cement sales (Pozzolan Markets)
- It enables to accurately predict when catalysts have to be replaced in SCR

SOLUTION:

The solution is LaserGas™ II NH3 analyzer. With the fast response time and high reliability is a perfect solution to control the injection of NH3. With a high sensitivity, the LaserGas™ II is the best option for measuring low concentrations of NH3. Typical applications include is in-situ measurement for Continuous Emission Monitoring Systems. LaserGas II NH3 SP can be delivered as a TÜV certified analyzer (process dependent).

Example of reduced maintenance:

With NH3 slip < 2ppm air heaters can run 6 months to one year before washing is required. At NH3 Slip > 10 ppm washing is required every 2 weeks – 3 months

BENEFITS:

- Reduce the NOx emission to air.
- In-situ measurement (no sampling system)
- Fast response to process changes
- Easy control of the injection of the NH3
- Optimize/reduce the NH3 (Urea) consumption
- Extend lifetime of plant equipment
- Reduce running costs for plant equipment
- Low maintenance on plant equipment

LaserGas™ II NH3 SP

- Measure directly in the process (In-Situ)
- No need for sampling systems
- Fast response time (typical 2 sec)
- Additional H2O measurement (optional)
- Stable calibration
- High sensitivity
- No Zero drift
- Integrated Span check (optional)
- No consumables
- Low maintenance cost
- High reliability and long liftime
- Applicable for high dust concentrations
- ATEX/CSA
- TÜV approved technology

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