Precision Spray Nozzles & Control Skid
for SNCR System
Up-to-date Facility with CNC technology
Spray Test Laboratory
## Current Scenario of NOx Emissions

Table 3.2: Emissions of NOx by country group in the Current Policies Scenario, thousand tons/year

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7 % 15 %
Sources such as boilers, incinerators, and gas turbines all create NOx.

Electric power plant boilers produce about 40% of the NOx emissions from stationary sources.

Industrial boilers, incinerators, gas turbines, reciprocating spark ignition and Diesel engines in stationary sources, iron and steel mills, cement manufacture, glass manufacture, petroleum refineries, and nitric acid manufacture: 60%.

The major source of NO\textsubscript{x} production from nitrogen-bearing fuels such as certain coals (mainly petcoke) and oil. Fuel NO\textsubscript{x} can contribute as much as 50% of total emissions when combusting oil, and as much as 80% when combusting coal.
Theoretically, it is a stoichiometric equation. The ideal case, where every parameter is stable and predictable. Unfortunately, it is not so in a real case. Changing gas volumes, changing pressure values, changing temperature values, changing gas compositions, changing flow behavior etc. Is inevitable. The system which adapts itself faster to the changing conditions, is the most efficient one.

Hence, You need to hit the right NO molecule at the right place and in right environment conducive for reaction, with minimum reagent consumption.

Lechler has predictive mechanisms and actuators, to ensure the probability of hitting the right NO molecule, at right time and ambience. Lechler has knowledge and measurement of droplet size generation, for maximum surface area creation for reaction, actuators to change the droplet size when required, high turndown ratio of the special spray nozzles to cater to low and high flows of reagent, as per needs and while maintaining allowed NH₃ slip values. It is a tight balancing act.
SNCR Process

UREA versus Ammonia

**UREA-Reaction**

\[ 2 \text{CH}_4\text{N}_2\text{O} + 4 \text{NO} + \text{O}_2 \rightarrow 4 \text{N}_2 + 4 \text{H}_2\text{O} + 2\text{CO}_2 \]

**Ammonia Water - Reaction**

\[ 4 \text{NH}_3 + 4 \text{NO} + \text{O}_2 \rightarrow 4 \text{N}_2 + 6 \text{H}_2\text{O} \]
UREA versus Ammonia

**UREA-Injection**

- Advantage:
  - Evaporation of water is essential to dispose UREA and NOx.
  - Beneficial for injection in high temperatures above 1.050° C.
  - Easier safety regulations (Non explosive)
  - Available all over the world due to Add Blue Technique

- Disadvantage:
  - Risk of clogging

**Ammonia Water - Injection**

- Advantage:
  - Quick Residual free action
  - No mixing station necessary
  - Virtually all Lechler projects with skids have been made with ammonia

- Disadvantage:
  - Ammonia Vapours are explosive
Control Technology for High efficiency SNCR

Some typical Actuators

PH Fan, Cyclone, Chimney, Flue Gas Flow, Riser Duct
SNCR System

System Layout

- Storage NH₄OH
- Waste Gas
- Injection Pumps
- NOₓ Setpoint at Control Panel
- PID Regulation NOₓ
- Cleaning

Lechler India
Skid and Nozzle lances for SNCR System

System Layout / Scope of Supply

Utilities (Media / Air) (By Customer)

Ammonia Unloading / Storage

Nozzle Lance

Process Control System

Distribution Skid

Safety Precautions (By Customer)

Pumping Unit
Precision Spray Nozzles for SNCR System

Innovative system control possibilities

Based on individual control of each lance/nozzle every single point within the process window can be adjusted and controlled.

This leads to:
- High flexibility
- Cost reduction possibilities
- the right droplet at the right time (for the correct conditions)
Precision Spray nozzle Lances for SNCR

Special properties

**Small spray angle** (15°), suitable for small cross-sections and horizontal ducts

**Turn-down ratio** of 20:1 (in some cases up to 40:1)

**Typical pressure range**
- Liquid 1-6 bar, g
- Atomizing air 1-6 bar, g

**Adjustment of the droplet spectrum**
by changing the air/fluid ratio

**Very fine droplet spectrum**

**Wide and flat jet**, spray angle 60°

**Turn-down ratio** of over 10:1

**Spray alignment possible**

**Adjustment of the droplet spectrum**
by changing the air/fluid ratio

**Typical pressure range**
- Liquid 1-5 bar, g
- Atomizing air 1-5 bar, g
SNCR System

Nozzle Lances

ammonia
atomizing air
barrier air
Lechler Laval Nozzles

Air and water amount are individually controllable.

The design is especially made for the use within cement plants – clogging resistant.

Laval nozzles are known for fine droplets due to ultrasonic flows.

Due to high outlet velocities a higher penetration depth can be achieved.

Internal mixing nozzle will allow the adjustment of nearly any droplet size.
SNCR System

Atomization (media + air)
Our core products are: ... Skids
Scope and Competencies

- Working with major OEMs.
- Experience and necessary qualifications for skid design and fabrication.
- Spray technology
DeNox solutions

Good Reasons to try Lechler

- Market leader in Europe based on high quality & reliable systems
- Own engineering, R&D, commissioning support and service
- Sophisticated nozzle and lances for different processes available
- Individual control of each nozzle (lance)
- Intime & inplace control of all necessary variables
- Best possible results in reduction of reagents / daily costs
- Existing references in several cement plants.
- Customized or standard solutions available for customers

25.09.2017
Lechler India
Thank you for your attention!

As an international company, Lechler is represented in more than 50 countries worldwide. For contact details and more information, please visit our website: www.lechler.com.