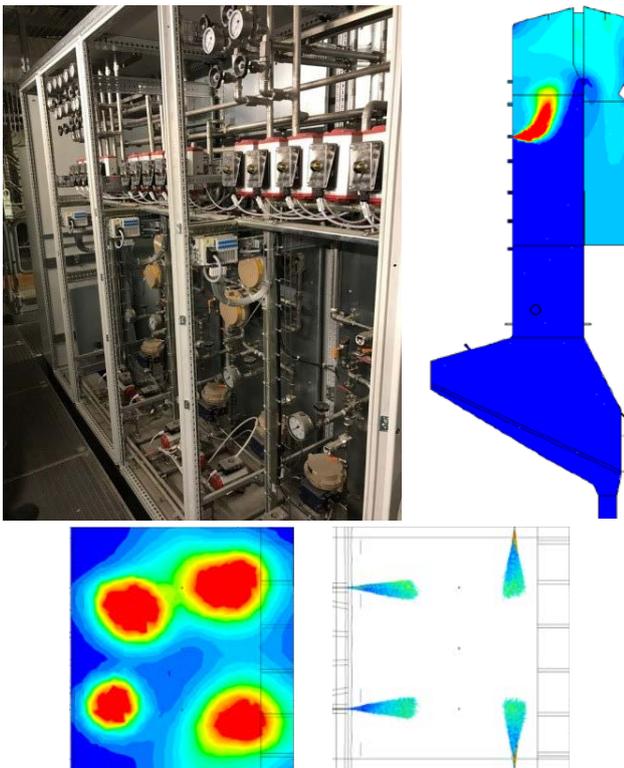


Adaptive SNCR for Boiler NO_x Reduction

VØLUND™ SYSTEMS TECHNOLOGY



SNCR Benefits

- Optimised SNCR for your boiler
- Control philosophy
- Adaptive NO_x control

Bringing the SNCR system in-house

New legislation in the EU on NO_x emissions from waste-to-energy (WtE) plants have become more stringent and are now set to 50 to 120 mg/Nm³ for new plants and 50 to 150 mg/Nm³ for existing plants. [1]

To meet these stricter emissions limits, Babcock & Wilcox Renewable (B&W) has developed our Volund™ adaptive SNCR system. Our systems are designed to address the new EU emission limits and have successfully been deployed across Europe.

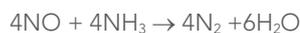
Figure 1 illustrates how our SNCR system can deliver a stable NO_x and NH₃ slip level. The effectiveness of our design is highlighted when ammonia injection is stopped (between 15:00 and 15:30).

Combining boiler and SNCR design

WtE and biomass boilers can have large variations in heating value while combined heat and power boilers have large load variations. These operating variables can cause variations in flue gas flow and temperatures, both important boiler and SNCR design factors. By knowing the detailed design criteria of the SNCR system and integrating this into our computational fluid dynamics (CFD)-based boiler design process, we are able to optimize boiler operation and NO_x emissions.

SNCR technology

Removing nitrogen oxides (NO_x) from boiler flue gas is important as these gases, when emitted into the atmosphere, can lead to acid rain and the formation of micro-particles, which are hazardous to humans. The selective non-catalytic reduction (SNCR) system injects an ammonia or urea reagent into the flue gas in a temperature range between 850 to 1100°C. In this temperature window the NO_x reacts with the reagent and produces nitrogen gas and water:



The simplicity of the SNCR system makes it cost effective, reliable, and durable. The SNCR system can be divided into five major components:

- Reagent storage and pumping facilities
- Mixing and distribution unit
- Injection lances
- Measurement equipment
- Process control system

An SNCR system may reduce NO_x by more than 80% depending on conditions. This reduction efficiency is strongly connected to boiler design, SNCR controls, allowable amount of unreacted reagent, unabated NO_x levels, and the SNCR system design.

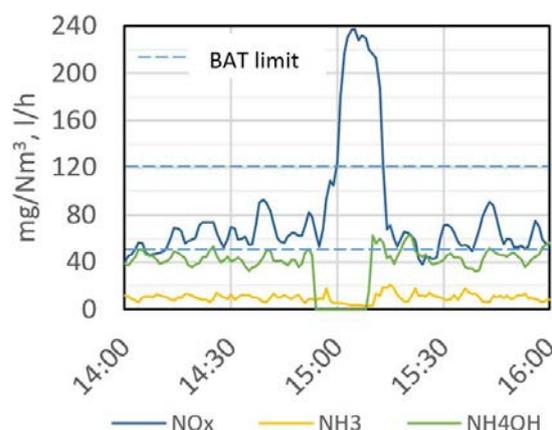


Figure 1. NO_x, NH₃ slip and ammonia consumption

Note: All emissions concentrations are at the reference state 11% O₂ dry gas.

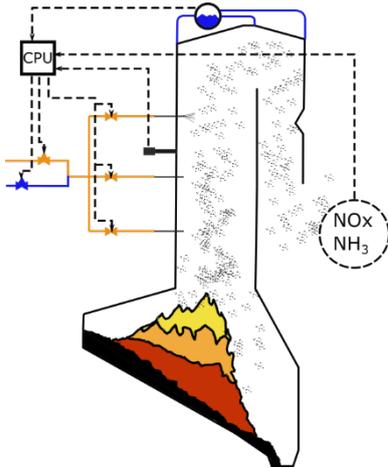
[1] The higher end of 180 mg/Nm³ is allowed when an SCR is not applicable.

continued ▶

SNCR system control is important

An expertly developed control system is required to meet both short- and long-term emissions requirements.

Control inputs include NO_x, NH₃, boiler load, and flue gas temperature. These values determine lance operation for water and reagent flow of the SNCR system. Our controls can effectively adapt to changing process conditions and compensate for an IR sensor that is drifting or losing signal.



Feasibility studies for existing plants

Existing plants may also benefit from system upgrades or equipment replacement.

Various conditions may provide opportunities for existing plants to upgrade or replace equipment or complete systems, including:

- Meeting new emissions limits
- Changing boiler load
- Changing fuel mixture
- Removing or adding boiler refractory
- Updating an outdated SNCR system

B&W can perform feasibility studies by gathering relevant design features for evaluation. We can then recommend the optimal solution for your plant, from equipment replacement and upgrades to complete installation of a new SNCR system.

SNCR service agreements

While an SNCR system is considered low maintenance relative to other plant equipment, replacement parts and modifications may be necessary throughout the lifetime of the system. Our boiler service agreements will also include the SNCR system.

Installation Case: NO_x reduction at Swedish waste-to-energy plant

In 2020, our adaptive SNCR was installed as an upgrade at the 27 t/h Filborna waste-to-energy plant in Helsingborg, Sweden. The plant is equipped with a water-cooled DynaGrate® combustion grate and an advanced combustion control system.

Utilizing computational fluid dynamics (CFD) to optimise the design for Filborna's boiler, our adaptive SNCR system achieved average NO_x levels of only 77 mg/Nm³ 11% O₂ dg in its first year of operation. This annual 24% NO_x reduction was a significant cost savings for the plant owner as payments are required to the Swedish government for its NO_x emissions. B&W Renewable's maintenance plan and operational strategies allow continual optimised operation of this SNCR system.



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