

NAWTEC Speaker Abstract
A European Alternative to SNCR and SCR NO_x Reduction Systems

Ulf Hagström
ECOMB AB
Sodertalje, Sweden
+46 8 55012550
ulf@ecomb.se

This presentation uses a case study of the installation of the Ecotube System in two Waste to Energy (WTE) plants in Bessieres, France to examine alternative ways to reduce NO_x emissions. Plant owner Econotre, a subsidiary of SUEZ, chose the Ecotube System despite strong competition from SNCR and SCR suppliers. The Ecotube system has been installed in over twenty boilers worldwide. The decision to install Ecotube was made based on economics and a desire to use an environmentally-friendly solution. The Ecotube System did not require chemical agents such as ammonia or urea to meet the NO_x reduction goals.

The Ecotube System uses retractable lances to inject high-velocity air at a precisely engineered location in the boiler. Although not needed in this installation; water can be injected for Gas Temperature Control. Likewise, Ammonia, Urea and Limestone, can be injected by the Ecotube System additional NO_x reduction as well as reduction of SO_x and HCl.

The presentation will look at project data from the Bessieres waste to energy plant. The WTE plant, built in 1998, is located just outside the tiny village of Bessieres; 20 miles northeast of Toulouse France. There are no visible stacks seen from the main road, for the plant was built below ground level to satisfy strong demands of maximum plant height. Consequence for the two units, each incinerating 11,4 ton waste per hour, was that the first furnace passes couldn't be built vertically – they had to be inclined from the middle elevation and downwards.

The annual amount of household waste incinerated at the WTE plant in Bessieres is 170,000 tons, collected from 158 communities, with 370,000 inhabitants in the north part of the region Haute Garonne. Small amounts of Industrial waste are also incinerated. The two units are each producing 38.5 ton steam/h (375°C, 46 bar), connected to a common steam turbine generating 13 MW to the grid. The flue gas cleaning system for each unit comprises an electrostatic precipitator, a scrubber injecting limestone for reduction of HCl and heavy metals, another scrubber injecting activated carbon and NaOH for reduction of SO₂ and dioxins and as the final step a dust extractor for reduction of particulates.

The injection of high-velocity air at the Bessieres WTE plant improved the mixing of the combustion products resulting in destruction of laminar gas columns and the formation of completely mixed turbulent flow patterns. CFD and a special in-furnace camera technique were used to confirm the most appropriate position for the Ecotube lances. The angle of air injection was customized to maximize performance. The camera was also used to visually verify improved gas flow during post-installation performance testing.

The major characteristics of the Econotre Ecotube System for each of the two units are:

- Two Ecotubes with carriage assemblies and controls
- Air System, including one 6000 CFM fan, piping, and controls with a design configuration appropriate for providing air to both Ecotube assemblies
- Water System – Closed loop, consisting of appropriate pumps, air cooler, valves, and piping with a design configuration appropriate for Ecotube system cooling
- Ecotube Control System, including operator controls, operations logics, and other panels, control valves, control wiring, and other essential equipment with a design configuration appropriate for controlling the Ecotube system.

Upon completion of the system mechanical installation and the equipment commissioning activities, the ECOMB AB professionals began the process of tuning the Ecotube System in order to achieve maximum NO_x reduction using “air only” at base load (full load) steady state conditions. This very detailed process typically takes several weeks to strategically “hone in” and complete fine-tuning of the optimum operating arrangement for the specific client boiler. Very early testing, during the initial stages of the Ecotube System tuning process yielded results around 40% NO_x reduction; typical results from Tests on Nov 24 and further tuning provided over 60% NO_x reduction, which corresponded to numbers well below the maximum allowed NO_x concentration stated in WID. This performance was achieved at reduced Stoichiometric Ratio (S.R.) in the furnace, mainly from reduced secondary air flow.

Installation results at Bessieres using only pure air:

- 60%+ Reduction of Nox
- 11.7% Increase in Waste Throughput over a 6 months period
- 4.6% Increased Power Output over a 6 months period
- Effective Control of Flame Temperatures with Water Injection through the Ecotubes.
- An added benefit was a reduction in Fire-side Erosion and Corrosion
- Projected 10%+ Reduction of Fly-Ash (not verified yet)

Ulf Hagström is one of the founders of ECOMB AB, of SÖDERTÄLJE, SWEDEN. He was instrumental in the development of the Ecotube System and has managed many installations. He can be reached by telephone at : +46 8 55012550, ulf@ecomb.se.