45% NOx Reduction Goal Met by Use of Spray Injectors

Problem:

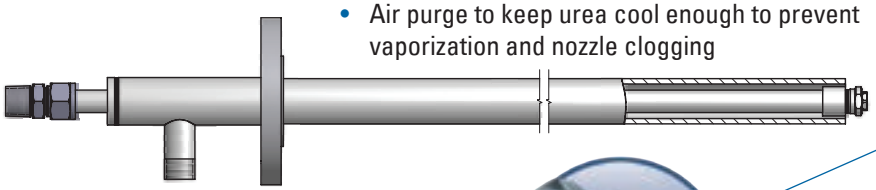
Faced with a compliance deadline established by the Environmental Protection Agency's Clean Air Interstate Rule (CAIR), a power plant in the midwestern US needed to find a NOx control system that would reduce emissions by 30 to 50%. Plant personnel requested a proposal from a leading air pollution control equipment company. The recommended solution was a custom system with a US$1,000,000 price tag. Plant personnel decided to explore more options.

Acting on a referral from another power plant in the region, plant personnel contacted Spraying Systems Co. and requested a proposal. The utility provided furnace parameters and geometries and Spraying Systems Co. collected sample temperature readings.

Solution:

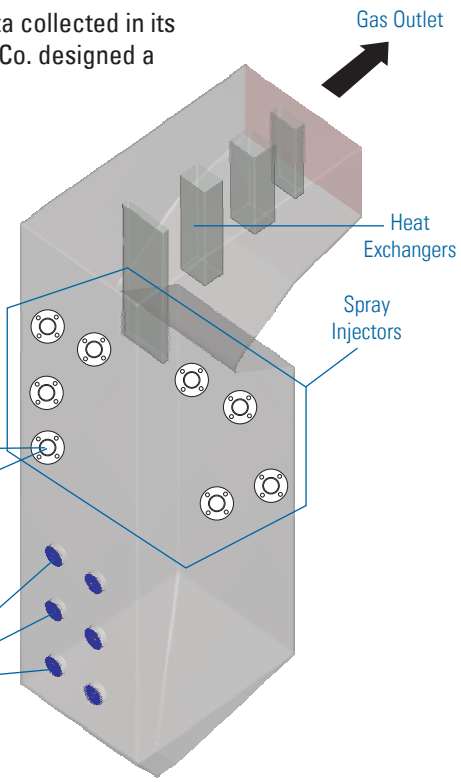
Using proprietary gas cooling calculations, drop size data collected in its test labs and decades of experience, Spraying Systems Co. designed a solution:

- Eight air purge injectors installed on three levels
- Each injector equipped with a hydraulic hollow cone nozzle spraying a water/urea mixture perpendicular to the furnace wall
- Injectors to withstand temperatures up to 1750°F (954°C)
- Air purge to keep urea cool enough to prevent vaporization and nozzle clogging



The inner pipe and inlets are constructed of 316 stainless steel; the flange, outer pipe and nozzle are 310 stainless steel

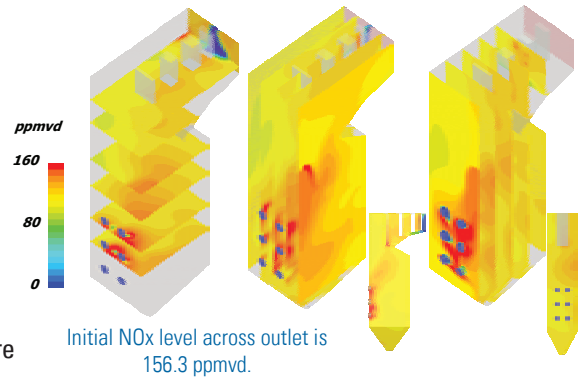
WhirlJet® Hollow Cone Spray Nozzle: 310 stainless steel



45% NOx Reduction Goal Met by Use of Spray Injectors – Continued

Design Validation:

CFD (Computational Fluid Dynamics) modeling was recommended by Spraying Systems Co. to validate the design and uncover any unforeseen problems caused by the operating conditions in the furnace.

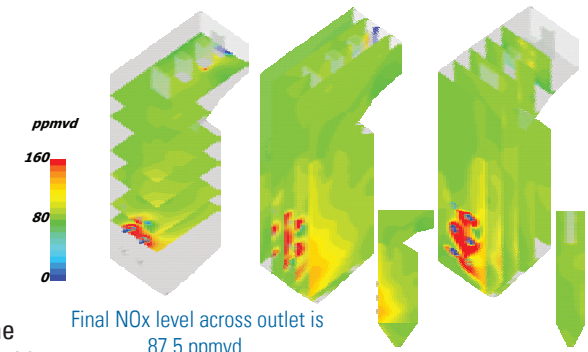


Initial NOx level across outlet is 156.3 ppmvd.

Results:

The CFD study validated the design and no modifications were required. The injectors were constructed and installed in 12 weeks.

- NOx emissions have been reduced by 45%
- Urea carryover is negligible and within acceptable limits
- Nozzles are clog-free and injectors are performing to specification
  - The mixing of the urea in the gas stream is adequate and the desired reaction occurs
  - The droplets produced by the hollow cone nozzles are evaporating prior to contact with furnace walls, eliminating damage and excess maintenance caused by wetting
  - The use of hydraulic nozzles eliminates the need for costly compressed air and helps keep operating costs low
- The Spraying Systems Co. solution was just 1/3 of the cost of another supplier's, saving the power plant several hundred thousand dollars (US)
- The project was completed several months before the compliance deadline. The power plant earned emission credits that can be sold in the future



Final NOx level across outlet is 87.5 ppmvd.

Spraying Systems Co.®
Experts in Spray Technology

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