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SNCR

NOxOUT® and HERT™ Processes

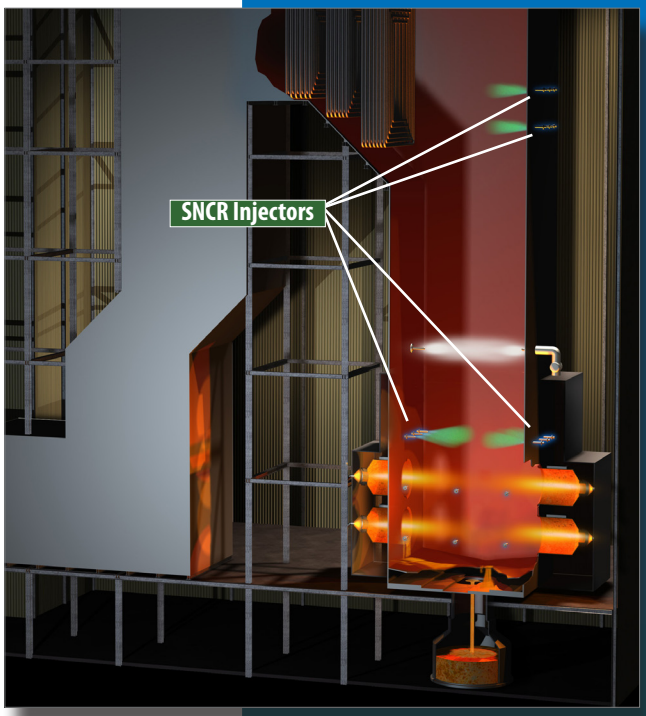
Proven solutions for flexible and cost-effective NO_X reduction

Fuel Tech's urea-based Selective Non-Catalytic Reduction (SNCR) process is a post-combustion NO_x reduction method that reduces NO_x emissions through a controlled injection of an aqueous urea solution into the combustion gas path of fossil-fired and waste-fired boilers, furnaces, incinerators, or heaters.

Fuel Tech has enhanced the basic SNCR technology by developing chemical injection hardware, widening the applicable temperature range, and applying process control expertise required for commercial applications.

Fuel Tech has two urea-based SNCR technologies: NO_xOUT® systems, which utilize low energy, air atomized injectors, and HERT™ High Energy Reagent Technology systems, which utilize mechanically atomized injectors and carrier air for injection into the furnace.

The NO_x - reducing reaction is temperature sensitive: the optimum temperature range is specific to each application. The reagent needs to be distributed within this optimum temperature zone to obtain the best performance. The most commonly used reagent consists of a 50% urea solution. This reagent is readily available and requires no special safety precautions for handling.



SNCR Injection Process

SNCR Processes

Fuel Tech's SNCR processes are designed with the aid of Computational Fluid Dynamics (CFD) and Chemical Kinetic Modeling (CKM) in addition to results from field tests. The CFD model simulates flue gas flows and temperature inside a unit while the CKM calculates the reaction between urea and NO_x based on temperature and flow information from CFD. The combination of these two models determines the optimum temperature region and the optimum injection strategy to distribute the reagent.

NO_xOUT® Process Injection	SNCR Technology	HERT™ Process Injection
• High momentum injectors • Maximize performance • Adjustable for NO_x reduction downstream of injection point	• CFD/CKM Modeling • Reliable equipment • On-site optimization	• High energy, low momentum injectors • Maximize performance with minimal ammonia slip • Localized NO_x reduction

25-50% NO_x Reduction

- Over 590 SNCR systems installed worldwide
- Average NO_x outlet for systems >400MW is less than 224 mg/Nm3
- Easy to retrofit – little downtime required
- Utility and industrial applications
- Guaranteed performance
- Safe reagent

FUEL TECH®
Technologies to enable clean efficient energy

SNCR Systems

We have over 1,000 APC system installations worldwide on wide range of fuels and combustion units.

Commercial Combustion Units

- Tangentially-Fired Utility Boilers
- Cyclone-Fired Utility Boilers
- Wall-Fired Utility Boilers (wet & dry)
- Refinery Crude Heaters and CO Boilers
- Sludge Combustors
- Industrial Power Boilers
- Municipal Waste Combustors
- Incinerators
- Circulating Fluidized Bed Boilers
- Stoker-Fired Boilers Burning Wood and Coal
- Package Boilers

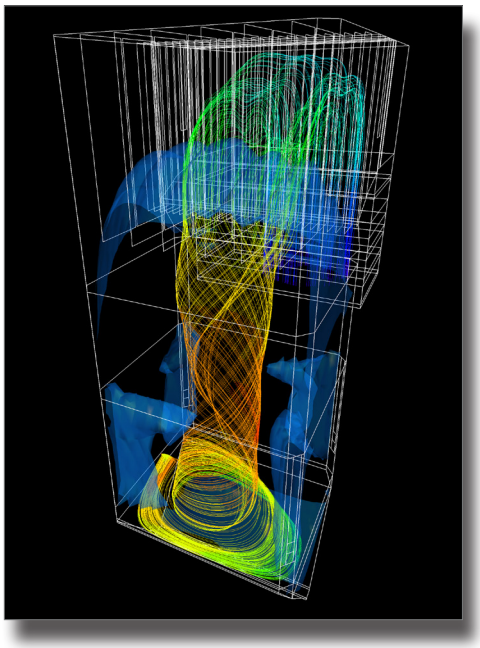
Process Combustion Units

- Cement Kilns
- Glass Furnaces
- Ethylene Furnaces
- Calciners
- Coke Ovens
- Lime Kilns

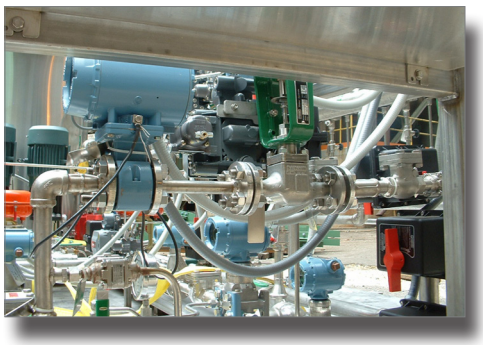
Fuels:

- Coal
- Lignite
- Oil
- Gas
- Sludge
- Wood
- Biomass
- Refinery/CO Gas

Each application has a customized design and injection strategy to maximize NO_X reduction



CFD Models of NO_XOUT® and HERT™ SNCR systems determine injector locations to maximize coverage resulting in optimal NO_X reduction.



Independent Zone Metering Module

Chemical injectors developed by Fuel Tech facilitate the reagent distribution. The NO_XOUT® injection system utilizes air-atomized injectors which direct the urea solution into the combustion gas path. The droplet size distribution and spray coverage promote efficient contact between the chemical and the NO_X in the flue gas.

The HERT™ injection system utilizes mechanical atomizers which carry the urea into the furnace using a high energy air stream. Fuel Tech evaluates both for each specific application and offers the best solution to meet our customer's needs.

Fuel Tech's SNCR systems provide effective boiler load following capabilities to maximize overall NO_X reduction.

Through computer modeling and proven field experience, an injection strategy is developed that makes use of multilevel injection, control of reagent concentration, droplet size and spray patterns, as well as jet penetration.

NO_xOUT® and HERT™ systems are applicable on various types of units firing many different fuels, which has been verified by years of field-testing. Since SNCR is a post-combustion process, unit size, boiler type and fuel type can be accommodated in the customized process design.

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