Reinhold Environmental Ltd.

2007 NOx Round Table & Expo Presentation

February 5-6, 2007 in Cincinnati, OH

Babcock Power Inc.

2007 Reinhold NOx Round Table

One Source *Many Solutions* *One Purpose*

Panel on the Effects of Fuel & Combustion Practices on SCR/SNCR Operation

Robert A. Lisauskas

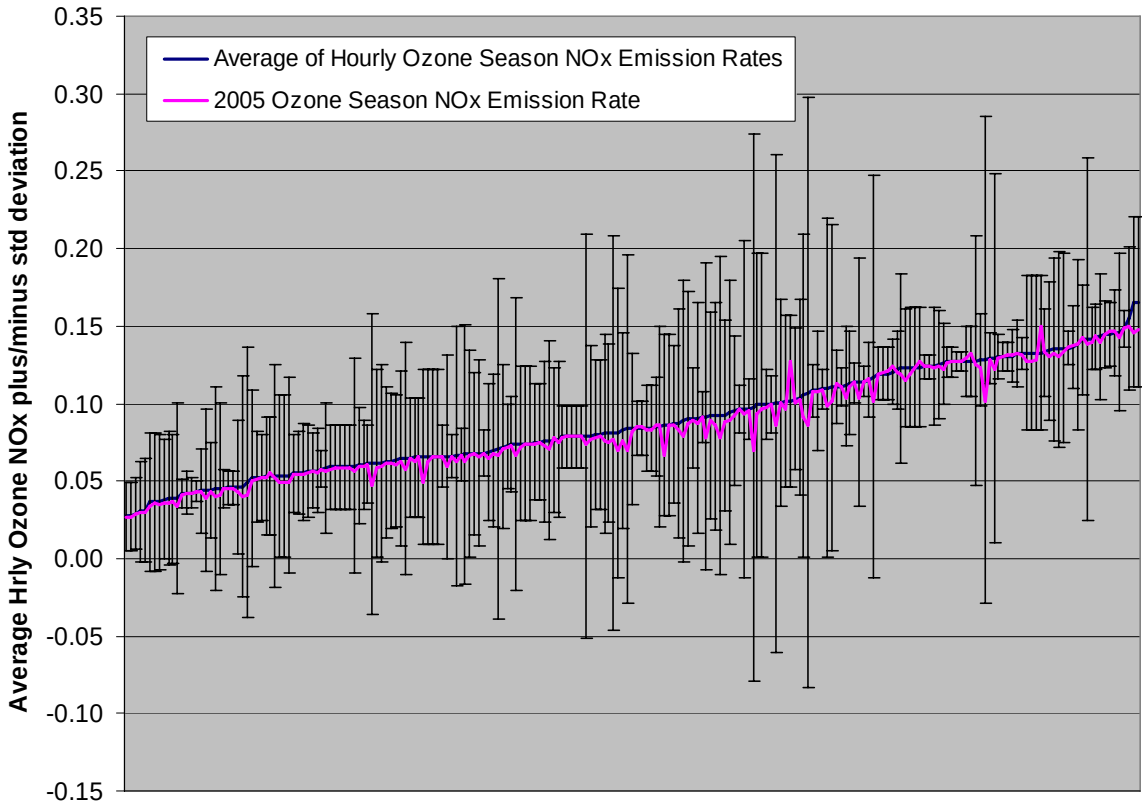
CURC/EPRI Roadmap 2006

Existing Plants Roadmap Performance Targets

Innovations for Existing Plants	2005	2010	2015
Emissions			
SO_2, % removal (emissions, lb SO_2 /MM Btu)	90-95 (0.22 - 0.04)	98 (0.09 – 0.009)	99 (0.04 - .01)
NOx, lb/MM Btu (SCR equipped)	0.04 - 0.08	0.02 - 0.04	0.01 - 0.02
NOx, lb/MM Btu (comb. cntls.)	0.1 - 0.3	0.06 - 0.1	<0.05 - 0.1
Hg removal, %	co-benefits 30 - 90%	65 - 90	80 - 95
PM emissions, lb/MM Btu	0.03 - 0.1	0.01 - 0.02	0.01
SO_3 emissions, ppmv	50 - </=2	10 - </=2	</=2
CO_2 Capture	See advanced technology roadmap for CO_2 capture goals		
Heat-rate improvement, Btu/kWh (HHV)	baseline	baseline	baseline
Fresh water use, % reduction	baseline	5 - 10	25
By-product Utilization, %	39	50	75
Total R&D and Demonstration costs, $ Million		580	580

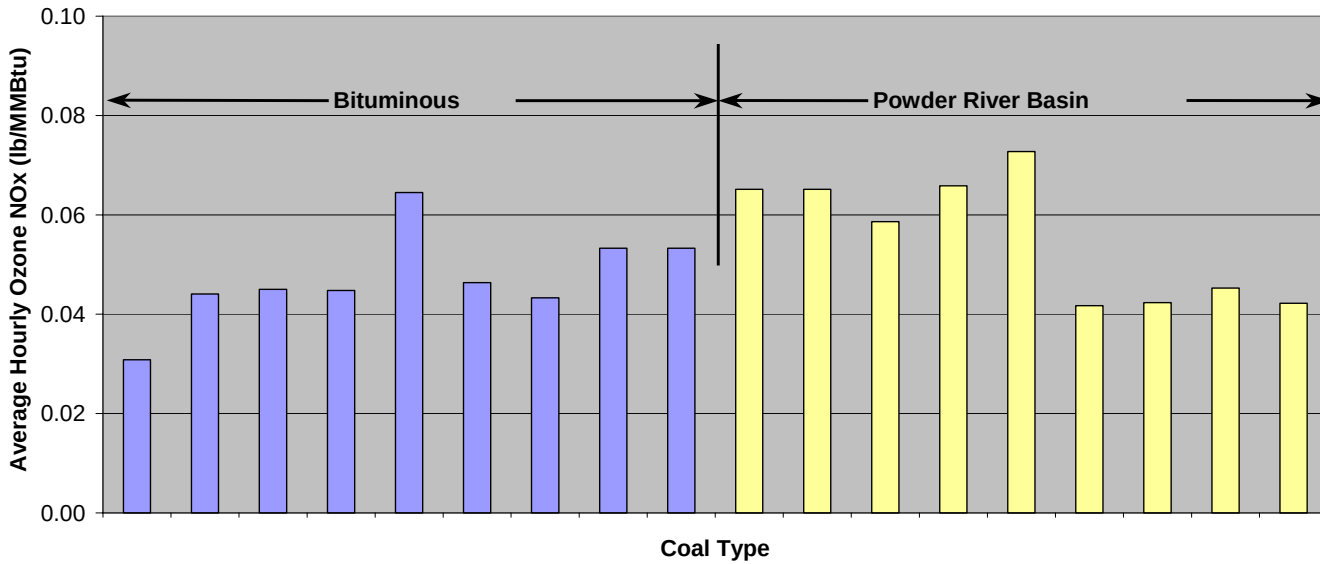
Note that the targets are dependent on the coal type being used and that the data represent targets for both bituminous and sub bituminous coals

Average Hourly Ozone Season NOx
2005



Erickson and Staudt, 2006 Mega Symposium

Average Hourly NOx Bituminous vs PRB
2005 Ozone Season



Erickson and Staudt, 2006 Mega Symposium

Fuel Types

- Bituminous
  - Fine ash
  - Arsenic
  - SO_3
- Sub-bituminous
  - Fine ash
  - Calcium
  - Staged Combustion
- Lignite
  - Ash content
  - Silica/Erosion
  - Alkali: (eg, Sodium)

Honeycomb Catalyst

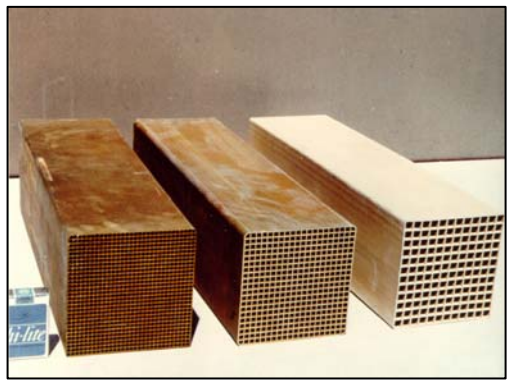
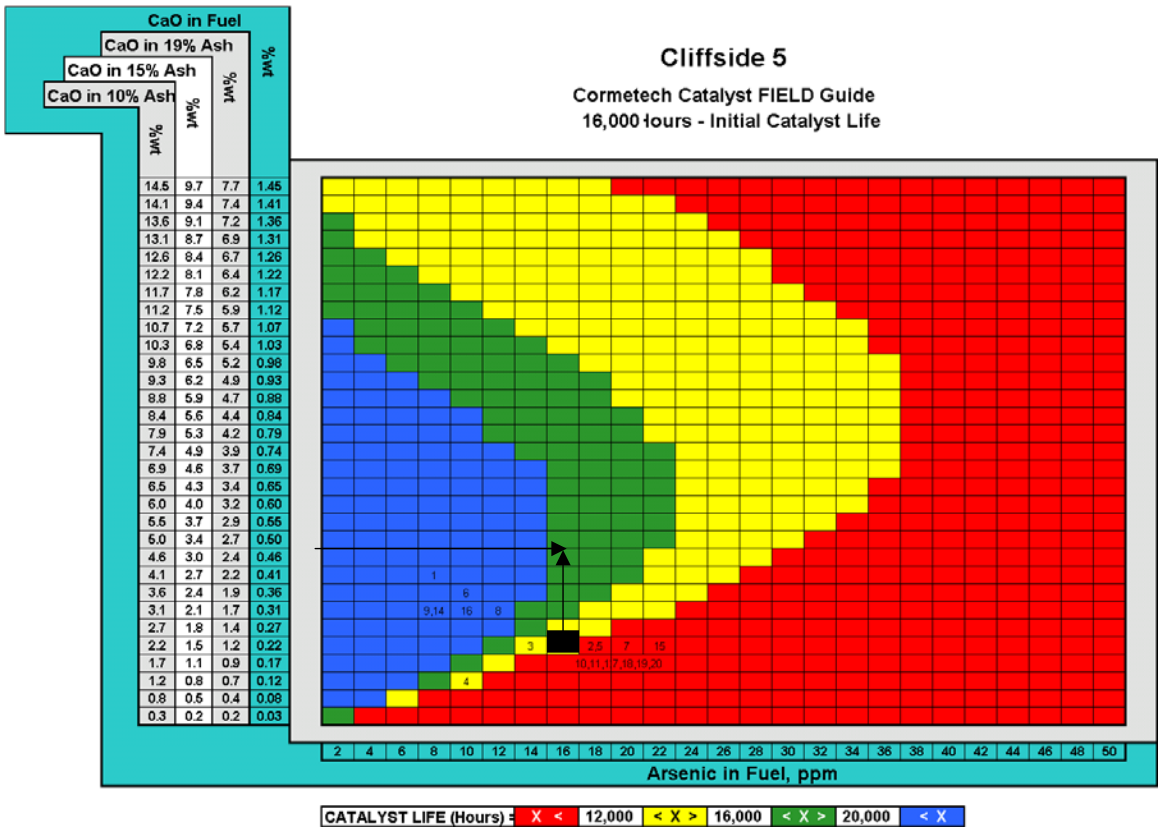


Plate Catalyst

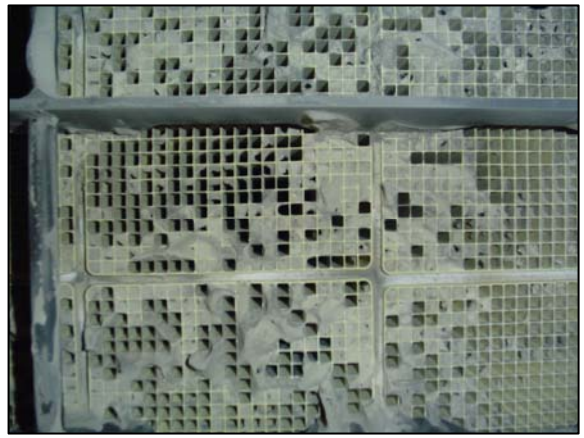
Arsenic/Calcium



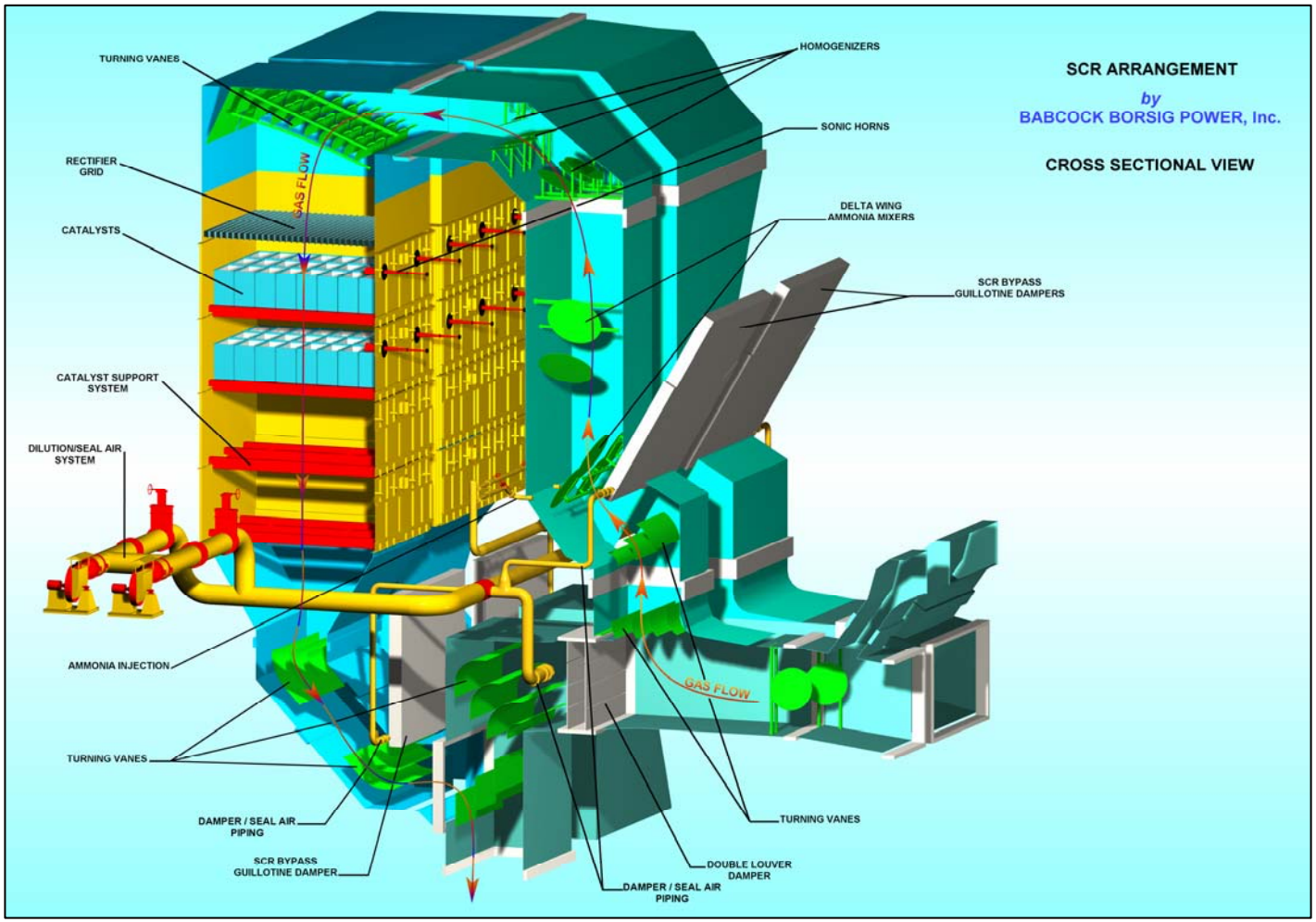
Medeiros et al, 2003 Mega Symposium

Large Particle Ash

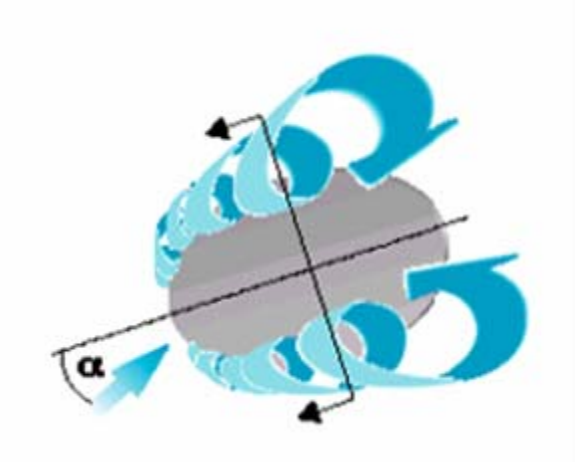
- Size > 4 mm
- Density 0.6 to 1.3 g/cm^3
- Sphericity 0.35 to 0.99
- Coeff. Of Restitution 0.15 to 0.44

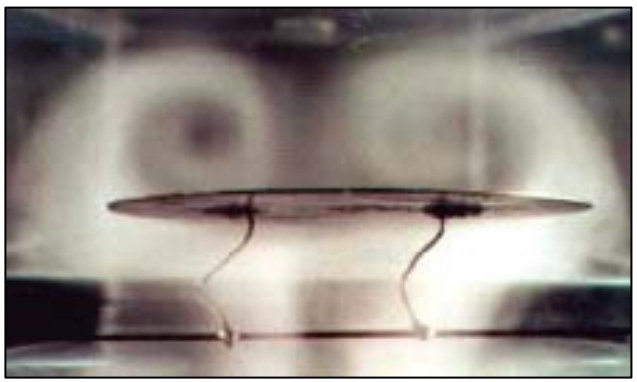


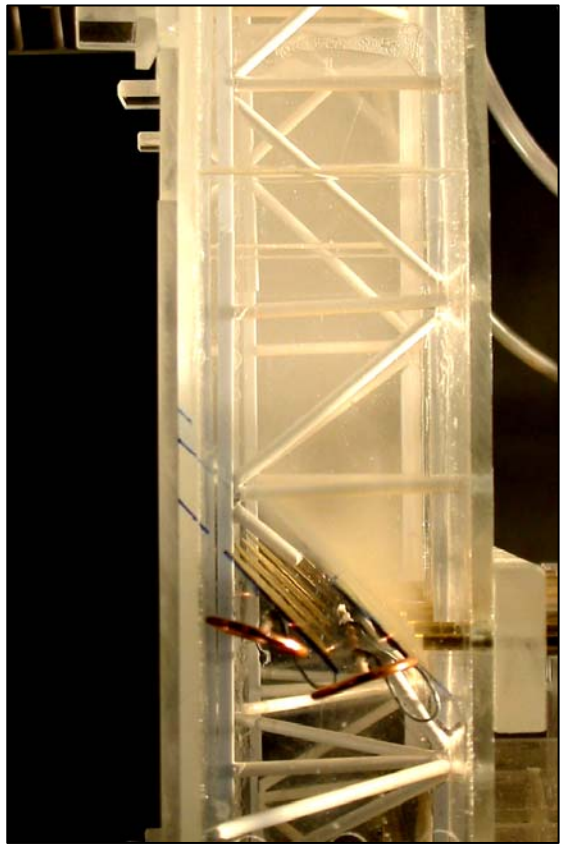
SCR Reactor



Delta Wing®
Static Gas Mixer

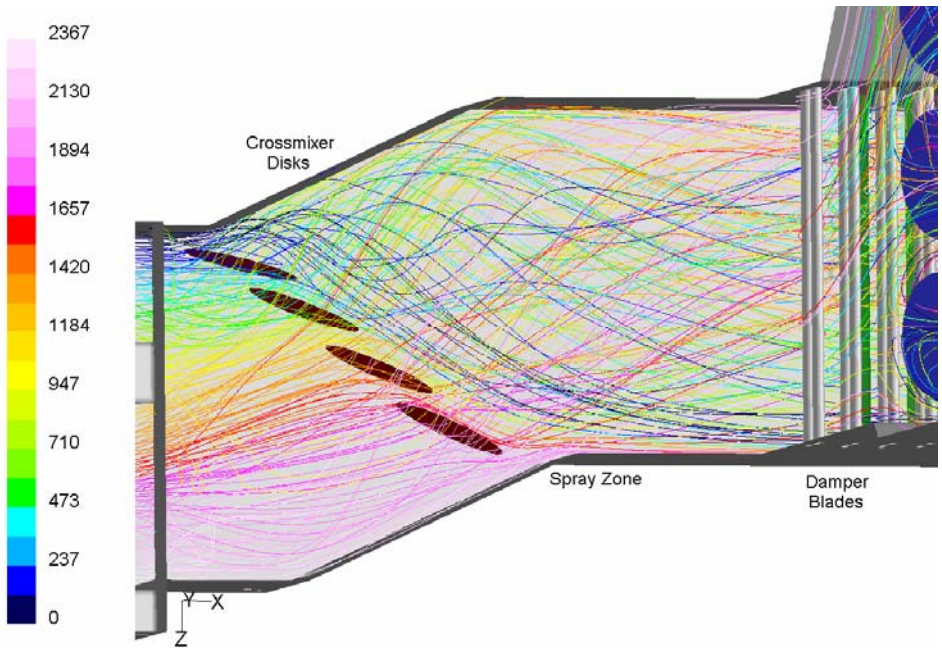


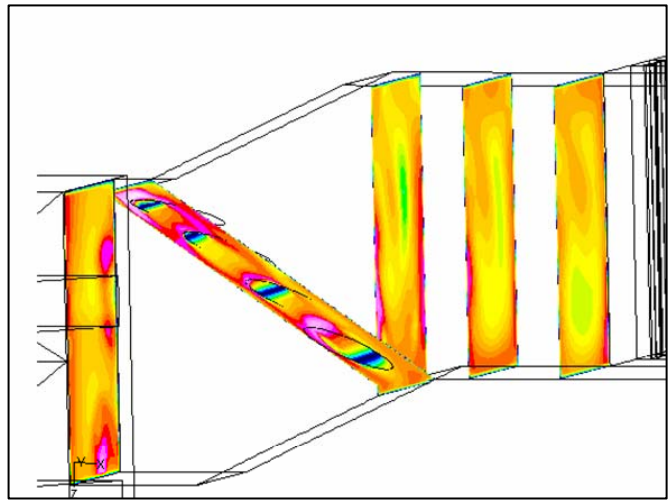


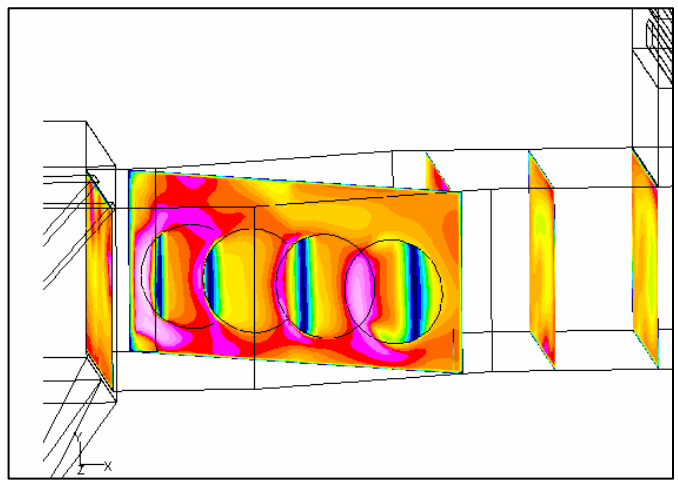


Achieving Uniform SCR Inlet Conditions

Cross Mixing Flow







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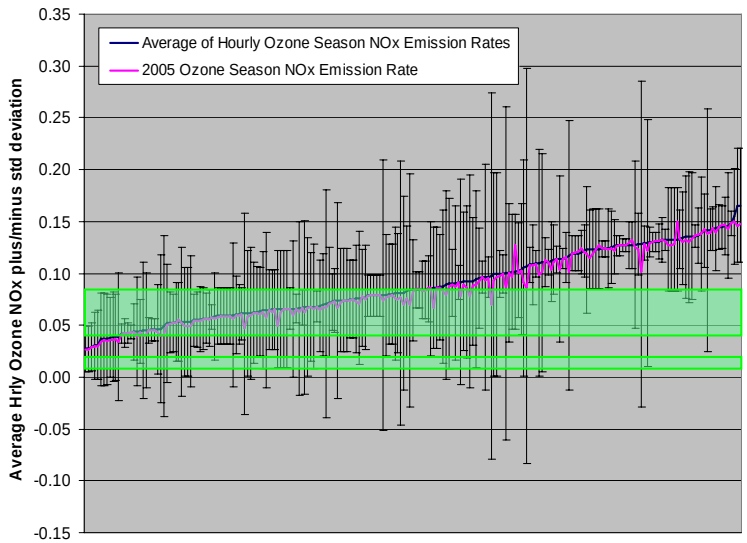
Achieving the Next Level of NOx Control



Future NOx control may involve many layers.

- Combustion controls
- In-furnace reagents
- Selective Catalytic Reduction