REINHOLD ENVIRONMENTAL Ltd.

2011 NOx-Combustion Round Table & Expo Presentation

February 7-8, 2011, in Birmingham, AL / Hosted by Southern Company

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NOx Monitoring for SCR Optimization

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American Electric Power

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SCR PERFORMANCE OPTIMIZATION

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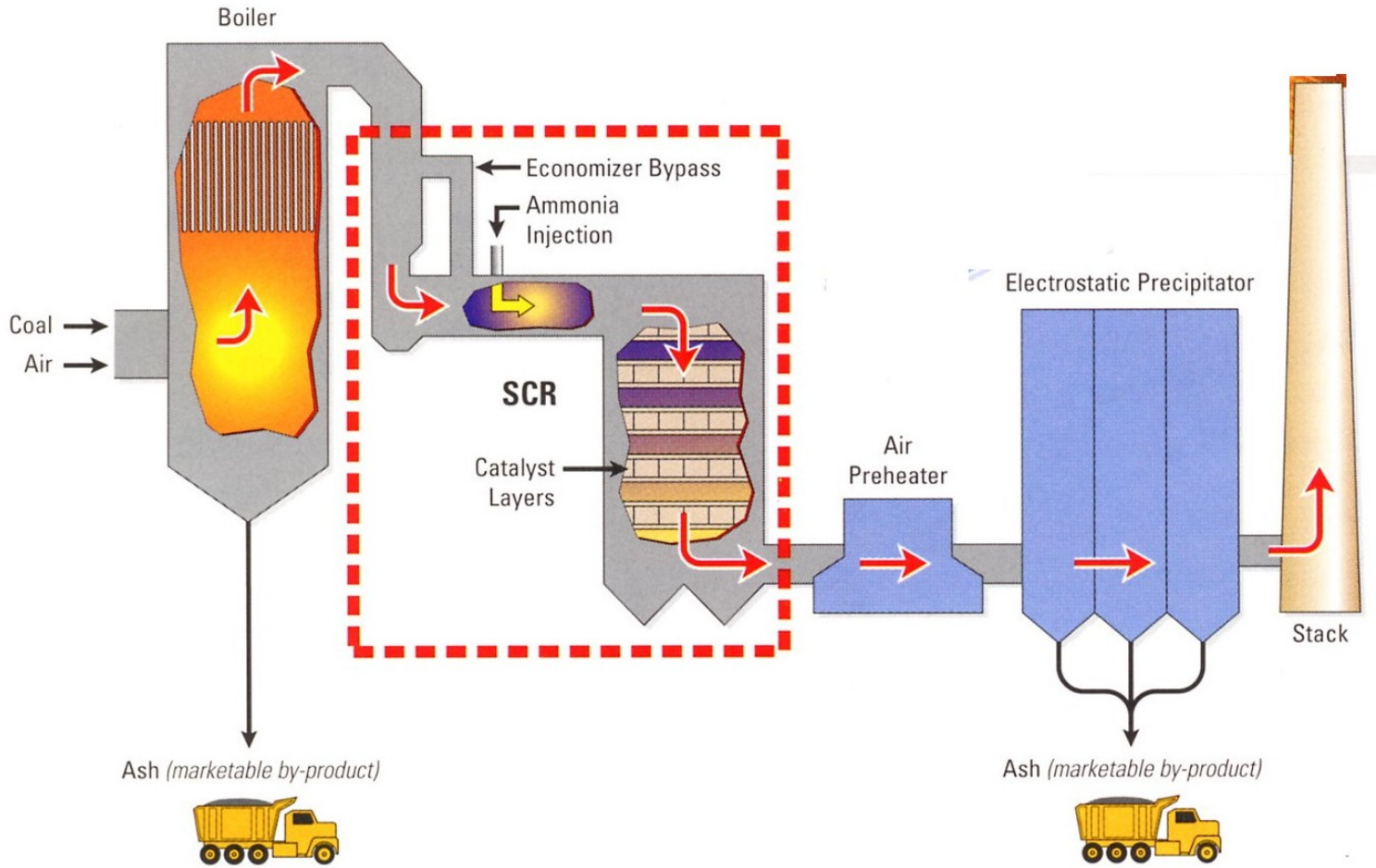

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SCR PERFORMANCE OPTIMIZATION

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- How does AEP operate their SCRs?
- What are the main criteria we use for best operating performance?
- Accurate NOx numbers?
- Minimal response time?

- How does the speed of response help with SCR operation?
- Better control for transient conditions?
- Alert to malfunction of injection system?

- How are you obtaining this information for control and optimization?
- Continuous monitoring with traditional dilution NOx monitoring?
- Periodic testing with portable/test trailer?

TESTING OF AN INSITU CHEMILUMINESCENSE NOx PROBE

- How as the probe performed in comparison to existing unit?

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SCR PERFORMANCE OPTIMIZATION

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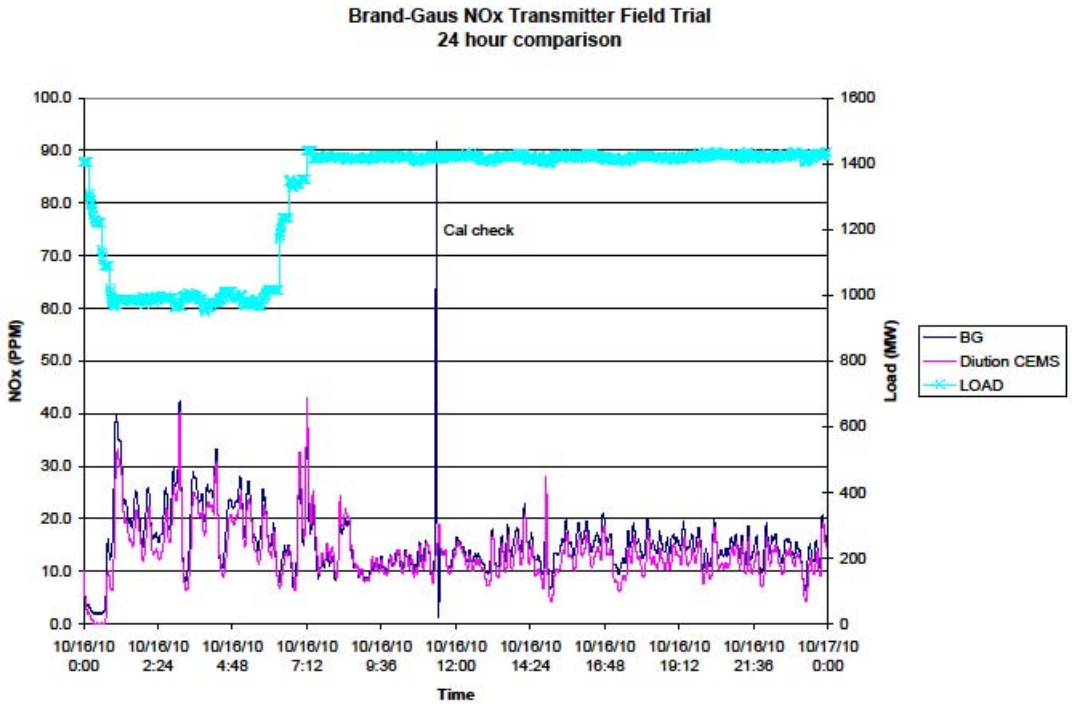

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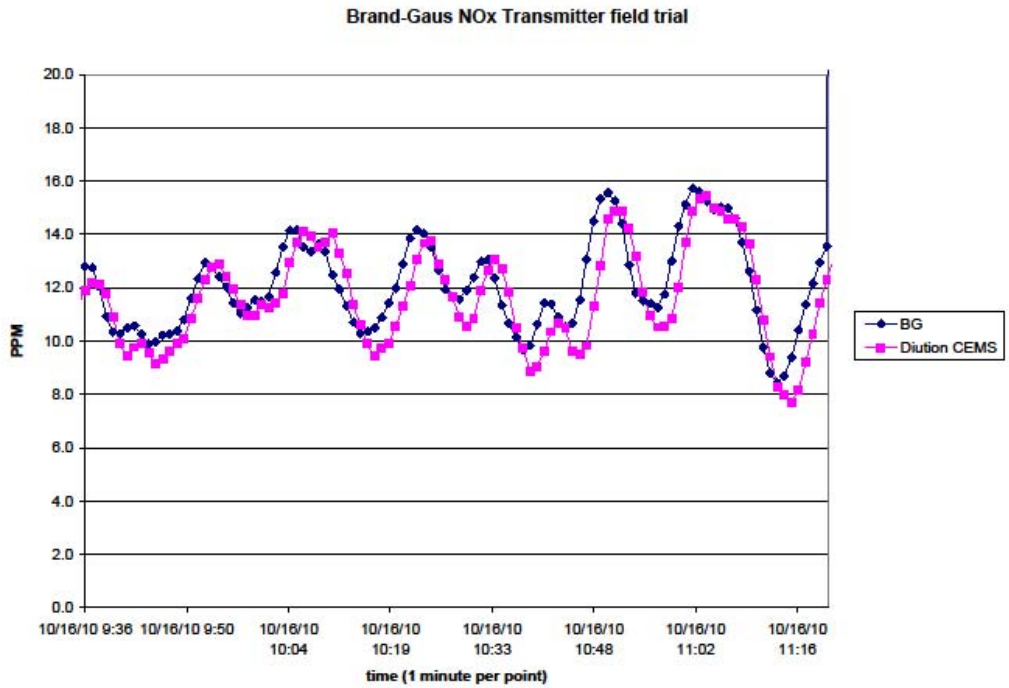

Probe install: 13th October 2010, approximately 1/2day work.

ISSUES/SOLUTIONS

- Reading drift due to changes in duct pressure. (analyzer compensated to ambient conditions)
- Changes to sensor pressure compensation referenced to duct pressure. Problem solved .
- Zero error due to ambient temperature fluctuations
- Improvement to temperature control of Detector removed zero drift.

ISSUES/SOLUTIONS

- Calibration setup required fine tuning for flow and pressure.
- Calibration gas flow path changed solved calibration error.
- Filter design change improved response time to better than 30 seconds

TEST PERIOD:

- System ran untouched with daily calibration, within 1ppm of dilution system and a faster response by 90 seconds.
- No maintenance applied, to determine what other possible deficiencies would affect long term operation without maintenance.
- System ran for over 2 months until middle of December when cold weather forced a pluggage in the analyzer head, due to condensation.

RESULT:

- Probe removed cleaned and had heater installed for cold ambient conditions to avoid condensation in head.
- 3 Man Hrs install, system up and running and tracking within 1ppm of dilution system.
- New probes now have NH3 scrubber installed.

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SCR NOx- Monitor

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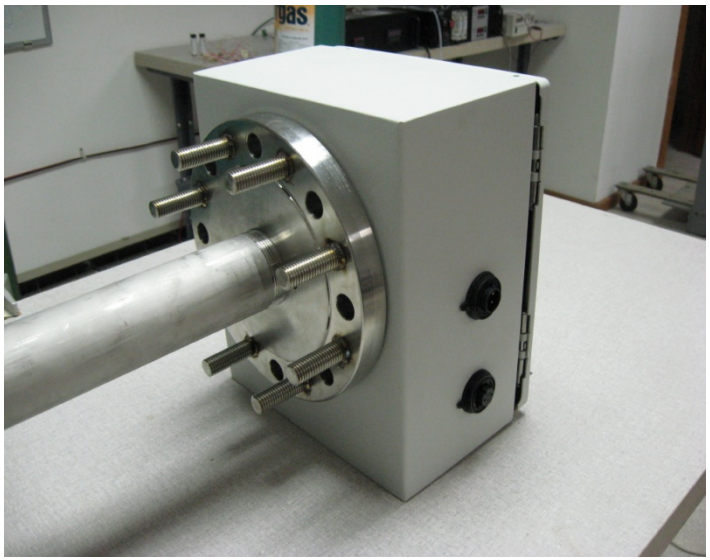

Insitu Duct/ Stack Mount Analyzer

Design Criteria:

- Conventional proven Dilution technology
- EPA approved detection method
- Comparable with testing methodology
- Compliance Accuracy with Long Term Stability
- Low Drift and Low Maintenance

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SCR NOx- Monitor

- **Chemiluminescense:**
- Is recognized world wide as best NOx measurement technique
- Sensitivity: **ppb** easily measureable

- **Dilution:**
- Well proven and accepted in EPA applications
- Best technique for particulate laden flue gas applications.

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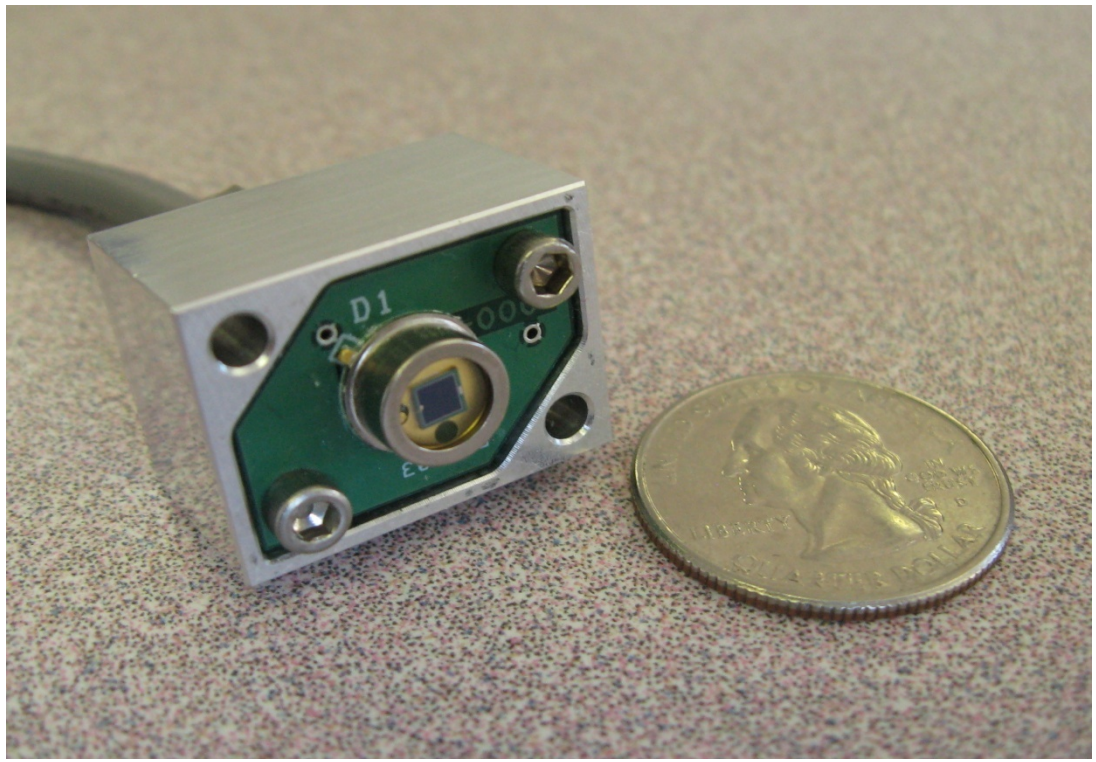
SCR NOx- Monitor

Insitu Chemiluminescence Measurement



High performance solid-state detector to Ultra-small size in a rugged Insitu Probe

Advantages of Photodiodes for Chemiluminescence NOx detection:

- Dramatically smaller
- Can be close-coupled to reaction, no optics other than a window needed
- Eliminates high voltage power supply
- Eliminates need for large TE coolers and drivers

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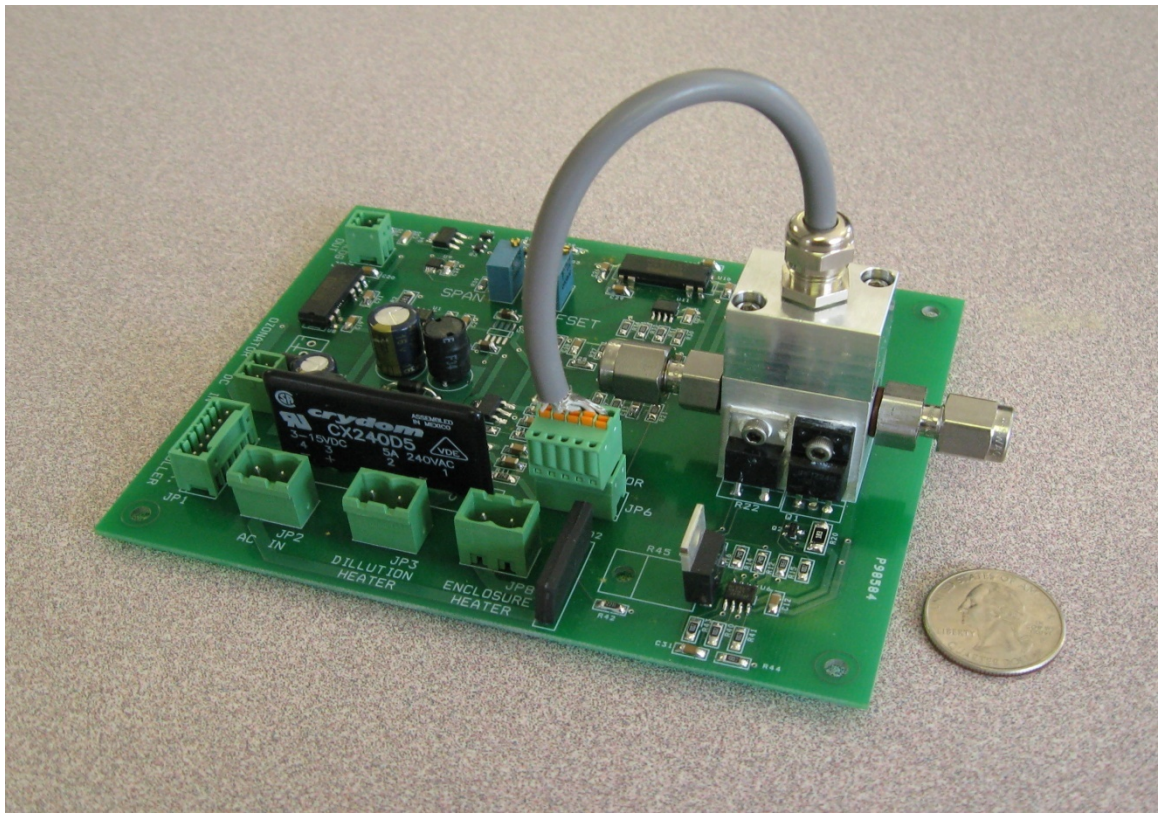
SCR NOx- Monitor

High performance electronics



Good for high vibration & high temperature applications.

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SCR NOx- Monitor

BENEFIT:

- High Temperature Operation
- (flue gas – 850F) (Ambient, -20 - + 140F)

- Minimal Zero Drift (weekly calibration)

- High Accuracy at Low Detection Levels

In Stack Dilution block/probe design

- Heated to ~350 C to avoid condensation of acid gases before dilution, also provides orifice temperature control
- Heated dual-stage filtration and low flow avoids pluggage.
- Robust NO2 converter (for gas fired applications)

In Stack Dilution block/probe design

- Highly integrated pneumatics combines analyzer and low flow / low dilution probe into a single instrument.
- Simple interface (4” ANSI flange), power (120V) and clean dry instrument air.
- Minimal number of parts and interconnects

ADVANTAGES:

- Low Flow – Low Dilution sample technology, 10:1
- No Sample Conditioning
- Fast Response < 30 seconds to 90% step change
- Low Maintenance, low installation cost

OPTIONS AVAILABLE;

- Ammonia Scrubber for Post SCR Applications
- NO2 Converter (total NOx)
- Controller - Local NEMA 4 or Remote 19” Rack
- S.S. or Hasteloy Probe body