

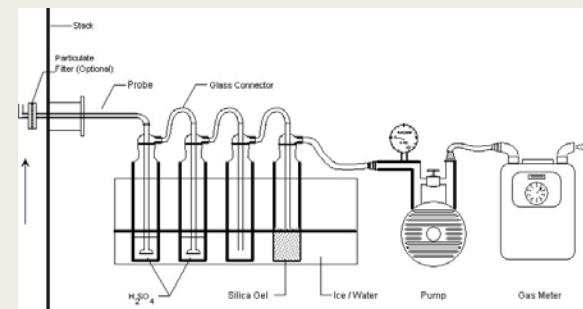
Advances and New Direction in Ammonia Slip Monitoring

**Cemtek KVB-Enertec CEMS Conference
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Ammonia Slip from Stationary Sources

- **Ammonia Slip from Ammonia/Urea Use in SCRs to Control NO_x Emissions**
- **SCAQMD NH₃ Slip Limits in Existing and Proposed Rules**
 - BACT NH₃ Slip Limits
 - ✓ 5 ppm @ 15% O₂ for Gas Turbines (Simple Cycle and Combined Cycle)
 - ✓ 5 ppm @ 3% O₂ for Boilers and Heaters
- **Compliance Determination by SCAQMD Method 207.1**
 - Initially Quarterly Testing, then Annual Schedule after Consistent Compliance Demonstration
- **Many SCAQMD Permits Require NH₃ Slip Determination**
 - Differential NO_x Measurement
 - Equations Calculate NH₃ Slip
 - Information but not for Compliance



Ammonia Slip Calculation Procedure

- **Inlet and Outlet SCR NO_x Measurements**
- **Ammonia Injection Rate**
- **Dry Exhaust Gas Flow Rate**
- **Determine NH₃ Slip by Calculation Procedure**



Gas Turbine Ammonia Slip

- **Large Difference Between Measured NH₃ vs. Calculated NH₃ Slip**
- **Currently Not Used by SCAQMD for Compliance Purposes**

Parameters	Values ^{***}
Gaseous Emissions (Inlet):	
NO _x inlet, ppm volume dry	N/A
Gaseous Emissions (Outlet):	
NO _x outlet, ppm volume dry	3.58
Measured NH₃ slip, ppm volume dry @ 15% O₂ *	2.70
Calculated NH₃ slip, ppm volume dry @ 15% O₂ **	2.01
Difference between measured and calculated NH₃ slip	26%

* Using SCAQMD Method 207.1

** NH₃ slip calculated from NO_x CEMS measurement difference of (1) stack gas NO_x and (2) stack gas NO_x and NH₃ slip converted to NO_x

*** Average of 2 runs

Gas Turbine Ammonia Slip

- **Large Difference Between Measured NH₃ vs. Calculated NH₃ Slip**
- **Currently Not Used by SCAQMD for Compliance Purposes**

Parameters	Values ***
Gaseous Emissions (Inlet):	
NO _x inlet, ppm volume dry	32.2
Gaseous Emissions (Outlet):	
NO _x outlet, ppm volume dry	2.55
Measured NH₃ slip, ppm volume dry @ 15% O₂ *	2.73
Calculated NH₃ slip, ppm volume dry @ 15% O₂ **	3.59
Difference between measured and calculated NH₃ slip	32%

* Using BAAQMD Method ST1B

** NH₃ slip calculated from NO_x CEMS measurement difference of (1) SCR inlet NO_x and (2) stack gas NO_x

*** Average of 3 runs

Ammonia Slip Measurement

- **NH₃ is a PM_{2.5} Pre-cursor**
 - Reducing NH₃ Slip Reduces PM_{2.5}
 - SCAQMD Non-attainment for PM_{2.5}
- **SCAQMD Rule 1325**
 - PM_{2.5} NSR May be Triggered for NH₃ Emissions >40 tpy
- **Continuous and Accurate Measurement of NH₃ Slip = Better Control of NO_x Emissions and NH₃/Urea Injection Rate**
- **Optimization of NH₃ Injection Rate**
 - Potential Reduction in NH₃/Urea Usage and Cost Savings
 - Monitor SCR Catalyst Performance

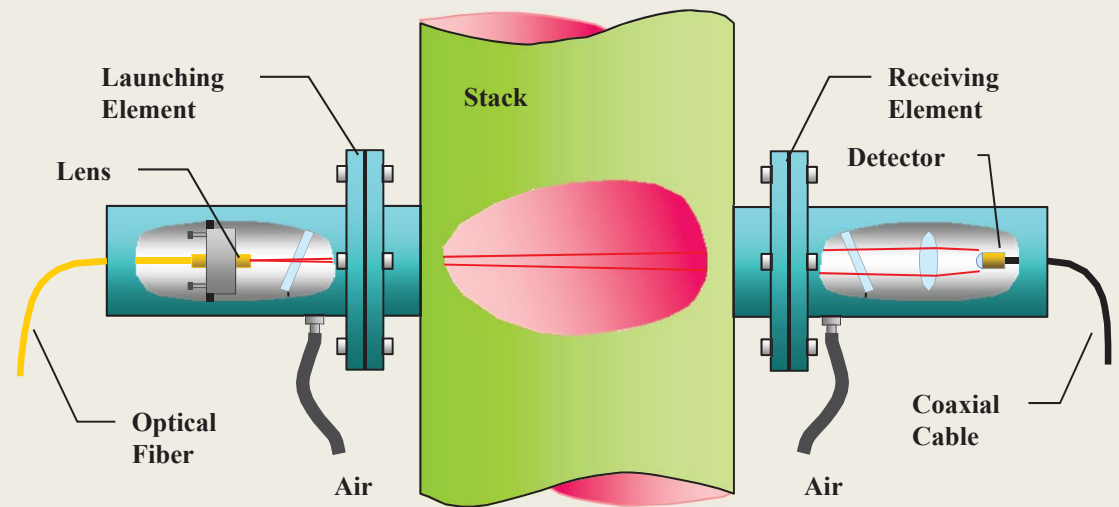
Ammonia CEMS

- **Calculation Method not Accurate to Determine Compliance with NH₃ Slip Limits**
 - Quarterly/Annual Source Testing not Adequate to Determine Ongoing Compliance
- **Continuous and Real Time Monitoring is Desirable**
 - NH₃ CEMS Provides Accurate Ongoing Compliance Determination with NH₃ Slip Limits



Ammonia CEMS Technologies

- **Tunable Diode Laser (TDL)**
 - Some Facilities in South Coast Air Basin are Currently Using TDL NH₃ CEMS
- **Fourier Transform Infrared (FTIR)**
- **Most In-Situ Systems**



Ammonia CEMS Certification Procedure

- **Use CEMS for Compliance/Enforcement**
 - Discussed with CARB, CEC, BAAQMD, TCEQ, EPA
 - TCEQ is using EPA PPS-001
- **SCAQMD Proposed Plan for CEMS Certification**
 - Use EPA PPS-001
 - ✓ Certification
 - ✓ Ongoing CEMS QA/QC
 - SCAQMD Method 207.1 as Reference Method for CEMS Certification

Ammonia CEMS Certification Procedure (continued)

- **Conduct Demonstration Project**
 - Certification and Ongoing CEMS QA/QC per EPA PPS-001
 - ✓ RATA, Daily Calibration Tests
 - ✓ CEMS Performance Stability Tests
 - SCAQMD Method 207.1 as Reference Method
 - Working with CEC, BAAQMD, CARB

Conclusion

- **Benefits to Air Quality**
 - Monitor Ongoing NH₃ Slip Compliance
 - ✓ Specially with Lower NO_x Limits in Proposed Rules
 - Reduce PM_{2.5} Emissions
 - Better Estimate of PM_{2.5} Emissions for SCAQMD Planning and Emissions Inventory Purposes
 - Helps Towards Clean Air Goals for South Coast Air Basin
- **Benefits to Industry**
 - Better Control of NO_x Emissions During Startup and Normal Operation
 - Controlled/Reduced NH₃/Urea Injection Rate
 - Monitor SCR Catalyst Performance and Predict SCR Useful Life
 - Excess NH₃ Slip May Reduce Potential Corrosion Problems Downstream of SCR
 - Monitor Combustion Equipment Performance

Lastly....

**Looking for Host Site to Conduct
Ammonia CEMS Demonstration Project**

Questions & Comments?

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South Coast Air Quality Management District