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ORD Methods Development Support to OAQPS: HCl CEMS Pilot-Plant Testing

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National Risk Management Research Laboratory.

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Background

- OAQPS is developing a new Performance Specification (PS-18) for HCl CEMS to support emissions monitoring in the Portland Cement MACT and Electric Utility MATS rules
- Data regarding CEMs measurement performance and quality to inform decision making is a component of the development process
- ORD is conducting research to support data needs
- Independent, industry-driven research/demonstration testing is also taking place

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Many Things to Consider …

- HCl emissions monitoring is a new requirement with its own challenges
- Multiple technologies are available with many fundamental differences and technical issues
- Movement towards a performance based Performance Specification that is inclusive of these technologies
- Low level regulatory emission limits present technical challenges
  - HCl CEMS
  - Reference Methods (RMs)
- Quality and availability of Reference Gas Standards

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EPA Research and Support Objectives

- Establish data supporting finalization of PS
- Evaluate commercial HCl CEMS (extractive only) as per Draft PS under controlled and representative emission environments
  - Stack gas composition
  - HCl emission levels
- Demonstrate suitability of candidate RMs
- Demonstrate status and quality of available Gas Standards
- Provide environment for vendors to optimize their CEMS

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Participating HCl CEMS

- 4 Commercially-available, extractive technologies in Test Program
  - 2 Gas Filter Correlation (GFC)
  - 1 FTIR
  - 1 Cavity Ring-Down (CRD)
  - No TDLAS cross stack (open path) system
- Span ranges:
  - 0-5 ppm
  - 0-10 ppm
  - Over span measurement capabilities (≤100 ppm)

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PS-18 Elements and ORD Testing Focus

- **Interference Tests**
- **Limit of Detection (LOD) Tests**
- 7-Day Drift
- Linearity
- RATAs
- **Dynamic Spiking**

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Test Facility

- ORD's Multi-Pollutant Combustion Research Facility
  - 4M Btu/h down-fired combustor firing coal and/or NG
  - Multiple pollution control configurations possible
    - SCR,ESP,FF,Wet Scrubber
  - Duct injection of gases to control emission profiles and combinations
    - HCl, SO_2, NO_x, CH_4, CO, NH_3, H_2O, CH_2O
  - All CEMS and RM measurements from same basic location

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Reference Methods

- Method 26A
- Methods 320/321
  (ASTM D6348-12 too)

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RM FTIRs

- Looking at 3 different high resolution FTIR analyzers
- Focus on DLs, measurement quality and RM performance at very low HCl levels
- Point of reference for HCl Gas Standards

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Gas Standards

- Gas Standards are needed as part of PS and on-going Quality Assurance operations
- Conventional compressed gases (dry), evaporative (wet), and humidification of dry gases being considered
- NIST traceable gas standards do not yet exist (but are in the works)
- Reference Gas quality at low concentrations and practicality a focus of our efforts

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Status

- Still in early stages of testing due to extended facility maintenance
- All HCl CEMSs and RM FTIRs installed
  - Vendors are returning for final optimization
- Testing to date has focused on:
  - FTIR RM measurement capabilities and performance
  - Evaluating HCl Gas Standards
  - Preliminary interference tests
- Testing to resume in early February ‘13

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What We've Learned So Far …

- FTIR analyzers optimized for low level HCl RM measurements
  - Spectral interferences
  - Excellent measurement sensitivity
  - Successful dynamic spiking
- FTIR sensitivity and performance suitable for associated regulatory applications

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What We've Learned So Far …

- Interferences are an important consideration
  - Spectral and chemical

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What We've Learned So Far …

- Industry-sponsored RATA testing indicates that multiple HCl CEMS technologies are accurate at concentrations above and below associated regulatory limit
- The cross-stack (open path) TDL technology is appealing to industry and is a technology that EPA needs to learn more about

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What We've Learned So Far …

- HCl Gas Standards will be a challenge
  - How to rapidly mature the compressed gases?
  - Dry gases have transport concerns
  - Practicality of the wet, evaporative systems

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Questions ...