Updates

PS-11 (PM CEMS),
Multi-metals CEMS,
Multi-metals Fence Line Monitoring, &
CEMS Cost Model
Status of PS – 11 for PM CEMS

• Promulgated January 12, 2004
  – PS-11 (initial correlation)
  – Procedure 2 (ongoing QA/QC)
  – Corrections final November ‘06
• Guidance development
  – Spreadsheets, statistical tools, problem troubleshooting
  – Final November ‘06
Applicability of PM CEMS

- Work in any stack where filterable PM stack test (Method 17, Method 5, Method 5B or Method 5i) is used for compliance
- Work in wet or dry stacks
- Some technologies work only in dry stacks and others work in both
Correlation Testing Requirements

- Calibration gases not feasible
- PM CEMS responses are correlated to reference method for PM concentration using regression analysis
- Minimum of 15 test runs simultaneous with PM CEMS responses
  - Low, medium, high levels
Correlation & RCA Test Trendlines

RCA: \( y = 5.674x + 12.177 \)

Correlation: \( y = 5.798x + 10.943 \)
Operational PM CEMS

- Electric utilities (coal)
  - Approximately 8 units
    * wet stacks and dry stacks
    * 4 to 5 have passed audit tests showing stability of correlations
- Pulp mill recovery boiler (spent liquor)
  - 3 years of data
- 2 solid/liquid incinerators
  - 2 years of data for one
- 15 recent coal-fired utility permits require PM CEMS
PM CEMS Costs

- First costs $120K (expected to go down 15% next year)
  - Includes correlation testing and installation
- Annual costs $40K
- SO\(_2\) CEMS costs for comparison
  - First costs $134K
  - Annual costs $30K
- COMS costs for comparison
  - First costs $64K
  - Annual costs $13K
- Adjusted PM CEMS costs for elimination of COMS
  - First costs $120K - $64K = $56K
  - Annual costs $40K - $13K = $27K
Regulatory Options

• Require PM CEMS
  – Deviation regulatory language similar to industrial boiler MACT
    • “Deviation not always a violation”
  – Or, allow units to have a grace period prior to PM CEMS data becoming enforceable
• Make an option, but not require, PM CEMS for units as a replacement for COMS
Future PM CEMS Work

• PM 2.5 PM CEMS Development
  – Dilution technology
  – Sharp cut cyclones
  – Beta Gauge for back end gravimetrics
  – Baldwin Environmental and Desert Research
  – Hope to go to field in ‘08
Eli Lilly Petitioned EPA for Alternative monitoring for their Haz Waste Incinerator in Lafayette, Indiana.

Metals, particulate matter (PM), and HCl/Cl Continuous Monitoring in place of parameters (scrubber flow rates, temperatures, etc.).
Concept to Proof

- Eli Lilly hired Cooper Environmental
- Met with us and OSWER
- Program designed together
- M-301 testing in the lab to prove quantitative aerosol generator (QAG)
- M-301 testing in the field to prove the multimetals CEMS with the QAG
- Multimetals CEMS called X-ACT
  - Non-destructive X-ray Fluorescence analysis (XRF)
Draft Methods from Program

• Multimetals CEMS Performance Specification
• Multimetals filter method
• Multimetals quantitative aerosol generation method
• HCL low level performance specification
Multimetal Fence Line Monitoring

Real-Time Ambient Metals Emissions Apportionment?
Fugitive Emissions Can Dominate Local Impacts –

Not all stacks are created equal.

Blast Furnace Upset

Doctors Clinic

Stack/Ducted Emissions

School
Can it be modified for a fence line monitor application?
Concentration Range of Interest

mg/m$^3$  µg/m$^3$  ng/m$^3$  pg/m$^3$

Xact-CEMS
Xact-IAP
XFM
Xact-FLM
Fence Line

Xact-ATM
Air Toxics

QAG Validation
Why Multi-Metals FLM?

**Metals**
- Eight of EPA’s 33 highest concern pollutants
- High local concentrations
- Persistent
- Under reported

**Fugitive/Area/Low Emissions**
- Can dominate local exposure
- Infrequent/difficult measurements
- High uncertainty

**Stack Emissions**
- Uncertain, but MM-CEMS available
Why Short Term averaging?

- Protect Health
- Accurate emissions assessment
- Minimize emissions before they become problem
Xact-CEMS to FLM Transition

CEMS to FLM Modifications
- Inlet
- Tape
- Flow

Firmware
- Time

Control Module
- Flow Module
- Tape Drive & XRF Modules
- Control Module
XACT-FLM SAMPLING AND ANALYSIS

- X-Ray Tube
- Aerosol Deposit
- Sample Flow
- Analysis Area
- Filter Tape
WS, WD and MMs Can Provide Accurate Emissions Apportionment
Multiple Species Contribute to Accurate Apportionment

Portland, OR CAMS - January 27, 1978

Traffic Sources (road dust, tail pipe)

Industrial Source (ferromanganese)

12 am - 4 am
4 am - 8 am
8 am - 12 pm

Multiple Species Contribute to Accurate Apportionment
Pseudo-deterministic Receptor Model (PDRM)

Urban Arsenic – Sydney, FL

Ondov, U of MD 2005
This Technology Provides a Tool to:

- Assess and protect health
- Effectively enforce compliance
- Effectively reduce emissions

- Near real time response would allow emissions minimization before becoming a problem -
Other Potential Applications

• Air quality and emissions assessment
• Strategy development and regulation setting
• Compliance assurance and enforcement
• Emergency response, clean up and solid waste management
Possible Discussion Topics

• Regulatory options?
• How do these options impact measurements?
  – Monitor location and number
  – Reporting times
• Where to monitor – fence line or local community?
• How close to fence line to be a “fence line monitor”?
• Modeling approach
Where do we go from here?
Dispersion Model
\[ M_j = D_j E_j \]

Receptor Model
\[ M_i = \sum F_{ij} M_j \]

Most Probable Actual Impact
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<tr>
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<td>Sb</td>
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**Range of Interest: 0.01 to 1,000 µg/m³**

*95% confidence, interference free

**60 minute sampling and analysis, 40 lpm/cm²
Comparison of Emission Estimating Models

Measured Impact
- Periodic Stack Measurements
- PI-ORS FL-Plume Measurements
- MM-Xact-FLM Measurements

Model
- Plant Operating Model Feed/Fuel Controls
- Dispersion/Flow Modeling
- Receptor Modeling
- Reconciled Dispersion Modeling -PDRM

Product
- Total Emission Estimate
- Total Emission Estimate
- Source/Process-Specific Impact Contribution
- Total and Source-Specific Emissions
CEMS Revised Cost Model
CEMS Revised Cost Model

- Crude Computer model early 90’s for SO2 and NOx
- 1998 – Updated Menu driven model with real cost data and questionnaire information
- 2006 – Updated cost information
  - Added Bag leak detectors and Hg CEMS
  - Split PM CEMS into several categories
  - Xcel Spreadsheet format
- EMC website
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<th>Test</th>
<th>ODCs</th>
<th>Total</th>
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<td>Support Facilities</td>
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### Annual Costs

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<td>PM Monitor RCA</td>
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<td>PM Monitor RRA</td>
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<td>Cylinder Gas Audits (ACA/SVA for PM)</td>
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<td>Recordkeeping and Reporting</td>
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<td>Total w/o capital recovery</td>
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<td>Total with capital recovery</td>
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