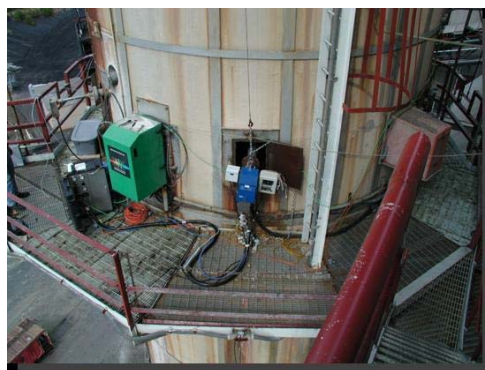


EXHIBIT H

Mercury CEMS and Sorbent Trap System Certification Under New Rules



EMC Measurement Technology Workshop

Robin Segall

**U.S. Environmental Protection Agency
Office of Air Quality Planning and Standards
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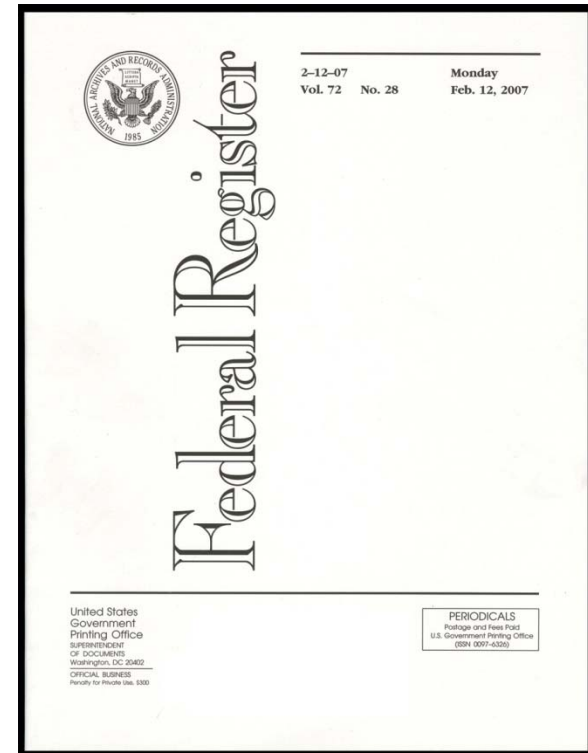


Topics

- Mercury Measurement Requirements in New Rules
- Mercury Monitoring Specifications
 - Performance Specification 12A
 - Performance Specification 12B
 - MATS, Appendix A
- Ongoing QA Criteria for Mercury Monitoring
 - Procedure 5
 - MATS, Appendix A

Key New Rules w/ Mercury Measurement Requirements

- **Mercury Air Toxics Standards (MATS) for Utility Boilers (Subpart UUUUU)**
 - Compliance date 4/16/2015
- **Portland Cement MACT**
 - Compliance date 9/9/2015
- **Commercial/Industrial Incinerator MACT (CISWI)**
 - Compliance date 8/7/2013
- **Boiler MACT**
 - Compliance date 1/31/2016
- **Sewage Sludge Incinerator MACT (SSI)**
 - Earliest compliance date 3/21/2016



Mercury Air Toxics Standards (MATS)

- Solid fuel/IGCC units
 - Must use Hg CEMS or sorbent trap monitoring systems
 - Appendix A contains mercury monitoring requirements
 - All Hg CEMS requirements
 - References Performance Specification 12B for sorbent trap monitoring system installation, maintenance and operation
 - Reference Method (RM) options: Methods 29, 30A, 30B or ASTM D6784-02
 - Ongoing QA requirements

Portland Cement MACT

- New and existing kilns
 - Must use Hg CEMS or sorbent trap monitoring systems
 - Performance Specification 12A (PS 12A) for Hg CEMS
 - Performance Specification 12B (PS 12B) for sorbent trap monitoring systems
 - Procedure 5 for ongoing QA of Hg CEMS and sorbent trap monitoring systems
 - RM options: Method 29, 30A, 30B or ASTM D6784-02

Commercial/Industrial Solid Waste Incinerators

- **New Waste-burning Kilns**
 - Must use Hg CEMS or sorbent trap monitoring systems (Table 7); option for other affected units (60.2165(j))
 - PS12A for Hg CEMS
 - PS12B for sorbent trap monitoring systems
 - Procedure 5 for ongoing QA
 - RM options: Method 29, 30A, 30B or ASTM D6784-02

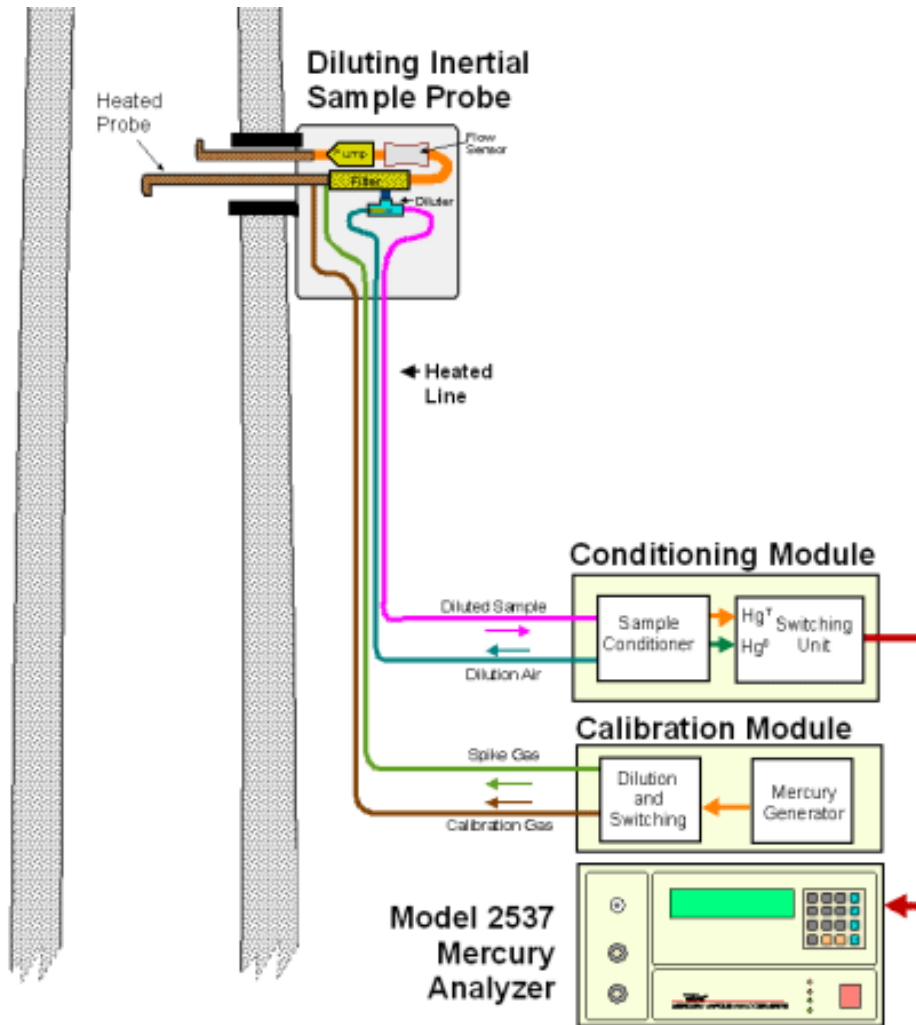
Boiler MACT

- Large coal-, oil-, and biomass-fired units
 - Optional use of Hg CEMS or sorbent trap monitoring system
 - PS 12A for Hg CEMS
 - PS12B for sorbent trap monitoring systems
 - Procedure 5 for ongoing QA of Hg CEMS and sorbent trap monitoring systems
 - RM options: Method 29, 30A, 30B or ASTM D6784-02

Sewage Sludge Incinerators

- All affected units
 - Optional use of Hg CEMS or sorbent trap monitoring system
 - PS 12A for CEMS
 - Procedure 5 for CEMS
 - RM options: Method 29, 30B or ASTM D 6784
 - PS12B for sorbent trap monitoring systems not specified, but would be an appropriate alternative that we could approve should a source request

Hg CEMS



- Measure gaseous Hg
 - Elemental (Hg⁰)
 - Oxidized (Hg²⁺)
- Almost all convert oxidized Hg to elemental Hg for measurement of total gaseous Hg
- Calibrate using NIST-traceable mercury gas generators or cylinders

Performance Specification 12A for Hg CEMS

- Certification Testing Requirements
 - 7-day calibration drift test -- with Hg⁰ or Hg²⁺
 - Measurement error test -- 3 levels with Hg⁰ and Hg²
 - Relative accuracy against a RM



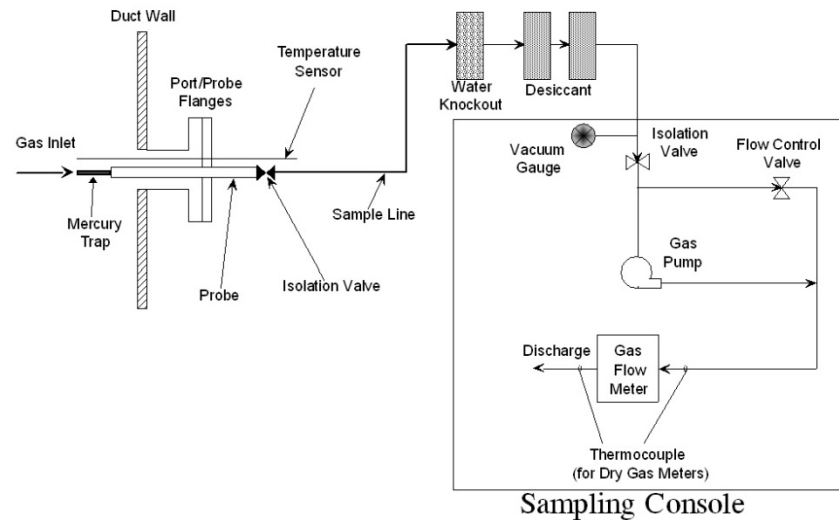
Performance Specification 12A

Performance Criteria

Certification Test	Acceptance Criteria
Calibration Drift	$\leq 5\%$ of span
Measurement Error	For $\text{Hg}^0 \leq 5\%$ of span For $\text{Hg}^{2+} \leq 10\%$ of span
Relative Accuracy	$\leq 20\%$ or $ RM_{\text{avg}} - C \leq 1 \text{ ug/scm}$ if RM is $\leq 0.5 \text{ ug/scm}$

Sorbent Trap Monitoring System Background

- Integrated sample measures total gaseous Hg
- For post-PM control locations
- Paired traps, in-stack w/ 3 sections
- Proportional sampling



Performance Specification 12B for Sorbent Trap Monitoring Systems

- Sampling/analytical requirements
 - Sampling train and operations
 - Sampling/sample QA
- Certification testing requirements
 - Spike recovery study
 - Sorbent capture capability
 - Analytical capability
 - Relative accuracy against a RM

Performance Specification 12B

Performance Criteria

Certification Test	Acceptance Criteria
Spike Recovery Study	$85\% \leq \%R_{\text{avg}} \leq 115\%$
Relative Accuracy	$\leq 20\%$ or $ RM_{\text{avg}} - C \leq 1 \text{ ug/scm}$ if RM is $\leq 0.5 \text{ ug/scm}$
Pre- and Post- Leak Checks	$\leq 4\%$ of target (avg) sampling rate
Stack Gas Flow Ratio	95% of hourly ratios within 25% of reference ratio
Trap Section 2 Breakthrough	$\leq 5\%$ of Section 1 mass; $\leq 20\%$ RD or difference $\leq 0.03 \text{ ug/scm}$ when conc $\leq 1.0 \text{ ug/scm}$
Paired Trap Agreement	$\leq 10\%$ RD; $\leq 20\%$ RD or difference $\leq 0.03 \text{ ug/scm}$ when conc $\leq 1.0 \text{ ug/scm}$
Calibration	
Trap Section 3 Spike Recovery	75 to 125% of spike amount
Gas Meter Calibration	Measured Y $\pm 5\%$ of initial Y
Temperature Sensor Calibration	$\pm 1.5\%$ of reference sensor
Barometer Calibration	$\pm 10 \text{ mm}$ of NIST-traceable barometer

Appendix F, Procedure 5 for Ongoing QA

- For Hg CEMS
 - Daily calibrations -- with Hg⁰ or Hg²⁺
 - Weekly system integrity check with Hg²⁺
 - Quarterly s test run RAA or 3-level gas audit with Hg⁰ and Hg²⁺
 - Annual relative accuracy test audit (RATA)
- For sorbent trap monitoring systems
 - Annual RATA
 - PS12B, not Procedure 5, specifies routine QA/QC (leak checks, calibrations, paired train agreement, spike recovery, breakthrough)

Procedure 5 Performance Criteria

Certification Test	Acceptance Criteria
Calibration Drift (Daily)	$\leq 5\%$ of span
System Integrity Check (Weekly)	None
Gas Audit (3 Quarters)	$\pm 15\%$ of avg audit value or ± 0.5 ug/m ³
3-Run RAA (3 Quarters)	$\pm 20\%$ of 3-run avg or $\pm 10\%$ of applicable standard
RATA (Yearly)*	Same as PS12A

*CEMS and Sorbent Trap Systems

MATS, Appendix A

- Certification Testing Requirements
 - 7-day calibration error test -- with Hg^0 or Hg^{2+}
 - Linearity check at 3 levels -- with Hg^0
 - System integrity check at 3 levels -- with Hg^{2+}
 - Not required if no converter
 - Cycle time test
 - Relative accuracy against a RM

MATS, Appendix A

Certification Performance Criteria

Certification Test	Acceptance Criteria
Calibration Drift	$\leq 5\%$ of span or absolute value ≤ 1.0 ug/scm
Linearity Check System Integrity Check (3-level)	$\pm 10\%$ of reference gas value or absolute value ≤ 0.8 ug/scm
Cycle Time Test	15 minutes
Relative Accuracy*	$\leq 20\%$ or $ RM_{avg} - C \leq 1.0$ ug/scm if RM is ≤ 0.5 ug/scm
*CEMS and Sorbent Trap Systems	

MATS, Appendix A

QA Performance Criteria

Certification Test	Acceptance Criteria
Calibration Error (Daily)	$\leq 5\%$ of span or absolute value ≤ 1.0 ug/scm
Single-level System Integrity Check (Weekly)	$\pm 10\%$ of reference gas value or absolute value ≤ 0.8 ug/scm
Linearity Check <u>or</u> 3-level System Integrity Check (Quarterly)	$\pm 10\%$ of reference gas value or absolute value ≤ 0.8 ug/scm
RATA (Yearly) *	$\leq 20\%$ or $ RM_{avg} - C \leq 1.0$ ug/scm if RM is ≤ 0.5 ug/scm
*CEMS and Sorbent Trap Systems	

Key Differences Between PS 12A and MATS Certification Criteria

- Calibration Drift (Error)
 - MATS has alternate absolute value criterion
- Measurement Error (Linearity) with Hg^0
 - MATS has alternate absolute value criterion
- Measurement Error (System Integrity) with Hg^{2+}
 - MATS has alternate absolute value criterion
 - PS 12A has less strict sole criterion
- Cycle Time Test
 - PS 12A has no cycle time test

Key Differences Between PS 12A and MATS Ongoing QA Criteria

- Daily Calibration Drift (Error)
 - MATS has alternate absolute value criterion
- Quarterly Gas Audits (3-level Linearity or System Integrity) with Hg⁰ and/or Hg²⁺
 - MATS only requires use of Hg⁰ or Hg²⁺ while PS 12A requires both
 - PS 12A has less strict % of reference gas criterion while MATS has less strict alternate absolute value criterion

Summary

- Most mercury monitoring system certifications will be occurring at coal-fired utility boilers and Portland cement plants
- Some differences between MATS and Portland cement certification and QA requirements, but not terribly significant
- Look for proposed adjustments in MATS requirements soon
 - No longer allow sole use of Hg^{2+} gas standard
 - Tighten up RATA criterion
- Future
 - Finalize Hg calibration gas traceability protocols and procedures



Questions?

