CERTIFICATION OF MERCURY MONITORING SYSTEMS AT LOW LEVELS USING EPA METHOD 30B

Timothy D. Rodak, James E. Wright, Volker Schmid

CleanAir ENGINEERING

Summary

Sorbent-trap-based monitoring and US EPA Method 30B have shown to be reliable in producing repeatable and quality-assured results at Hg levels well below 1 µg/dscm. However, as concentrations go below 0.5 µg/dscm, certifying the monitoring systems with US EPA Method 30B becomes somewhat of an academic exercise. At these levels, both the relative accuracy standard for the monitoring system and the quality assurance and control (QA/QC) requirements for the reference method are less rigorous than they are at higher concentrations.

This paper examines the performance of Method 30B as applied to low-level relative accuracy test audits (RATA) and assesses the necessity of relaxing the standards at these levels. Data are presented from three RATAs conducted at Hg concentrations below 1 µg/dscm. These data confirmed that Method 30B provides accurate and quality-assured data at levels ranging from 1 µg/dscm down to 0.025 µg/dscm. Even at the lowest of these levels, the method has been shown to easily pass all stringent Method QA/QC criteria such as Hg spike recovery, relative deviation and trap breakthrough.

Method 30B §8.2.4 - Determination of Target Sample Volume

…Note: For the purposes of relative accuracy testing of Hg monitoring systems under part 75 of this chapter and Performance Specification 12A in appendix B to this part, when the stack gas Hg concentration is expected to be very low (<0.5 µg/dscm)…

you may estimate the Hg concentration at 0.5 µg/dscm .

40 CFR Part 75 - Appendix A §3.3.8

…for affected units where the average of the reference method measurements of Hg concentration during the relative accuracy test audit is less than

5.0 µgm/scm…

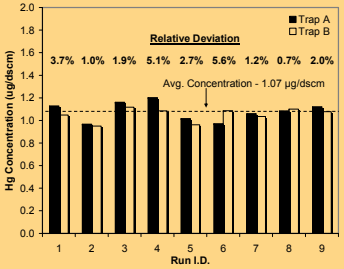
the test results are acceptable if the difference between the mean value of the monitor measurements and the reference method mean value does not exceed

1.0 µgm/scm…

Experimental

- **Hg RATA at three Facilities**
  - **(Facility A) Hg Concentration = 1.0 µg/dscm**
  - **(Facility B) Hg Concentration = 0.5 µg/dscm**
  - **(Facility C) Hg Concentration < 0.5 µg/dscm**
- **Sorbent Trap Monitoring Systems (MET-80)**
- **Method 30B traps supplied by OhioLumex**
- **Analysis by Thermal Desorption (OhioLumex)**

Facility A RATA Results
Hg Concentration = 1.0 µg/dscm



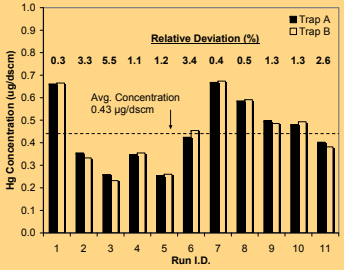
Data Results
Avg. Conc. (µg/dscm) 1.07
Avg. Diff. (µg/dscm) 0.08

QA/QC Results
Avg. Spike Recovery 98.5%
Avg. Relative Deviation 2.6%
Avg. Breakthrough 1.0%
Max. Breakthrough 1.8%

Method of Analysis
Thermal Desorption

Relative Accuracy = 9.3%

Facility B RATA Results
Hg Concentration = 0.5 µg/dscm



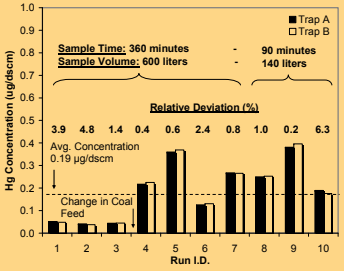
Data Results
Avg. Conc. (µg/dscm) 0.43
Avg. Diff. (µg/dscm) 0.04

QA/QC Results
Avg. Spike Recovery 97.6%
Avg. Relative Deviation 1.9%
Avg. Breakthrough 2.0%
Max. Breakthrough 3.4%

Method of Analysis
Thermal Desorption

Relative Accuracy = 8.1%

Facility C RATA Results
Hg Concentration < 0.5 µg/dscm



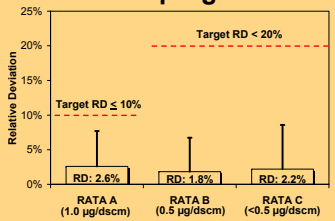
Data Results
Avg. Conc. (µg/dscm) 0.19
Avg. Diff. (µg/dscm) 0.01

QA/QC Results
Avg. Spike Recovery 98.7%
Avg. Relative Deviation 2.2%
Avg. Breakthrough 1.2%
Max. Breakthrough 2.3%

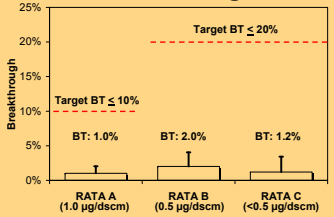
Method of Analysis
Thermal Desorption

Relative Accuracy = 3.3%

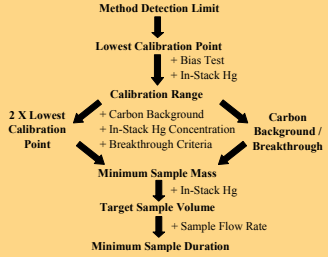
Paired Trap Agreement



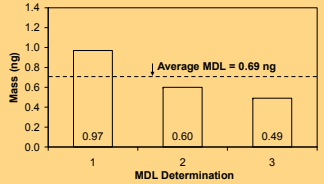
Breakthrough



Method Detection Limit Drives the Method



Method Detection Limit



How low can we go?

Parameter	Value
Method Detection Limit	0.69 ng
Lowest Point on Calibration Curve*	4.0 ng
Calibration Range	4 – 110 ng
Hg Background in Trap Section 2**	<0.69 ng
Method 30B Breakthrough Criteria	20%
Minimum Sample Mass	8.0 ng

* Based on the assumption that sorbent background is less then the MDL

** Based on sorbent blanks and industry standards