

The Avogadro Group, LLC

Source Emissions Testing and Emissions Specialists

PM CEMS Certification and Quality Assurance

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What is Different

- Gaseous CEMS
 - A More Prescriptive Approach – do it this way
 - Check precision and accuracy based on **Calibration**
- PM CEMS
 - A More Performance-Based Approach – meet these criteria whichever way works
 - Determine precision and accuracy through **Correlation** with Reference Method results (no calibration gases for PM)
 - need more test runs to evaluate performance

Performance Criteria

40 CFR 60

- Appendix B, Performance Specification 11
Initial Correlation (installation and performance)
To Evaluate Acceptability of PM CEMS
- Appendix F, Procedure 2
Periodic Audits
To Evaluate Ongoing Performance of CEMS

Initial Correlation

Performance Specification 11

- Select the right type of CEMS for your source
 - in-situ (e.g. light-scattering)
 - extractive (e.g. BAM)
- Install properly
 - to represent emissions
 - to allow good correlation testing
- Correlation Test Planning Period
 - Operate in varying process conditions for sufficient time:
 - make sure CEMS covers the range
 - learn how process changes influence readings
 - adjust the plan for operation of CEMS
- Pass 7-day Drift Test before Correlation Test
- Design, conduct and pass the Correlation Test

Drift Test

- Daily Zero and Upscale check with 2 reference standards:
- Zero to 20% of range
- 50 to 100% of range

These are drift check standards, not really calibration standards (there are no calibration standards for PM)

Pass within the criteria for 7 days before running the Correlation Test...

Correlation Test

- 15 paired test runs – Method 5, 5i, or 17
20+ minutes per run (longer for low concentrations)
- At 3 different levels of PM mass concentration by
 - varying process operating conditions,
 - varying PM control device conditions, or
 - by means of PM spiking
- At least 3 runs at each of the following levels:
 - Level 1: 0 to 50 percent of the max PM concentration
 - Level 2: 25 to 75 percent of the max PM concentration
 - Level 3: 50 to 100 percent of the max PM concentration

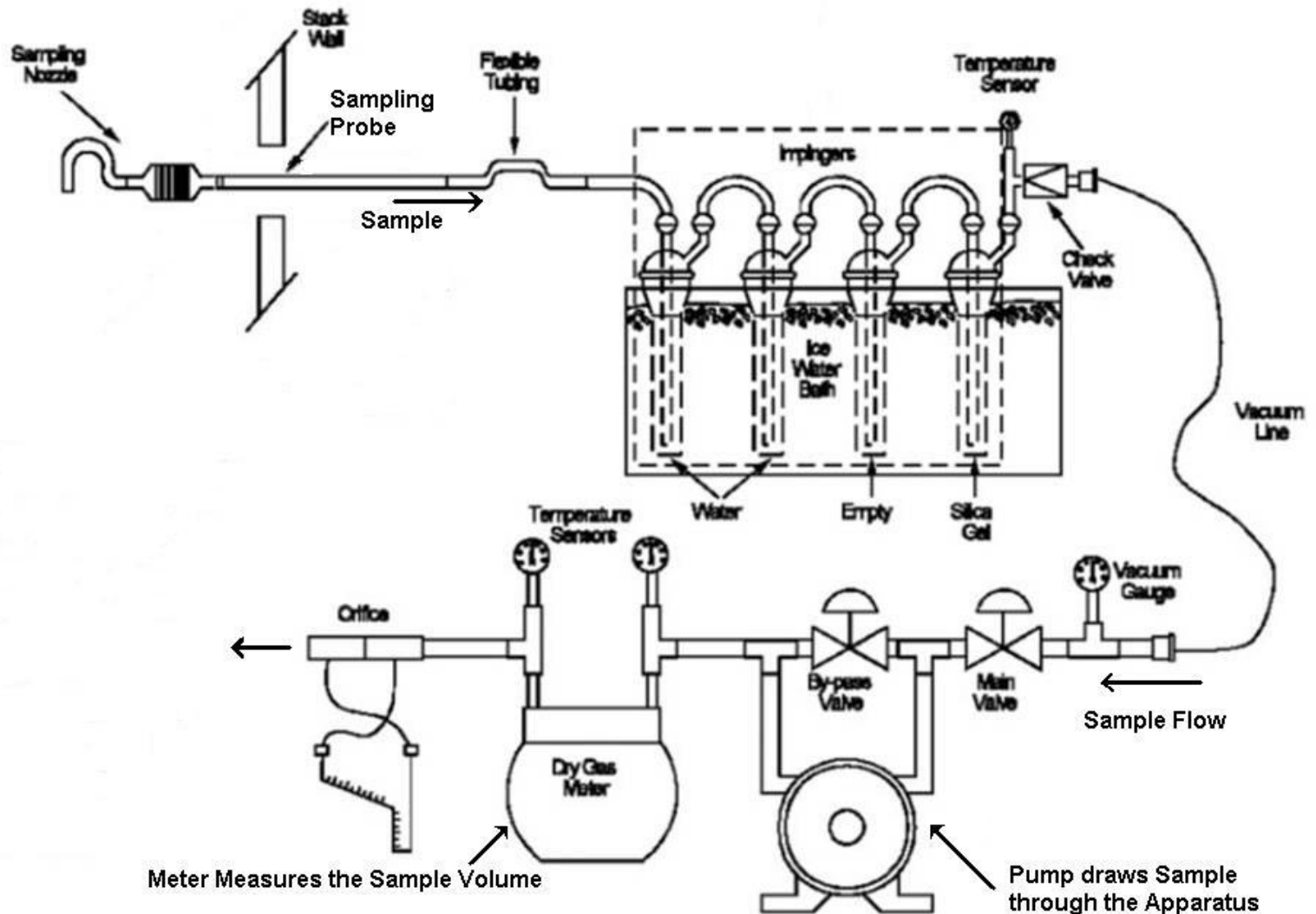
Although the above levels overlap, you may only apply individual run data to one level

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Preliminary Testing

- EPA recommends that you perform preliminary reference method testing after the correlation test planning period (before the official Correlation Test)
- Measure the PM emission concentration corresponding to the highest PM CEMS response observed:
 - during the full range of normal operation,
 - when perturbing the control equipment, or
 - as the result of PM spiking
- Also measure at the low end of the range:
 - fans on, process off
 - running solid fuel unit on gas

Diagram, EPA Method 17



Periodic Audits

Appendix F, Procedure 2

- Evaluate the effectiveness of QA-QC procedures and Quality of the Data
 - QC and Corrective Action

QC Program to include maintenance and audits:

- ACA – absolute correlation audit
- SVA – sample volume audit (extractive CEMS only)
- RCA – response correlation audit
- RRA – relative response audit

Periodic Audits – RCA, RAA

- Perform RCA or RRA at the frequency specified in the regulation or permit
- RCA is like the initial Correlation Test, but 12 paired runs (rather than 15) at the 3 levels of PM mass concentration
 - Fail? Usually able to adjust the Correlation factors
(worst case, run a new Correlation Test)
- RRA is 3 paired runs at the as-found condition
 - Fail? Correct the problem and pass another RRA
(worst case, run and pass new RCA)

Quarterly Audits – ACA, SVA

- Perform **ACA** Quarterly (but 60 days apart) unless you run a RCA or RRA in that quarter
- ACA - challenge the CEMS with 3 audit standards (or equivalent audit reference) 3 times each:
0-20% / 40-60% / 70-100% of range
 - Fail? Correct the problem and pass another ACA
- Perform **SVA** every quarter (on extractive systems only)
- SVA - independent measurement of sample volume
3 times, compare with volumes measured by CEMS
 - Fail? Correct the problem and pass another SVA

Prepare for Success

- Budget Realistically – time and expense
- Select a CEMS that will work for **your site**
- Install it in a good location for Representative measurement
AND for good Correlation Testing
- Operate it and learn what affects its readings
 - drift or other operations or maintenance issues
 - process variables
 - range of measurement (change range to fit)
 - how to change emissions for your 3 correlation points
 - conduct some preliminary correlation test runs
- Budget for the Correlation Test
- Develop the Quality Plan – draft it, then improve it
- Budget for Daily drift checks, Quarterly audits, etc.

Questions ???

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