The Avogadro Group, LLC

Source Emissions Testing and Emissions Specialists

PM CEMS Certification and Quality Assurance

Kevin Crosby, The Avogadro Group, LLC
Antioch CA / Portland OR / Medford OR / Phoenix AZ

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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
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
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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Technical Director
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