


US EPA ARCHIVE DOCUMENT


EPA United States Environmental Protection Agency
MACT EEE Training Workshop
Dallas, Texas November 3-7, 2008

AECOM

**B.6 CEM Calibrations,
Operator Training and the
Documentation of Compliance**

Two topics will be covered in this module – Continuous Emissions Monitoring System Calibrations and Operator Training Requirements under Subpart EEE


 **MACT EEE Training Workshop**
CEM Calibrations and Operator Training



Presentation Overview

- CEMs System
- Calibration Procedures
 - Initial
 - Daily calibrations
 - Quarterly calibrations
 - Annual RATA
- Operator Training
 - Program options
 - Who should be trained
 - Content of training
 - “Certification”
- Documentation of Compliance (DOC)

Revised 1/17/09



These topics will be covered in this module <go over 4 bullets>


EPA

MACT EEE Training Workshop
CEM Calibrations and Operator Training

AECOM

Basic Equipment - Continuous Emissions Monitors (CEMs)

Parameter	Manufacturer	Range	Principle
Oxygen	Servomex Model 1420	0-25%	Paramagnetic
Carbon Monoxide	Rosemont Model 880	0 – 200 ppmv 0 – 3000 ppmv	Non-dispersive Infrared (NDIR)



HWC facilities are required to continuously monitoring carbon monoxide or total hydrocarbons, they must be able to correct readings to 7% oxygen and for some subcategories, continuous opacity monitors are required as well. This slide depicts two of the typical analyzers used as part of an overall CEMs systems. There are a number of different vendors of this equipment and the two manufacturers shown are just for example and not mean to construe these are the only acceptable options. These analyzers can be installed as single units, which if they need to be repaired, would require the HWC to stop feeding wastes while that is being done. Or, they can be installed in duplicate so that un-interrupted can be provided.


EPA

MACT EEE Training Workshop
CEM Calibrations and Operator Training

AECOM

Basic Equipment - CEMs Sample Extraction System Components

- Probe and PM filter (may be heated)
- Heated sample line w/ valving for introducing calibration gases at probe
- Chiller and pump (if dry system)
- Sample pump
- Piping manifold for sampling and calibration
- PLC/data recording
- Conditioned shelter
- Gases



The analyzers themselves are part of a larger system that includes the additional equipment and supplies shown in this slide. Very often, the actual analyzers are installed in an air conditioned shelter located near the base of the HWC's stack, while the actual gas sampling location is usually near the other stack sampling ports or sometimes in the breach ductwork leading to the stack. The sampling probe is located so that it can extract a representative sample of the flue gas stream for analysis. It is pumped down to the analyzer shelter in a heated sample line. There is typically a gas manifold system in the CEMs shelter that allows flue gas samples and calibration gases to be piped into the appropriate analyzer. Carbon monoxide and oxygen are measured on a dry basis and so there is a chiller that conditions the flue gas sample to remove moisture. Total hydrocarbons is analyzed on a wet basis and so that sample does not pass through a chiller. The shelter is maintained at a controlled temperature and humidity for proper operation of the analyzers and the data recording equipment. Calibration gases are also part of the an overall CEMs system.


EPA

MACT EEE Training Workshop
CEM Calibrations and Operator Training

AECOM

CEMs Program - What Must Be Done?

- Initial Installation and Calibration
 - Verification of proper location
 - Initial Calibration Drift Test
 - Calibration Error Test
 - Response Time Test
 - Interference Response Test
 - Relative Accuracy Test



In order to adhere to the provisions of the applicable Performance Specification (4B in this case), there are several activities that must be performed upon initial installation. These are detailed along with the calculation procedures in the Performance Specification, but are summarized on this slide. Calibration drift is a seven day test to evaluate instrument drift during calibration over that time. Calibration error assesses the instruments' accuracy during calibration. Response time evaluates the length of time it takes for calibration gases to travel from the cylinder to the probe and produce a representative result from the analyzer. Interference response determines the difference between the calibration result at a given concentration versus the actual field measurement and assesses whether other gases that may be present in the flue gas are affecting analyzer results. Finally, the Relative Accuracy Test is a side-by-side comparison of results from the permanent CEM system and a separate CEM system brought in and operated according to the EPA reference method.

SEPA


MACT EEE Training Workshop

CEM Calibrations and Operator Training


AECOM

CEMs Program - What Must Be Done?

- Ongoing Requirements
 - Daily System Audit
 - Daily Calibration Drift Test
 - Quarterly Calibration Error Test
 - Annual Relative Accuracy Test
- Documentation and performance of required audits and calibrations are essential!




Ongoing requirements are summarized on this slide. There are two daily requirements – a zero and span check to make sure the system is calibrated daily and a calibration drift check. In addition, there are quarterly requirements and annual requirements. HWC facilities should have this information documented.


 **MACT EEE Training Workshop** | **AECOM**
CEM Calibrations and Operator Training


Calibration Drift (CD) and Zero Drift (ZD) Requirement

- Operators must check, record, and quantify the ZD and the CD at least once daily
- The CEMS calibration must be adjusted whenever the daily ZD or CD exceeds the limits in the Performance Specifications.
- If the following occurs for ZD or CD, hazardous waste must not be fed until corrected:
 - ZD or CD exceeds two times the limits in the Performance Specifications,
 - or if the cumulative adjustment to the ZD and/or CD exceed(s) three times the limits in the Performance Specifications
- Hazardous waste burning cannot resume until the owner or operator documents that the CEMS is in compliance with the Performance Specifications by carrying out an ACA.




The daily calibration drift is summarized on this slide. If not passed, the HWC must cease burning hazardous waste until the CEMS system passes an absolute calibration audit.

 **MACT EEE Training Workshop**
CEM Calibrations and Operator Training





Performance Evaluation for CEMS

- Carbon Monoxide (CO), Oxygen (O₂), and Hydrocarbon (HC) CEMS.
- An Absolute Calibration Audit (ACA) must be conducted quarterly, and a Relative Accuracy Test Audit (RATA) must be conducted yearly.
- An Interference Response Tests must be performed whenever an ACA or a RATA is conducted.
- When a performance test is also required under §63.1207 to document compliance with emission standards, the RATA must coincide with the performance test.




This slide summarizes the components of an overall CEMS performance evaluation. This should be conducted in coordination with a CPT when CPTs are planned.

 **MACT EEE Training Workshop**
CEM Calibrations and Operator Training



Relative Accuracy Test Audit (RATA)

- This requirement applies to O₂ and CO CEMS.
- The RATA must be conducted at least yearly.
- Conduct the RATA as described in the RA test procedure (or alternate procedures section) described in the applicable Performance Specifications.
- In addition, analyze the appropriate performance audit samples if received from the EPA.



Procedures for conducting the RATA are described in the applicable Performance Specification and in some cases, the lead agency may want to have audit samples analyzed as well.


EPA

MACT EEE Training Workshop
CEM Calibrations and Operator Training

AECOM

Absolute Calibration Audit (ACA)

- The ACA must be conducted at least quarterly except in a quarter when a RATA is conducted instead.
- Conduct an ACA as described in the calibration error (CE) test procedure described in the applicable Performance Specifications.



Quarterly absolute calibration audits are required, except in the quarter a RATA is conducted. The applicable performance specification includes the procedures to be followed.

Interference Response Test

- The interference response test must be conducted whenever an ACA or RATA is conducted.
- Conduct an interference response test as described in the applicable Performance Specifications.



Similar requirements apply to the Interference Response Test.


EPA

MACT EEE Training Workshop
CEM Calibrations and Operator Training

AECOM


Excessive Audit Inaccuracy

- If the RA from the RATA or the CE from the ACA exceeds the criteria in the applicable Performance Specifications, hazardous waste burning must cease immediately.
- Hazardous waste burning cannot resume until the operator takes corrective measures and audit the CEMS with a RATA to document that the CEMS is operating within the specifications.



<go over bullets>


Quarterly and annual test requirements must be met or the HWC can not burn waste until corrective measures can enable the CEMs system to pass.

 **MACT EEE Training Workshop**
CEM Calibrations and Operator Training


AECOM


Performance Specifications

- CEMS used by owners and operators of HWCs must comply with the following performance specifications in appendix B to part 60:
 - CO 4B
 - O₂ 4B
 - THC 8A




The applicable performance specifications are found in Appendix B to 40 CFR § 60.

 **MACT EEE Training Workshop**
CEM Calibrations and Operator Training





Downtime due to Calibration

- Facilities may continue to burn hazardous waste for a maximum of 20 minutes while calibrating the CEMS.
- If all CEMS are calibrated at once, the facility must have twenty minutes to calibrate all the CEMS.
- If CEMS are calibrated individually, the facility must have twenty minutes to calibrate each CEMS. If the CEMS are calibrated individually, other CEMS must be operational while the individual CEMS is being calibrated.




HWC facilities do have a 20 minute allowance in the Performance Specifications for daily calibrations where they can continue to burn waste. Typically the last CEMs value from the start of the calibration is held during calibration. <go over 2nd and 3rd bullets>

 **MACT EEE Training Workshop**
CEM Calibrations and Operator Training



Span of the CEMS

- **CO CEMS**
 - must have two ranges, a low range with a span of 200 ppmv and a high range with a span of 3000 ppmv at an oxygen correction factor of 1.
 - one-range CEMS may be used, but it must meet the performance specifications for the low range in the specified span of the low range.
- **O₂ CEMS**
 - must have a span of 25 percent.
 - The span may be higher than 25 percent if the O₂ concentration at the sampling point is greater than 25 percent.
- **THC CEMS**
 - Must have a span of 100 ppmv

Revised 1/17/09 

Under Subpart EEE, carbon monoxide analyzers must have two ranges. A single range may be used, but might have difficulty passing the performance specification in the low range of the instrument. During operation of a CO CEMS, should the CO value hit the upper span value of 3,000 ppmv, the calculating computer must actually be programmed to utilize a value of 10,000 ppmv for the rolling hourly average calculation. Oxygen CEMS must have a span of 25% unless the concentration at the sampling point is expected to be higher. THC analyzers must have a span of 100 ppmv.


EPA

MACT EEE Training Workshop
CEM Calibrations and Operator Training

AECOM

Span of the CEMS

- When an operator installs a CEMS at a location of high ambient air dilution, i.e., where the maximum oxygen correction factor is greater than 2, the operator must install a CEM with a lower span, proportionate to the larger oxygen correction factor, than those specified above.
- Operators may request approval to use alternative spans and ranges to those specified. Alternate spans must be approved in writing in advance. In considering approval of alternative spans and ranges, measurements beyond the span will be recorded as values at the maximum span for purposes of calculating rolling averages.
- The span value must be documented by the CEMS manufacturer with laboratory data.




This slide summarizes some additional provisions regarding instrument span value.
<go over bullets>


Oxygen Correction

- Measured pollutant levels must be corrected for the amount of oxygen in the stack according to the following formula:
 - $P_c = P_m \times 14 / (E - Y)$, where
 - P_c = concentration of the pollutant or standard corrected to 7 percent oxygen, dry basis;
 - P_m = measured concentration of the pollutant, dry basis;
 - E = volume fraction of oxygen in the combustion air fed into the device, on a dry basis (normally 21 percent or 0.21 if only air);
 - Y = measured fraction of oxygen on a dry basis at the sampling point.




This slide summarizes the formula for the oxygen correction factor that must be used for correcting raw data.

 **MACT EEE Training Workshop**
CEM Calibrations and Operator Training





Operator Training

- Purpose
- Requirements
- Options for implementation
- What to look for




Now, turning to the Operator Training requirements included in Subpart EEE, this slide summarizes what will be reviewed in the remainder of this module.

 **MACT EEE Training Workshop**
CEM Calibrations and Operator Training




Purpose of HWC MACT Operator Training

- In the 1990's there was a general concern for HWC's and at least one report issued that raised safety and operational concerns regarding them
- Citizen groups argued strongly for better training
- RCRA training requirements were fairly minimal




Subpart EEE has specific and unique requirements to address operator training that stem from concerns dating back to the early 90's. During the combustion debates of the early to mid 90's as the early work was being done to formulate today's current regulations, citizen groups argued strongly for better training, particularly since existing RCRA training requirements were/are fairly minimal.

 EPA


MACT EEE Training Workshop | AECOM
CEM Calibrations and Operator Training

HWC MACT Operator Training Requirements – 40 CFR §63.1206(c)(6)

- Anyone working at an HWC facility who has the potential to affect HAP emissions needs to be trained and certified
- Relevant topics, commensurate with job duties
- Facility must be operated at all times by trained and certified staff

 20


The term “Operator” as used in Subpart EEE, however is a bit of a misnomer as the training and certification requirements of the regulations are applicable to anyone working at an HWC who has the potential to affect HAP emissions. Thus, not only operators, but engineers, supervision, maintenance staff and even certain folks in lab or administrative jobs may need training on relevant topics that are germane to their duties and the HWC must be operated at all times by trained and certified staff.

 **MACT EEE Training Workshop**
CEM Calibrations and Operator Training


AECOM

Options for Training Program

- Trained and certified under ASME's QHO-1-1994
 - Provisional certification
 - Full certification
- State developed program
- Site specific program



The regulations provide several options to comply with this requirement ranging from a training and certification program developed and administered by the American Society of Mechanical Engineers to a site specific program. In general, site specific programs are being used to address this requirement.

 EPA


MACT EEE Training Workshop | AECOM
CEM Calibrations and Operator Training


Content of a site specific program

- Environmental concerns, including types of emissions;
- Basic combustion principles, including products of combustion;
- Operation of the combustor;
- Startup, waste firing, and shutdown procedures;
- Combustion controls and continuous monitoring systems;
- Operation of air pollution control equipment;
- Inspection and maintenance of the HWC;
- Malfunctions and their corrective actions;
- Residue characteristics and handling procedures; and
- Other applicable regulations, including OSHA workplace standards.




The regulations cite specific topics that must be addressed in the training program and these are listed on this slide. <go over bullets>

 **MACT EEE Training Workshop**
CEM Calibrations and Operator Training





Additional Content of a Site Specific program

- Program should include provisions for
 - Training existing employees
 - Training new employees
 - Keeping records for current and past employees
- Program should include
 - Initial training
 - Annual refresher




In addition, the program should be designed to address training of existing and new employees and include initial and annual refresher training.

 **MACT EEE Training Workshop**
CEM Calibrations and Operator Training





What to look for in a Training Program

- Someone who's responsible for making the training happen and keeping records
- Summary of what jobs are at the site and which are subject to training under HWC MACT
- Training and testing content that covers the required topics
- True operations and OSHA training are likely to be handled outside of this
 - HWC MACT training is often focused on key regulatory requirements, like AWFCO limits, SSM procedures, notification




In evaluating the sufficiency of a Subpart EEE training, there should be someone identified who provides overall management and administration of the program. There should be some type of documentation as to what job types need training. The program should describe what topics will be covered in the training and how staff will be “certified”. This is usually done through testing. Depending on how other training is conducted at the facility, this training is most likely to focus on the regulatory aspects of the Subpart EEE compliance program, while specific operations safety training is handled separately.

 **MACT EEE Training Workshop**
CEM Calibrations and Operator Training





Documentation of Compliance – 40 CFR § 63.1211(c)

- Must identify the applicable emission standards and limits on the operating parameters
- Must include a signed and dated certification in the DOC that states:
 - Required CEMs and CMS are installed, calibrated, and continuously operating in compliance with the requirements of this subpart; and
 - Based on an engineering evaluation that the facility is in compliance with the emission standards of this subpart; and
 - The limits on the operating parameters under §63.1209 ensure compliance with the emission standards of this subpart.
- Facility must comply with the emission standards and operating parameter limits specified in the Documentation of Compliance.

 25


On the Compliance Date, the facility must have a Documentation of Compliance or DOC on file. The regulations at 40 CFR § 63.1211(c) specify what needs to be included in the DOC and these requirements are summarized on this slide. This is an enforceable document and HWCs must comply with the standards and OPLS cited in it.

 **MACT EEE Training Workshop**
CEM Calibrations and Operator Training



Other DOC Contents

- Operating Records
- HWC MACT Plans
 - FSAP
 - CPT Plan
 - O/M Plan
 - SSMP
 - Training Program and Records


26

Besides the information referenced on the previous slide, the DOC needs to include all relevant operating records and copies of the five different plans and programs required to be developed under Subpart EEE. <list plans>