

Proposed Performance Specification 13, of Appendix B, 40 CFR Part 60 for HCL continuous emission monitoring systems. Proposed Revised Standards for Hazardous Waste Combustors [Federal Register: April 19, 1996 (Proposed Rules)] [Page 17434]

PERFORMANCE SPECIFICATION 13 -- Specifications and test procedures for hydrochloric acid continuous monitoring systems in stationary sources

1. *Applicability and principle*

1.1 *Applicability.* This specification is to be used for evaluating the acceptability of hydrogen chloride (HCl) continuous emission monitoring systems (CEMS) at the time of or soon after installation and whenever specified in the pertinent regulations. Some source specific regulations require the simultaneous operation of diluent monitors. These may be O₂ or CO₂ monitors.

This specification does not evaluate the performance of installed CEMS over extended periods of time. The specification does not identify specific calibration technique or other auxiliary procedures that will assess the CEMS performance. Section 114 of the Act authorizes the administrator to require the operator of the CEMS to conduct performance evaluations at times other than immediately following the initial installation.

This specification is only applicable to monitors that unequivocally measure the concentration of HCl in the gas phase.

It is not applicable to CEMS that do not measure gas phase HCl, per se, or CEMS that may have significant interferences. The Administrator believes that HCl CEMS must measure the concentration of gaseous HCl thereby eliminating interferences from volatile inorganic and/or organic chlorinated compounds. CEMS that are based upon infrared measurement techniques, non-dispersive infrared (NDIR), gas filter correlation infrared (GFC-IR) and Fourier Transform infrared (FTIR) are examples of acceptable measurement techniques. Other measurement techniques that unequivocally measure the concentration of HCl in the gas phase may also be acceptable.

1.2 *Principle.* This specification includes installation and measurement location specifications, performance and equipment specifications, test procedures, and data reduction procedures. This specification also provides definitions of acceptable performance.

This specification stipulates that audit gas tests and calibration drift tests be used to assess the performance of the CEMS. The determination of the accuracy with which the CEMS measures HCl is measured by challenging the CEMS with audit gas

of known concentration. There is no absolute determination of interference with the measurement of gas phase HCl with other constituents in the stack gases.

2. Definitions

2.1 Continuous Emission Monitoring System. The total equipment required for the determination of the concentration of a gas or its emission rate. The CEMS consist of the following subsystems:

2.1.1 Sample Interface. That portion of the CEMS used for one or more of the following: sample acquisition, sample transportation, sample conditioning, and protection of the monitor from the effects of the stack effluent.

2.1.2 Pollutant Analyzer. That portion of the CEMS that senses the pollutant gas and generates an output that is proportional to the gas concentration.

2.1.3 Diluent Analyzer. That portion of the CEMS that senses the concentration of the diluent gas (e.g., CO₂ or O₂) and generates an output that is proportional to the concentration of the diluent.

2.1.4 Data Recorder. That portion of the CEMS that provides a permanent record of the analyzer output. The data recorder may include automatic data reduction capabilities.

2.2 Point CEMS. A CEMS that measures the gas concentration either at a single point or along a path equal to or less than 10 percent of the equivalent diameter of the stack or duct cross section. The equivalent diameter must be determined as specified in Appendix A, Method 1 of this Part.

2.3 Path CEMS. A CEMS that measures the gas concentration along a path greater than 10 percent of the equivalent diameter (Appendix A, Method 1) of the stack or duct cross section.

2.4 Span Value. The upper limit of a gas concentration measurement range specified for affected source categories in the applicable subpart of the regulations. The span value shall be documented by the CEMS manufacturer with laboratory data.

2.5 Accuracy. A measurement of agreement between a measured value and an accepted or true value, expressed as the percentage difference between the true and measured values relative to the true value. For these performance specifications, accuracy is checked by conducting a calibration error (CE) test.

2.6 Calibration Error (CE). The difference between the concentration indicated by the CEMS and the known concentration of the cylinder gas. A CE test procedure is performed to document the accuracy and linearity of the monitoring equipment over the entire measurement range.

2.7 Calibration Drift. (CD). The difference between the CEMS output and the concentration of the calibration gas after a stated period of operation during which no unscheduled maintenance, repair, or adjustment took place.

2.8 Centroidal Area. A concentric area that is geometrically similar to the stack or duct cross section is no

greater than 1 percent of the stack or duct cross-sectional area.

2.9 Representative Results. Defined by the RM test procedure outlined in this specification

3. *Installation and Measurement Location Specifications*

3.1 CEMS Installation and Measurement Locations. The CEMS shall be installed in a location in which measurements representative of the source's emissions can be obtained. The optimum location of the sample interface for the CEMS is determined by a number of factors, including ease of access for calibration and maintenance, the degree to which sample conditioning will be required, the degree to which it represents total emissions, and the degree to which it represents the combustion situation in the firebox. The location should be as free from in-leakage influences as possible and reasonably free from severe flow disturbances. The sample location should be at least two equivalent duct diameters downstream from the nearest control device, point of pollutant generation, or other point at which a change in the pollutant concentration or emission rate occurs and at least 0.5 diameter upstream from the exhaust or control device. The equivalent duct diameter is calculated as per 40 CFR part 60, appendix A, method 1, section 2.1. If these criteria are not achievable or if the location is otherwise less than optimum, the possibility of stratification should be investigated as described in section 3.2. The measurement point shall be within the central area of the stack or duct cross section.

3.1.1 Point CEMS. It is suggested that the measurement point be (1) no less than 1.0 meter from the stack or duct wall or (2) within or centrally located over the centroidal area of the stack or duct cross section.

3.1.2 Path CEMS. It is suggested that the effective measurement path (1) be totally within the inner area bounded by a line 1.0 meter from the stack or duct wall, or (2) have at least 70 percent of the path within the inner 50 percent of the stack or duct cross-sectional area.

3.2 Stratification Test Procedure. Stratification is defined as a difference in excess of 10 percent between the average concentration in the duct or stack and the concentration at any point more than 1.0 meter from the duct or stack wall. To determine whether effluent stratification exists, a dual probe system should be used to determine the average effluent concentration while measurements at each traverse point are being made. One probe, located at the stack or duct centroid, is used as a stationary reference point to indicate the change in effluent concentration over time. The second probe is used for sampling at the traverse points specified in 40 CFR part 60 appendix A, method 1. The monitoring system samples sequentially at the reference and traverse points throughout the testing period for five minutes at each point.

4. *Performance and Equipment Specifications.*

4.1 Data Recorder Scale. The CEMS data recorder response

range must include zero and a high-level value. The high-level value is chosen by the source owner or operator and is defined as follows:

For a CEMS intended to measure an uncontrolled emission (e.g., at the inlet of a scrubber) the high-level value must be between 1.25 and 2.0 times the average potential emission concentration, unless another value is specified in an applicable subpart of the regulations. For a CEMS installed to measure controlled emissions or emissions that are in compliance with an applicable regulation, the high-level value must be between 1.5 times the HCl concentration corresponding to the emission standard level and the span value. If a lower high-level value is used, the operator must have the capability of requirements of the applicable regulations.

The data recorder output must be established so that the high-level value is read between 90 and 100 percent of the data recorder full scale. (This scale requirement may not be applicable to digital data recorders.) The calibration gas, optical filter or cell values used to establish the data recorder scale should produce the zero and high-level values. Alternatively, a calibration gas, optical filter, or cell value between 50 and 100 percent of the high-level value may be used in place of the high-level value, provided that the data recorder full-scale requirements as described above are met.

The CEMS design must also allow the determination of calibration drift at the zero and high-level values. If this is not possible or practicable, the design must allow these determinations to be conducted at a low-level value (zero to 20 percent of the high-level value) and at a value between 50 and 100 percent of the high-level value.

4.2 Calibration Drift. The CEMS calibration must not drift or deviate from the reference value of the gas cylinder, gas cell, or optical filter by more than 2.5 percent of the span value. If the span value of the CEMS is 20 ppm or less then the calibration drift must be less than 0.5 parts per million, for 6 out of 7 test days.

If the CEMS includes both HCl and diluent monitors, the calibration drift must be determined separately for each in terms of concentrations (see PS 3 for the diluent specifications).

4.3 Calibration Error (CE). Calibration error is assessed using EPA protocol 1 cylinder gases for HCl. The mean difference between the indicated CEMS concentration and the reference concentration value for each standard at all three test levels indicated below shall be no greater than 15 percent of the reference concentration at each level.

4.3.1 Zero Level. Zero to twenty (0 - 20) percent of the emission limit.

4.3.2 Mid Level. Forty to sixty (40 - 60) percent of the emission limit.

4.3.3 High Level. Eighty to one-hundred and twenty (80 - 120) percent of the emission limit.

4.4 CEMS Interference Response Test. Introduce the gaseous components listed in Table PS HCl-1 into the measurement system of the CEMS, while the measurement system is measuring the concentration of HCl in a calibration gas. These components may be introduced separately or as gas mixtures. Adjust the HCl calibration gas and gaseous component flow rates so as to maintain a constant concentration of HCl in the gas mixture being introduced into the measurement system. Record the change in the measurement system response to the HCl on a form similar to Figure PS HCl-1. If the sum of the interferences is greater than 2 percent of the applicable span concentration, take corrective action to eliminate the interference.

Table PS HCl-1
Interference Test Gases Concentrations

Gas	Concentration
Carbon Monoxide	500 ± 50 ppm
Carbon Dioxide	10 ± 1 percent
Oxygen	20.9 ± 1 percent
Sulfur Dioxide	500 ± 50 ppm
Water Vapor	25 ± 5 percent
Nitrogen Dioxide	250 ± 25 ppm

Figure PS HCl -1
Interference Response

Date of Test _____
 Analyzer Type _____
 Serial Number _____
 HCl Calibration Gas Concentration _____

Test Gas	Concentration	Analyzer Response	Analyzer Error	Percent of Span

Conduct an interference response test of each analyzer prior to its initial use in the field. Thereafter, re-check the measurement system if changes are made in the instrumentation that could alter the interference response, e.g., changes in the type of gas detector.

4.5 Sampling and Response Time. The CEMS shall sample the stack effluent continuously. Averaging time, the number of measurements in an average, and the averaging procedure for reporting and determining compliance shall conform with that specified in the applicable emission regulation.

4.5.1 Response Time. The response time of the CEMS should not exceed 2 minutes to achieve 95 percent of the final stable value. The response time shall be documented by the CEMS manufacturer.

4.5.2 Waiver from Response Time Requirement. A source owner or operator may receive a waiver from the response time requirement for instantaneous, continuous CEMS in section 4.5.1 from the Agency if no CEM is available which can meet this specification at the time of purchase of the CEMS.

4.5.3 Response Time for Batch CEMS. The response time requirement of Section 4.5.1 does not apply to batch CEMS. Instead it is required that the sampling time be no longer than one third of the averaging period for the applicable standard. In addition, the delay between the end of the sampling time and reporting of the sample analysis shall be no greater than one hour. Sampling is also required to be continuous except in that

the pause in sampling when the sample collection media are changed should be no greater than five percent of the averaging period or five minutes, whichever is less.

5. *Performance Specification Test Procedure*

5.1 Pretest Preparation. Install the CEMS, prepare the RM test site according to the specifications in Section 3, and prepare the CEMS for operation according to the manufacturer's written instructions.

5.2 Calibration Drift Test Period. While the affected facility is operating at more than 50 percent of normal load, or as specified in an applicable subpart, determine the magnitude of the calibration drift (CD) once each day (at 24-hour intervals) for 7 consecutive days according to the procedure given in Section 6. The CD may not exceed the specification given in Section 4.2.

5.3 CE Test Period. Conduct a CE test prior to the CD test period. Conduct the CE test according to the procedure given in section 7.

6. *The CEMS Calibration Drift Test Procedure*

The CD measurement is to verify the ability of the CEMS to conform to the established CEMS calibration used for determining the emission concentration or emission rate. Therefore, if periodic automated or manual adjustments are made to the CEMS zero and calibration settings, conduct the CD test immediately before these adjustments, or conduct it in such a way that the CD can be determined.

Conduct the CD test at the two points specified in Section 4.1. Introduce the reference gases, gas cells or optical filters (these need not be certified) to the CEMS. Record the CEMS response and subtract this value from the reference value (see the example data sheet in Figure 2-1).

7. Calibration Error Test Procedure

7.1 Sampling Strategy. The CEMS calibration error shall be assessed using the calibration source specified in Section 4.3. Challenge the CEMS at the measurement levels specified in Section 4.3. During the test, operate the CEMS as nearly as possible in its normal operating mode. The calibration gases should be injected into the sampling system as close to the sampling probe outlet as practical and shall pass through all filters, scrubbers, conditioners, and other monitor components used during normal sampling.

7.2 Number of tests. Challenge the CEMS three non-consecutive times at each measurement point and record the responses. The duration of each challenge should be for a sufficient period of time to ensure that the CEMS surfaces are conditioned and a stable output obtained.

7.3 Calculations. Summarize the results on a data sheet. Calculate the mean difference between the CEMS response and the known reference concentration at each measurement point according to equations 1 and 2 of Section 8. The calibration error (CE) at each measurement point is then given by:

$$CE = |d / R_v| \times 100,$$

where R_v is the reference concentration value.

8. Equations

8.1 Arithmetic Mean. Calculate the arithmetic mean of the

$$\bar{d} = \frac{1}{n} \sum_{i=1}^n d_i$$

difference, d , of a data set as follows:

Where: **Proposed**

$$\sum_{i=1}^n d_i = \begin{array}{l} \text{Algebraic sum of the individual} \\ \text{differences } d_i \end{array}$$

n = number of data points.

When the mean of the differences of pairs of data is calculated, be sure to correct the data for moisture, if applicable.

9. Reporting

At a minimum (check with the appropriate regional office, or State, or local agency for additional requirements, if any)

summarize in tabular form the results of the CD tests and the relative accuracy tests or alternative RA procedure as appropriate. Include all data sheets, calculations, charts (records of CEMS responses), cylinder gas concentration certifications (if applicable), necessary to substantiate that the performance of the CEMS met the performance specifications.

Proposed