

Question 9.1

Topic: Zero Air Material

Question: What is zero air material?

Answer: Zero air material is a calibration gas that may be used to zero an SO₂, NO_x or CO₂ analyzer. Zero air material has an effective concentration of 0.0% of the span value for the component being zeroed, and is free of certain other interfering gaseous species. Zero air material may be used for calibration error checks in lieu of a "zero-level" EPA Protocol gas (i.e., a gas standard with a concentration > 0.0%, but ≤ 20% of the span value for the gaseous component of interest -- see Question 9.31). According to 40 CFR § 72.2, zero air material includes the following:

- (1) A calibration gas certified by the gas vendor not to contain concentrations of SO₂, NO_x, or total hydrocarbons above 0.1 parts per million (ppm), a concentration of CO above one ppm or a concentration of CO₂ above 400 ppm;
- (2) Ambient air conditioned and purified by a CEMS for which the CEMS manufacturer or vendor certifies that the particular CEMS model produces conditioned gas that does not contain concentrations of SO₂, NO_x, or total hydrocarbons above 0.1 ppm, a concentration of CO above one ppm, or a concentration of CO₂ above 400 ppm;
- (3) For dilution-type CEMS, conditioned and purified ambient air provided by a conditioning system concurrently supplying dilution air to the CEMS; or
- (4) A multicomponent mixture certified by the supplier of the mixture that the concentration of the component being zeroed is less than or equal to the applicable concentration specified in paragraph (1) of this definition, and that the mixture's other components do not interfere with the CEM readings.

Option (1) above describes a gaseous standard that is certified by the vendor not to contain the gaseous components listed (i.e., SO₂, NO_x, THC, CO, and CO₂) at concentrations exceeding the levels specified in the zero air material definition. A cylinder of high purity air meeting this requirement may be used as a universal zero standard for SO₂, NO_x, or CO₂ analyzers (but obviously *not* for O₂ analyzers, since air contains 20.9% oxygen -- see Question 9.2).

Option (2) allows the use of ambient air purified by a CEMS air clean-up system, where the CEM vendor provides a certification statement that the system design (which must include adequate quality assurance and quality control procedures) ensures that the purified ambient air used for the zero level check will meet the specifications in the zero air material definition. Then, as long as the owner or operator implements the identified QA/QC procedures, purified ambient air may be used as a zero air material for

SO₂, NO_x, or CO₂ analyzers.

Option (3) allows purified dilution air from a conditioning system to be used to zero a dilution-extractive type SO₂, NO_x, or CO₂ monitor. This option does not require the same level of certification as Option (1) or (2), since any background concentrations of the component being zeroed (or any potential interfering compounds) are also present during normal emission measurements. This effectively "zeros-out" any background effects. However, the dilution air purification system should be maintained and operated according to the manufacturer's instructions.

Finally, Option (4) allows you to use a multi-component gas mixture as zero air material, provided that:

- (1) The concentration of the component being zeroed is certified by the vendor not to exceed the level specified in the zero air material definition; and
- (2) None of the other components of the mixture is known to interfere with the analysis of the component being zeroed.

To facilitate the implementation of Option (4), you may assume that a multi-component EPA Protocol gas mixture is suitable for use as a zero air material if:

- (1) The component being zeroed is not listed as a component of the gas mixture on the vendor's calibration gas certificate; or
- (2) The component being zeroed is listed, its concentration does not exceed the level specified in the zero air material definition; and
- (3) None of the other components of the mixture is known to interfere with the analysis of the component being zeroed.

For example, if you have a NO_x-diluent monitoring system consisting of a NO_x analyzer and a CO₂ analyzer, you may use a NO_x Protocol gas standard consisting of NO_x in nitrogen to zero the CO₂ analyzer, if:

- (1) The certificate supplied by the vendor indicates either that CO₂ is not a component of the mixture or that the CO₂ concentration in the mixture is ≤ 400 ppm; and
- (2) Neither NO_x nor N₂ is known to interfere with the CO₂ measurements.

References: § 72.2, Question 9.2

History: First published in May 1993, Update #1; revised in October 1999 Revised Manual; revised in October 2003 Revised Manual