

- (ii) FIDppm = FID reading in ppmC.
- (iii) SAMppm = methanol concentration in the sample bag, or gas bottle, in ppmC. SAMppm for sample bags

$$= \frac{0.02406 \times \text{Fuel injected} \times \text{Fuel density}}{\text{Air volume} \times \text{Mol. Wt. CH}_3\text{OH}}$$

Where:

- (iv) 0.02406 = Volume of one mole at 29.92 in. Hg and 68 °F, m³.
- (v) Fuel injected = Volume of methanol injected, ml.
- (vi) Fuel density = Density of methanol, 0.7914 g/ml.
- (vii) Air volume = Volume of zero grade air, m³.
- (viii) Mol. Wt. CH₃OH = 32.04.

(d) *FID response factor to methane.* When the FID analyzer is to be used for the analysis of gasoline, diesel, methanol, ethanol, liquefied petroleum gas, and natural gas-fueled vehicle hydrocarbon samples, the methane response factor of the analyzer must be established. To determine the total hydrocarbon FID response to methane, known methane in air concentrations traceable to the National Institute of Standards and Technology (NIST) must be analyzed by the FID. Several methane concentrations must be analyzed by the FID in the range of concentrations in the exhaust sample. The total hydrocarbon FID response to methane is calculated as follows:

$$r_{\text{CH}_4} = \text{FIDppm} / \text{SAMppm}$$

Where:

- (1) r_{CH₄} = FID response factor to methane.
- (2) FIDppm = FID reading in ppmC.
- (3) SAMppm = the known methane concentration in ppmC.

[54 FR 14525, Apr. 11, 1989, as amended at 59 FR 48508, Sept. 21, 1994; 60 FR 34345, June 30, 1995; 70 FR 40433, July 13, 2005]

§ 86.122-78 Carbon monoxide analyzer calibration.

The NDIR carbon monoxide analyzer shall receive the following initial and periodic calibrations:

- (a) *Initial and periodic interference check.* Prior to its introduction into service and annually thereafter the NDIR carbon monoxide analyzer shall

be checked for response to water vapor and CO₂:

- (1) Follow the manufacturer's instructions for instrument startup and operation. Adjust the analyzer to optimize performance on the most sensitive range to be used.

- (2) Zero the carbon monoxide analyzer with either zero-grade air or zero-grade nitrogen.

- (3) Bubble a mixture of 3 percent CO₂ in N₂ through water at room temperature and record analyzer response.

- (4) An analyzer response of more than 1 percent of full scale for ranges above 300 ppm full scale or of more than 3 ppm on ranges below 300 ppm full scale will require corrective action. (Use of conditioning columns is one form of corrective action which may be taken.)

(b) *Initial and periodic calibration.* Prior to its introduction into service and monthly thereafter the NDIR carbon monoxide analyzer shall be calibrated.

- (1) Adjust the analyzer to optimize performance.

- (2) Zero the carbon monoxide analyzer with either zero-grade air or zero-grade nitrogen.

- (3) Calibrate on each normally used operating range with carbon monoxide in N₂ calibration gases having nominal concentrations of 15, 30, 45, 60, 75, and 90 percent of that range. Additional calibration points may be generated. For each range calibrated, if the deviation from a least-squares best-fit straight line is 2 percent or less of the value at each data point, concentration values may be calculated by use of a single calibration factor for that range. If the deviation exceeds 2 percent at any point, the best-fit non-linear equation which represents the data to within 2 percent of each test point shall be used to determine concentration.

§ 86.123-78 Oxides of nitrogen analyzer calibration.

The chemiluminescent oxides of nitrogen analyzer shall receive the following initial and periodic calibration.

- (a) Prior to introduction into service and at least monthly thereafter the chemiluminescent oxides of nitrogen analyzer must be checked for NO₂ to NO converter efficiency. Figure B78-9