

*emission limit?* In most cases where an emission unit is subject to more than one emission limit, the analysis should be designed for the most stringent limit. An emission unit that is shown to be in compliance with the most stringent limit when the analysis is designed in this way is also in compliance with the other applicable limits.

## 2.0 Summary of Method

In this method, you continuously sample the emission gas and convey the sample to an analyzer that measures the concentration of NO<sub>x</sub>. You may measure NO and NO<sub>2</sub> separately or simultaneously together but, for purposes of this method, NO<sub>x</sub> is the sum of NO and NO<sub>2</sub>. You must adhere to the performance requirements of this method to validate your data.

## 3.0 Definitions

3.1 *Analyzer calibration error* means the difference between the manufacturer certified calibration gas concentration and the concentration reported by the analyzer in direct calibration mode.

3.2 *Calibration curve* means the relationship between the analyzer's response and the concentration of the gas introduced to the analyzer over the calibration range of the analyzer.

3.2.1 *Direct Calibration* means introducing the calibration gases directly to the analyzer according to manufacturer's published calibration procedure.

3.2.2 *System Calibration* means introducing the calibration gases into the measurement system at the probe and upstream of all sample conditioning components.

3.3 *Calibration gas* means the gas mixture containing NO<sub>x</sub> at a concentration of known pedigree and produced and certified in accordance with "EPA Traceability Protocol for Assay and Certification of Gaseous Calibration Standards," September 1997, as amended August 25, 1999, EPA-600/R-97/121. The tests for analyzer calibration error and sampling system bias require a span-, mid-, and low-level calibration gases.

3.4 *Converter Efficiency Gas* means a calibration gas with a known NO<sub>2</sub> concentration.

3.5 *Data recorder* means the equipment that permanently records the concentrations reported by the analyzer.

3.6 *Gas analyzer* means the equipment that senses the gas being measured and generates an output proportional to its concentration.

3.7 *Interference check* means the test intended to detect analyzer responses to things other than the compound of interest, usually a gas present in the measured gas stream, that is not adequately accounted for in the calibration procedure and hence results in excessive bias.

3.8 *Measurement system* means all the equipment used to determine the NO<sub>x</sub> concentration. The measurement system comprises six major subsystems: Acquisition, sample transport, sample conditioning, flow control/gas manifold, gas analyzer, and data recorder.

3.9 *Range* means the interval between the nominal minimum and maximum

concentration that the gas analyzer manufacturer cites for the analyzer full-scale response. Gas analyzers that have single-range or multiple-range capability with either automated or manual switching are potentially acceptable. The range must be at least 5 percent greater than the concentration of the span-level gas you use to calibrate the analyzer, so that sampling system bias can be determined.

3.10 *Response time* is the time it takes the data acquisition system to read 95 percent of the stable reading from a step change in concentration when the sampling system is operating at its design flow rate.

3.11 *Sampling system bias* means the difference between the manufacturer certified calibration gas concentration and the concentration the analytical system gives for the same gas when it is introduced in system calibration mode, divided by the emission standard.

3.12 *Span* means the highest concentration of the calibration curve and is synonymous with the concentration of the highest calibration gas. In most cases, the span will be higher than the concentration of the emission standard.

## 4.0 Interferences [Reserved]

## 5.0 Safety

*What safety measures should I consider when using this method?* This method may require you to work with hazardous materials and in hazardous conditions. We encourage you to establish safety procedures before using this method. Among other precautions, you should become familiar with the safety recommendations in the gas analyzer user's manual. Occupational Safety and Health Administration (OSHA) regulations may also apply to you.

## 6.0 Equipment and Supplies

The performance criteria in this method will be met or exceeded most of the time if you are properly using equipment designed for this application.

6.1 *What do I need for the measurement system?* Figure 7E-1 is a diagram of an example measurement system. You may use alternative equipment and supplies provided (1) your sample flow rate is maintained within 5 percent of the design flow rate, (2) the probe, filter, and the sample line from the sample probe to the moisture removal system (if necessary) is constructed of materials which do not absorb or otherwise alter the sample gas and are heated to at least 140 °C (284 °F) or 25 °C (77 °F) above the concentration dew point of the sample, whichever is higher, to prevent condensation, and (3) the interference and sampling system bias criteria are met. An NO<sub>x</sub> measurement system that meets the following specifications is likely to meet the interference and sampling system bias requirements and are provided as guidance. The essential components of the measurement system are described below:

6.1.1 *Sample Probe (Stinger)*. Glass, stainless steel, or equivalent, of sufficient length to traverse the sample points. The sampling probe must reach all sample points and be heated to at least 140 °C (284 °F) to prevent condensation or 25 °C (77 °F) above

the concentration dew point of the sample, whichever is higher.

6.1.1.1 *Particulate Filter*. An in-stack or out-of-stack filter. The probe filter and all flow components located at the probe must be heated to at least 140 °C (284 °F) or 25 °C (77 °F) above the dew point of the sample, whichever is higher. The filter media must be included in the sampling system bias test and be made of materials that are nonreactive to the gas being sampled.

6.1.2 *Heated Sample Line*. The sample line from the probe to the moisture removal system (if necessary) and to the sample pump should be made of stainless steel, teflon, or other material that does not absorb or otherwise alter the sample gas. Heat the sample line between the probe and moisture removal system to at least 140 °C (284 °F) to prevent condensation or 25 °C (77 °F) above the dew point of the sample, whichever is higher.

6.1.3 *Sample Lines*. Stainless steel or Teflon tubing to transport the sample from the moisture removal system to the flow control gas manifold.

6.1.4 *Moisture Removal System*. A thermo-electric type condenser or similar device to remove condensate continuously from the sample gas while maintaining minimal contact between the condensate and the sample gas. The gas temperature at the outlet of the drier must be <60 °F (15 °C) as measured in the drier outlet tubing, and the drier outlet gas dew point temperature must be maintained equal to or less than 41 °F (5 °C). The moisture removal system is not necessary for analyzers that measure gas concentrations on a wet basis. For these analyzers (1) heat the sample line and all sample transport components up to the inlet of the analyzer to at least 140 °C (284 °F) or 25 °C (77 °F) above the concentration dew point of the sample, whichever is higher, to prevent condensation, and (2) determine the moisture content and correct the measured gas concentrations to a dry basis using appropriate methods, subject to the approval of the Administrator. You do not need to determine sample moisture content if your analyzer measures concentration on a wet basis when (1) a wet basis CO<sub>2</sub> analyzer operated according to Method 3A is used to obtain simultaneous measurements, and (2) the pollutant/CO<sub>2</sub> measurement system is used to determine emissions in units of the standard. The wet analyzer must pass the same sampling system bias check as the dry measurement system. The sampling system bias check must include the same water (±1 percent absolute) concentration found in the sample.

6.1.5 *Sample Pump*. A leak-free pump to pull the sample gas through the system at a flow rate sufficient to minimize the response time of the measurement system. The pump may be constructed of any material that is nonreactive to the gas being sampled.

6.1.6 *Flow Control/Gas Manifold*. An assembly of manual or solenoid valves to allow the introduction of calibration gases either directly to the gas analyzer in direct mode, or into the measurement system, at the probe, in system mode. A calibration valve assembly, three-way valve assembly, or equivalent, for blocking the sample gas flow