STANDARD OPERATING PROCEDURE
Use of Portable Analyzer for Title V Semi-Annual Testing

5/2/2007

The North Dakota Department of Health approves the use of portable analyzers to measure NO_x and CO emissions with quality assurance procedures equivalent to EPA Test Methods in 40 CFR 60, Appendix A or the following minimum Standard Operating Procedure (SOP). The purpose of the SOP is not to replace the Reference Methods of 40 CFR 60, Appendix A, but to facilitate the measurement of emissions from sources that require periodic emissions testing. The SOP is limited to measurements of NO_x (NO and NO_2), and CO.

The tester may submit other quality assurance procedures/protocol for Department approval. The protocol *must comply with the minimum requirements* of the SOP. The protocol must address all pertinent information regarding the analyzer and all requirements as listed in the following sections.

I. Pre-Test Calibration

A. Calibration Gas Concentration Verification – The analyzer shall be calibrated prior to the emission test with calibration gases certified to ±2% accuracy.

B. Three calibration gases (zero, mid and high) for CO, NO, and NO_2 shall be used.

Zero-Level Gas – purified ambient air may be used as the zero gas.

Mid-Level Gas – concentration that is 40% to 60% of the high range calibration gas.

High-Level Gas – concentration of the high range calibration gas shall be no higher than 125% of the expected concentration nor less than 90% of the expected concentration. The high-level gas is equal to the calibration span.

C. Analyzer calibration error shall be no more than ±5% of the calibration span value for the mid and high range calibration gases, or 5 ppm, whichever is less restrictive. The calibration error shall be calculated as follows:

$$\% \text{ Difference} = \frac{\text{Analyzer Response} - \text{Gas Concentration}}{\text{Calibration Span}} \times 100$$

For the zero gas, the calibration error shall be no more than 10 ppm:

ppm Difference = Analyzer Response – Zero Gas Concentration

II. Cross Interference Check

A. While performing the pre-test calibration, check for and record any response noted on one sensor while calibrating another cell. Interference shall be calculated using the following equation:

$$\% \text{ Interference} = \frac{\text{Analyzer Response}}{\text{Gas Concentration}} \times 100$$

Interference shall be no greater than ±5%.

III. Emissions Testing

A. Allow the analyzer to purge the calibration gases prior to beginning the emissions test.

B. A test shall consist of three runs, with each run at least 20 minutes in length.

C. Record the readings for CO, NO, and NO_2 at 2 minute intervals during the 20 minute run.

IV. Post-Test Calibration

A. After a maximum of three valid 20-minute emissions tests, conduct a post-test calibration as follows for the CO, NO and NO_2 calibration gases:

1. Allow the analyzer to purge the gas sample until a stable zero reading is observed. Record the zero reading.

2. Introduce the high range calibration gas to the analyzer and allow it to reach a stable reading. Record the analyzer reading.

3. Introduce the mid range calibration gas to the analyzer and allow it to reach a stable reading. Record the analyzer reading.

B. Calculate the difference to the pre-test calibration value. If the difference is greater than ±5% or 5 ppm, whichever is less restrictive, the emissions test runs are invalid and must be repeated.

$$\% \text{ Difference} = \frac{(\text{Post-Test Reading}) - (\text{Pre-Test Reading})}{\text{Pre-Test Reading}} \times 100$$

For the zero gas, the post-test calibration error shall be no more than 10 ppm.

V. Stack Gas Volumetric Flow and Moisture Content

The stack gas volumetric flow and moisture content may be determined using 40 CFR 60, Appendix A, Methods 1-4 or by knowledge of fuel gas composition and combustion stoichiometry. Combustion stoichiometry may be used to determine stack flow only if quality assurance procedures are submitted to the Department and approved prior to use in the field.

Notes:

The Department will not accept any portable analyzer test unless all the above conditions are met or a separate testing protocol has been approved in advance by the Department.

The Department reserves the right to withdraw or modify this SOP without advance notice.

Approved by:

_____ Date: _____

James Semerad
Manager
Permitting and Compliance
Division of Air Quality

Emission Test Worksheet

Date_____
Testing Crew_____
Company & Station_____
Engine Serial No._____ Unit Number (EUI)_____
Engine rpm_____ Normal Operating rpm_____
Suction/Discharge Pressures_____

NO Pre-Test Calibration

NO Calibration Gas	Gas Concentration (ppm)	Analyzer Response (ppm)	Difference
Zero-Level			ppm
Mid-Level			%
High-Level			%

NO_2 Pre-Test Calibration

NO_2 Calibration Gas	Gas Concentration (ppm)	Analyzer Response (ppm)	Difference
Zero-Level			ppm
Mid-Level			%
High-Level			%

CO Pre-Test Calibration

CO Calibration Gas	Gas Concentration (ppm)	Analyzer Response (ppm)	Difference
Zero-Level			ppm
Mid-Level			%
High-Level			%

Company & Station	
Unit Number (EUI)	

Cross Interference Check

Gas	Span Calibration	CO Response	NO Response	NO_2 Response	% Interference	
CO		-				
NO			-			
NO_2				-		

NO Post-Test Calibration

NO Calibration Gas	Pre-Test Analyzer Response	Post-Test Analyzer Response	Difference
Zero-Level			ppm
Mid-Level			%
High-Level			%

NO_2 Post-Test Calibration

NO_2 Calibration Gas	Pre-Test Analyzer Response	Post-Test Analyzer Response	Difference
Zero-Level			ppm
Mid-Level			%
High-LEvel			%

CO Post-Test Calibration

CO Calibration Gas	Pre-Test Analyzer Response	Post-Test Analyzer Response	Difference
Zero-Level			ppm
Mid-Level			%
High-Level			%

Emission Tests

Run	Time	CO (ppm)	NO (ppm)	NO_2 (ppm)	NO_x (ppm)
1	0:02				
	0:04				
	0:06				
	0:08				
	0:10				
	0:12				
	0:14				
	0:16				
	0:18				
	0:20				
	average				
2	0:02				
	0:04				
	0:06				
	0:08				
	0:10				
	0:12				
	0:14				
	0:16				
	0:18				
	0:20				
	average				
3	0:02				
	0:04				
	0:06				
	0:08				
	0:10				
	0:12				
	0:14				
	0:16				
	0:18				
	0:20				
	average				

NO_x (ppm) = NO (ppm) + NO_2 (ppm)