

Source Test Procedure **ST-1B**

AMMONIA INTEGRATED SAMPLING

(Adopted January 20, 1982)

REF: Regulation 7-303

1. APPLICABILITY

- 1.1 This method is used to quantify emissions of ammonia. It determines compliance with Regulation 7-303.

2. PRINCIPLE

- 2.1 Sample gas is drawn through a solution of 0.1 normal (0.1N) hydrochloric acid which absorbs the ammonia. The ammonia is then analyzed according to Analytical Procedure Lab-1.

3. RANGE

- 3.1 The minimum measurable concentration of ammonia is 1 ppm at the sample volume specified in this procedure.
- 3.2 Elevated concentrations of ammonia may be determined by increasing the concentration of the absorbing reagent, hydrochloric acid solution. The concentration of reagent to be used may be determined by stoichiometry, allowing a 50% excess.

4. INTERFERENCE

None Known.

5. APPARATUS

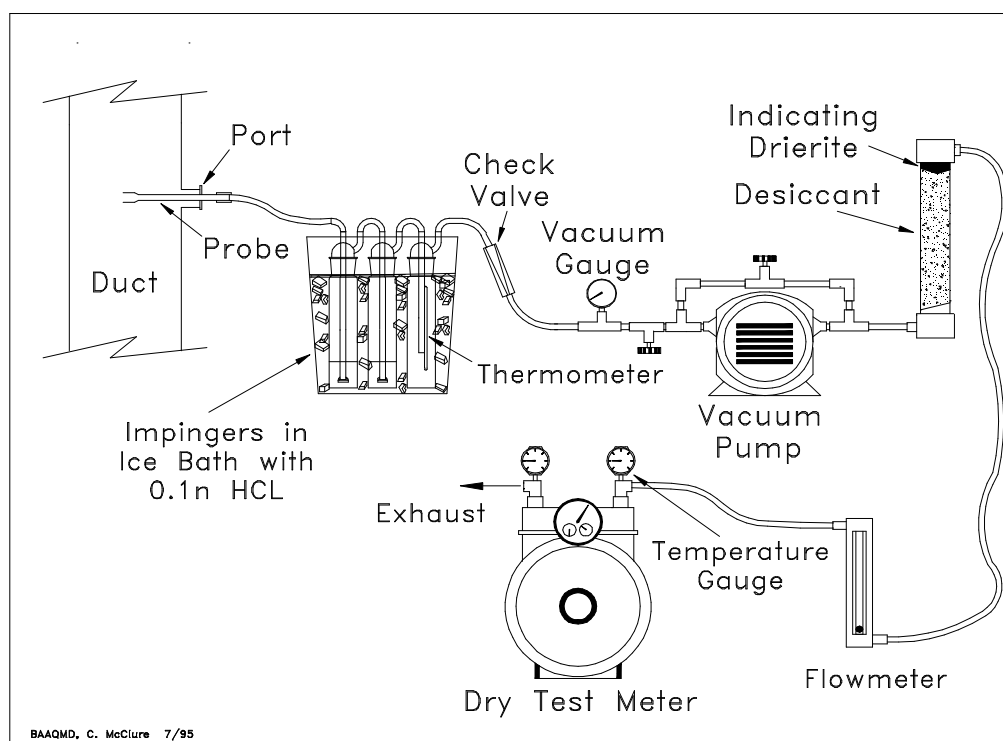
- 5.1 Probe. The probe is constructed of borosilicate glass tubing fitted with a glass wool filter in the nozzle.
- 5.2 Condensers. Use three Greenberg-Smith impingers as adsorber/condensers. The final impinger has a thermometer attached to the inlet stem.
- 5.3 Cooling System. Use an ice bath to contain the impingers.
- 5.4 Sample Pump. Use a leak-free vacuum pump capable of maintaining a 14.3 liter/min (0.5 CFM) flow rate at 15 inches of mercury. The pump must have a flow control valve and vacuum gauge attached to the inlet.
- 5.5 Silica Gel Tube. Use approximately 500cc of silica gel (with a Drierite indicator) to insure that the gas entering the dry test meter is dry.
- 5.6 Dry Test Meter. Use a dry gas test meter accurate within $\pm 2\%$ of the true volume and equipped with a thermometer to measure the outlet temperature.

- 5.7 Connections. Use Teflon tubing in making all connections that come in contact with the sample. Vinyl tubing is acceptable for all other connections.
- 5.8 Barometer. Use a barometer that is accurate to within ± 0.2 inches of mercury.
- 5.9 Rotameter. Use a calibrated rotameter to measure the sampling rate.

6. REAGENTS

- 6.1 Hydrochloric acid, 0.1N. Dissolve 7.30 ml concentrated HCl in sufficient water to make a 1.0 liter solution.

Figure 1B-1
Ammonia Sampling Train



7. PRE-TEST PROCEDURES

- 7.1 Add 100ml of the HCl solution to each of two impingers.
- 7.2 Stopper the impingers.
- 7.3 Retain 100 ml of the HCl solution to analyze as a blank.
- 7.4 Assemble the sampling train as shown in Figure 1B-1.
- 7.5 Leak-test the sampling train by starting the pump, plugging the probe, and adjusting the pump inlet vacuum to 10 inches Hg. The leak rate must not exceed 0.6 liter/min (0.02 CFM) through the dry test meter. Before stopping the pump, carefully release the plug in the sample probe to avoid backflow of the impinger solution.

- 7.6 Record the initial dry test meter reading and barometric pressure on the sampling data sheet, Form 1B-1.
- 7.7 If there is evidence of concentration stratification, select the sampling traverse points according to ST-18. Otherwise, sample at a single point.

8. SAMPLING

- 8.1 Each test run shall be of thirty minute duration when testing emissions from continuous operations. Each test run at batch process operation shall be for 90% of the batch time or thirty minutes, whichever is less.
- 8.2 Position the probe at the sampling point and start the pump.
- 8.3 Sample at a constant rate of 14.3 liter/min (0.5 CFM) during the test as determined by the rotameter. Use the rotameter only to establish the initial sampling rate. Then remove it from the system.
- 8.4 Record the following information at five-minute intervals.

Dry test meter temperature
Impinger outlet temperature
Dry test meter volume

- 8.5 Add ice as necessary to maintain impinger temperature at 7 °C (45°F) or less.
- 8.6 At the conclusion of each run, stop the pump, remove the probe from the stack, record the final meter reading. Point the probe upward and purge the sample train with ambient air.
- 8.7 Take three consecutive samples.

9. POST-TEST PROCEDURES

- 9.1 Stopper the impingers until they are analyzed.
- 9.2 Individually analyze the hydrochloric acid solutions and blank for total ammonia content according to Analytical Procedure Lab-1.

10. CALCULATIONS

- 10.1 Standard sample volume:

$$V_o = \frac{(17.71)V_m P_b}{T_m}$$

Where:

- V_o = Corrected sample volume, SDCF at 70 °F and 29.92 inches Hg.
- V_m = Uncorrected meter volume, ft³
- T_m = Average run meter temperature, °R
- P_b = Barometric pressure, inches Hg.
- 17.71 = A constant correcting to 70 °F and 29.92 inches Hg

10.2 Ammonia Concentration:

$$C = \frac{5.02 \times 10^4 W}{V_o}$$

Where:

C = Ammonia concentration, ppm by volume on a dry basis

W = Total weight of ammonia in the impinger catch, for each run, grams

5.02×10^4 = A constant derived from the molecular weight and correcting to 70°F and 29.92 inches Hg

11. REPORTING

11.1 Report the data indicated on Form 1B-2.

Bay Area Air Quality Management District

939 Ellis Street, San Francisco, CA 94109

Form 1B-1

Source Test Data Sheet

Plant # _____
 Source I.D. _____
 Sample Type _____
 Process Cycle _____
 Duct Size _____
 Duct Shape _____
 Duct Pressure _____
 Assumed %H₂O _____

Run # _____
 Temp Meter # _____
 Mag. Gauge # _____

Date: _____
 Box ΔH@ _____
 Meter (Y) _____

_____ Nozzle Diameter
 _____ Pitot Tube I.D., Cp
 _____ Gas System
 _____ Pbar, Barometer
 _____ Leak Test Rate
 _____ Time @ Point
 _____ # of Points
 _____ Time/Run (Min.)

Sampling Train: Probe # _____ Filter # _____ Imp. # _____ Imp. # _____ Pump/Box # _____

Initial Traverse Data					Sampling Data									
Trav. Point I.D.	Dist. from Wall	Duct Temp. °F	ΔP "H ₂ O	Angle of Flow	Traverse Point I.D.	ΔP "H ₂ O	Duct Temp. °F	Vs FPS	Time (minutes)	Meter Rate CFH	Meter Temp. °F	Meter Volume Ft ³	Train Vacuum "Hg	Sat'd Gas Temp. °F

Post Run Impinger Catch (ml) = _____
 Assumed O₂ = _____
 Assumed CO₂ = _____
 Post Run Calculated %H₂O = _____

Source Test Team

Comments: _____

Form 1B-2

<p>Distribution:</p> <p>Firm Permit Services Enforcement Services Technical Services Planning Requester DAPCO</p>	<p>BAY AREA AIR QUALITY MANAGEMENT DISTRICT</p> <p><i>939 Ellis Street San Francisco, California 94109 (415) 771-6000</i></p> <p>Summary of Source Test Results</p>	<p>Report No.: _____</p> <p>Test Date: _____</p> <p>Test Times:</p> <p>Run A: _____</p> <p>Run B: _____</p> <p>Run C: _____</p>
Source Information		BAAQMD Representatives
Firm Name and Address	Firm Representative and Title Phone No. ()	Source Test Engineers
Permit Conditions:	Source: Plant No. Permit No. Operates Hr/Day & Day/Yr.	Permit Services Division/Enforcement Division Test Requested By:
Operating Parameters		
Applicable Regulations:		VN Recommended:

Source Test Results and Comments:

<u>METHOD</u>	<u>TEST</u>	<u>RUN A</u>	<u>RUN B</u>	<u>RUN C</u>	<u>AVERAGE</u>	<u>LIMIT</u>
ST-1B	Ammonia, ppmv					

Air Quality Engineer II	Date	Supervising Air Quality Engineer	Date	Approved by Air Quality Engineering Manager
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