

Source Test Procedure **ST-22**

TRIMETHYLAMINE

(Adopted January 20, 1982)

REF: Regulation 7-303

1. APPLICABILITY

1.1 This method is used to quantify emissions of Trimethylamine (TMA). 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 TMA. The TMA is subsequently separated and analyzed as specified in Analytical Procedure Lab-14.

3. RANGE AND SENSITIVITY

3.1 The minimum measurable concentration of TMA is 20 ppb at the sample volume specified in this procedure.

3.2 Elevated concentrations of TMA 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

4.1 None known.

5. APPARATUS

5.1 Probe. The probe is constructed of borosilicate glass tubing.

5.2 Absorbers. Use three Greenberg-Smith impingers. The third impinger has a thermometer attached to the inlet stem.

5.3 Cooling system. An ice bath is used to contain the impingers.

5.4 Sample pump. Use a leak-free vacuum pump capable of maintaining a 0.5 CFM flow rate at 15 inches of mercury-vacuum. The pump must have a flow control valve and vacuum gauge attached to the inlet.

5.5 Silica gel tube. Use approximately 500 cc 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 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 mercury, aneroid, or other 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, 0.1 N.

7. PRE-TEST PROCEDURES

7.1 Add 100 ml of the HCl solution to each of two impingers.

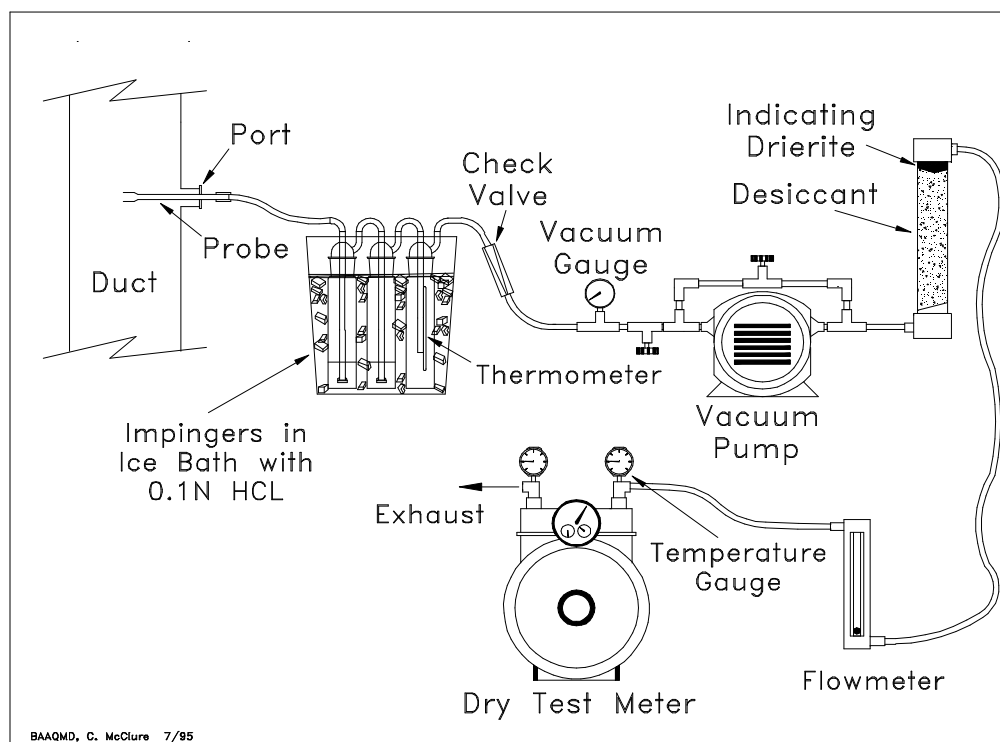
7.2 Stopper the impingers.

7.3 Retain 100 ml of the hydrochloric acid to analyze as a blank.

7.4 Assemble the sampling train as shown in Figure 22-1.

Figure 22-1

Trimethylamine Sampling Train



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 0.02 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 the barometric pressure as shown in Form 22-1.

8. SAMPLING

- 8.1 Each test run shall be of sixty minutes duration when testing emissions from continuous operations. Each test run at batch process operations shall be for 90% of the batch time or sixty 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 reading
- 8.5 The temperature in the modified impinger shall not exceed 7 °C (45°F).
- 8.6 At the conclusion of each run, stop the pump, remove the probe from the stack and record the final meter volume.
- 8.7 Take three consecutive samples.

9. POST-TEST PROCEDURES

- 9.1 Immediately after each test run, stopper the impingers to minimize sample losses.
- 9.2 Individually analyze the hydrochloric acid solutions and blank for TMA content according to Analytical Procedure Lab-14.

10. CALCULATIONS

- 10.1 Standard sample volume:

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

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 TMA concentration:

$$C = \frac{14.4 \times 10^3 W}{V_o}$$

where:

- C = TMA concentration, ppm by volume on a dry basis

- W = Total weight of TMA in the impinger catch, for each run, grams
14.4 = Constant derived from molar volume, molecular weight, and 454
grams/lb

11. REPORTING

- 11.1 Report the data indicated on Form 22-2.

Bay Area Air Quality Management District
939 Ellis Street, San Francisco, CA 94109

Form 22-1
Source Test Data Sheet

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

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

Date: _____
 Box ΔH@ _____
 Meter (Y) _____
 Imp. # _____

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

Source Test Team _____

Comments: _____

Post Run Calculated %H₂O = _____

Form 22-2

Distribution: Firm Permit Services Enforcement Services Technical Services Planning Requester DAPCO	BAY AREA AIR QUALITY MANAGEMENT DISTRICT <i>939 Ellis Street San Francisco, California 94109 (415) 771-6000</i> Summary of Source Test Results	Report No.: _____ Test Date: _____ Test Times: Run A: _____ Run B: _____ Run C: _____
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	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>
Stack Gas Temperature, °F					
ST-22 TMA concentration, ppmv					

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