

TABLE 2—T=VALUES—Continued

n-1 ^a	t-value						
12	2.179	18	2.101	24	2.064	30	2.042
13	2.160	19	2.093	25	2.060	40	2.021
14	2.145	20	2.086	26	2.056	60	2.000
15	2.131	21	2.080	27	2.052	120	1.980
16	2.120	22	2.074	28	2.048	8	1.960

^(a)n is the number of independent pairs of measurements (a pair consists of one spiked and its corresponding unspiked measurement). Either discrete (independent) measurements in a single run, or run averages can be used.

[48 FR 13327, Mar. 30, 1983 and 48 FR 23611, May 25, 1983, as amended at 48 FR 32986, July 20, 1983; 51 FR 31701, Aug. 5, 1985; 52 FR 17556, May 11, 1987; 52 FR 30675, Aug. 18, 1987; 52 FR 34650, Sept. 14, 1987; 53 FR 7515, Mar. 9, 1988; 53 FR 41335, Oct. 21, 1988; 55 FR 18876, May 7, 1990; 55 FR 40178, Oct. 2, 1990; 55 FR 47474, Nov. 14, 1990; 56 FR 5526, Feb. 11, 1991; 59 FR 64593, Dec. 15, 1994; 64 FR 53032, Sept. 30, 1999; 65 FR 62130, 62144, Oct. 17, 2000; 65 FR 48920, Aug. 10, 2000; 69 FR 1802, Jan. 12, 2004; 70 FR 28673, May 18, 2005; 71 FR 55127, Sept. 21, 2006; 72 FR 32767, June 13, 2007]

APPENDIX C TO PART 60—DETERMINATION OF EMISSION RATE CHANGE

1. Introduction

1.1 The following method shall be used to determine whether a physical or operational change to an existing facility resulted in an increase in the emission rate to the atmosphere. The method used is the Student's *t* test, commonly used to make inferences from small samples.

2. Data

2.1 Each emission test shall consist of *n* runs (usually three) which produce *n* emission rates. Thus two sets of emission rates are generated, one before and one after the change, the two sets being of equal size.

2.2 When using manual emission tests, except as provided in §60.8(b) of this part, the reference methods of appendix A to this part shall be used in accordance with the procedures specified in the applicable subpart both before and after the change to obtain the data.

2.3 When using continuous monitors, the facility shall be operated as if a manual emission test were being performed. Valid data using the averaging time which would be required if a manual emission test were being conducted shall be used.

3. Procedure

3.1 Subscripts a and b denote prechange and postchange respectively.

3.2 Calculate the arithmetic mean emission rate, *E*, for each set of data using Equation 1.

$$E = \sum_{i=1}^n E_i = \frac{E_1 + E_2 + \dots + E_n}{n} \quad (1)$$

Where:

E_i=Emission rate for the *i* th run.
n=number of runs.

3.3 Calculate the sample variance, *S*², for each set of data using Equation 2.

$$S^2 = \frac{\sum_{i=1}^n (E_i - E)^2}{n-1} = \frac{\sum_{i=1}^n E_i^2 - \left(\sum_{i=1}^n E_i\right)^2/n}{n-1} \quad (2)$$

3.4 Calculate the pooled estimate, *S_p*, using Equation 3.

$$S_p = \left[\frac{(n_a - 1) S_a^2 + (n_b - 1) S_b^2}{n_a + n_b - 2} \right]^{1/2} \quad (3)$$

3.5 Calculate the test statistic, *t*, using Equation 4.

$$t = \frac{E_b - E_a}{S_p \left[\frac{1}{n_a} + \frac{1}{n_b} \right]^{1/2}} \quad (4)$$

4. Results

4.1 If *E_b* > *E_a* and *t* > *t'*, where *t'* is the critical value of *t* obtained from Table 1, then with 95% confidence the difference between *E_b* and *E_a* is significant, and an increase in emission rate to the atmosphere has occurred.

TABLE 1

Degrees of freedom (<i>n_a</i> = <i>n_b</i> -2)	<i>t'</i> (95 percent confidence level)
2	2.920
3	2.353
4	2.132
5	2.015
6	1.943
7	1.895

TABLE 1—Continued

Degrees of freedom ($n_i=n_b-2$)	<i>f</i> (95 per cent confidence level)
8	1.860

For greater than 8 degrees of freedom, see any standard statistical handbook or text.
 5.1 Assume the two performance tests produced the following set of data:

Test a	Test b
Run 1. 100	115
Run 2. 95	120
Run 3. 110	125

- 5.2 Using Equation 1—
 $E_a=100+95+110/3=102$
 $E_b=115+120+125/3=120$
- 5.3 Using Equation 2—
 $S_a^2=(100-102)^2+(95-102)^2+(110-102)^2/3-1=58.5$
 $S_b^2=(115-120)^2+(120-120)^2+(125-120)^2/3-1=25$
- 5.4 Using Equation 3—
 $S_p=[(3-1)(58.5)+(3+1)(25)/3+3-2]^{1/2}=6.46$
- 5.5 Using Equation 4—

$$t = \frac{120 - 102}{6.46 \left[\frac{1}{3} + \frac{1}{3} \right]^{1/2}} = 3.412$$

5.6 Since $(n^2+n^2-2)=4$, $t'=2.132$ (from Table 1). Thus since $t>t'$ the difference in the values of E_a and E_b is significant, and there has been an increase in emission rate to the atmosphere.

6. Continuous Monitoring Data

6.1 Hourly averages from continuous monitoring devices, where available, should be used as data points and the above procedure followed.

[40 FR 58420, Dec. 16, 1975]

APPENDIX D TO PART 60—REQUIRED EMISSION INVENTORY INFORMATION

(a) Completed NEDS point source form(s) for the entire plant containing the designated facility, including information on the applicable criteria pollutants. If data concerning the plant are already in NEDS, only that information must be submitted which is necessary to update the existing NEDS record for that plant. Plant and point identification codes for NEDS records shall correspond to those previously assigned in NEDS; for plants not in NEDS, these codes shall be obtained from the appropriate Regional Office.

(b) Accompanying the basic NEDS information shall be the following information on each designated facility:

(1) The state and county identification codes, as well as the complete plant and point identification codes of the designated facility in NEDS. (The codes are needed to match these data with the NEDS data.)

(2) A description of the designated facility including, where appropriate:

- (i) Process name.
- (ii) Description and quantity of each product (maximum per hour and average per year).
- (iii) Description and quantity of raw materials handled for each product (maximum per hour and average per year).
- (iv) Types of fuels burned, quantities and characteristics (maximum and average quantities per hour, average per year).
- (v) Description and quantity of solid wastes generated (per year) and method of disposal.

(3) A description of the air pollution control equipment in use or proposed to control the designated pollutant, including:

- (i) Verbal description of equipment.
- (ii) Optimum control efficiency, in percent. This shall be a combined efficiency when more than one device operates in series. The method of control efficiency determination shall be indicated (e.g., design efficiency, measured efficiency, estimated efficiency).
- (iii) Annual average control efficiency, in percent, taking into account control equipment down time. This shall be a combined efficiency when more than one device operates in series.

(4) An estimate of the designated pollutant emissions from the designated facility (maximum per hour and average per year). The method of emission determination shall also be specified (e.g., stack test, material balance, emission factor).

[40 FR 53349, Nov. 17, 1975]

APPENDIX E TO PART 60 [RESERVED]

APPENDIX F TO PART 60—QUALITY ASSURANCE PROCEDURES

PROCEDURE 1. QUALITY ASSURANCE REQUIREMENTS FOR GAS CONTINUOUS EMISSION MONITORING SYSTEMS USED FOR COMPLIANCE DETERMINATION

1. Applicability and Principle

1.1 Applicability. Procedure 1 is used to evaluate the effectiveness of quality control (QC) and quality assurance (QA) procedures and the quality of data produced by any continuous emission monitoring system (CEMS) that is used for determining compliance with the emission standards on a continuous basis as specified in the applicable regulation. The CEMS may include pollutant (e.g., SO₂ and NO_x) and diluent (e.g., O₂ or CO₂) monitors.

This procedure specifies the minimum QA requirements necessary for the control and