



**DEQ**

**FORM F1103**

**Worksheet 1**

**Actual Emissions Using Verified Emission Factors: Emissions calculations using source test data**

State of Oregon  
Department of  
Environmental  
Quality

1. Reporting year	
2. Facility name	3. Permit number
4. Device or process ID	5. Pollutant

Form F1103 Worksheet 1 is part of the form series provided to Title V Operating Permit holders to report annual emissions of regulated air pollutants subject to fees to the Department of Environmental Quality (DEQ). Read the instructions for form F1103 before completing Worksheet 1. The source owner or operator must complete Worksheets 1 and 2 and form F1103 if he or she has chosen to pay for emissions based on actual emissions using verified emission factors and source test data.

This worksheet provides for owners and operators to calculate emissions from normal operations based on source test data. As described in the instructions for form F1103, the owner or operator must have conducted at least three source tests. Each test must have consisted of at least three individual test runs.

Complete a worksheet for each emission source (device or process) for which emissions are being calculated using source test data, and for each pollutant that was tested. Complete as many worksheets as needed. Submit the worksheets to DEQ with form F1103.

The worksheet may be copied from previous years if the information is correct for the current reporting year. If new source tests are performed and new test data is available, the worksheet must be completed for the current reporting year using the new verified emission factors.

Part A

A-1.

Enter the following information in the table provided at the top of page 1 of this worksheet.

A-2. Enter an identifier for each source test run (e.g. T1R1 for test 1, run 1) and complete the table below. To calculate the emission factor, divide the emissions for the test run (in pounds per hour) by the applicable process rate during that test run. The source tests must represent the entire range of operating levels: at least one test must be conducted at minimum operating conditions, at normal or average operating levels and at anticipated maximum operating levels. If the process rate is constant, all tests must be conducted at that rate.

Test Number	Source test run ID	Emissions (lbs/hr)	Process rate (include units/hr)	Emission factor (specify units)
1				
2				
3				



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A-3. Perform a regression analysis on the emission factors calculated in section A-2. The regression analysis will determine the best-fit equation and the correlation coefficient  $R^2$ . Enter the results of the regression analysis below.

$R^2 = \underline{\hspace{2cm}}$

If  $R^2$  is less than 0.50, skip section A-4 and proceed to Part B.

If  $R^2$  is equal to or greater than 0.50, proceed to section A-4.

A-4. Indicate whether the process operation is constant or variable (circle one).

If constant, proceed to Part C. In addition, the owner or operator must submit documentation to DEQ demonstrating a constant process rate.

If variable, proceed to Part D.

**Part B**

Complete this section if  $R^2$  (in section A-3) is less than 0.50. This section will help the owner or operator determine the emissions estimate adjustment factor (EEAF) and the actual emissions (AE) in a manner that recognizes the relatively weak relationship between emissions and process rates, as revealed by  $R^2$ . Part B contains the following equations:

$EEAF = 1 + SD/EF_{avg}$

Where: EEAF = emissions estimate adjustment factor

SD = standard deviation of the test run emission factors

$EF_{avg}$  = average of the test run emission factors

$AE = EF_{avg} \times EEAF \times P$

Where: AE = actual emissions

$EF_{avg}$  = average of the emission factors

EEAF = emissions estimate adjustment factor

P = total production for the year

B-1. Determine the standard deviation (SD) of the test run emission factors reported in section A-2. Use the following:

$$SD = \sqrt{\frac{\sum_{i=1}^N (X_i - \bar{X})^2}{N - 1}}$$

In this formula, X is the value of the mean, N is the sample size, and  $X_i$  represents each data value from  $i=1$  to  $i=N$ . The  $\sum$  symbol indicates that you must add up the sum of the individual values.

Enter SD here:           

B-2. Determine the average of the emission factors ( $EF_{avg}$ ) in section A-2.

Enter  $EF_{avg}$  here and in section 6h of form F1103:           

B-3. Determine the emissions estimate adjustment factor (EEAF).

$EEAF = SD/EF_{avg} + 1$

Enter EEAF here and in section 6f of form F1103:           

B-4. Determine the total annual production (P) for the device or process for the reporting year. If the device or process had any emissions during startups, shutdowns, maintenance periods or upsets, the production that took place during those periods should be excluded from P here. Those emissions will be reported on another worksheet.

Enter P here and in section 6g of form F1103:



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B-5. Determine actual emissions (AE). Multiply  $EF_{avg}$  (section B-2), EEAF (section B-3) and P (section B-4).

$$AE = EF_{avg} \times EEAF \times P$$

Enter AE here and in section 6i of form F1103: \_\_\_\_\_

Part C

Complete this section if  $R^2$  (in section A-3) is equal to or greater than 0.50 and the process operation is constant (section A-4). Part C will help the owner or operator determine the emissions estimate adjustment factor (EEAF) and the actual emissions (AE) in a manner that recognizes the relatively strong relationship between emissions and process rates, as revealed by  $R^2$ . Part C contains the following equations:

$$EEAF = 1 + (1 - R^2)$$

Where: EEAF = emissions estimate adjustment factor

$R^2$  = correlation coefficient

$$AE = EF_{avg} \times EEAF \times P$$

Where: AE = actual emissions

$EF_{avg}$  = average of the test run emission factors

EEAF = emissions estimate adjustment factor

P = production time or quantity during startup, shutdown or upset

C-1. Determine the emissions estimate adjustment factor (EEAF).

$$EEAF = 1 + (1 - R^2)$$

$R^2$  is in section A-3.

Enter EEAF here and in section 6f of form F1103: \_\_\_\_\_

C-2. Determine the average of the emission factors ( $EF_{avg}$ ) in section A-2.

Enter  $EF_{avg}$  here and in section 6h of form F1103: \_\_\_\_\_

C-3. Determine the total annual production (P) for the device or process for the reporting year. If the device or process had any emissions during startups, shutdowns, maintenance periods or upsets, the production that took place during those periods should be excluded from P here. Those emissions will be reported on worksheet 2.

Enter P here and in section 6g of form F1103: \_\_\_\_\_

C-4. Determine actual emissions (AE). Multiply EEAF (section C-1),  $EF_{avg}$  (section C-2) and P (section C-3).

$$AE = EEAF \times EF_{avg} \times P$$

Enter AE here and in section 6i of form F1103: \_\_\_\_\_

Part D

Complete this section if  $R^2$  (in section A-3) is equal to or greater than 0.50 and the process operation is variable (section A-4). This section will help the owner or operator determine the emissions estimate adjustment factor (EEAF) and the actual emissions (AE) in a manner that recognizes the relatively strong relationship between emissions and process rates, as revealed by  $R^2$ . Because the process rate of operation is variable, identify annual production at three different levels of operation: minimum, normal and maximum. Part D contains the following equations:

$$AE = EEAF \times [(EF_{max} \times P_{max}) + (EF_{norm} \times P_{norm}) + (EF_{min} \times P_{min})]$$



Where: AE = actual emissions

EEAF = emissions estimate adjustment factor

EF = the averages of the test run emission factors at maximum, normal, and minimum production rates

P = the production times or quantities at maximum, normal, and minimum production levels

D-1. Enter production rate (PR) levels from the source tests in section A-2 as follows:

PR<sub>max</sub> = average maximum production rates from at least three source test runs = \_\_\_\_\_

PR<sub>norm</sub> = average of normal production rates from at least three source test runs = \_\_\_\_\_

PR<sub>min</sub> = average of minimum production rates from at least three source test runs = \_\_\_\_\_

D-2. Determine average emission factors (EF<sub>avg</sub>) for each production rate. Enter these in the spaces below and enter all three in section 6h of form F1103.

i. EF<sub>max</sub> = average emission factor at maximum production rate from at least three test runs = \_\_\_\_\_

ii. EF<sub>norm</sub> = average emission factor at normal production rate from at least three test runs = \_\_\_\_\_

iii. EF<sub>min</sub> = average emission factor at minimum production rate from at least three test runs = \_\_\_\_\_

D-3. Calculate the total annual production (P) for the device or process for the reporting year at each of the three production levels (maximum, normal and minimum). If the device or process had any emissions during startups, shutdowns, maintenance periods or upsets, the production that took place during those periods should be excluded from P here. Those emissions will be reported on another worksheet. The production levels are defined as follows:

i. Maximum level = any production level greater than  $[(PR_{max} + PR_{norm}) / 2]$

ii. Normal level = any production rate less than  $[(PR_{max} + PR_{norm}) / 2]$  and greater than  $[(PR_{norm} + PR_{min}) / 2]$

iii. Minimum level = any production rate less than  $[(PR_{norm} + PR_{min}) / 2]$

Enter the three production levels in the spaces below and enter each one in section 6g of form F1103.

i. P<sub>max</sub> = total production at maximum level of operation = \_\_\_\_\_

ii. P<sub>norm</sub> = total production at normal level of operation = \_\_\_\_\_

iii. P<sub>min</sub> = total production at minimum level of operation = \_\_\_\_\_

D-4. Calculate the emissions estimate adjustment factor (EEAF).

$$EEAF = 1 + (1 - R^2)$$

R<sup>2</sup> is reported in section A-3.

Enter EEAF here and in section 6f of form F1103: \_\_\_\_\_

D-5. Determine actual emissions (AE). Multiply D-2i and D-3i; multiply D-2ii and D-3ii; multiply D-2iii and D-3iii. Add these products together. Multiply the sum by D-4.

$$AE = EEAF \times [(EF_{max} \times P_{max}) + (EF_{norm} \times P_{norm}) + (EF_{min} \times P_{min})]$$

Enter AE here and in section 6i of form F1103: \_\_\_\_\_