



Worksheet 2

FORM F1103

Actual Emissions Using Verified Emission Factors: Emissions during startups, shutdowns and upsets

1. Reporting year	
2. Facility name	5. Permit number
3. Device or process ID	6. Pollutant
4. Type of period	7. Option used

Form F1103 Worksheet 2 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 DEQ. Read the instructions for form F1103 before completing Worksheet 2. The source owner/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.

Complete Worksheet 2 to determine emissions that occur during startups, shutdowns, maintenance periods and upsets. Startups and shutdowns are times during which an air contaminant source or emission-control equipment is brought into normal operation or normal operation is terminated, respectively. A maintenance period is any time during operation that routine maintenance is performed without shutting down the process or device. An upset is any period of failure or malfunction of any pollution control equipment or operating equipment that may cause excess emissions.

This worksheet is required when the emissions during startups, shutdowns, maintenance periods, and upsets exceed the levels that occur during normal operations. There are two options to determine the quantity of these emissions.

Option 1 This method assumes that emissions during startups, shutdowns, maintenance periods or upsets are equivalent to operation without a pollution control device. This method is most common.

Option 2 This method determines emissions during startups, shutdowns and maintenance based on source tests performed during a startup, shutdown and maintenance period. This method is uncommon.

To use Option 2, the owner/operator must have conducted a source test during the period type (startup, shutdown or maintenance) and it must have consisted of at least three individual test runs. Example: to determine emissions during the shutdowns based on source test data, the owner/operator must perform a source test with three runs during any shutdown period. The emission factor derived from this source test would be used to determine emissions during the total shutdown time during the reporting year.

Complete as many worksheets as needed. Submit worksheets to DEQ with form F1103 as part of the Title V facilities annual fee report. Worksheet 2 is required unless the owner/operator demonstrates to DEQ that no excess emissions occur during startups, shutdowns and maintenance periods; and no upsets occurred during the reporting year.

OAR 340-220-0020 states that for purposes of the Title V Operating Permit fees, particulates mean PM₁₀; or if a source's permit specifies Particulate Matter (PM) and not PM₁₀, then PM; or if a source's permit specifies PM_{2.5} and neither PM₁₀ nor PM, then PM_{2.5}. A verified emission factor must be based on the same fraction of PM as the source is required to pay fees for so the efficiency of the pollution control device must also be based on that same PM fraction.

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Part A

Indicate the type of period(s) being calculated and the option from Parts B or C used to calculate the emissions for each period. While Part B - option 1 may be reported on a single worksheet for the applicable periods, a separate worksheet must be completed for each period where emissions are determined using Part C - option 2.

Period types being reported	Check the period	Check option being used
Startups		1 2
Shutdowns		1 2
Maintenance		1 2
Upsets		1 2

Proceed to part B to apply Option 1.

Proceed to part C to apply Option 2.

Part B – Option 1.

This section provides for the owner or operator to calculate emissions during periods of startup, shutdown, maintenance and upsets as equivalent to operation without a control device. Calculate emissions during these periods by adjusting the normal emissions factor for the pollutant/processes by the efficiency of the control device as follows:

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

$$EF_E = (EF_{avg} \times EEAF) / (1-PCDE)$$

Where:

EF_E = Adjusted emission factor during periods of excess emissions.

EF_{avg} = Average emission factor determined for this pollutant, control device and emission source under normal, controlled operations (from Worksheet 1).

EEAF = The emission estimate adjustment factor (from Worksheet 1).

PCDE = pollution control device treatment efficiency

Standard efficiencies for several control devices and pollutants are listed below. If the owner/operator believes the efficiency of the control device is different from the standard, he/she must submit a justification and request for DEQ's approval with the worksheet and form F1103.

Pollutant	Control Device	PCDE
Particulate matter:	ESP or baghouse	0.90
	High energy wet scrubber	0.80
	Low energy wet scrubber	0.70
	Cyclonic separator	0.50
Acidic gases:	Wet or dry scrubber	0.90
VOCs:	Incinerator	0.98
	Carbon absorber	0.95

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Enter the normal emission factor EF_{avg} as reported on Worksheet 1 (from section B-2 or C-2; or the average of the three EFs from section D-2): _____

Enter the normal emission estimate adjustment factor (EEAF) as reported on Worksheet 1 (B-3 or C-1): _____

Enter the PCDE here and in section 7a of form F1103 as a fraction (0.90 represents removal of 90% of the pollutant by the control device): _____

Enter the adjusted emission factor (EF_E): _____

- B-2. Enter production (P) for the time periods for which emissions are being calculated. Because the device or process may have been producing product at a reduced rate, or not producing any product, during startups, shutdowns or maintenance, P may need to be calculated using the total period of time of startups, shutdowns or maintenance during the reporting year and estimating the equivalent production using standard engineering methods. Attach estimation calculations and explanations to the worksheet as needed. If emissions are being calculated for upsets, P must represent the total production (e.g. number of tons of aluminum) produced during all of the upset periods during the reporting year. Estimate equivalent production (P) if the upset affects production, and attach explanation and calculations.

Enter P for the period types being reported, including units, here and in section 7b of form F1103:

Startups: _____

Shutdowns: _____

Maintenance: _____

Upsets: _____

- B-3. Calculate the actual emissions (AE) using the corresponding production (P) value in B-2 for each period type.

$$AE = EF_E \times P$$

Enter AE for the period types being reported, here and in section 7c of form F1103, including units

Startups: _____

Shutdowns: _____

Maintenance: _____

Upsets: _____

Part C – Option 2

This section provides for the owner/operator to calculate emissions during startups, shutdowns or maintenance periods using emission factors from source test data. A minimum of one source test with three source test runs must have been completed during the specific period for which emissions are being reported (e.g. at least one source test with three runs must be completed during a startup in order to use the emission factors to determine emissions during all startups). A separate worksheet must be completed for each period where emissions are determined using Option 2.

- C-1. What period is being reported in this section (check one)? Startups Shutdowns Maintenance

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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. A minimum of one test is required for the period being reported.

Test Number	Source test run ID	Emissions (lbs/hr)
1		
2		
3		

C-2. Calculate the average emissions (E_{avg}): _____

C-3 Calculate the standard deviation (SD): _____ (the formula is provided in section B-1 of Worksheet 1)

C-4 Calculate the verified emission factor during startup, shutdown, or malfunction:

$$EF_E = E_{avg} + SD$$

Where:

EF_E = emissions factor in pounds per hour during startup, shutdown, or maintenance period

E_{avg} = the average emissions in pounds per hour during a startup, shutdown, or maintenance period.

SD = the standard deviation of the test results during a startup, shutdown, or maintenance period.

C-5 Enter the total hours of operation during the startup, shutdown, or maintenance period (H): _____

C-6 Calculate the actual emissions during the startup, shutdown, or maintenance period as follows:

$$AE_E = EF_E \times H$$

Where:

AE_E = Actual emissions during startup, shutdown, or maintenance periods when the emissions exceed normal operations

EF_E = Verified emission factor during periods of startup, shutdown, or maintenance

H = Hours of operation during startup, shutdown, or maintenance periods