

1. We have a natural gas fired engine subject to 40 CFR 60, Subpart JJJJ requirements. Table 2 of Subpart JJJJ allows the calculation of exhaust flow rate using EPA Method 19. In our review of Method 19, there are no specific instructions as to how these measurements and calculations are to be conducted; how should I calculate these values?

While Method 19 does not provide specific details for the calculation of exhaust flow rate, the formulae in Method 19 may be used to derive post-combustion flow rate where diluent measurements are made, fuel samples are analyzed, and fuel consumption is measured and recorded. Calculation of the emission flow rate using this procedure requires a test-specific F-factor and Btu value of the fuel being combusted. These values must be calculated from fuel analysis and used in the formulae below to calculate emission rates of other measured constituents (e.g. NO_x).

Note: We do not sanction the use of the default F-factor for fuels published in Method 19, Table 19-2, for emissions flow rate calculations.

The source must obtain from their supplier an ultimate and heat content analysis of the fuel combusted on test day. Method 19, Sections 12.3.2.3 and 12.3.2.4, describe the methods for these analyses. Alternatively, the source may collect fuel samples as specified in Method 19, Section 12.5.2.1 or 12.5.2.2 during the emission testing and submit these samples to a lab for analysis with the methodology listed above.

The output of the fuel analyses are then used with Equation 19-13 or 19-15, in Method 19, Section 12.3.2.1, to calculate a test specific F_d or F_c factor, respectively. This factor is then used in calculating the emission flow rate with the corresponding equation below.

The source must also measure a diluent gas, either O₂ or CO₂, in the emission gas stream. Diluent measurement must be made by EPA Method 3A or Method 3B, concurrent with the pollutant measurements and fuel meter readings.

The calculation for determination of flow rate, using a dry O₂ reading and an oxygen-based F factor, dry basis, as a basis for the calculation is as follows:

$$Q_s = F_d (H)(20.9/(20.9-O_2))$$

where:

Q_s = stack flow rate [dscf/min]

F_d = fuel-specific oxygen-based F factor, dry basis, from Method 19 [scf / 106 Btu]

H = fuel heat input rate, [106 Btu/min], at the HHV, measured at engine fuel feed line, usually as feed rate calculated as (fuel feed rate in ft³/min)(fuel heat content in 106 Btu/ft³)

O₂ = stack oxygen concentration, dry basis [%]

Alternatively, a source may want to measure dry CO₂ and use the carbon dioxide based F factor, dry basis. That equation is:

$$Q_s = F_c (H)(100/CO_2)$$

where:

Q_s = stack flow rate [dscf/min]

F_c = fuel-specific carbon dioxide based F factor, dry basis, from Method 19 [scf / 106 Btu]

H = fuel heat input rate, [106 Btu/min], measured at engine fuel feed line, usually as feed rate calculated as (fuel feed rate in ft³/min)(fuel heat content in 106 Btu/ft³)

CO_2 = stack carbon dioxide concentration, dry basis [%]

A post-test calibration of the fuel meter installed for use during the testing must be conducted, and documentation must accompany the source test report. Where a test meter has not been installed for the measurement of gas flow during the testing, and a permanently mounted meter has been used to measure the amount of fuel burned during each test, a pretest calibration value will be acceptable provided that the calibration criteria are met. Fuel meter calibration must meet the requirements of EPA Method 2A, Section 6.1, and the calibration must be conducted using the same fuel type (e.g. natural gas) as that being measured by the fuel meter during the testing.

If not using a pressure and temperature compensated meter, you must include gas temperature and pressure readings along with meter volume readings for each start and stop observation; correct the meter volume readings, as necessary, to determine the standard cubic feet of gas combusted during each test. Calibration documentation for the temperature and pressure devices must also conform to EPA Method 2A, Section 6.1.

Fuel meter readings must correspond with the start and stop times of each emissions test.

Coarse measurement or estimates of fuel usage during the testing are not acceptable for calculating emission flow rates.

Higher Heating Values (HHV) results from fuel BTU analyses should be used with all Method 19 calculations