FREQUENTLY ASKED QUESTIONS (FAQS) for Method 19

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: Method 19 does not allow for the use of BTU/HP-HR calculations that leverage the BHP output of the engine to calculate a flow rate. Additionally, 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 O_2 or CO_2, 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 O_2 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 / 10^6 Btu]

H = fuel heat input rate, [10^6 Btu/min], at thesor HHV, measured at engine fuel feed line, usually as feed rate calculated as (fuel feed rate in ft^3/min)(fuel heat content in 10^6 Btu/ft^3)

O_2 = stack oxygen concentration, dry basis [%]

Alternatively, a source may want to measure dry CO_2 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 / 10^6 Btu]

H = fuel heat input rate, [10^6 Btu/min], measured at engine fuel feed line, usually as feed rate calculated as (fuel feed rate in ft^3/min)(fuel heat content in 10^6 Btu/ft^3)

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.

2. How should the calibration of the fuel meter discussed in the question above be conducted?

When using Method 19 to calculate the fuel flow rate on a natural gas fired engine subject to 40 CFR 60, Subpart JJJJ, the fuel meter must be calibrated and meet the requirements of EPA

Method 2A, Section 6.1, as discussed above. The calibration methodology described in Section 10 of EPA Method 2A, or an equivalent procedure, should be used.

3. **We are attempting to install a fuel gas meter at a location with a fuel gas pressure of 120 psig. This means the full-scale range of the meter needs to be higher than meter specifications listed in EPA Method 2A. We have found a device with a 0-300psi range. In the questions above, the EPA has provided guidance that the fuel meter must meet the requirements of section 6.1 of Method 2A, which states:**

   6.1 Gas Volume Meter. A positive displacement meter, turbine meter, or other direct measuring device capable of measuring volume to within 2 percent. The meter shall be equipped with a temperature sensor (accurate to within ±2 percent of the minimum absolute temperature) and a pressure gauge (accurate to within ±2.5 mm Hg). The manufacturer's recommended capacity of the meter shall be sufficient for the expected maximum and minimum flow rates for the sampling conditions. Temperature, pressure, corrosive characteristics, and pipe size are factors necessary to consider in selecting a suitable gas meter.

   Converting the required accuracy of 2.5mm Hg into psi (0.048psig), creates an accuracy requirement of 0.016% of the 300psig full scale, which is unachievable with the pressure instrumentation available*. What is the appropriate QC parameter for a fuel meter with a higher pressure range, as described?*

If the manufacturer of the gas volume meter can provide an uncertainty analysis to demonstrate the accuracy of the pressure measurement as a percentage of full scale and still maintain the accuracy of the volumetric measurement within ±2 percent, then the gas volume meter is acceptable for use when using Method 19 to calculate the fuel flow rate on a natural gas fired engine under 40 CFR 60, Subpart JJJJ . Ideally, the nominal gas delivery pressure should fall within 20-80 percent of the gas pressure gauge indicating scale during normal operations.

The manufacturer-provided documentation of the uncertainty analysis should be included in the report.

4. **May a facility/owner/operator/contractor make use of a formula that calculates exhaust flow rate using manufacturers information/curves that relate the Brake Horsepower output and fuel consumption, or some combination of other operating curves to an exhaust flow rate and use that value for demonstrating compliance with 40 CFR 60, Subpart JJJJ?**

No, this approach of calculating a flow rate value is not accepted for demonstrating compliance with Subpart JJJJ, nor is its use allowed in Method 19.