3.5 When are corrections for stack gas moisture content required?

Determination of the stack gas moisture content is required only in certain situations where CEMS are used to satisfy the Part 75 monitoring requirements. Table 7 summarizes when correction for the stack gas moisture content is required. Generally speaking, the stack gas moisture content must be monitored when two parameters in the emission or heat input rate equation (e.g., gas concentration and stack gas flow rate) are not measured on the same moisture basis (i.e., one is measured on a wet basis and the other on a dry basis).

Table 6: Calculating Emissions and Heat Input Rate

To calculate this quantity. . .	These parameters must be monitored . . .	And an equation with this general structure is used . . .	Example Equations [a]
SO_2 or NO_x mass emission rate (lb/hr) or CO_2 mass emission rate (tons/hr)	SO_2 concentration and stack gas flow rate or CO_2 concentration and stack gas flow rate	E = (K) * (C) * (Q) *(H_2O) Where: E = SO_2 , NO_x , or CO_2 mass emission rate (lb/hr or tons/hr) K = Species-specific conversion constant [b] C = Hourly average SO_2 , NO_x , or CO_2, concentration (ppmv or % CO_2) Q = Hourly average volumetric flow rate (scfh) H_2O = Moisture correction term (if SO_2 , NO_x , or CO_2 is measured on a dry basis)	F-1, F-2, F-26a, F-26b
SO_2 , NO_x , or CO_2 mass emissions (lb or tons)	SO_2 , NO_x , or CO_2 concentration, stack gas flow rate and operating time	M = (E) * (t_{op}) Where: E = SO_2 , NO_x , or CO_2 mass emission rate, calculated as shown above (lb/hr, or tons/hr) t_{op} = Operating time [c] (hr)	F-3, F-12, F-26c
NO_x mass emissions (lb) (Alternate method)	Heat input rate, NO_x emission rate, and operating time	M = (R) * (HI) * (t_{op}) Where: M = NO_x mass emissions (lb) R = NO_x emission rate (lb/mmBtu) HI = Heat input rate (mmBtu/hr) t_{op} = Operating time [c] (hr)	F-24
NO_x emission rate (lb/mmBtu)	NO_x concentration and Diluent gas (CO_2 or O_2) concentration	R = (K) * (C) * (F) * (D)* (H_2O) Where: R = NO_x emission rate (lb/mmBtu) K = Conversion constant [b] C = Hourly average NO_x concentration (ppmv) F = Fuel-specific F-factor (dscf/mmBtu or scf CO_2/mmBtu) D = Diluent gas correction term H_2O = Moisture correction term (if NO_x and diluent are measured on a different moisture basis)	F-5, F-6, 19-4, 19-8

To calculate this quantity. . .	These parameters must be monitored . . .	And an equation with this general structure is used . . .	Example Equations [a]
Heat input rate (mmBtu/hr)	Diluent gas concentration and stack gas flow rate	HI = (Q) * (1/F) * (1/D)*(H_2O) Where: HI = Heat input rate (mmBtu/hr) Q = Hourly average volumetric flow rate (scfh) F = Fuel-specific F-factor (dscf/mmBtu or scf CO_2/mmBtu) D = Diluent gas correction term H_2O = Moisture correction term (if required)	F-15, F-16, F-17, F-18
Opacity	Opacity (%)	Follow the site-specific instructions of the instrument manufacturer	-------

a. Equation codes beginning with "F" are from Appendix F of Part 75. Equations beginning with "19" are from EPA Method 19, in Appendix A-7 of 40 CFR Part 60.

[b] The appropriate conversion constants are 1.660×10^{-7} lb/scf-ppm for SO_2 , 1.194×10^{-7} lb/scf-ppm for NO_x , and 5.7×10^{-7} tons/scf-%CO_2 for CO_2

[c] See Section 3.4.4, above

For example, flow rate monitors always measure stack gas flow on a wet basis. This means that the volume of gas measured includes the contribution from the moisture content of the stack gas. Therefore, when a gaseous pollutant such as SO2 is measured on a dry basis, in order to obtain the correct mass emission rate in lb/hr, the dry-basis SO2 concentration is multiplied by the wet-basis stack gas flow rate, and a moisture correction is applied. As a second example, when NOx emisssion rate in lb/mmBtu is measured, a moisture correction is needed if the NOx concentration and diluent gas monitors measure on different moisture bases.

If a correction for the stack gas moisture content is required, one of the following moisture measurement methods must be used:

• An O2 analyzer (or analyzers) capable of measuring on both a wet and dry basis.

• A continuous moisture sensor.

• A stack temperature sensor and a moisture look-up table (for saturated gas streams only).

• A fuel-specific default moisture value defined in §75.11(b) or §75.12(b) (for coal, wood, and natural gas, only).

• A site-specific default moisture value approved by petition under §75.66.

Table 7: Correction for Stack Gas Moisture Content

For this parameter . . .	A correction for stack gas moisture is required if . . .
SO_2 mass emission rate (lb/hr)	SO_2 concentrations are measured on a dry basis
NO_x emission rate (lb/mmBtu)	NO_x and diluent gas concentrations are not measured on the same moisture basis
NO_x mass emissions (lb)	NO_x mass is calculated as the product of NO_x concentration, stack gas flow rate and operating time, and the NO_x concentrations are measured on a dry basis
CO_2 mass emission rate (tons/hr)	CO_2 concentrations are measured on a dry basis
Heat input rate (mmBtu/hr)	CO_2 is the diluent gas and is measured on a dry basis; or O_2 is measured as the diluent gas