South Coast
Air Quality Management District
21865 Copley Drive, Diamond Bar, CA 91765
909/396-2000 • http://www.aqmd.gov

COMPLIANCE ADVISORY

Date: January 6, 2017

To: All RECLAIM Participants

Subject: Calculation of NOx Mass Emissions for Large Sources and Process Units with Concentration Limit and Stack or Fuel Flow Measured at 60°F

On February 5, 2016, Appendix A of Rules 2011 and 2012 were amended by the South Coast Air Quality Management District (SCAQMD) Governing Board to include an alternative temperature of 60°F in addition to 68°F as follows: "Standard Gas Conditions are defined as one atmosphere of pressure and a temperature of 68ºF or 60ºF, provided that one of these temperatures is used throughout the facility".

As seen in the attachment, the equations in the Rule 2012 Protocol (Appendix A to Rule 2012) for calculation of large source and process unit NOx mass emissions using a concentration limit and stack flow or stack flow calculated from fuel flow utilize a mass conversion factor of 1.195×10^{-7} lbs/ft^3 based on stack flow or fuel flow measured at 68°F. However, for facilities that have chosen to monitor stack gas volumetric flow rate at 60°F or calculate stack gas volumetric flow based on fuel flow taken at 60°F, a different temperature-dependent mass conversion factor (1.214×10^{-7} lbs/ft^3) is required in order to properly quantify emissions.

All RECLAIM facilities that quantify emissions for large sources or process units using equations for either the concentration limit and stack flow measured at 60°F, or the concentration limit and calculated stack gas volumetric flow based on fuel flow taken at 60°F must determine and report emissions using the correct mass NOx conversion factor (i.e., 1.195×10^{-7} lbs/ft^3 for facilities using 68°F and 1.214×10^{-7} lbs/ft^3 for facilities using 60°F as standard temperature) **starting from January 1, 2017**[1]. **Failure of RECLAIM facilities to apply the appropriate mass conversion factor according to this advisory after December 31, 2016 will be subject to enforcement action**.

For the RECLAIM 2015 Compliance Year annual audit for Cycle 1 and Cycle 2 facilities, as well as emission reporting periods in 2016, SCAQMD's compliance teams will correct the NOx calculated emissions for these large sources and process units during these audits. If the recalculation of NOx mass emissions using the correct mass conversion factor results in a facility exceeding its Allocation, the excess emissions will be deducted from the facility's future RECLAIM Trading Credits (RTCs) holding pursuant to Rule 2010 (b)(1)(A). SCAQMD will review inaccurate emission reporting during Compliance Years 2015 and 2016 on a case-by-case basis and will take enforcement action in addition to allocation deductions, if appropriate.

Any questions or concerns regarding this Compliance Advisory should be directed to the RECLAIM Hotline at (909) 396-3119.

[1] The first emission reports due for the reporting period starting January 1, 2017 are emission reports for NOx Large Sources and are to be submitted no later than February 15, 2017.

Attachment

A mass conversion factor is used when calculating NOx emissions from sources based on NOx concentration (PPMV) in an exhaust stream. For example, Equations 17 and 17 b of Rule 2012, Appendix A, Chapter 3, D.2.a. below are used to calculate NOx mass emissions from Large sources using fuel flow or stack flow, respectively.

$$E_k = PPMV_{O2}\ [20.9/(20.9 - b)] \times 1.195 \times 10^{-7} \times \sum_{j=1}^{r} (F_{dj} \times d_j \times V_j) \qquad \text{(Eq.17)}$$

$$E_k = PPMV_{ST} \times 1.195 \times 10^{-7} \times \sum_{j=1}^{N} F_j \qquad \text{(Eq.17b)}$$

Similarly, Equations 28a and 28c of Rule 2012, Appendix A, Chapter 4, B.4.a. below are used to calculate NOx mass emissions from Process Units based on fuel flow or stack flow, respectively.

$$E_k = PPMV_{O2}\ [20.9/(20.9 - b)] \times 1.195 \times 10^{-7} \times \sum_{j=1}^{r} (F_{dj} \times d_j \times V_j) \qquad \text{(Eq.28a)}$$

$$E_k = PPMV_{ST} \times 1.195 \times 10^{-7} \times \sum_{j=1}^{N} F_j \qquad \text{(Eq.28c)}$$

Additional equations using the same mass conversion factor (1.195×10^{-7}) can be found in Rule 2012, Appendix A. This conversion factor is derived based on gas volume at 68°F and 1 atmosphere as:

$$\frac{46\ lb/lb\ mole}{385\ ft^3/lb\ mole\ x\ \ 10^6\ \ at\ 68^0F} = \mathbf{1.195\ x\ 10^{-7}}\ lb/ft^3$$

Whereas, the NOx mass conversion factor at 60°F is:

$$\frac{46\ lb/\ lb\ mole}{379\ ft^3/lb\ mole\ x\ \ 10^6\ \ at\ 60^0F} = \mathbf{1.214\ x\ 10^{-7}}\ lb/ft^3$$

Derivation of molar volume:

Ideal Gas Law: PV = NRT

Molar Volume: V/N = RT/P

Where R = 0.730 ft^3 atm $^oR^{-1}$ $lbmole^{-1}$

For Temperature at 519^{o}R (60^{o}F) and Pressure at 1 atm.:

Molar Volume = 0.730 (519) / 1 = 379 ft^3/lb mole x 10^6

Note: the 10^6 term is to convert the concentration in PPMV to fraction.