## Question 20.3

**Topic:** Monitoring Requirements for $NO_x$ Mass

**Question:** What are the $NO_x$ mass emissions monitoring requirements for subtractive stack configurations under Subpart H of 40 CFR Part 75?

**Answer:** The monitoring requirements for the common stack and for the nonaffected units are found in § 75.72(b)(2). These provisions are summarized in Sections A and B, below. Note, that the subtractive option in § 75.72(b)(2)(ii) requires a petition under § 75.66. The hourly $NO_x$ emission rates, $NO_x$ mass emissions, and heat input rates described in Sections A and B are calculated using the applicable equations from Appendix F or Appendix D to Part 75:

A. Main Common Stack $NO_X$ Monitoring Requirements

The owner or operator must determine $NO_x$ mass emissions at the common stack using either a "$NO_x$ emission rate and heat input rate" methodology or a "$NO_x$ concentration and stack flow rate" methodology, as follows:

(1) You may install a $NO_x$-diluent CEMS for $NO_x$ emission rate determination and a stack flow monitor and a diluent monitor for heat input rate determination; or

(2) You may install a $NO_x$ concentration CEM and a stack flow monitor; or

(3) If the subtractive stack configuration consists exclusively of oil and gas-fired units exhausting to a common stack, you may install a $NO_x$-diluent CEM at the main common stack to determine the $NO_x$ emission rate, use Appendix D fuel flowmeters to determine unit-level heat input rates, and then derive the heat input rate at the common stack from the unit-level heat input rates and operating times, using Equation F-25 in Appendix F of Part 75 (see heat input apportionment and summation formula Table under Question 20.4, below).

B. Nonaffected Unit(s) Hourly $NO_x$ Monitoring Requirements

The owner or operator must determine hourly $NO_x$ mass emissions at the nonaffected unit(s) using one of the following methodologies:

(1) Install a $NO_x$-diluent CEMS, a stack flow monitor, and a diluent monitor in the duct leading from each nonaffected unit to the common stack; or

(2) If the emissions from two or more nonaffected units in the subtractive stack configuration are combined prior to discharging through the main common stack, you may monitor the combined nonaffected unit $NO_x$ emission rate and heat input rate at a single location in lieu of installing separate CEMS on each unit. Define the monitoring location

as a secondary common stack serving the nonaffected units; or

(3) If the following conditions are met you may opt to install $NO_x$-diluent monitoring systems on the nonaffected units (or group(s) of units) and monitor heat input rate only at the main common stack:

(i) All units (affected and nonaffected) exhausting to the main common stack combust the same type of fuel and use the same F factor; and

(ii) All units (affected and nonaffected) exhausting to the main common stack are of the same basic design with a similar combustion efficiency (± · 10%); and

(iii)There is no suitable location in the existing ductwork at which to install a flow monitor.

Paragraph A in Question 20.4 explains how to determine the nonaffected unit heat input rates when heat input rate is monitored only at the main common stack; or

(4) You may install a $NO_x$ concentration CEM and flow monitor in the duct from each nonaffected unit to the common stack; or

(5) If the emissions from two or more nonaffected units in the subtractive stack configuration are combined prior to discharging through the main common stack, you may monitor the combined nonaffected unit $NO_x$ concentration and flow rate at a single location in lieu of installing separate CEMS on each unit. Define the monitoring location as a secondary common stack serving the nonaffected units; or

(6) For nonaffected oil or gas-fired units, you may install a $NO_x$-diluent CEMS in the duct from each nonaffected unit to the common stack, and use Appendix D fuel flowmeter(s) to determine the unit heat input rate(s).

(Note: If any of the nonaffected units receive fuel through a common pipe, you must apportion the heat input rate measured at the common pipe to the individual units (see Question 20.4)); or

(7) If the emissions from two or more nonaffected oil and gas-fired units in the subtractive stack configuration are combined prior to discharging through the main common stack, you may monitor the combined nonaffected unit $NO_x$ emissions at a single location in lieu of installing separate $NO_x$-diluent CEMS on each unit. Define the monitoring location as a secondary common stack serving the nonaffected units. Determine the heat input rate at the secondary common stack by summing the unit-level heat inputs, using Equation F-25 in Appendix F of Part 75 (see heat input rate apportionment and summation formula Table in Question 20.4, below).

C. Affected Unit(s) Hourly $NO_x$ Mass Emissions Determination

Determine the *total* hourly $NO_x$ mass emissions (in lb) for the affected unit(s), by substituting the measured NO mass emissions from Sections A and B, above into Equation SS-2a (see Table 20-2). Then, use Equation SS-2b or SS-2c (as applicable) (see Table 20-2) to apportion the total hourly $NO_x$ mass emissions to the individual affected units. Equation SS-2b applies when unit load is reported in megawatts. Equation SS-2c applies when unit load is reported in klb of steam per hour. Note that the summation terms in the denominators of these equations include only the heat input rates and load values for the *affected* units.

Ensure that Equations SS-2a, SS-2b, and SS-2c (as applicable) are implemented on an hourly basis in the data acquisition and handling system (DAHS), so that the $NO_x$ mass emissions reported are correct.

Keep records of all hourly $NO_x$ mass emissions values for the affected units, as determined from these equations, and use the hourly values to calculate the quarterly and cumulative $NO_x$ mass emissions (in tons) for these units. However, do *not* report any hourly $NO_x$ mass emissions values for the affected units.

When using Equation SS-2a, if in a given hour the measured total $NO_x$ mass emissions (lb) at the nonaffected units are greater than the mass emissions measured at the common stack (i.e., if the summation term to the right of the minus sign in Equation SS-2a is greater than the term to the left of the minus sign), this will result in negative mass emissions for that hour. For any hour in which this happens, substitute a value of zero for the total $NO_x$ mass emissions from the affected units.

## Table 20-2: Hourly $NO_x$ Mass Emissions for the Affected Unit(s)

| Equation Code | Formula | Where |
|---|---|---|
| SS-2a | $NOXM_{aff-tot} = NOXM_{CS} - \sum_{all-nonaff} NOXM_{nonaff}$ | $NOXM_{aff-tot}$ = Total hourly $NO_x$ mass emissions from the affected unit(s) (lb)<br>$NOXM_{CS}$ = Hourly $NO_x$ mass measured at the common stack (lb)<br>$NOXM_{nonaff}$ = Hourly $NO_x$ mass measured at a particular nonaffected unit (lb) |
| SS-2b | $NOXM_{aff-i} = NOXM_{aff-tot} \frac{MW_{aff-i} t_{aff-i}}{\sum_{all-aff} MW_{aff-i} t_{aff-i}}$ | $NOXM_{aff-i}$ = Hourly $NO_x$ mass emissions from a particular affected unit (lb)<br>$NOXM_{aff-tot}$ = Total hourly $NO_x$ mass emissions from the affected unit(s) (lb)<br>$(MW)_{aff-i}$ = Hourly load for a particular affected unit (MW)<br>$t_{aff-i}$ = Operating time for a particular affected unit (hr) |

| Equation Code | Formula | Where |
|---|---|---|
| SS-2c | $NOXM_{aff-i} = NOXM_{aff-tot} \frac{ST_{aff-i} t_{aff-i}}{\sum_{all-aff} ST_{aff-i} t_{aff-i}}$ | $NOXM_{aff-i}$ = Hourly $NO_x$ mass emissions from a particular affected unit (lb)<br>$NOXM_{aff-tot}$ = Total hourly $NO_x$ mass emissions from the affected unit(s) (lb)<br>$(ST)_{aff-i}$ = Hourly load for a particular affected unit (klb/hr of steam)<br>$t_{aff-i}$ = Operating time for a particular affected unit (hr) |

D. Affected Unit(s) Hourly Heat Input Rate Determination

Determine the hourly heat input rate for each affected unit using the applicable method described under Question 20.4.

E. Affected Unit Hourly Load and Operating Time

As indicated in Sections A through C, above, emissions from the affected units in a subtractive stack configuration are not measured directly.

However, the owner or operator must report hourly records of unit load and unit operating time for each affected unit, for purposes of apportioning emissions and/or heat input to the individual affected units.

**References:** § 75.72(b)(2)

**History:** First published in March 2000, Update #12; revised in October 2003 Revised Manual; revised in 2013 Manual