**Section 225.APPENDIX B Continuous Emission Monitoring Systems for Mercury**

**Section 225.EXHIBIT C Conversion Procedures**

1. Applicability

Use the procedures in this Exhibit to convert measured data from a monitor or continuous emission monitoring system into the appropriate units of the standard.

2. Procedures for Heat Input

Use the following procedures to compute heat input rate to an affected unit (in mmBtu/hr or mmBtu/day):

2.1

Calculate and record heat input rate to an affected unit on an hourly basis. The owner or operator may choose to use the provisions specified in 40 CFR 75.16(e), incorporated by reference in Section 225.140, in conjunction with the procedures provided in Sections 2.4 through 2.4.2 to apportion heat input among each unit using the common stack or common pipe header.

2.2

For an affected unit that has a flow monitor (or approved alternate monitoring system under subpart E of 40 CFR 75, incorporated by reference in Section 225.140, for measuring volumetric flow rate) and a diluent gas (O2 or CO2) monitor, use the recorded data from these monitors and one of the following equations to calculate hourly heat input rate (in mmBtu/hr).

2.2.1

When measurements of CO2 concentration are on a wet basis, use the following equation:

 (Eq. F-15)

Where:

|  |  |  |
| --- | --- | --- |
| HI | = | Hourly heat input rate during unit operation, mmBtu/hr. |
| Qw | = | Hourly average volumetric flow rate during unit operation, wet basis, scfh. |
| Fc | = | Carbon-based F-factor, listed in Section 3.3.5 of appendix F to 40 CFR 75 for each fuel, scf/mmBtu. |
| %CO2w | = | Hourly concentration of CO2 during unit operation, percent CO2 wet basis. |

2.2.2

When measurements of CO2 concentration are on a dry basis, use the following equation:

 (Eq. F-16)

Where:

|  |  |  |
| --- | --- | --- |
| HI | = | Hourly heat input rate during unit operation, mmBtu/hr. |
| Qh | = | Hourly average volumetric flow rate during unit operation, wet basis, scfh. |
| Fc | = | Carbon-based F-factor, listed in Section 3.3.5 of appendix F to 40 CFR 75 for each fuel, scf/mmBtu. |
| %CO2d | = | Hourly concentration of CO2 during unit operation, percent CO2 wet basis. |
| %H2O | = | Moisture content of gas in the stack, percent. |

2.2.3

When measurements of O2 concentration are on a wet basis, use the following equation:

 (Eq. F-17)

Where:

|  |  |  |
| --- | --- | --- |
| HI | = | Hourly heat input rate during unit operation, mmBtu/hr. |
| Qw | = | Hourly average volumetric flow rate during unit operation, wet basis, scfh. |
| F | = | Carbon-based F-factor, listed in Section 3.3.5 of appendix F to 40 CFR 75 for each fuel, scf/mmBtu. |
| %O2w | = | Hourly concentration of O2 during unit operation, percent O2 wet basis. |
| %H2O | = | Hourly average stack moisture content, percent by volume. |

2.2.4

When measurements of O2 concentration are on a dry basis, use the following equation:

 (Eq. F-18)

Where:

|  |  |  |
| --- | --- | --- |
| HI | = | Hourly heat input rate during unit operation, mmBtu/hr. |
| Qw | = | Hourly average volumetric flow during unit operation, wet basis, scfh. |
| F | = | Dry basis F-factor, listed in Section 3.3.5 of appendix F to 40 CFR 75 for each fuel, dscf/mmBtu. |
| %H2O | = | Moisture content of the stack gas, percent. |
| %O2d | = | Hourly concentration of O2 during unit operation, percent O2 dry basis. |

2.3

Heat Input Summation (for Heat Input Determined Using a Flow Monitor and Diluent Monitor)

2.3.1

Calculate total quarterly heat input for a unit or common stack using a flow monitor and diluent monitor to calculate heat input, using the following equation:

 (Eq. F-18a)

Where:

|  |  |  |
| --- | --- | --- |
| HIq | = | Total heat input for quarter "q", mmBtu. |
| HIi | = | Heat input rate for hour "i" during unit operation, using Equation F-15, F-16, F-17, or F-18, mmBtu/hr. |
| ti | = | Hourly operating time for the unit or common stack, hour or fraction of an hour (in equal increments that can range from 100th to one quarter of an hour, at the option of the owner or operator). |
| n | = | Number of unit operating hours in the quarter. |

2.3.2

Calculate total cumulative (year-to-date) heat input for a unit or common stack using a flow monitor and diluent monitor to calculate heat input, using the following equation:

 (Eq. F-18b)

Where:

|  |  |  |
| --- | --- | --- |
| HIc | = | Total heat input for the year-to-date, mmBtu. |
| HIq | = | Total heat input for quarter "q", mmBtu. |

2.4 Heat Input Rate Apportionment for Units Sharing a Common Stack or Pipe

2.4.1

Where applicable, the owner or operator of an affected unit that determines heat input rate at the unit level by apportioning the heat input monitored at a common stack or common pipe using megawatts must apportion the heat input rate using the following equation:

 (Eq. F-21a)

Where:

|  |  |  |
| --- | --- | --- |
| HIi | = | Heat input rate for a unit, mmBtu/hr. |
| HIcs | = | Heat input rate at the common stack or pipe, mmBtu/hr. |
| MWi | = | Gross electrical output, MWe. |
| ti | = | Unit operating time, hour or fraction of an hour (in equal increments that can range from 100th to one quarter of an hour, at the option of the owner or operator). |
| tcs | = | Common stack or common pipe operating time, hour or fraction of an hour (in equal increments that can range from 100th to one quarter of an hour, at the option of the owner or operator). |
| n | = | Total number of units using the common stack or pipe. |
| i | = | Designation of a particular unit. |

2.4.2

Where applicable, the owner or operator of an affected unit that determines the heat input rate at the unit level by apportioning the heat input rate monitored at a common stack or common pipe using steam load must apportion the heat input rate using the following equation:

 (Eq. F-21b)

Where:

|  |  |  |
| --- | --- | --- |
| HIi | = | Heat input rate for a unit, mmBtu/hr. |
| HIcs | = | Heat input rate at the common stack or pipe, mmBtu/hr. |
| SF | = | Gross steam load, lb/hr, or mmBtu/hr. |
| ti | = | Unit operating time, hour or fraction of an hour (in equal increments that can range from 100th to one quarter of an hour, at the option of the owner or operator). |
| tcs | = | Common stack or common pipe operating time, hour or fraction of an hour (in equal increments that can range from 100th to one quarter of an hour, at the option of the owner or operator). |
| n | = | Total number of units using the common stack or pipe. |
| i | = | Designation of a particular unit. |

2.5 Heat Input Rate Summation for Units with Multiple Stacks or Pipes

The owner or operator of an affected unit that determines the heat input rate at the unit level by summing the heat input rates monitored at multiple stacks or multiple pipes must sum the heat input rates using the following equation:

 (Eq. F-21c)

Where:

|  |  |  |
| --- | --- | --- |
| HIUnit | = | Heat input rate for a unit, mmBtu/hr. |
| HIs | = | Heat input rate for the individual stack, duct, or pipe, mmBtu/hr. |
| tUnit | = | Unit operating time, hour or fraction of the hour (in equal increments that can range from 100th to one quarter of an hour, at the option of the owner or operator). |
| t5 | = | Operating time for the individual stack or pipe, hour or fraction of the hour (in equal increments that can range from 100th to one quarter of an hour, at the option of the owner or operator). |
| s | = | Designation for a particular stack, duct, or pipe. |

3. Procedure for Converting Volumetric Flow to STP

Use the following equation to convert volumetric flow at actual temperature and pressure to standard temperature and pressure.

 (Eq. F-22)

Where:

|  |  |  |
| --- | --- | --- |
| FSTP | = | Flue gas volumetric flow rate at standard temperature and pressure, scfh. |
| FActual | = | Flue gas volumetric flow rate at actual temperature and pressure, acfh. |
| TStd | = | Standard temperature = 528 degreesR. |
| TStack | = | Flue gas temperature at flow monitor location, degreesR, where degreesR = 460 + degreesF. |
| PStack | = | The absolute flue gas pressure = barometric pressure at the flow monitor location + flue gas static pressure, inches of mercury. |
| PStd | = | Standard pressure = 29.92 inches of mercury. |

4. Procedures for Mercury Mass Emissions.

4.1

Use the procedures in this Section to calculate the hourly mercury mass emissions (in ounces) at each monitored location for the affected unit or group of units that discharge through a common stack.

4.1.1

To determine the hourly mercury mass emissions when using a mercury concentration monitoring system that measures on a wet basis and a flow monitor, use the following equation:

 (Eq. F-28)

Where:

|  |  |  |
| --- | --- | --- |
| Mh | = | Mercury mass emissions for the hour, rounded off to three decimal places (ounces). |
| K | = | Units conversion constant, 9.978 x 10-10 oz-scm/µg-scf. |
| Ch | = | Hourly mercury concentration, wet basis (µg/wscm). |
| Qh | = | Hourly stack gas volumetric flow rate (scfh). |
| th | = | Unit or stack operating time (hr), as defined in 40 CFR 72.2, incorporated by reference in Section 225.140. |

4.1.2

To determine the hourly mercury mass emissions when using a mercury concentration monitoring system that measures on a dry basis or a sorbent trap monitoring system and a flow monitor, use the following equation:

 (Eq. F-29)

Where:

|  |  |  |
| --- | --- | --- |
| Mh | = | Mercury mass emissions for the hour rounded off to three decimal places (ounces). |
| K | = | Units conversion constant, 9.978 x 10-10 oz-scm/µg-scf. |
| Ch | = | Hourly mercury concentration, dry basis (µg/dscm). For sorbent trap systems, a single value of Ch (i.e., a flow-proportional average concentration for the data collection period) is applied to each hour in the data collection period, for a particular pair of traps. |
| Qh | = | Hourly stack gas volumetric flow rate (scfh). |
| Bws | = | Moisture fraction of the stack gas expressed as a decimal (equal to %H2O 100). |
| th | = | Unit or stack operating time (hr) as defined in 40 CFR 72.2, as incorporated by reference in Section 225.140. |

4.1.3

For units that are demonstrated under Section 1.15(d) of Appendix B to emit less than 464 ounces of mercury per year, and for which the owner or operator elects not to continuously monitor the mercury concentration, calculate the hourly mercury mass emissions using Equation F-28 in Section 4.1.1 of this Exhibit, except that "Ch" will be the applicable default mercury concentration from Section 1.15(c), [(d)](http://www.westlaw.com/TOC/Default.wl?rs=dfa1.0&vr=2.0&DB=1000547&DocName=40CFRS75.81&FindType=VP&ReferencePositionType=T&ReferencePosition=SP_5ba1000067d06), or [(e)](http://www.westlaw.com/TOC/Default.wl?rs=dfa1.0&vr=2.0&DB=1000547&DocName=40CFRS75.81&FindType=VP&ReferencePositionType=T&ReferencePosition=SP_7fdd00001ca15) of Appendix B, expressed in µg/scm. Correction for the stack gas moisture content is not required when this methodology is used.

4.2

Use the following equation to calculate quarterly and year-to-date mercury mass emissions in ounces:

 (Eq. F-30)

Where:

|  |  |  |
| --- | --- | --- |
| Mtime\_period | = | Mercury mass emissions for the given time period, i.e., quarter or year-to-date rounded to the nearest 1000th (ounces). |
| Mh | = | Mercury mass emissions for the hour rounded to three decimal places (ounces). |
| n | = | The number of hours in the given time period (quarter or year-to-date). |

4.3

If heat input rate monitoring is required, follow the applicable procedures for heat input apportionment and summation in Sections 2.3, 2.4 and 2.5 of this Exhibit.

5. Moisture Determination from Wet and Dry O2 Readings

If a correction for the stack gas moisture content is required in any of the emissions or heat input calculations described in this Exhibit, and if the hourly moisture content is determined from wet- and dry-basis O2 readings, use Equation F-31 to calculate the percent moisture, unless a K-factor or other mathematical algorithm is developed as described in Section 6.5.6(a) of Exhibit A to Appendix B:

 (Eq. F-31)

Where:

|  |  |  |
| --- | --- | --- |
| %H20 | = | Hourly average stack gas moisture content, percent H2O. |
| O2d | = | Dry-basis hourly average oxygen concentration, percent O2. |
| O2w | = | Wet-basis hourly average oxygen concentration, percent O2. |