

Question 3.5

Topic: Accuracy of Flow Monitoring and Reference Methods

Question: Are the SO₂ emissions data reported under the Acid Rain Program high due to inaccuracy in the reference method for volumetric flow (EPA Test Method 2)? If it is uncertain, what is EPA doing to resolve the issue?

Answer: The evidence amassed to date does not indicate a clearly consistent pattern. Claims of overestimation are counterbalanced by evidence of little or no overestimation. The results appear to be highly dependent on site-specific flow patterns, particularly whether the emission flow is axial, going straight out the stack, or off-axial (i.e., swirling out the stack). In addition, many of the claims appear to be based on a comparison between flow rates derived from fuel factors and fuel sampling-based heat input and flow rates derived from continuous emission monitoring systems (CEMS) as required by Part 75. Concluding that SO₂ measurements are incorrect because the monitored flow rates are higher than the fuel-factor derived flow rates is questionable.

The frequency of measurement (hourly) and quality assurance (daily) is generally much higher with the Acid Rain certified CEMS than with fuel sampling. Estimating flow over short periods of time from fuel factors and heat input also depends on a high degree of consistency in the fuel supply, which is rarely the case at coal-fired boilers.

In response to the concerns of the regulated community and because of the importance of accurate emission measurements for environmental protection, and for the effective operation of the SO₂ allowance market, EPA developed three test methods (Reference Methods 2F, 2G, and 2H) for measuring volumetric flow. These test methods were published in the Federal Register and became effective on July 13, 1999.

Method 2F measures the axial velocity, taking into account both the yaw and pitch angles, using a three-dimensional probe, such as a prism-shaped, five-hole probe (commonly called a DA or DAT probe) or a five-hole spherical probe.

Method 2G is a variant of existing Method 2, which uses a Type S pitot tube or a three-dimensional probe to determine the flue gas velocity in a stack or duct, taking into account the yaw angle of flow. Method 2G does not account for the pitch angle of flow.

In a stack or duct with flowing gas, the gas velocity will approach zero near the stack or duct wall. Method 2H can be used in conjunction with existing Method 2 or new Methods 2F or 2G to account for this velocity drop-off when determining volumetric flow rate.

Questions 3.10 through 3.20 and 3.23 through 3.34 in this manual provide implementation guidelines for the flow methods.

References: 40 CFR Part 60, Appendix A (RMs 2, 2F, 2G, and 2H)

History: First published in November 1995, Update #7; revised in October 1999 Revised Manual; revised in October 2003 Revised Manual; revised in 2013 Manual