



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

RESEARCH TRIANGLE PARK, NC 27711

APR 08 2014

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

MEMORANDUM

SUBJECT: Interim Guidance on the Treatment of Condensable Particulate Matter Test Results in the Prevention of Significant Deterioration and Nonattainment New Source Review Permitting Programs

FROM: Stephen D. Page, Director
Office of Air Quality Planning and Standards (C404-04)

TO: EPA Regional Air Division Directors, Regions 1-10

This memorandum provides interim guidance on the treatment of condensable particulate matter (CPM) under the EPA's new source review (NSR) permit programs for particulate matter (PM). As explained below, the NSR regulations require that the measurement and control of PM from major stationary sources and major modifications include the condensable component for both PM₁₀ and PM_{2.5} emissions. Accordingly, CPM must be considered for permits addressing PM₁₀ and PM_{2.5} that are issued under the Prevention of Significant Deterioration (PSD) program and the nonattainment NSR program in areas that are classified attainment/unclassifiable and nonattainment, respectively, for the PM₁₀ and PM_{2.5} national ambient air quality standards (NAAQS).

This guidance addresses the use of CPM test results obtained with EPA Method 202¹ in (1) determining whether a new major stationary source or a major modification is subject to PSD or nonattainment NSR with respect to PM₁₀ and/or PM_{2.5}; (2) conducting the air quality analyses required to obtain a PSD permit; and (3) determining the quantity of required emissions offsets in nonattainment areas. It also addresses the use of Method 202 when conducting compliance tests and the use of AP-42² and other emission factors for CPM that are based on Method 202.

Summary

Since January 1, 2011, air agencies have been required to account for CPM in establishing emissions limits for both PM₁₀ and PM_{2.5} in all applicable PSD and nonattainment NSR permits.³ Method 202, as revised in 2010, provides a test method for quantifying CPM in emissions from stationary sources, and

¹ Method 202 is contained in 40 CFR part 51 appendix M. See 75 FR 80118, December 21, 2010.

² AP 42, Fifth Edition, Compilation of Air Pollutant Emission Factors, Volume 1: Stationary Point and Area Sources, <http://www.epa.gov/ttnchie1/ap42/>.

³ See 40 CFR §§ 51.165(a)(1)(xxxvii)(D), 51.166 (b)(49)(vi) and 52.21(b)(50)(vi).

may be incorporated as a component of other test methods and may be required as a method to demonstrate compliance with control measures implemented by air agencies in other actions, such as individual PSD permits. In using Method 202, industry stakeholders have expressed concern that source-specific CPM test results obtained with the method could include positive bias that translates into overestimations of emissions. Such overestimation could inappropriately affect applicability determinations for both PSD and nonattainment NSR permits. This, in turn, could cause overestimated emissions to be used when a new source or modification conducts its required air quality impact analyses (PSD) or determines the amount of emissions offsets needed (nonattainment NSR).

Method 202 involves the use of a variety of solvents and materials, implemented by individuals under various environmental conditions, all of which present the potential for contamination of emissions samples if appropriate care is not taken. As explained below, the EPA acknowledges the potential for blank contamination associated with the implementation of Method 202. The EPA has begun an independent investigation of the reported issues and plans in the future to issue a best practices document for conducting Method 202 and to revise the method, if necessary.

Interim Guidance

In this guidance, we are recommending to air agencies and permit applicants that it is appropriate on an interim basis to allow major source permit applicants to depart from one aspect of Method 202, specifically the current upper limit of 2.0 mg for the value of the field train recovery blank that can be used in the calculation of source CPM. During the prescribed interim period, air agencies may allow permit applicants to use field train proof blanks in lieu of field train recovery blanks and to allow blank values as high as 5.1 mg to be used in the calculation of CPM. This interim guidance applies for the purposes of (1) determining source applicability to PSD or nonattainment NSR with respect to PM₁₀ and/or PM_{2.5}; (2) conducting the air quality analyses required to obtain a PSD permit; (3) determining the quantity of required emissions offsets in nonattainment areas; and (4) conducting the necessary compliance tests. The interim period will end on the effective date of any revision that the EPA may make for Method 202 regarding the use of blanks in the field train on individual test results or on a date specified by Federal Register notice in the event that the EPA determines that a revision of Method 202 is not needed.

Background

Primary PM is the sum of filterable PM and CPM. Filterable PM are particles that are directly emitted by a source as a solid or liquid at stack or release conditions and captured on the filter of a stack test train. CPM are emissions that are vapor phase at stack conditions, but which condenses and/or reacts upon cooling and dilution in the ambient air to form solid or liquid PM immediately after discharge from the stack.

Shortly after the EPA promulgated the PM₁₀ NAAQS in 1987, our guidance began recommending that air agencies consider, in certain circumstances, the condensable portion of PM₁₀ emissions; however, it

was not until 2008 that the EPA codified a requirement to count CPM as part of the measurement and control of emissions of PM from major stationary sources and major modifications. Specifically, in its 2008 PM_{2.5} NSR Implementation Rule, the EPA revised the definition of “regulated NSR pollutant” for both PSD and nonattainment NSR to require that CPM be considered in applicability determinations and in establishing emissions limits for “particulate matter emissions,” “PM₁₀ emissions” and “PM_{2.5} emissions.” See 73 FR 28321 (May 16, 2008). The definition of “regulated NSR pollutant” was again revised in 2012 to correct the definition by removing the requirement that CPM be counted in the measurement and control of “particulate matter emissions.”⁴ See 77 FR 65107 (October 25, 2012). In the 2008 PM_{2.5} NSR Implementation Rule, citing various concerns raised about uncertainties associated with the EPA test method, the EPA announced that it would not require air agencies to implement the requirement to account for CPM in establishing enforceable emissions limits for either PM₁₀ or PM_{2.5} in permits until the completion of a transition period that ended on January 1, 2011. Accordingly, since January 1, 2011, air agencies have been required to account for CPM in establishing enforceable emissions limits for both PM₁₀ and PM_{2.5} in all applicable PSD and nonattainment NSR permits issued.

In requiring that CPM be counted in measurements of emissions of PM₁₀ and PM_{2.5}, the PSD and nonattainment NSR regulations do not refer explicitly to the test method to be used for quantifying CPM. However, it should be noted that the EPA defines “PM₁₀ emissions” at 40 CFR 51.100(rr) to include the following: “...as measured by an applicable reference method, or an equivalent or alternative method specified in this chapter or by a test method specified in an approved state implementation plan.” This definition is applicable to the use of the terms “PM₁₀ emissions” and “PM_{2.5} emissions” (which should be considered a subset of PM₁₀) in any regulations developed pursuant to part 51, including the regulations for NSR (§51.165) and PSD (§51.166).

The EPA developed Method 202 as a measurement method to quantify the CPM fraction of primary PM to be used in conjunction with a filterable particulate matter measurement method. The EPA originally promulgated Method 202 in 1991. The original Method 202 contained a multitude of measurement options that were present in a variety of air agencies’ CPM measurement methods. Method 202 has the potential for a “sulfate measurement artifact” that occurs when the sulfur dioxide gas present in the stack gas dissolves in water contained in the impingers.⁵ Over time, the dissolved sulfur dioxide slowly converts to sulfur trioxide and then to sulfuric acid. This converted sulfur dioxide is then improperly quantified as CPM.

In 2010, Method 202 was revised in order to greatly reduce the potential for the sulfur dioxide-to-sulfuric acid artifact by removing the requirement for sample gas to bubble through water to reduce the gas/water interactions, increasing the CPM impinger temperature to lower sulfur dioxide solubility and requiring a nitrogen purge to remove any dissolved sulfur dioxide. The revision of some options and

⁴ “Particulate matter emissions” is a term that refers to the measurement of particles captured by a Method 5 source test. Particles in that size range include PM_{2.5} and PM₁₀ as well as particles that have an aerodynamic diameter greater than PM₁₀. Such larger particles are not considered in the measurement of the indicators for the PM₁₀ and PM_{2.5} NAAQS.

⁵ For further discussion of this topic, see the preamble to the Method 202 revision (75 FR 80118, December 21, 2010) and the relevant response to comments document (Docket EPA-HQ-OAR-2008-0348).

removal of other options allowed in the 1991 version of Method 202 also increased the precision of the measurements for the 2010 revised methodology.

In Method 202, CPM is collected in dry impingers after filterable PM has been collected on a filter maintained as specified in either Method 5 of appendix A-3 to 40 CFR part 60, Method 17 of appendix A-6 to part 60 or Method 201A of appendix M to part 51. The organic and aqueous fractions on the impingers and an out-of-stack CPM filter are then dried and weighed. The total weight of the impinger fractions and the CPM filter represents the source's CPM portion of its PM₁₀ or PM_{2.5} emissions.

Method 202 uses a variety of solvents (water, acetone and hexane) and materials (glass impingers, filters, sample jars, solvent squirt bottles, etc.). Each of these components, as well as the sample recovery technician and the recovery area, presents a potential for contamination of sample. Blanks are used as both a qualitative and quantitative means of contamination control.

Field train recovery blanks are generally used as quality assurance checks to insure both proper recovery of the sample from the previous test run and low contamination level of solvents, recovery, and analytical equipment and procedures. In Method 202, the result for a field train recovery blank is also used as the value for blank correction in order to reduce the quality assurance and control analysis burden. Field train proof blanks, another quality assurance and control sample, are not influenced by poor recovery of a preceding run.

Industry Concerns

In using Method 202 in NSR permitting, industry stakeholders have expressed concern that source-specific CPM test results obtained with the method can include positive bias stemming both from the conversion of gaseous material to particulate form in the test apparatus (i.e., a measurement artifact) and from contamination of the apparatus and solvents. According to industry stakeholders, these biases translate into estimates of CPM associated with proposed new or modified emission units that are higher than the amount of CPM that actually would be emitted. To the extent that this overestimation of CPM is true with regard to a specific source, it can affect whether the source is determined to be subject to the PSD program or the nonattainment NSR program for PM_{2.5} and/or PM₁₀. The alleged positive bias problem could also affect the demonstration via air dispersion modeling as to whether the new or modified source will cause or contribute to a violation of the PM₁₀ or PM_{2.5} NAAQS or applicable increment. The alleged overestimation problem could make it difficult for a source to satisfy certain requirements needed to obtain a PSD permit or nonattainment NSR permit. It could force the source to constrain its design or operation in ways not actually necessary to avoid causing or contributing to a violation of the NAAQS or applicable increment. The alleged problem could also affect the determination of the quantity of required emissions offsets in nonattainment areas. The use of emission factors that are based on Method 202 (or other testing methods with similar artifact and contamination issues) could lead to similar problems in estimating a source's CPM.

The National Council for Air and Stream Improvement, Inc. (NCASI) presented a report entitled “Investigations of Potential Biases Associated with EPA Methods 201A and 202” (September 20, 2013) to the EPA outlining its concerns with the use of Methods 201A and 202 and AP-42 emission factors in modeling for PSD. To examine the blank contamination due to method implementation issues, NCASI collected over 50 data points representing field train recovery blanks, reagent blanks and field train proof blanks. The train blank values presented by NCASI ranged from 0.5 mg to 13.3 mg. NCASI evaluated a subset of blank data and proposed that a blank correction of 7.0 mg was needed with the use of field train proof blanks in lieu of field train recovery blanks. To examine the positive bias associated with sulfur dioxide conversion, NCASI presented cation and anion concentrations from a single test series at a natural gas-fired boiler.

After reviewing the data presented by NCASI and our own investigations, the EPA acknowledges there can be an issue with implementation of Method 202 by some testing firms to meet the 2.0 mg levels allowed as a blank correction. The EPA has been investigating these issues independently and plans in the future to issue a best practices document for Method 202 and to revise Method 202, as necessary. The EPA independently assessed all of the train blank data presented by NCASI and determined that it is appropriate to use a blank correction of 5.1 mg⁶ when using the value from a field proof blank in lieu of the field recovery blank. If this larger blank correction allowance is used, it is also critical to use a site-specific field train proof blank in lieu the field train recovery blank, since a field train recovery blank also measures the impact of a poor recovery procedure from the previous use of the sampling train. Sampling campaigns with field proof blank values larger than 5.1 mg should consider assessing their sample recovery practices and materials used and retesting the source.

However, after assessing the NCASI data on sulfur dioxide positive bias, the EPA does not believe it is necessary to change our existing guidance.⁷ The EPA believes that the NCASI data set provides an incomplete understanding of the source matrix, and any potential biases or measurement artifacts are due to the limited data presented and the extremely long test runs. The EPA does not see sufficient evidence of a significant sulfur dioxide artifact. We do not recommend any departures from Method 202 as promulgated with respect to this issue.

There is ongoing work by the EPA to assess the issues associated with implementation of Method 202 by some private contractors resulting in blank levels above the required 2.0 mg. The EPA plans to issue guidance on best practices for Method 202 implementation and revise Method 202 in the future, as necessary.

⁶ 95th percentile upper confidence level of all train blank data in the submitted NCASI “Investigations of Potential Biases Associated with EPA Methods 201A and 202” report

⁷ For further discussion of this topic, see the preamble to the Method 202 revision (75 FR 80118, December 21, 2010) and the relevant response to comments document (Docket EPA-HQ-OAR-2008-0348).

Consideration of Emission Factors

In some cases, stack testing is not an option and reliance must be placed on emission factors from available references or emission factors developed by the permit applicant based on stack testing at other sources. While the test method for CPM used for all of the current AP-42 PM_{2.5} emission factors had the potential for a sulfate artifact, this issue is not uniformly associated with all emission factors. Many PM_{2.5} emission factors include only the filterable component of particulate matter and do not include CPM. As a result, these factors are biased low. In addition, when the condensable component was included, the previous version of Method 202 allowed testers and air agencies significant latitude in the laboratory methods used for its analysis. In the development of AP-42 emission factors, an attempt was made to exclude tests that would have a significant bias. However, few test companies provided adequate documentation to determine which of the many allowed or tester-generated analyses were performed. As a result, it is speculative to state categorically that all PM_{2.5} emission factors which include CPM have a high bias.

It is important to note that as we use recent PM_{2.5} test data to revise emission factors, we have the ability to compare the existing data to the new test data to evaluate whether to exclude the old data. We have worked effectively with industry to update other types of AP-42 factors (e.g., with corn refiners on factors for paved roads⁸) using data and analyses developed in cooperation with industry. We encourage similar collaborative efforts to resolve issues with PM_{2.5} emission factors.

The EPA prefers stack emission measurements from individual sources rather than the use of estimates or emission factors. If representative source-specific data cannot be obtained, emissions information from equipment vendors (particularly emissions performance guarantees or actual test data from similar equipment) may be an acceptable source of information for permitting decisions. However, the use of any performance guarantees or actual test data from similar equipment should be carefully assessed to insure that the information being provided is based on measurement methods that are consistent with the most recent revision of Method 202. When such information is not available, use of emission factors may be necessary as a last resort. Whenever emission factors are being considered for use, the EPA emphasizes that their limitations in accurately representing the emissions from a particular facility, and the uncertainties of using emission factors in such situations, should be evaluated against the cost of further testing or analyses.

The recommendations contained in this interim guidance are not binding or enforceable against any person, and no part of the guidance or the guidance as a whole constitutes final agency action or the consummation of agency decision making. This document is not a rule or regulation, and individual air agencies may determine that the guidance it contains may not apply to a particular situation based upon the individual facts and circumstances. This guidance does not change or substitute for any law, regulation or other legally binding requirement and is not legally enforceable.

⁸ Emission Factor Documentation for AP-42, Section 13.2.1 Paved Roads Background Document 2.2.6
<http://www.epa.gov/ttn/chief/ap42/ch13/bgdocs/b13s0201.pdf>.