DEPARTMENT : POLLUTION CONTROL AGENCY

STATE OF MINNESOTA

Office Memorandum

DATE : February 9, 2004

TO : Air Permitting Staff
Air Compliance & Enforcement Staff
Emission Inventory Staff

FROM : VOC Workgroup (Stuart Arkley, Dan Brady, Paula Connell, David Crowell, Steve Giddings, Mike Mondloch, Don Smith, Mike Smith)

THRU: Ann Foss Ann Foss

PHONE : 296-7512

SUBJECT : Mass Basis of VOC Emissions for Permitting, Compliance and Emission Inventory

Introduction:
This memorandum addresses issues arising from the development of emission factors for volatile organic compounds (VOC) when the data is based on a performance test. It should be noted that the majority of facilities use AP-42 emission factors or mass balance equations and recordkeeping to assess their emissions and therefore this majority is already quantifying VOC emissions on an acceptable mass basis.

Several different performance test methods are available for quantifying emissions of VOC, all measuring a different sub-set of compounds and each reporting on a different mass basis (e.g. pounds per hour as carbon or pounds per hour as <specific VOC compound>).

While on occasion EPA has provided specific guidance to individual states regarding specific industries, this local guidance has not been well publicized on the national level. With the exception of some supporting documents in relation to AP-42 emission factors[1] there has been scant reference to how VOC should be measured for purposes such as applicability determinations. This has led to widely varying practices from state to state.

More recent EPA guidance clarifies EPA's position that VOC should be measured to reflect the actual mass of VOC emitted[2]. However, it does not fully solve the technical problems arising from the limitations of the EPA methods. The technical issues need to be addressed on a case by case, or at least a sector by sector basis.

The MPCA agrees in principle with the AP-42 approach[1]:

> When possible, report the emission factors in terms of actual weight of the emitted substance. When the actual organic species present in the emissions are unknown, attempt an educated guess at the composition and report as appropriate. If the actual species are unknown and an educated guess is not feasible, calculate the VOC emissions at an assumed molecular weight of 44, and report "as propane".

---

[1] EPA document EPA-454/R-95-015, "Procedures for Preparing Emission Factor Documents", Section 2-7 (Revised, November 1997)

[2] Letter from Stephen Page, Director, OAQPS, to Mary Gade of Sonnenschein, Nath and Rosenthal LLP, December 30, 2003

When VOC limits in a permit are based on this approach, the permit should specify the method of compliance and whether the measurement is to be (1) on an actual mass basis, or (2) as an acceptable surrogate mass basis reflective of actual mass. This memorandum provides an outline for implementing this principle in a consistent manner and for managing the transition for cases where past determinations were based on measuring VOC "as carbon."

NOTE: *The options in Sections A – C are intended to provide a* ***general framework*** *for the transition to a more comprehensive review of VOC emissions factors for applicability and emission inventory purposes.* ***There will be many cases that do not fit neatly into this framework so staff will need to address these issues on a case-by-case basis.***

A. Correction of VOC Measurement Basis - Transition Options For Permitting

Some possible scenarios and approaches are listed below. This is intended for general guidance as ***unique factors may apply in any given situation***. In general, special steps will only be necessary when the emissions data is based on stack testing or CEM results, although all VOC emission factors will probably need some level of evaluation.

1) New source

With new sources we have the opportunity to address VOC at the application stage, ensuring that application data is on an as-VOC mass basis and carrying this through to the establishment of any emission limits.

a) Review VOC emission factors
- AP-42 factors are assumed to be expressed "as VOC"
- If the factor is based on manufacturer data, the permit writer should, in consultation with performance test staff, (i) determine quantification method and mass basis; (ii) determine if the method was appropriate
- If test data has been used, the permit writer needs to determine the mass basis and if the method was appropriate. Performance test staff may be consulted for technical input.

b) Applicability Determination
- Must be done on an "as VOC" basis – i.e. reflecting actual average molecular weight of the VOCs or an acceptable surrogate for the industry (e.g. propane)
- If based on AP-42 or mass balance, the information will generally be useable as-is, but should still be reviewed

c) Emission Limits
- Establish the limit on the same mass basis that would be used for an applicability determination (e.g., same as AP-42 factor or the *adjusted,* as in 1(b), test data)
- The permit should state the mass basis of the limit and in most cases should specify the procedure for determining compliance, which includes method(s), averaging time and mass basis, e.g.,

(1) Source with annual limit to maintain synthetic minor status:

VOC: 95 tons per year (actual VOC mass). Compliance to be demonstrated based on a three-run average of no more than 12.0 lb/hr VOC, as propane, using EPA Method 25 or Method 25A.
[95 tpy * 2000 lb/ton / 8760 hrs/year * 1.22 (propane:carbon) / 2.2 (scaling factor)]

(2) OSB Source with short term BACT limit:

VOC: 25.0 lb/hr (AP-42 basis). Compliance to be demonstrated using a performance test for formaldehyde conducted simultaneously with Method 25A. Results shall be reported on an "as VOC" basis, summing the Method 25A data (as propane) and the formaldehyde (as formaldehyde) test result.

Propane is the preferred default mass basis for Method 25A if a single-chemical surrogate is to be used as it is the typical calibration gas for the instrument and is the default used in AP-42. While the limit could still be scaled down to "as-carbon" this is a practice to be discouraged over the longer term.

2) Modifying source
Essentially the same procedures as in (1) but recognizing that the original calculations may have been based on as-carbon data. Therefore an "accounting adjustment" may be needed to bring the permit in line with correct VOC policy.

a) If the original data was reported on an as-carbon basis or used inappropriate methods:
- If possible, correct the past data to an as-VOC basis (i.e. the same basis that current and future emissions calculations will be based on)
- May require additional testing if conversion not possible
- Convert the data to the new mass basis and proceed as in (1)(a) – (1)(c), above.
- *[Need to develop separate Enforcement Transition guidance that deals with what happens if the conversion produces a technical violation of some kind – likely a case by case determination for discussion in an Enforcement Forum or Permitting Forum]*

b) If the past data was reported on an as-VOC basis but MPCA has been using as-carbon testing for compliance:
- Check the data against current procedures for VOC measurement then proceed as in (1)(a) – (1)(c), above.
- *[Address possibility of prior, undiscovered non-compliance in separate Enforcement Transition guidance]*

3) Permit re-issuance or existing facility getting first Title V permit.

- For re-issuance permit, check past VOC calculations and recalculate PTE for VOC, following the guidance in (1) and (2).

- For initial Title V permit, check past VOC calculations used in TFP and/or construction permits and recalculate PTE for VOC, following the guidance in (1) and (2).

4) Permit re-opening

- May be necessary to open up non-expiring State permits that no longer qualify after a change in accounting for VOC emissions. Follow guidance in (1) – (3).
- EPA enforcement action of non-compliance with a VOC limit may also be grounds for reopening a permit. Follow guidance in (1) – (3).

B. Emission Inventory (EI) Transition

General goals:

(1) Facilities using performance test data

- For the 2003 EI, ethanol plant VOC emissions will be "scaled" in accordance with EPA procedure.
- Starting with the 2004 EI, other industries will transition to reporting VOC on an as-VOC basis, as part of a coordinated EI/compliance & enforcement initiative to identify industry sectors where change is needed. New reporting requirements, including any adjustment factors, will be communicated to the affected sources as well as to the EI mailing list as a whole.
- The same principles apply to the small number of facilities using continuous monitors (CEMS) to quantify VOC emissions.
- Facilities whose VOC limits are based on carbon, e.g. because that is the way an NSPS limit is expressed (see Section C), may continue to use as-carbon test methods. However, the results will not be valid for Emission Inventory use or Permitting applicability purposes unless additional testing is conducted and/or the numbers can be scaled to more accurately represent actual VOC emissions.

(2) VOC emission factors not based on performance test data

- In general facilities using a mass balance approach or calculating emissions based on AP-42 emission factors should be able to continue this practice. However, individual facilities should take steps to ensure that the assumption that these factors already report "as VOC" is valid.

C. VOC Test Protocol Development For Major Categories Of VOC Emissions

*This table provides **general guidance** for VOC testing. Practical considerations may make site specific alternatives preferable to those suggested below, and may be allowed or suggested by performance test staff during the test plan approval process.*

These procedures, or equivalent procedures, should be applied to all performance tests for VOC. However, in the transition period where, for example, a permit contains a limit based on "as carbon" test data, the facility may follow both the past and the new requirements. Only "as VOC" test protocols will be acceptable for use in determining permitting applicability, new source review applicability or emission factor development, or for use in Emission Inventory submittals once the new EI reporting requirements are in place.

Examples of cases where new, as-VOC protocols must be applied are:

- Tests planned to support a permit amendment and/or NSR modification
- Tests planned to establish Emission Inventory factors
- Existing sources whose permit limits have been adjusted or affirmed under Transition Plan

Source Type	Old Procedure	New Options
Any source with an NSPS or NESHAP VOC limit	Use methods prescribed by the standard	Use methods prescribed by the standard [BUT caution that as-carbon testing will not be accepted for EI or in support of a permit application].
Printing / Coating Operations with Thermal or Catalytic Oxidizer	M25A for %Destruction Efficiency (DE); M25A outlet result used as emission rate (lb/hr, C)	(1) Determine %DE using M25A or approved alternative; (2) Rather than using the uncertain M25A inlet data, determine *actual* inlet VOC rate (lb/hr, as VOC) by mass balance, from MSDS, etc. May need %Capture Efficiency (CE) determination. (3) Multiply inlet VOC-as-VOC by %DE
Printing / Coating Operations with no APCE for VOC	Mass balance or M25A / M25 test.	Use M25A with appropriate response factors based on known constituents of gas stream; *or* Use M25 and convert the as-C result to reflect molecular weight of actual VOCs
Wood Products	M25 or M25A. Results expressed as C. In few cases formaldehyde and methanol had been determined separately. EPA method for formaldehyde was flawed. (New NCASI method better).	Adapt the *Oregon* approach: Use Method 25A and NCASI method for wood products HAPS. Convert to M25A result to propane basis. Add formaldehyde and methanol mass emission rates to the M25A result. (Option methanol correction can also be done). *Or* use AP-42 approach (Method 25A as propane + formaldehyde)
Ethanol	Total VOC methods had been attempted but no single protocol established.	Use EPA's Midwest Scaling Procedure for consent decree testing. Possible identification of surrogates for inclusion of routine testing in the permits.
Combustion Sources (Coal/Gas/Fuel Oil/MSW)	Method 25A. Expressed as C	Will vary with fuel type(s), level of combustion control, etc. M25A, expressed as Propane, may work in some cases. Use AP-42 as guidance.
Fugitive VOC emissions from refineries and petroleum distribution facilities	Method 21 (LDAR) routinely used for leak detection and quantification of fugitive emissions.	Acceptable as emissions data for permitting and emission inventory if the correct EPA empirical equations are used.
DEFAULT POSITION – IF NO BETTER OPTION AVAILABLE	Measurement as carbon	Measurement as propane (Carbon x 1.22)