State of Oregon Department of Environmental Quality

Internal Management Directive

Guidance for Evaluating VOC Emissions from Drying and Hot-Pressing Activities Common to the Wood Products Industry

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Approval:	Andrew Ginsburg	AQ.00.011	

1. Purpose:

The purpose of this document is to direct Source Test Coordinators on evaluating VOC testing strategies, calculating VOC emissions, and correcting existing VOC emissions testing data. This document shall also be used to direct permit writers on modifying permits and to direct permit writers and inspectors on how to make compliance determinations during permit modifications and in the interim period prior to permit modifications.

2. Applicability:

a) This Directive applies to quantification of VOC emissions from the drying and hot-pressing activities common to the wood product facilities that have relatively well-defined VOC emission streams with characteristics that are suitable for measurement using this guidance. These facilities include permitted facilities that dry wood (excluding dry kilns) and/or press resin-impregnated or adhesive-containing wood materials together under heat and pressure. These facilities include but are not limited to:

- Particle Board Facilities
- Medium Density Fiberboard Facilities
- Hardboard Facilities
- Plywood Manufacturing Facilities
- Veneer Drying Facilities
- Oriented Strand Board Facilities

b) This Directive is intended solely as guidance for Air Quality staff and other employees of the Department.

c) The Directive does not create any rights, duties, obligations, or defenses, implied or otherwise, in any third parties.

d) It does not constitute rulemaking by the Environmental Quality Commission and may not be relied upon to create a right or benefit, substantive or procedural, enforceable by law or in equity, by any person. DEQ may take action which varies from this directive.

3. Background:

Recognizing there wasn't a perfect solution to quantifying VOC emissions from the wood products industry in Oregon, yet recognizing the need for a reasonable and consistent approach, ODEQ chose to quantify VOC emissions based on the carbon content of the VOC measured by Method 25A.

During EPA's enforcement actions in the Wood Products Initiative, EPA quantified VOC emissions by adjusting Method 25A data, correcting for a mass-to-carbon ratio of 1.13 (terpenes) and by applying a sample moisture correction factor.

In December of 2000, the EPA responded to an ODEQ inquiry regarding the calculation of VOC emissions. Within the EPA response, the total mass of VOCs was defined two ways:

> *For the purpose of major source or major modification determinations (and similarly for Title V applicability), emissions must be calculated as the total mass of VOCs (an "as VOC" basis). Expressing VOC emissions in any other way (e.g. as carbon) may underestimate the quantity of VOCs being emitted and thereby result in erroneous major source/modification determinations.*
>
> *However, for the purposes of determining compliance with source category specific emission limits or performance standards, VOCs may be expressed according to the test methods in the approved State Implementation Plan or 40 C.F.R. Part 60, Appendix A, as specified in the particular rule or regulation. This can be on a carbon, propane calibration gas, or compound specific basis.*

ODEQ recognized they had to develop a new method for quantifying VOC emissions from the wood products industry since their current methods underestimated actual emissions by approximately 22% given that it did not count the weight of the non-carbon atoms and it ignores the relative sensitivity of the test method in measuring some specific VOC's.

The new testing strategy is defined within Section 5 of this document and is largely dependent on the process types and their emission controls. Formaldehyde, methanol, and terpenes are the principal VOCs of interest. Each will be measured independently and their sum will represent VOC emissions on an "as VOC" basis. Terpene emissions will be conservatively approximated utilizing EPA Method 25A expressed "as propane". Section 4 discusses the limited usefulness of EPA Method 25A and Attachment 2 addresses test methods used to quantify formaldehyde and methanol emissions.

4. Technical Discussion of the Shortcomings of Method 25A:

Drying and pressing processes that meet the applicability requirements of this guidance document emit complex forms of volatile organic compounds (VOCs), which are difficult to quantify by any one testing method. The most common VOC testing methodology currently accepted by the Department to determine regulatory compliance is EPA Method 25A. Method 25A is very repeatable, relatively easy to perform, and is one of the least expensive VOC testing methodologies. However, Method 25A has multiple shortcomings that can significantly affect emission test results.

EPA Method 25A is applicable for the measurement of gaseous organic compounds that consist primarily as alkanes, alkenes, and aromatic compounds by use of a flame ionization detector (FID). The FID response is roughly proportional to the rate of organic carbon atoms introduced to the flame and is dependent on the analyzer manufacturer, FID fuel composition, calibration materials, sample-gas moisture content, sample-gas oxygen concentration, and the characteristics of the organic molecules being analyzed. Therefore, depressed or elevated responses from the Method 25A analyzer are common.

Once more, EPA Method 25A is applicable for the measurement of gaseous organic compounds that consist primarily as alkanes, alkenes, and aromatic compounds. Applying EPA Method 25A to sources that emit other complex strains of VOCs requires the use of empirical data to determine the molar response of each organic compound. This data reduction technique is beyond the scope of this guidance.

5. ODEQ's Approach for VOC testing:

The approach to VOC testing under this guidance is dependent on the source type and whether the source is equipped with VOC Best Available Control Technology (BACT), Reasonably Available Control Technology (RACT), or with VOC Lowest Achievable Emission Rate (LAER) technology.

5.1 Wood Dryers

For wood dryers <u>not equipped</u> with VOC BACT, RACT or LAER, the Department will require the use of EPA Method 25A (expressed as propane) for measuring the gaseous organic compounds that consist primarily as terpenes. Methanol and formaldehyde are to be measured separately and concurrently at least once to verify their contribution to the total VOC emissions. If methanol and formaldehyde emissions are of significant consequence, it will be necessary to measure them concurrently with EPA Method 25A every time VOC emissions testing is performed. Significant consequences will be a case-by-case determination based on the potential of the methanol and formaldehyde emissions to cause an exceedance of a regulatory threshold such as Title V permitting, major source determination, NSR/PSD, etc. Mass emissions results from EPA Method 25A (as propane), methanol, and formaldehyde will be summed to determine VOC mass emissions. Refer to Attachments 1 & 2 for more details on calculations and specific test methods.

For direct-fired dryers that combust natural gas, ethane and/or methane may significantly bias an EPA Method 25A test. Methane and ethane are deemed to have "negligible photochemical reactivity" and are not regulated VOCs. Therefore, methane and ethane may be measured independently and the analyzer response of EPA Method 25A may be corrected. The measurement of methane and ethane should be an available option but not a requirement. Refer to Attachments 1 & 2 for more details.

5.2 Press Vents

For press vents not equipped with VOC BACT, RACT or LAER, the Department will require the use of EPA Method 25A (expressed as propane) for measuring the gaseous organic compounds that consist primarily as terpenes. Methanol and formaldehyde are to be measured separately and concurrently every time VOC emissions testing is performed. Mass emissions results from EPA Method 25A (as propane), methanol, and formaldehyde will be summed to determine VOC mass emissions. Refer to Attachments 1 & 2 for more details.

5.3 Sources Equipped with VOC BACT, RACT or LAER Control Technology

For sources equipped with VOC Best Available Control Technology (BACT), Reasonably Available Control Technology (RACT) or with VOC Lowest Achievable Emission Rate (LAER) technology prior to the implementation of this guidance, the Department recognizes an existing limit may have been based on an identified control technology and testing methodology that understated the total mass of VOC emissions. Under these circumstances the Department cannot merely apply a new VOC test method to evaluate compliance with the previous limit because that could make the limit more stringent, possibly forcing the installation of a different control technology than that already established. For these reasons, VOC testing methodology incorporated on sources equipped with BACT, RACT or LAER prior to the implementation of this guidance will be evaluated on a case-by-case basis.

For sources equipped with BACT, RACT or LAER technology after the implementation of this guidance, the Department will require the use of EPA Method 25A (expressed as propane) for measuring the mass-rate of gaseous organic compounds exhausting from the control equipment. The Department will evaluate each BACT, RACT or LAER source on a case-by-case basis to determine if additional measurements of methanol and formaldehyde are necessary to quantify VOC emissions.

For VOC control equipment that requires the combustion of natural gas, ethane and/or methane may significantly bias an EPA Method 25A test and an adjustment is commonly made for the bias. Methane and ethane are deemed to have "negligible

photochemical reactivity" and are not regulated VOCs. Therefore, methane and ethane may be measured independently and the analyzer response of EPA Method 25A may be corrected. The measurement of methane and ethane should be an available option but not a requirement. Refer to Attachments 1 & 2 for more details.

The measurement of VOC emissions for determining destruction and removal efficiency (DRE) is beyond the scope of this guidance.

5.4 Explanatory Comments Regarding Phenol Testing

Sources applicable to this guideline may also emit a significant amount of phenol emissions. Phenol is a designated VOC, however, EPA Method 25A expressed as propane will account for approximately 85% of the total phenol emitted. In an attempt to formulate a representative and comprehensible VOC sampling approach, the Department considers the independent quantification of phenol unnecessary when this guidance is applied.

6. Implementation of this Guidance:

Full implementation of this guidance will involve many parts. Ultimately all affected permits will have to be revised to reflect the new method for quantifying VOC emissions. Until that is accomplished, staff will be faced with determining compliance with VOC emission limits, approving source test protocols, and reviewing source test results. Because this guidance does not directly lead to any emission reductions and due to the significant workload of revising permits, it is not of the highest priority to revise all permits immediately. Permits should be revised to reflect this guidance upon renewal, during a major permit modification for other reasons, or at the request of the permittee. See Section 7 of this guidance for further details on permit revisions. What follows is guidance for issues staff will face **until all affected permits are revised.**

6.1 Approving source test protocols

With the effective date of this guidance, all source test protocols for VOC testing of processes described in the applicability section should follow the procedures in Section 5 of this guidance. Results should be reported consistent with this guidance to enable development of new VOC emission limits and consistent with the test methods used to establish the existing permit limits to enable a determination of compliance with the existing permit.

6.2 Reviewing source test results

Source test reports received after the effective date of this guidance, based on protocols approved prior to the effective date of this guidance, should be evaluated based on the approved protocol.

Determining compliance with permit conditions

Evaluation of source test results to determine compliance must be consistent with the test methods used to establish the emission limits.

7. Permit Revisions:

As stated earlier, due to the significant workload for these permit revisions, ODEQ will implement the permit revisions during permit renewals, significant permit modifications, or at the request of a permittee. Emphasis should be placed on updating the permit to current allowable emissions using these new procedures for calculating VOC emissions. It is not high priority to go back and re-examine every physical change from the past, using this new method to calculate VOC emissions, to evaluate whether those changes may have triggered New Source Review or Prevention of Significant Deterioration. In the Wood Products Initiative, EPA already did this evaluation for most of the bigger facilities to which this new guidance will apply.

Permit revisions will involve establishing new emission factors for PSELs, baseline emission rates, and the netting basis. If source test results are available that follow this new guidance, calculation procedures are straightforward. If there are source tests available that follow the old guidance, the results of those tests should be recalculated using the guidance in Attachment 1.

7.1 Compliance issues discovered as a result of permit revision

As baseline emission rates, netting basis, and current PSELs are recalculated using this guidance, there may be instances where compliance issues are discovered such as the recalculated PSEL exceeds the netting basis by an amount greater than the SER. In general, formal enforcement is not warranted for violations resulting solely from recalculation, provided that the source satisfies any subsequently triggered requirement. For instance, the source would have to either reduce previously approved emission increases to less than the SER or satisfy the requirements of New Source Review (NSR) or Prevention of Significant Deterioration (PSD), or other applicable state rules. The appropriate timeline would have to be determined on a case-by-case basis.

If a source could reasonably reduce permitted emission levels and stay below relevant thresholds, they should be required to do so. Failure to do so could be considered a willful continuing violation. In some cases sources may have difficulty staying below thresholds because they have entered into contracts based on previously approved production increases that would not be allowed based on corrected emission rates. In such a case, staff should allow the source a reasonable period of time to satisfy any subsequent requirements such as NSR, PSD, or TV permitting requirements.

Staff should seek to create an enforceable compliance schedule through a Mutual Agreement and Order (MAO), unilateral Order, or a compliance schedule in the permit.

Note however, that creation of a compliance schedule will not absolve the source of potential enforcement from EPA.

If the only compliance issue is an apparent exceedance of the PSEL without triggering any new applicable requirement, the permit writer should request the permittee modify the permit application in hand to request a higher PSEL.

Although it is not high priority to re-examine all past physical changes against this new guidance for calculating VOC emissions, staff may identify cases where a permittee had been granted an emissions increase from a physical change and the emissions increase was below the SER, thereby avoiding NSR or PSD permitting requirements. In some cases, a permittee may have knowingly underestimated the VOC emissions increase, which could be a Class I violation if the permittee *submitted false, inaccurate or incomplete information to the department where the submittal masked a violation, caused environmental harm, or caused the department to misinterpret any substantive fact* (*OAR 340-012-0053(1)(b)*). The fact that the permit application was submitted after EPA's Wood Products Initiative was conducted would not normally be sufficient, in and of itself, to indicate that a permittee knowingly underestimated emissions. Staff should examine the situation on a case-by-case basis using the most-current Enforcement Guidance to determine if a violation occurred, how it should be classified, and whether formal enforcement is warranted.

8. Internal Contacts:

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Attachment 1

CALCULATION OF VOC EMISSIONS FROM DRYING OR PRESSING OF WOOD

Calculating the VOC emissions on an "as VOC basis" will be performed as per Equation A-1. The supplementary measurement of VOCs not addressed within Section 5 of this guidance is not required, but is included in equation A-1 for completeness. Production or process rate factors are addressed in equation A-2, below, while corrections to method 25A test results are addressed in equations A-3 and A-4.

$$Evoc = E_{FID} + E_{FOR} + E_{MOH} + \sum_{i=1}^{n} Evoc_i \qquad \textit{(Equation A-1)}$$

WHERE:
Evoc = Total VOC emissions rate, lbs/hr as VOC basis.
E_{FID} = Terpene emissions by Method 25A, lbs/hr as propane.
E_{FOR} = Formaldehyde emissions rate, lbs/hr as formaldehyde.
E_{MOH} = Methanol emissions rate, lbs/hr as methanol.
$Evoc_i$ = VOC emissions rate of pollutant "i", lbs/hr as VOC, measured in conjunction with and quantified independently from terpene, formaldehyde and methanol emission measurements.
n = Number of additional VOC pollutants measured in conjunction with Method 25A.

Process based VOC emissions factor is calculated as follows:

$$EFvoc = \frac{Evoc}{P} \qquad \textit{(Equation A-2)}$$

Where:
EFvoc = Process based VOC emission factor, lbs VOCs/unit.
Evoc = VOC emissions rate, lbs/hr (from equation A-1).
P = Process rate, number of units per hour.

CALCULATION OF TERPENE EMISSIONS (E_{FID}) FROM UNREFINED METHOD 25A TEST DATA

At times, it will be necessary for the Source Test Coordinator (STC) to calculate terpene emissions from unrefined EPA Method 25A test data. Following is an overview of the calculations a STC will have to perform to accomplish such a task:

Overall correction of Method 25A data for methane, ethane, methanol and other applicable VOC compounds is performed as per Equation A-3. These corrections to Method 25A are optional, as the source might consider these emissions to be insignificant or may wish to retain a degree of conservatism in the test results.

$$C_{FID}' = C_{FID} - \left[\frac{C_M \times RF_M}{3}\right] - \left[\frac{2 \times C_E \times RF_E}{3}\right] - \left[\frac{C_{MOH} \times RF_{MOH}}{3}\right] - \sum_{i=1}^{n} \frac{NC_i \times C_i \times RF_i}{3} \quad \textit{(Equation A-3)}$$

Where:

C_{FID}' = Corrected FID response, ppmv as propane (dry/wet basis)[2]. C_{FID}' must not be less than the sensitivity of Method 25A (2% of the system span).

C_{FID} = Average FID response, ppmv as propane (dry/wet basis) [1, 2].

C_M = Methane concentration, ppmv as methane (dry/wet basis) [1,2].

C_E = Ethane concentration, ppmv as ethane (dry/wet basis) [1,2].

C_{MOH} = Methanol concentration, ppmv as methanol (dry/wet basis) [1, 2].

C = Concentration of pollutant "i", ppmv as VOC (dry/wet basis) [1,2], measured in conjunction with and quantified independently from terpene, formaldehyde and methanol emission measurements.

NC_i = Number of carbon atoms in VOC "i" molecule (dry/wet basis).

RF_M = Method 25A response factor for methane (as methane), default of 1.0.

RF_E = Method 25A response factor for ethane (as ethane), default of 1.0.

RF_{MOH} = Method 25A response factor for methanol (as methanol), default 0.55.

RF_i = Method 25A response factor to VOC "i", expressed as decimal fraction.

n = Number of additional VOC pollutants measured in conjunction with Method 25A.

Notes:

1) C_M, C_E, C_{MOH}, and/or C_i are equal to "0" if measurements are below detection limit or if not measured in conjunction with EPA Method 25A.
2) C_M, C_E, C_{MOH}, and/or C_i must be expressed on an equivalent basis, either dry or wet. For consistency reasons, the Department prefers all concentrations expressed on a dry basis.

Terpene emissions measured by EPA Method 25A (as propane) are calculated as follows:

$$E_{FID} = (6.84 \times 10^{-6})\ (C_{FID}')\ (Qs) \qquad \textit{(Equation A-4)}$$

Where:

E_{FID} = Terpene emissions measured by 25A, lbs/hr as propane.

C_{FID}'= FID response, corrected for methane, ethane, methanol, and/or VOC_i where applicable, ppmv (dry/wet) as propane (Equation A-3). C_{FID}' must not be less than the sensitivity of Method 25A (2% of the system span).

Qs = Exhaust gas flow rate, dry scfm if pollutant concentrations are expressed on a dry basis, wet scfm if pollutant concentrations are expressed on a wet basis.

CORRECTING VOC TEST RESULTS THAT ARE EXPRESSED AS CARBON OR AS METHANE

As permits are renewed, permit writers may need to adjust VOC Baseline emissions or VOC PSELs that were based on test results that were expressed "as carbon" or "as methane". The Department may be required to aid in evaluating how the VOCs were expressed and how to correct the results. Utilize the correction factors in Table I to adjust the emissions to an "as VOCs" basis.

TABLE I:

CONVERSION FACTORS FOR CORRECTING VOC EMISSIONS DATA*

VOC PARAMETER	CONVERT FROM	CONVERT TO	MULTIPLY BY
EPA 25A (TERPENES)	AS CARBON	AS PROPANE	1.22
EPA 25A (TERPENES)	AS METHANE	AS PROPANE	0.92
FORMALDEHYDE	AS CARBON	AS FORMALDEHYDE	2.50
FORMALDEHYDE	AS METHANE	AS FORMALDEHYDE	1.88
METHANOL	AS CARBON	AS METHANOL	2.67
METHANOL	AS METHANE	AS METHANOL	2.00

Notes:

These conversion factors are utilized to convert mass emission rates (lbs/hr) and production based emission rates (lb/# units), and are not applicable for correcting pollutant concentrations.

EXAMPLE CALCULATIONS TO DEMONSTRATE USE OF TABLE I CONVERSION FACTORS:

Source: Steam-heated Veneer Dryer

Reported VOC Emissions Test Results:

Terpenes (EPA Method 25A) = 10.5 lbs/hr as carbon
Formaldehyde Testing Results = 2.3 lbs/hr as carbon
Methanol Testing Results = 1.7 lbs/hr as carbon
Total VOCs = 14.5 lbs/hr as carbon
Process Rate = 12,000 sq ft/hr 3/8" basis
Emission Factor = 1.21 lbs/Msf (3/8" basis) as carbon

Corrected Test Results as per Guideline:

Terpenes (EPA M25A)	**=**	**(10.5 lbC/hr) x 1.22**	**= 12.8 lbs/hr as propane**
Formaldehyde	**=**	**(2.3 lbC/hr) x 2.50**	**= 5.8 lbs/hr as formaldehyde**
Methanol	**=**	**(1.7 lbC/hr) x 2.67**	**= 4.5 lbs/hr as methanol**
Total VOCs	**=**	**(12.8+5.8+4.5)**	**= 23.1 lbs/hr (as VOC)**
Emission Factor	**=**	**23.1 lbs/hr / 12Msf (3/8")**	**= 1.93 lbs/Msf (3/8" basis) as VOCs**

A correction for methanol may be appropriate to avoid double counting a portion (approximately 55%) of the measured methanol emissions. If these corrections were not applied to the response of the FID analyzer as demonstrated in *Equation A-3*, procedures for correcting the terpene emissions as measured by Method 25A for methane, ethane and methanol are demonstrated below. Note that these corrections are optional and are not required by the Department.

Correction of mass emission rate of terpenes as measured by EPA Method 25A:

$$E_{FID}' = E_{FID} - \left[\frac{E_M \times 44}{3 \times 16}\right] - \left[\frac{E_E \times 2 \times 44}{3 \times 30}\right] - \left[\frac{E_{MOH} \times 0.55 \times 44}{3 \times 32}\right] \quad \textit{(Equation A-5)}$$

Where:
E_{FID}'= Corrected terpene emissions, lbs/hr as propane.
E_{FID} = Terpene emissions by Method 25A (uncorrected), lbs/hr as propane.
E_M= Methane emissions rate, lbs/hr as methane (default response factor of 1.0).
E_E= Ethane emissions rate, lbs/hr as ethane (default response factor of 1.0).
E_{MOH} = Methanol emissions rate, lbs/hr as methanol (default response factor of 0.55).

Notes:

- E_M, E_E, and/or E_{MOH} are equal to "0" if measurements are below detection limits or if not measured in conjunction with EPA Method 25A.
- It is not acceptable to produce a corrected terpene emission value (E_{FID}') that is less than the sensitivity of EPA Method 25A (2% of the system span).

Attachment 2

Testing Methods

Acceptable testing Methods for measuring VOC emissions from sources applicable to this guideline are listed below. Note however, that since the drafting of this document, new methods may have been promulgated or a listed method may have been deemed non-representative.

EPA Method 25A for Terpene:

Calibration Materials: Calibrate the FID detector utilizing reference materials comprised of a known concentration of propane. If the oxygen concentration of the measured exhaust gas is greater or equal to 15 % by volume, then it is recommended, although not required, to use a reference material comprised of propane with a balance of air.

FID Fuel: It is recommended, although not required, that a FID fuel be used that is composed of 40% hydrogen and 60% helium. It is understood that some analyzers require a 100% hydrogen fuel and that a 40/60 fuel mixture may not be feasible.

Exhaust Moisture: It is recommended, although not required, to use a sample dilution system if the moisture content of the measured exhaust gas exceeds 20% by volume. The sample dilution system should be capable of reducing the moisture content of the sample gas to less than 10% by volume.

Response Corrections for Methane, Ethane & Methanol: Corrections to the FID response for the presence of methane, ethane & methanol are allowed, although not required. For a response correction to be considered valid, the concentration of ethane, methane, and/or methanol must be measured in conjunction with Method 25A testing utilizing pre-approved testing methodology. A default FID response factor of 1.0 shall be assumed for methane and ethane, while a default FID response factor of 0.55 shall be assumed for methanol. Alternatively, a site specific response factor can be determined utilizing auditing procedures defined within a Department approved test plan. Refer to the calculation procedures of Attachment 1.

Response Corrections for Additional VOC Compounds: Corrections to the FID response based on supplementary measurements of VOCs not addressed within Section 5 of this guidance are allowed, although not required. For a response correction to be considered valid, the concentration of the supplementary VOC must be measured in conjunction with Method 25A testing utilizing pre-approved testing methodology. Corresponding response factors for each VOC compound must be determined experimentally for the Method 25A sampling system and must represent in-field sampling conditions. Techniques utilized to determine Method 25A response factors must be pre-approved by the Department prior to their implementation.

Results: Test results from Method 25A are to be reported as ppmv (as propane) and mass rate of VOCs (as propane). **If the net calculated terpene concentration (after applicable response corrections) is less than the sensitivity of Method 25A (2% of the span) emission calculations must be performed utilizing the sensitivity value.**

Formaldehyde

EPA Method 0011 – DNPH Method:
EPA Method 0011 is an isokinetic sampling method that has inherent sample stability problems that should be addressed in the field. Caution, this method may be inappropriate for wood dryers that operate at elevated inlet temperatures (approximately 1,000^{o}F or greater)

EPA Method 323, NCASI Methods CI/WP-98.01 or 99.02 – Chilled Impinger Methods:
These are non-isokinetic test methods that utilize a simple colorimetric analysis to measure formaldehyde emissions. Methanol can also be measured from the same sample utilizing a Gas Chromatograph (GC/FID). Caution, these methods may be inappropriate for gas streams that contain significant amounts of entrained water droplets.

NCASI Method ISS/FP-A105.01-BHA Method:
This is a non-isokinetic midget impinger method developed to capture the six HAPs of interest within the PCWP MACT. Formaldehyde is quantified utilizing a gas chromatograph with a nitrogen phosphorous detector (GC/NPD). Methanol and phenol can also be measured from the same sample utilizing a Gas Chromatograph with a flame ionization detector (GC/FID). Caution, this method may be inappropriate for gas streams that contain significant amounts of entrained water droplets.

EPA Method 320 – Extractive Fourier Transform Infrared (FTIR):
EPA Method 320 is a difficult method but gives "real-time" data. It includes the use of a heated sample system and a FTIR analyzer. Due to the limitations of alternative methods, the use of Method 320 may become more prevalent as testers become familiar with the FTIR instrumentation.

To assure data quality, it is very important to follow QA/QC procedures of each method. Results are to be expressed as ppmv of formaldehyde and mass rate of formaldehyde emissions.

Methanol

EPA Method 308 – Chilled Midget Impingers:
Non-isokinetic sample, methanol analyzed by GC/FID. Caution, this method may be inappropriate for gas streams that contain significant amounts of entrained water droplets.

NCASI Methods CI/WP-98.01 or 99.02 – Chilled Impinger Methods:
NCASI CI/WP-98.01 or 99.02 are non-isokinetic midget impinger methods that utilize a GC/FID to measure methanol. Formaldehyde may also be determined from the same sample. Caution, these methods may be inappropriate for gas streams that contain significant amounts of entrained water droplets.

NCASI Method ISS/FP-A105.01-BHA Method:
This is a non-isokinetic midget impinger method developed to capture the six HAPs of interest within the PCWP MACT. Methanol is quantified utilizing a GC/FID. Formaldehyde can also be measured from the same sample utilizing a GC/NPD. Caution, this method may be inappropriate for gas streams that contain significant amounts of entrained water droplets.

EPA Method 320 – FTIR:
EPA Method 320 is a difficult method but gives "real-time" data. It includes the use of a heated sample system and a FTIR analyzer. Due to the limitations of alternative methods, the use of Method 320 will become more prevalent as testers become familiar with the FTIR instrumentation.

To assure data quality, it is very important to follow QA/QC procedures of each method. Results are to be expressed as ppmv of methanol and mass rate of methanol emissions.

Methane and Ethane

EPA Method 18 (or equivalent) – Gas Chromatograph

This method is able to speciate gaseous organic compounds and provides a number of sampling options. Samples are generally extracted from the source utilizing a sample transport system common to EPA Method 25A and stored in tedlar bags (evacuated canisters are acceptable for methane and ethane analysis). These samples are either analyzed on-site or shipped to a laboratory. Direct interface sampling and dilution interface sampling are two techniques that are not as common, but acceptable. If samples are analyzed after being stored at or below room temperature, then measured results are to be considered dry concentrations. Results are to be expressed as ppmv of methane and ppmv of ethane. When correcting response of EPA Method 25A data, it is very important to report results on a consistent basis, ppmv dry or ppmv wet.