NCASI METHOD CI/WP-98.01

CHILLED IMPINGER METHOD FOR USE AT WOOD PRODUCTS MILLS TO MEASURE FORMALDEHYDE, METHANOL, AND PHENOL

NCASI
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This method was prepared by Dr. David Word, Program Manager, Dr. MaryAnn Gunshefski, Senior Research Scientist, and Ward Dickens, Research Associate, at the NCASI Southern Regional Center. Other assistance was provided by Terry Bousquet, Senior Research Scientist, with the NCASI West Coast Regional Center.

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CHILLED IMPINGER METHOD FOR USE AT WOOD PRODUCTS MILLS TO MEASURE FORMALDEHYDE, METHANOL, AND PHENOL

1.0 Introduction

1.1 This method is intended for the sampling of formaldehyde (CAS # 50-00-0), methanol (CAS # 67-56-1), and phenol (CAS # 108-95-2) concentrations in stationary source emissions at wood products mills or panel plants. The analysis for methanol, and phenol is performed by gas chromatography/flame ionization detection (GC/FID) and the analysis of formaldehyde is performed by use of the acetylacetone colorimetric procedure. This method has been written to conform with the contents and format of EPA Air Methods.

2.0 Method Description

2.1 Principle, applicability, interferences, and stability

2.1.1 Principle - The source gas is drawn through two midget impingers, each containing chilled organic free water. Formaldehyde, methanol and phenol are absorbed by the water. For analysis of methanol and phenol, the water from the impingers is analyzed by direct injection into a gas chromatograph equipped with a flame ionization detector (GC/FID). The retention times of each of the compounds are compared with those of known standards containing the same compounds. Concentrations of the analytes are calculated from calibration curves obtained from analysis of standard solutions.

The formaldehyde concentration in the impinger solution is determined by the acetylacetone procedure. This procedure involves the reaction of acetylacetone with formaldehyde to produce a colored derivative which is measured by colorimetric analysis.

EPA Methods 1-4, or equivalent methods, must be preformed in order to obtain mass emission rates. These methods are not described in this document.

2.1.2 Applicability - The method has been single laboratory validated using the United States Environmental Protection Agency (EPA) Method 301, *Field Validation of Emission Concentrations from Stationary Sources* (Appendix A to CFR 63). This method was found to be applicable for the measurement of formaldehyde, methanol, and phenol for dryer and press emission vents at a variety of wood products (panel) plants. From the accuracy section of the Method 301 validation studies correction factors were determined and are

given in Section 2.10 Table 1. From the precision section of the Method 301 validation studies it was determined that 3 samples must be taken at each location to obtain representative stack concentrations of the three compounds.

2.1.3 Interferences - Compounds present in the source gas can coelute with the analytes of interest during the chromatographic analysis. These types of interferences can be reduced by appropriate choice of GC columns, chromatographic conditions, and detectors. Method interferences may also be caused by contaminants in solvents, reagents, glassware and other sample processing hardware.

2.1.4 Stability - The stability of formaldehyde, methanol and phenol was found to be 28 days, with refrigeration at approximately 4 °C.

2.2 Apparatus

2.2.1 Sampling apparatus - A diagram of the sampling train is shown in Figure 1.

2.2.1.1 Heated Sampling Probe - The sampling probe is constructed of Teflon or stainless steel tubing. For wood products sources, the probe is maintained at 250 ± 25°F. The probe is placed near the center of the stack or duct.

2.2.1.2 Heated Filter Box - The heated probe is directly connected to a heated box containing a glass fiber or Teflon filter. The filter housing and connections may be Teflon or stainless steel. A thermocouple connected to or within the filter housing is used to record the filter temperature which should be maintained at 250 ± 25°F. An unheated Teflon line is used to convey the sample from the back of the heated filter box to the first impinger.

2.2.1.3 Midget Impingers - Two midget impingers are connected in series to the end of the teflon line exiting the heated filter box. The impingers should have regular tapered stems. All impinger train connectors should be glass and/or Teflon.

2.2.1.4 Rotameter - A rotameter should be placed in line after the impingers for a visual flow check during sampling. The rotameter is not used to determine the actual flow rate through the impingers.

2.2.1.5 Flow Control Device - A 400 ± 50 mL/min critical orifice should be used for flow control.

2.2.1.6 Vacuum pump - The critical orifice is followed by a pump capable of providing a vacuum of about 18 inches of Hg. (Pump capacity should be sufficient to obtain and maintain critical conditions at the orifice.)

2.2.1.7 Pressure gauges - One pressure gauge is placed before the critical orifice, and one pressure gauge is placed before the pump, and both are used when leak checking the sample train. The pressure gauge downstream of the critical orifice provides a check for critical flow conditions at the orifice.

2.2.1.8 On/Off Valve - An on/off valve is placed between the critical orifice and the second pressure gauge, and is used when leak checking the sample train.

2.2.1.9 Flowmeter - A bubble tube flowmeter, or comparable flow measurement device, is used to measure flow at the sampling line tip prior to and after sampling. Alternatively, a dry gas meter may be used.

2.2.1.10 Thermometer - An accurate thermometer is used to measure ambient temperature.

2.2.1.11 Barometer - A barometer is used to measure barometric pressure.

2.2.1.12 Sample storage bottles - Glass (ie 40mL VOA vials) or polyethylene bottles can be used to store the impinger catch sample after stack sampling is complete.

2.2.2 GC/FID analysis apparatus

2.2.2.1 Laboratory glassware - Volumetric pipets, volumetric flasks, autosampler vials, syringes, and cuvettes necessary for standards preparation and analysis.

2.2.2.2 Gas chromatography system - Gas chromatography analytical system complete with a temperature-programmable gas chromatograph suitable for splitless injection and all required accessories including syringes, analytical columns and gases. (Note that we suspect systems with EPC are not designed to handle aqueous injections, and as a result the FID flame may begin to go out during the runs. This could be due to the water which builds up in the GC system after several injections on any type of GC. Bakeouts are necessary for any type of GC

system, but more frequent bakeouts of a system with EPC may need to be performed.)

2.2.2.3 Column - 30 m x 0.32 mm x 0.25 µm bonded phase DB-WAX fused silica capillary column (J&W Scientific or equivalent), or 30 m x 0.53 mm x 3 µm bonded phase DB-624 fused silica capillary column (J&W Scientific or equivalent), or other column shown to be capable of separating methanol and phenol.

2.2.2.4 GC detector - Flame ionization detector with appropriate data system.

2.2.3 Formaldehyde analysis apparatus

2.2.3.1 Spectrophotometer - A spectrophotometer capable of measuring absorbance at 412 nm.

2.3 Reagents

2.3.1 Water - Deionized water is to be used as the impinger collection liquid, and in the preparation of all standard and spike solutions.

2.3.2 Pure compounds - Reagent grade methanol, phenol, and 37% formaldehyde solution (formalin) for preparation of standard and spike solutions.

2.3.3 GC/FID calibration primary stock solution - Prepare stock solution by diluting 0.126 mL of pure methanol and 200 mg of pure phenol in 100 mL volumetric flask with DI water. (1000 mg/L)

2.3.4 GC/FID calibration and matrix spike solutions. Prepare standard solutions by serial dilutions of the stock solution. The recommended calibration range is 0.5 to 1000 mg/L. It has been found that the linear range can be extended up to 10,000 mg/L. Prepare matrix spike solutions by calculating the concentration of analytes desired, and diluting the primary stock solution.

2.3.5 GC/FID internal standard primary spiking solution (if used) - Prepare primary stock solution by adding 0.312 mL cyclohexanol and diluting to 100 mL with DI water in a 100 mL volumetric flask (3 mg/mL cyclohexanol). Another internal standard material could be used if it is demonstrated that it does not interfere with the analyte peaks in the chromatogram.

2.3.6 Acetylacetone reagent - Prepare by dissolving 15.4 g of ammonium acetate in about 50 mL of DI water in a 100 mL volumetric flask. Add 0.20 mL of acetylacetone to this solution, along with 0.30 mL of glacial acetic acid. Mix thoroughly and dilute to 100 mL with DI water. Store reagent in a brown glass bottle in the refrigerator. Reagent is stable for at least two weeks.

2.3.7 Formaldehyde analysis primary stock solution - Prepare stock solution by diluting 2.7 mL of formalin in 1000 mL volumetric flask with DI water. (1000 mg/L formaldehyde)

2.3.8 Formaldehyde analysis calibration standard solution - Prepare standard solution by diluting 1.0 mL of primary stock solution in 100 mL volumetric flask with DI water. (10 mg/L formaldehyde)

2.3.9 Formaldehyde analysis calibration solutions - A series of calibration standards are made from the standard solution by adding 0, 0.1, 0.2, 0.4, 1.0 and 1.5 mL of the standard solution to individual screw-capped vials. The volume in each vial is adjusted to 2.0 mL with DI water. This corresponds to 0, 0.5, 1, 2, 5, 7.5 mg/L calibration solutions. To each vial, 2.0 mL of the acetylacetone reagent is added and the procedure described in Section 2.4.4.3 is then followed.

2.4 Procedure

2.4.1 Sample Bottle Preparation - Determine the number of samples bottles required for the sampling trip. Weigh each bottle and record the pre-sampling weight on the bottle.

2.4.2 Sampling - A sample field data sheet is shown in Figure 2.

2.4.2.1 Measure and record ambient temperature and barometric pressure. Source gas flow rate is determined by EPA methods 1-4 or equivalent methods.

2.4.2.2 Preparation of collection train - The sampling train consists of: a heated probe, heated filter box, two midget impingers in series immersed in an ice bath, a critical orifice, a rotameter, and a sample pump. The sample probe is made of ¼ inch OD Teflon or stainless steel tubing. The two impingers each contain 15 to 20 mL of organic free water. For sources with very high amounts of moisture (>40%), a third dry impinger, used as the first train impinger, may be necessary as a water dropout. For sources with moderate amounts of moisture (15 to 40 % by volume), the first impinger can be filled with just enough water to cover the bottom of the impinger stem and then allowed to fill with water condensed from the source gas. The critical orifice should allow collection of about 400 mL/min of dry air. A sample collection time of one hour is used.

2.4.2.3 Leak and flow check procedure - Make sure that the on/off valve is in the on position, plug the sampling line inlet tip and turn on pump to draw a vacuum. When the vacuum reading is approximately 25 inches of Hg, turn the on/off valve to off position, then record time and pressure reading on first pressure gauge. A leak is indicated by a flow of bubbles in the impinger, liquid being drawn into the stem of the impinger, or a loss of vacuum. If a leak is present, tighten fittings, connections, and impingers and restart leak check procedure. After 2 minutes, record the pressure reading on the first pressure gauge again. The leakage rate should not be in excess of 1 inch Hg (vacuum) in 2 minutes. Slowly and carefully remove the plug from the end of the probe, turn the on/off valve back to the on position.

Next, check the flow rate at the probe inlet with a bubble flowmeter. The flow rate should be comparable to the flow rate of the critical orifice with the impingers off-line. Record five measurements of the flow rate and turn off the pump.

2.4.2.4 Sample collection - Insert the probe into the stack perpendicular to the flow and secure it. Start the pump, recording the time and the flow reading on the rotameter. End the sampling after 60 minutes. Record the time and remove the tubing from the vent. Recheck the sample flow rate at the probe inlet and turn off the pump. If the flow rate has changed significantly, redo sampling with fresh capture water. A slight variation (< 5%) in flow can be averaged.

Disconnect the teflon tubing at the back of the heated box. Rinse the line into the impingers by adding about 10 mL of deionized water into the tubing. Use the sample pump to "pull" the rinse water into the first impinger.

2.4.3 Sample Recovery - Transfer the contents of the impingers into appropriate labeled and pre-weighed sample storage bottle. The contents of both impingers can be combined into one bottle. If a large amount of water was collected in the dropout impinger, 2 bottles can be used. Store sample bottles in a cooler with ice, or refrigerated at approximately 4^{o}C until they can be stored in a laboratory refrigerator.

2.4.4 Sample analysis

2.4.4.1 Preparation of impinger samples - Remove bottles from refrigerator. Weigh the sample bottles and record weights on the bottle. Transcribe initial and final bottle weight to sample

field data sheet. Bottles do not need to be at room temperature before weighing. Remove an aliquot of sample and place in autosampler vial, add 10 µL of internal standard solution (if using internal standard calibration curve), and cap vial.

2.4.4.2 GC/FID analysis - Analysis is performed by direct aqueous injection into the GC/FID. Because the difference in the elution times of these two compounds is typically large, the analyst may choose to make two relatively short GC runs, rather than one run with an extended time period. If the analyst chooses to use a single sample run for both compounds, initially the oven and column should be sufficiently cool to separate methanol from other volatile water soluble compounds such as acetone, acetaldehyde, MEK, etc. Representative conditions for the GC/FID analysis are given in Tables 3, 4 and 5. Other chromatographic columns and conditions may be used if it has been established that the compounds are separated and quality control parameters are met. Once the GC/FID system is optimized for analytical separation and sensitivity, the sample operating conditions must be used to analyze all samples, blanks, calibration standards and quality assurance samples. Note that constant injections of aqueous samples can cause water to buildup in the system. This will cause the retention times to shift, and the peaks to broaden. It is recommended that after approximately 50 injections a bakeout of the system be performed. This should consist of heating the injector to 250^{o}C, the oven to over 200^{0}C and the detector to 275^{o}C for at least several hours.

2.4.4.3 Formaldehyde sample analysis - Remove a 2.0 mL aliquot of the impinger sample and transfer to a screw-capped vial. Add 2.0 mL of the acetylacetone reagent and mix thoroughly. Place vial in a water bath at 60^{o}C for 10 minutes. Allow vials to cool to room temperature. Transfer solution to cuvette and measure the absorbance at 412 nm. If the sample concentration is above the calibration curve, dilute original sample solution and repeat entire procedure. Do not dilute colored (derivatized) samples.

2.4.5 Quality Assurance/Quality Control - Each field sampling program or laboratory that uses this method is required to operate a formal quality assurance program. Laboratory or field performance is compared to established criteria to determine if the results of analyses meet the performance criteria of the method.

2.4.5.1 Field blank samples - A field blank sample of water must be prepared to assure that the water being used in the impingers is

not contaminated. It is made in the field by filling a 40 mL VOA vial or polyethylene bottle with the same water being used to fill the impingers.

2.4.5.2 Field duplicate samples - Duplicate samples should be collected and are then analyzed as separate samples. One duplicate is collected per mill tested or per every ten sample runs conducted at a mill, whichever is more stringent. For the duplicate, dual impinger trains and pumps may be connected to a single probe and filter box. The average of the duplicate values are reported for the run value. Results of the duplicate sample analysis are reported with the sample results. There are no acceptance criteria for the analytical results of the field duplicates.

2.4.5.3 Field spike sample- A field spike recovery run should be conducted for each mill tested or per every 10 sample runs, whichever is more stringent. This spike recovery test should be conducted on the full sample train, that is the spike solution should be introduced into the tip of the sampling system (into the heated probe). The sample train is then operated outside or independent of the source(s) tested. The field spike solution should contain formaldehyde, methanol and phenol if all three compounds are to be sampled for and reported. Sample flow rate and sample time should be identical or very close to the actual sample runs. Care must be taken to prevent introduction of ambient formaldehyde, methanol, and phenol during this procedure. If a single spike is used, the mass of each analyte introduced should be targeted to be ± 50% of the mass expected to be captured in an actual sample run. Alternatively, both "low" and "high" spike solutions can be used on two separate spike recovery runs to bracket the expected capture from the source. Field spike recovery results must be reported. A criterion for field spike recovery of 70% to 130% is used to determine the validity of the sampling effort. This type of spiking provides a check of the complete field sampling procedure, sample storage, and sample analysis.

An alternative to this procedure is to set up duplicate sample trains to sample the source, then spike the first impinger of one of these two trains. The two sample trains are then run as a typical source sample. Spike recovery is determined by subtracting the source concentration obtained from the non-spiked-train from the total-spike-plus-source concentration determined from the spiked train. Targets and criteria are as specified in the paragraph above.

2.4.5.4 Laboratory blank sample - A laboratory blank sample should be analyzed with each batch of samples. A batch is considered no more than 10 samples of similar matrix type.

2.4.5.5 Laboratory duplicates - A replicate injection of one sample in the analytical batch should be performed. The results of the duplicate analysis should be within 10% of the mean of the original and duplicate sample analysis.

2.4.5.6 Laboratory matrix spike samples - A laboratory matrix spike sample may be prepared with each group of similar matrix type. Using the mean concentration determined by the replicate analyses, or the background level determined from a single measurement, determine the spiking level which will give one to four times the background. If the background sample does not have detectable levels of analytes, spike the sample at approximately five times the lowest calibration level of the instrument. Spike the sample with the determined amount of the calibration standard/matrix spike solution and proceed to analyze the sample in the normal manner. The results can be considered acceptable if the calculated spike recovery is 70 to 130%. In cases where multiple analytes are present, the analyte with the highest concentration should govern the acceptance criteria.

2.5 GC/FID analysis of calibration standards

2.5.1 Internal Standard Calibration

2.5.1.1 Inject 1µL of a methanol and/or phenol calibration solution containing the internal standard and determine the retention time of the analytes relative to the internal standard. Each analyst should optimize the temperature program or instrument conditions, as necessary, to establish distinct separate peaks.

2.5.1.2 Calculate the relative response factor for the analytes (RRF_M) using Equation 1. If the average of the relative response factor for the analytes is constant, i.e., exhibits a coefficient of variation less that 20%, the calibration is acceptable and the average RRF_M can be used in all subsequent calculations; otherwise, the calibration curve solutions must be reanalyzed and reevaluated. It may be necessary to perform instrument maintenance prior to reanalysis. If reanalysis also fails to produce a linear curve, new calibration standards must be prepared and analyzed.

2.5.1.3 Analyze and calculate the relative response factor of a mid-range calibration standard, daily, prior to each sample set, using Equation 2 to verify the calibration. The relative response factors must be within an acceptable range. If they are not, either prepare a new standard or perform instrument maintenance. If necessary, re-calibrate the instrument.

Equation 1

$$RRF_M = \left[\frac{A_M}{A_{IS}} x \frac{C_{IS}}{C_M} \right]$$

Where:

A_M = *area of analyte peak*
A_{IS} = *area of internal standard peak*
C_M = *concentration of analyte injected*
C_{IS} = *concentration of internal standard injected*

Equation 2

$$Concentration\,(mg/L) = \left(\frac{A_S \times C_{IS}}{A_{IS} \times RRF_M} \right)$$

Where:

A_s = *Area of the analyte peak in the sample*
C_{IS} = *Concentration of the internal standard (mg/L)*
A_{IS} = *Area of the internal standard peak*
RRF_M = *Relative response factor of analyte (Section 2.5)*

2.5.2 External Standard Calibration

2.5.2.1 Inject 1µL of a methanol and/or phenol calibration solution and determine the retention time of each analyte. Each analyst should optimize the temperature program or instrument conditions, as necessary, to establish distinct separate peaks.

2.5.2.2 Measure and plot the response of each analyte vs. concentration. If the correlation coefficient of the graph is greater than 0.99, the calibration is acceptable and the equation of the line can be used in all subsequent calculations; otherwise, the calibration curve solutions must be reanalyzed and reevaluated. It may be necessary to perform instrument maintenance prior to reanalysis. If reanalysis also fails to produce a linear curve, new calibration standards must be prepared and analyzed.

2.5.2.3 Analyze and calculate the concentration of a mid-range calibration standard, daily, prior to each sample set to verify the calibration. The percent recovery should be between 70 and 130%. If it is not, either prepare a new standard or perform instrument maintenance. If necessary, re-calibrate the instrument.

2.6 Analytical range and minimum calibration level

2.6.1 Demonstrate that the calibration curve is linear (relative response factors exhibit a coefficient of variation less than 20%, or correlation coefficient greater than 0.99) throughout the range of the calibration curve.

2.6.2 Demonstrate that the analytes are detectable at the minimum levels using the lowest level calibration curve solution.

2.7 Calculations

2.7.1 Nomenclature and calculations - Perform the calculations as follows:

Equation 3

Calculation of sample flow rate corrected to a dry basis:

$$S_C = S_U \left(\frac{BP - PW}{760} \right) \left(\frac{293}{273 + t} \right)$$

where:

S_C = *Corrected (dry standard) sampling flow rate, L/min*
S_U = *Uncorrected sampling flow rate, L/min*
BP = Barometric pressure at time of sampling, mm Hg
PW = Saturated partial pressure of water vapor, mm Hg at t
t = Ambient temperature at time of sampling, ^oC

Equation 4

Calculation of stack concentration:

$$C_S = \left(\frac{g_X}{MW_X} \right) \left(\frac{24.04}{S_C \, x \, S_T} \right) x \, CF \, x \, 10^6$$

where:

C_S = *Stack concentration, ppmv*
g_X = *Total amount of analyte collected in impingers, grams*
MW_X = *Molecular weight of analyte, grams/mole*
S_C = *Corrected (dry standard) sampling flow rate, L/min*
S_T = *Sampling time, min*
CF= Correction Factor from Tables 1 and 2

2.8 Alternative procedures - Not applicable to this method.

2.9 References

United States Environmental Protection Agency (EPA) Method 301, *Field Validation of Emission Concentrations from Stationary Sources* (Appendix A to CFR 63).

2.10 Tables, diagrams, flowcharts, and validation data

Table 1. Method 301 Validation Results

Compound	Rotary Dryer		MDF Dryer	
	Validated	CF	Validated	CF
Formaldehyde	Yes	none	Yes	none
Methanol	Yes	0.97	Yes	none
Phenol	Yes	0.99	Yes	1.01

Table 2. Method 301 Validation Results

Compound	Urea-Formaldehyde Press		Phenol-Formaldehyde Press	
	Validated	CF	Validated	CF
Formaldehyde	Yes	1.03	Yes	none
Methanol	Yes	none	Yes	none
Phenol	Yes	none	Yes	0.98

Table 3: GC/FID Operating Conditions for Methanol Analysis-DB-624 Column

Injection:	Direct
Injector Temperature:	150°C
Injection Volume:	1 µL
FID Detector Temperature:	250°C
Carrier Gas:	Helium
Column:	DB-624, 30 m x 0.53 mm id x 3 micron fused silica capillary column
Temperature Program °C:	
Initial:	10°C for 4 min
Ramp 1:	10°C/min to 50°C for 2 minutes
Ramp 2:	50°C/min to 200°C
Ramp 3:	
Final Hold Time:	3 minutes
Retention Time Order:	acetaldehyde, acetone, methyl ethyl ketone, methanol, cyclohexanol

Table 4: GC/FID Operating Conditions for Phenol Analysis -DB-WAX Column

Injection:	Direct
Injector Temperature:	170°C
Injection Volume:	1 µL
FID Detector Temperature:	275°C
Carrier Gas:	Helium
Column:	DB-WAX, 30 m x 0.53 mm id x 3 micron fused silica capillary column
Temperature Program °C:	
Initial:	160°C for 7.5 min
Ramp 1:	50°C/min to 200°C
Ramp 2:	
Ramp 3:	
Final Hold Time:	2 minutes
Retention Time Order:	cyclohexanol, phenol

Table 5: GC/FID Operating Conditions for Methanol and Phenol Analysis -DB-624 Column

Injection:	Direct
Injector Temperature:	170°C
Injection Volume:	1 µL
FID Detector Temperature:	275°C
Carrier Gas:	Helium
Column:	DB-624, 30 m x 0.53 mm id x 3 micron fused silica capillary column
Temperature Program °C:	
Initial:	0°C for 3 min
Ramp 1:	5°C/min to 50°C for 0 minutes
Ramp 2:	70°C/min to 105°C for 17 min
Ramp 3:	70°C/min to 220°C
Final Hold Time:	3 minutes
Retention Time Order:	acetaldehyde, methanol, acetone, n-propanol, methyl ethyl ketone, cyclohexanol, phenol

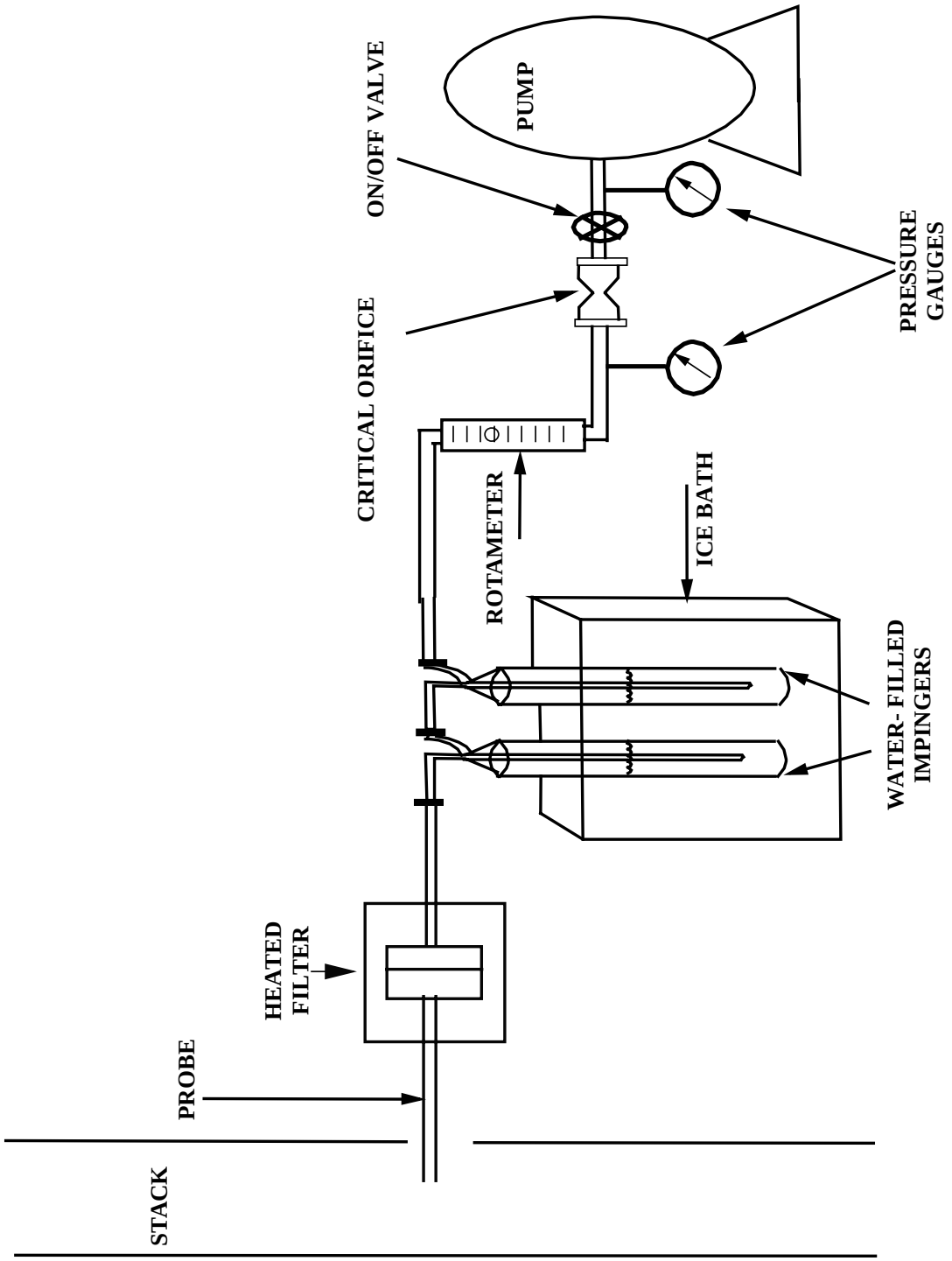

Figure 1. Chilled Impinger Sampling Train for Use at Wood Products Mills to Measure Formaldehyde Methanol and Phenol

NCASI CHILLED IMPINGER METHOD FOR USE AT WOOD PRODUCTS MILLS TO MEASURE FORMALDEHYDE, METHANOL AND PHENOL

Mill Name: _____ City: _____

_____ State: _____

Source Name: _____

Description of Location Sampled (include description of all control devices, quenches, air inlets, etc.):

_____

_____

Run Number: _____ Start Time: _____ Date: _____

Stop Time: _____

Measurement System Leak Check

Time: _____ Initial Measurement (in. Hg): _____

Time: _____ Final Measurement (in. Hg): _____

Leak Check Criteria - Must not lose more than 1 inch of Hg (vacuum) in 2 minutes. Meet Criteria? Yes No

Measurement System Flow Rates

Average 5 flow measurements below for Pre-Sample Flow (SF) = _____

1.	2.	3.	4.	5.

Average 5 flow measurements below for Post-Sample Flow (SF) = _____

1.	2.	3.	4.	5.

Average Sample Flow Rate _____ (indicate units)

Temperature Measurements

Ambient Temperature at Start of Run: _____ Time Recorded: _____

Ambient Temperature at End of Run: _____ Time Recorded: _____

Temperature Heated Probe at Start of Run: _____ Time Recorded: _____

Temperature Heated Probe at End of Run: _____ Time Recorded: _____

Temperature Heated Filter at Start of Run: _____ Time Recorded: _____

Temperature Heated Filter at End of Run: _____ Time Recorded: _____

Rotameter Readings

Time: _____ Flow: _____

Time: _____ Flow: _____

Time: _____ Flow: _____

Time: _____ Flow: _____

Time: _____ Flow: _____

Time: _____ Flow: _____

Quality Assurance Measures

Train Spike Conducted? Yes No

Duplicate Conducted? Yes No

Spiked Duplicate? Yes No

Field Blank Made? Yes No

Notes

Figure 2. Field Sampling Data Sheet

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
RESEARCH TRIANGLE PARK, NC 27711

JUN 30 1998

OFFICE OF
AIR QUALITY PLANNING
AND STANDARDS

Mr. David Word
NCASI
Southern Regional Center
P.O. Box 141020
Gainesville, Florida 32614-1020

Dear Mr. Word:

We have received the electronic file copy of the test method and the supporting report entitled, "Method 301 Validation of the NCASI Chilled Impinger Method for Use at Wood Products Mills to Measure Methanol, Phenol, and Formaldehyde." This completes the Method 301 validation process for this test method. We agree with your conclusion that this method met Method 301 criteria for measuring methanol, phenol, and formaldehyde from dryers and press vents at wood products mills. Although we agree that your method fulfills the Method 301 requirements, this is not an alternative method approval because there are currently no Federal emission standards or test methods for the target pollutants from wood products mills.

If you have any questions about our conclusions, please contact me at (919) 541-1062.

Sincerely,

Gary D. McAlister

Gary D. McAlister
Source Characterization Group

cc: Stephen A. Shedd (MD-13)

Figure 3. EPA Approval Letter