April 5, 2006

Mr. Timothy M. Becraft
Authorized Account Representative
MeadWestvaco Coated Board, Inc.–Mahrt Mill
P.O. Box 940
Phenix City, AL 36868-0940

Re: Final Approval of the Predictive Emission Monitoring Systems Installed on Units X022 and Z008 at the Mahrt Paper Mill (Facility ID (ORISPL) 54802)

Dear Mr. Becraft:

This letter finalizes the approval of the June 17, 2002 and April 30, 2003 petitions submitted by MeadWestvaco under §75.66(d) and 40 CFR Part 75, Subpart E. In those petitions, MeadWestvaco requested approval of predictive emission monitoring systems (PEMS) to continuously monitor nitrogen oxides (NO_x) emissions from Units X022 and Z008 at the Mahrt Paper Mill (Mahrt) in Cottonton, Alabama.

On January 28, 2003 (for Unit X022) and March 1, 2004 (for Unit Z008), EPA issued conditional approvals of the PEMS. The conditional approval for the Unit X022 PEMS was amended twice, on March 1, 2004 and June 3, 2004, and the conditional approval for the Unit Z008 PEMS was amended once, on June 3, 2004. In these conditional approvals, the Agency reserved the right to require more stringent quality-assurance (QA) testing of these PEMS, pending the outcome of two field studies that were in progress at that time. As discussed in Attachment C to this letter, the results of those studies indicate that increasing the QA requirements is justifiable, both technically and economically. In view of this, EPA is requiring additional QA testing of the PEMS as a condition of approval.

The additional QA requirements for Units X022 and Z008 include: (a) the installation of a more stringent PEMS sensor alarm system; (b) monthly three-run relative accuracy audits (RAAs) of the PEMS during the ozone season; (c) quarterly RAAs in the first and fourth quarters if the unit is affected by the Clean Air Interstate Rule; (d) three-load NO_x relative accuracy test audits (RATAs), with accompanying F-tests, correlation analyses, and t-tests, whenever the PEMS is recertified; and (e) a somewhat different daily QA/QC test.

EPA is including a separate attachment to this approval for each unit, to facilitate implementation of the final compliance requirements for the PEMS. Attachments A and B consolidate the provisions of EPA's conditional approvals of the PEMS, the amendments to those conditional approvals, and the additional QA that the Agency is requiring based on the results of its field studies.

Finally, note that on July 13, 2005, in accordance with §75.20(f), EPA published a notice in

the Federal Register concerning MeadWestvaco's request for approval of alternative monitoring systems (see 70 FR 40330, July 13, 2005). The 60-day public comment period closed on September 12, 2005. No comments were received.

This final approval relies on the accuracy of the information provided by MeadWestvaco in the June 17, 2002 and April 30, 2003 petitions and is appealable under Part 78. If there are any further questions or concerns about this matter, please contact John Schakenbach of my staff at 202-343-9158 or at (schakenbach.john@epa.gov).

Sincerely,

/s/
Sam Napolitano, Director
Clean Air Markets Division

cc: John Schakenbach, EPA, CAMD
Manuel Oliva, EPA, CAMD
David McNeal, EPA Region 4
Anthony Yarbrough, ALDEM

Attachments

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
AIR AND RADIATION

ATTACHMENT A

Mr. Timothy M. Becraft
Authorized Account Representative
MeadWestvaco Coated Board, Inc. - Mahrt Mill
P.O. Box 940
Phenix City, Alabama 36868-0940

Re: Consolidated Compliance Requirements for the NO_x Predictive Emission Monitoring System Installed on Unit X022 at the Mahrt Paper Mill (Facility ID (ORISPL) 54802)

Dear Mr. Becraft:

To facilitate implementation of the compliance requirements for the NO_x PEMS installed on MeadWestvaco's Unit X022 at the Mahrt Paper Mill (Mahrt), this Attachment consolidates the provisions of EPA's January 28, 2003 conditional approval of the PEMS, and the March 1, 2004, and June 3, 2004 amendments to the conditional approval, with the additional quality assurance (QA) tests that EPA is requiring based on the results of its PEMS[1] and portable analyzer[2] field studies.

Background

On June 17, 2002, MeadWestvaco Corporation (MeadWestvaco) petitioned for approval of a Pavilion Technologies *Software CEM*® NO_x and O_2 PEMS, which is a neural network based computer software system that utilizes turbine sensor inputs to estimate NO_x and O_2 emissions. The PEMS is installed on Unit X022 which is a 25 MW GE Frame 5, Model MS5001P combustion turbine at the Mahrt Paper Mill in Cottonton, Alabama. The Mahrt Paper Mill is owned and operated by MeadWestvaco. The PEMS was installed on the turbine in June 1998 to comply with New Source Performance Standards, Subpart GG.

The turbine was installed in 1998 and is designed to cogenerate steam and electricity for the mill. Natural gas is the primary turbine fuel, and No. 2 fuel oil with less than 0.05% sulfur by weight is the secondary fuel. The turbine is equipped with duct burners rated at 170 mmBtu/hr to provide supplemental energy to the heat recovery steam generator. A dry low NO_x combustor controls NO_x during gas firing; water injection provides NO_x control during oil firing.

[1] "Evaluation and Field Testing of Nitrogen Oxide (NO_x) Predictive Emission Monitoring Systems (PEMS) for Gas-fired Combustion Turbines - Synthesis Report", The Cadmus Group, Inc., December 29, 2004.
[2] "Evaluation of Portable Analyzers for Use in Quality Assuring Predictive Emission Monitoring Systems for NOx", The Cadmus Group, Inc., September 8, 2004.

Unit X022 is subject to the NO_x Budget Trading Program under Alabama Department of Environmental Management (ADEM) Code R. 335-3-8, which requires MeadWestvaco to continuously monitor and report NO_x mass emissions and heat input for this unit in accordance with Subpart H of 40 CFR Part 75, beginning on May 1, 2003. Code R. 335-3-8 further requires MeadWestvaco to hold NO_x allowances equal to the ozone season[3] NO_x mass emissions from Unit X022, beginning on May 31, 2004[4].

EPA's Determination

Under Subpart E, the owner or operator of a unit applying to the Administrator for approval of an AMS must demonstrate that the AMS has the same or better precision, reliability, accessibility, and timeliness (PRAT) as provided by a CEMS. The demonstration must be made by comparing the AMS to a contemporaneously operating, fully certified CEMS. Sections 75.41 through 75.46 discuss the criteria for evaluating PRAT, daily quality assurance, and missing data substitution for the AMS. Section 75.48 details the information that must be included in the application in order to demonstrate that the criteria in §§75.41-46 are met.

The following paragraphs describe how MeadWestvaco meets the requirements of a Subpart E AMS petition. As detailed below, EPA's approval applies only to the Unit X022 Mahrt turbine when firing natural gas, with no duct burner operation, and for certain PEMS outputs, i.e., lb NO_x/mmBtu, NO_x (ppm, dry), and O_2 (%, dry). If a PEMS input parameter value goes below certain minimum or above certain maximum values, MeadWestvaco shall report the maximum potential NO_x emission rate (MER). During startups, shutdowns, and lean/lean turbine operation, oil-fired operation, or if the PEMS alarms, MeadWestvaco must report the NO_x MER. When the combustion turbine and duct burners fire natural gas, a conservative NO_x alternative substitute data value shall be used.

1. Precision

Under §75.41, for the normal unit operating level, the owner or operator must provide paired AMS and fully certified CEMS hourly data for at least 90 percent of the hours during 720 unit operating hours for the primary fuel supply and for at least 24 successive unit operating hours for all alternative fuel supplies that have significantly different sulfur content. Missing data procedures must not be used to provide sample data. The data may be adjusted to account for any lognormality and time dependency autocorrelation. Three statistical tests must be passed, i.e., a linear correlation coefficient (r) $\geq$ 0.8, an F-test, and a one-tailed t-test for bias described in Appendix A to Part 75. Further, the owner or operator must provide two separate time series plots for AMS and CEMS data. Each data plot must have a horizontal axis representing the clock hour and calendar date of the readings and must contain a separate data point for every hour for the duration of the test. One data plot must show percentage difference vs. time, and the other data plot must show AMS and CEMS readings vs. time. Finally, a plot of the paired AMS (on the vertical axis) and CEMS (on the horizontal axis) concentrations must be provided.

MeadWestvaco provided 889 unit operating hours of paired CEMS vs PEMS data when the turbine was firing natural gas, with no duct burner operation. Since duct burners operated approximately 600 hours during the almost 1500 hour test period, only about 60% of the unit operating hours during the test period were utilized. MeadWestvaco did not technically meet the

[3]The ozone season ends on September 30 and, for 2005 and thereafter, starts on May 1.
[4]A court decision has mandated that the 2004 ozone season will begin on May 31 rather than May 1 in certain states (including Alabama).

requirement of using at least 90% of 720 consecutive unit operating hours, required by §75.41(a)(6). However, 889 unit operating hours of valid paired data (more than 90% of 720 hours or 648 hours) were submitted, and unit operation and testing were continuous. Therefore, the intent of the 90% requirement was met.

The table below shows the results of the statistical tests for three PEMS outputs.[5]

PEMS (NO_x ppm, dry)	**PEMS (lbs NO_x/mmBtu)**	**PEMS (O_2 %, dry)**
t-test: mean difference d = -1.175 abs. value of confidence coefficient cc = 0.069 **Evaluation:** Since $\|cc\| \geq d$, the model passed.	**t-test:** mean difference d = -0.005 abs. value of confidence coefficient cc = 0.000 **Evaluation:** Since $\|cc\| \geq d$, the model passed.	**t-test:** mean difference d = 0.002 abs. value of confidence coefficient cc = 0.007 **Evaluation:** Since $\|cc\| \geq d$, the model passed.
r-coefficient correlation: r = 0.82 **Evaluation:** Since $r \geq 0.8$, the model passed.	**r-coefficient correlation:** r = 0.78 **Evaluation:** Since $r \geq 0.8$, the model passed.	**r-coefficient correlation:** r = 0.13 **Evaluation:** Since $r < 0.8$, the model failed.
F-test: variance of PEMS = 1.519 variance of RM = 3.218 F = 0.472 $F_{critical}$ = 1.11 **Evaluation:** Since $F_{critical} \geq F$, the model passed.	**F-test:** variance of PEMS = 3.497×10^{-5} variance of RM = 6.187×10^{-5} F = 0.565 $F_{critical}$ = 1.11 **Evaluation:** Since $F_{critical} \geq F$, the model passed.	**F-test:** variance of PEMS = 0.004 variance of RM = 0.010 F = 0.431 $F_{critical}$ = 1.11 **Evaluation:** Since $F_{critical} \geq F$, the model passed.

The PEMS NO_x ppm, dry output passed all three statistics. For the second PEMS output, EPA recalculated the required statistics on a lb NO_x/mmBtu basis because MeadWestvaco uses lb NO_x/mmBtu to calculate NO_x mass emissions for the turbine. EPA used the NO_x and O_2 dry-basis concentration data presented by MeadWestvaco, equation 19-1 in Method 19 (40 CFR Part 60, Appendix A), and F-factor for natural gas (8710 dscf/mmBtu) to generate the lb NO_x/mmBtu data for the statistical tests. EPA finds that the PEMS NO_x lb/mmBtu output passed each of the three statistical tests.

The PEMS O_2 output passed the t-test and F-test, but failed the r correlation. However, the PEMS O_2 concentration was always within 0.5% O_2 of the reference method, except for one hourly value that was 0.8% O_2 different. Because this hourly value was the second data point collected and was more than 11 standard deviations below the mean of the PEMS O_2 concentration values, EPA considers the hourly value suspect. Further, both the Part 75 calibration error and linearity check performance specifications for an O_2 monitor are 0.5% O_2. Under these circumstances, EPA finds that the PEMS O_2 output was within the error allowed by Part 75 for a CEMS and is

[5]Under §75.41(b), in preparation for conducting the required statistical tests, the data may be screened for lognormality and time dependency autocorrelation. If either is detected, certain calculation adjustments are required. MeadWestvaco detected neither lognormality nor autocorrelation. Therefore, consistent with 75.41(b), no calculation adjustments were made to the data.

acceptable.

Further, MeadWestvaco supplied the appropriate data plots concerning the paired AMS and CEMS data under §§75.41(a)(9) and (c)(2)(i).

2. Reliability

According to §75.42, the owner or operator must demonstrate that the PEMS is capable of providing valid 1-hr averages for 95.0 percent or more of unit operating hours over a 1-yr period and that the system meets the applicable requirements of Part 75, Appendix B. MeadWestvaco complied with the reliability requirements by submitting four quarters of excess emissions reports with monitor equipment malfunction times indicating greater than 95.0% PEMS availability. By meeting the QA/QC requirements described in this letter, MeadWestvaco will also meet the applicable Appendix B quality assurance and quality control (QA/QC) requirements.

3. Accessibility and Timeliness

According to §§75.43 and 75.44, the owner or operator must demonstrate that the PEMS meets the recordkeeping and reporting requirements of Subparts F and G of Part 75. According to MeadWestvaco, the PEMS meets the Subpart F and G requirements. For example, the PEMS "will provide a continuous, quality assured permanent record of certified emissions data on an hourly basis," and, coupled with the selected recordkeeping and reporting system, "will be capable of issuing a record of data for the previous day within 24 hours."

4. Quality Assurance

Under §75.45, the owner or operator must demonstrate either that daily tests equivalent to those in Appendix B of Part 75 can be performed on the PEMS or that such tests are unnecessary for providing quality-assured data. Sections 75.48(a)(8)-(11) require the following information to be submitted: a detailed description of the process used to collect data, including location and method of ensuring an accurate assessment of operating hourly conditions on a real-time basis; a detailed description of the operation, maintenance, and quality assurance procedures for the AMS as required in Part 75, Appendix B; a description of methods used to calculate diluent gas concentration; and results of tests and measurements necessary to substantiate the equivalency of the AMS to a fully certified CEMS. EPA finds that the Unit X022 PEMS will satisfy these requirements if the following QA procedures are implemented:

(a) The PEMS shall use the following input parameters: splitter valve position, gas flow, load, inlet air temperature, exhaust gas temperature, and burner mode. The PEMS input parameters must stay within the minimum and maximum values (inclusive) in the below table (referred to as "the PEMS operating envelope"), unless the PEMS is retrained according to paragraph (g) below, in which case, the new training values will supercede the values in the below table. Except for burner mode parameter, if any PEMS input parameter value goes below the minimum or above the maximum table values by 5 percent or more, the PEMS shall be considered out-of-control, and the NO_x MER shall be used, calculated according to paragraph (h), starting with the hour in which the sensor value goes outside of the PEMS operating envelope and ending with the hour in which the sensor value is back within the PEMS operating envelope. Data from each PEMS input parameter shall be maintained on site in a form suitable for inspection for at least three (3) years from the date of each record.

If the burner mode is not steady state (mode 2), MeadWestvaco shall follow the procedures in paragraph (h).

PEMS Operating Envelope

PEMS Input Parameter	Minimum Value	Maximum Value
Splitter valve (steps open)	60.0	100.8
Gas flow (lbs/sec)	1.98 lbs/sec	4.03 lbs/sec
Load (MW)	16.9 MW	27.1 MW
Inlet air temp (°F)	40 °F	123 °F
Exhaust gas temp (°F)	476 °F	667 °F
Burner mode [a]	2	2

[a] Three modes: 0 = Startup (0-35% load with primary gas going in and being fired) or shutdown; 1 = Lean/Lean (35-70% load with primary and secondary gas going in and both being fired); 2 = Steady state (70-100% load with primary and secondary gas going in, but combustion only in the secondary zone).

(b) Ongoing QA/QC tests of the PEMS shall be performed according to the following table:

PEMS Ongoing QA/QC Tests

Test	Performance Specification	Frequency
Daily QA/QC	PEMS output - PEMS output = 0.000 lb NO_x/mmBtu (see paragraph (e))	Daily
3-run RAA	• Accuracy $\leq$ 10.0% or • For a low emitting source[6], results are acceptable if the mean value for the PEMS is within $\pm$ 0.020 lb/mmBtu of the reference mean value	Monthly during ozone season and possibly in quarters 1 and 4 (see paragraph (f))

[6]The unit is a low-emitting source if the mean reference value during the RATA or RAA is $\leq$ 0.200 lb/mmBtu NO_x

RATA	For semiannual RATA frequency: • RA > 7.5% and ≤ 10.0% or • For a low emitting source[6], results are acceptable if the mean value for the PEMS is within ± 0.020 lb/mmBtu of the reference method mean value. For annual RATA frequency: • RA ≤ 7.5% or • For a low emitting source[6], results are acceptable if the mean value for the PEMS is within ± 0.015 lb/mmBtu of the reference method mean value	Semiannual or annual (depending on the RATA results) for routine QA. Recertification RATA is required when a RAA or a RATA is failed or when operating conditions change. ≥ 9 test runs are required at normal operating level for annual or semiannual QA. ≥ 30 test runs are required at each of 3 operating levels for recertification. (see paragraphs (f) and (g)
Sensor validation system (minimum data capture)	Check for production of at least 1 valid data point per 15 minutes (see paragraph (c))	Before each RATA (see paragraphs (f) and (g))
Sensor validation system (failed sensor alert)	Alert operator of any failed sensors (see paragraphs (c) and (d))	Hourly
Bias adjustment factor	If $d_{avg} \leq \lvert cc \rvert$, bias test is passed	After each RATA. Perform bias test at the normal operating level (see paragraphs (f) and (g))
PEMS training (Linear correlation and F-test)	$r \geq 0.8$, and $F_{critical} \geq F$	According to paragraph (g)
Sensor validation system (alarm system set-up)	(see paragraphs (c) and (d))	After each PEMS training (see paragraph (g))

The sensor alarm system validation procedure is described in paragraphs (c) and (d). The daily QA/QC test is described in paragraph (e). The RATAs, 3-run RAAs, and bias adjustment factor are discussed in paragraphs (f) and (g). Recertification, including training, of the PEMS is discussed in paragraph (g).

(c) The sensors for the PEMS' input parameters must be maintained in accordance with the manufacturer's recommendations. A sensor validation system is required to identify sensor failures hourly to the operator and to reconcile failed sensors by: comparing each sensor to several other sensors, determining, based on the comparison, if a sensor has failed, and calculating a reasonable substitute value for the parameter measured by the failed sensor. MeadWestvaco must ensure that the sensor validation system validates sensor data in this way every minute of PEMS operation. To comply with §75.10(d)(1), hourly averages must be computed using at

least one valid data point in each fifteen minute quadrant of an hour in which the unit operates. All valid data recorded by the PEMS during the hour must be used to calculate the hourly averages.

(d) The sensor validation system shall include an alarm to inform the operator when sensors need repair and to indicate that the PEMS is out-of-control. In setting up the alarm system, a demonstration shall be performed at a minimum of four different PEMS training conditions, which must be representative of the entire range of expected turbine operations. For each of the four or more training conditions, the demonstration shall consist of the following:

(1) For all of the sensors used in the PEMS model, input a set of reference sensor values that were recorded either during the training of the PEMS or during a RATA of the PEMS (these values will all be within the PEMS operating envelope). Verify that these reference inputs produce the expected PEMS output, i.e., the expected NO_x emission rate;

(2) Perform one-sensor failure analysis, as follows. Artificially fail one of the sensors and then, using the calculated replacement value for that sensor (see paragraph (c), above), assess the effect on the accuracy of the PEMS. Calculate the percent difference between the reference NO_x emission rate from step (1) and the PEMS output. Repeat this procedure for each sensor, individually;

(3) Identify the sensor failure in step (2) that results in the worst accuracy. If the highest percent deviation exceeds $\pm$ 10.0%, then set up the PEMS to alarm when any single sensor fails. If none of the percent difference values exceeds 10.0%, proceed to step (4);

(4) Perform two-sensor failure analysis, as follows: Artificially fail the sensor from step (3) that produced the worst accuracy and also fail one of the other sensors. Then, using the calculated replacement values for both sensors, assess the accuracy of the PEMS hourly average output, as in step (2). Repeat this procedure, evaluating each sensor in turn with the sensor from step (3);

(5) Identify the combination of dual sensor failures that results in the worst accuracy. If the highest percent deviation exceeds $\pm$ 10.0%, then set up the PEMS to alarm when any two sensors fail. If none of the percent difference values exceeds 10.0%, then set up the PEMS to alarm with three sensor failures.

The results of this demonstration shall be maintained on site in a form suitable for inspection. For every hour of PEMS operation, the PEMS shall check for failed sensors and provide an alarm to alert the operator of any sensors needing repair. When the PEMS alarms, the PEMS is out-of-control, and MeadWestvaco shall report the NO_x MER, calculated according to paragraph (h), starting with the hour after the sensor validation alarm system alarms and ending with the hour after the sensor value is back within the expected range.

(e) A daily QA/QC test must be performed whenever the unit operates for any portion of the day. MeadWestvaco shall input to the PEMS a set of turbine operating

parameters used by the PEMS during a passed PEMS RATA or the most recent PEMS training. (Note: It is important that the same number of decimal places for the PEMS inputs be used here as was used in the passed PEMS RATA or most recent PEMS training) The resulting PEMS NO_x lb/mmBtu output divided by the BAF (this resets the BAF to 1.000 as it was during the passed PEMS RATA or most recent PEMS training) shall be compared to the corresponding PEMS NO_x lb/mmBtu output produced at the time of the passed PEMS RATA or most recent PEMS training (with no BAF applied). If the difference between the two PEMS NO_x outputs is within ± 0.002 lb NO_x/mmBtu, the daily QA/QC test is passed. If a daily QA/QC test is failed or not performed, the PEMS is out-of-control. Subpart D missing data procedures shall be followed starting with the hour of the failed test or, if the test was not performed, the hour after the test due date, and ending with the hour in which a daily QA/QC test is passed. No grace periods are allowed. The results of this check (pass/fail) shall be reported in RT 624 in EDR version 2.2. (Note: Use code "04" in start column 53 (QA test code) for the daily QA/QC check.)

(f) Ongoing semiannual or annual RATAs shall be performed at the normal operating level according to the procedures in Part 75, Appendix B, section 2.3.1 and shall be calculated on a lb/mmBtu basis. The reference method traverse point selection shall be consistent with Part 75, Appendix A, section 6.5.6. Notification of ongoing RATAs shall be provided according to §75.61(a)(5). Immediately prior to a RATA, the BAF shall be set to 1.000. Before each RATA, MeadWestvaco shall ensure that the sensor validation system is set to provide at least one valid data point per 15 minute period, as discussed in paragraph (c). After the RATA, MeadWestvaco shall calculate and apply a bias adjustment factor at the normal operating level according to Part 75, Appendix A, section 7.6. Report the RATA data and results in EDR record types 610 and 611 and report the bias test results in record type 611.

Ozone season, monthly, 3-run (minimum) relative accuracy audits (RAAs), described below, shall commence in May 2006. An RAA shall be performed in every calendar month of the ozone season (May through September) in which the unit operates for at least 56 hours, except for a month in which a full 9-run RATA or PEMS recertification is performed. Justification for these ozone season RAAs is provided in Attachment C.

Commencing on January 1, 2008, if Unit X022 is affected under the Clean Air Interstate Rule (CAIR), two additional RAAs are required to provide year round QA for the PEMS because of the year round monitoring requirements of CAIR. The RAAs are required in the first and fourth calendar quarters of each year, except for quarters in which: (a) the unit operates for less than 168 hours; (b) a full 9-run RATA is performed; or (c) the PEMS is recertified. Further justification for these two quarterly RAAs is provided in Attachment C.

The RAAs shall be done on a lb NO_x/mmBtu basis, and shall be performed using either EPA Reference Methods 7E and 3A in Part 60, Appendix A-4 or a portable analyzer. To the extent practicable, each RAA shall be done at different operating conditions from the previous one. Follow the portable analyzer manufacturer's recommended maintenance procedures.

The minimum time per RAA run shall be 20 minutes. The reference method traverse point selection shall be consistent with Part 75, Appendix A, section 6.5.6. Alternatively, a single measurement point located at least 1.0 meter from the stack or duct wall may be used without performing a stratification test.

Results of the RAA shall be calculated using Equation 1-1 in Appendix F to Part 60. Bias-adjusted data from the PEMS (using the bias adjustment factor from the most-recent RATA) shall be used in the calculations. The results of the RAA are acceptable if the performance specifications in the "PEMS Ongoing QA/QC Tests" table in paragraph (b) are met. If the RAA is failed, follow the provisions in paragraph (g). No grace periods are allowed.

Report the results of all RAAs in the appropriate quarterly electronic data report. Use EDR record type 624, and report the results of each test as either "pass" or "fail". Report the QA test code in column 53 of RT 624 as "05".

If a portable chemiluminescent NO_x analyzer is used to perform the required RAAs, the procedures of Method 7E in Part 60, Appendix A-4 shall be followed. The analyzer performance specifications in Method 7E for calibration error, system bias, and calibration drift shall be met.

If a portable electrochemical analyzer is used to perform the required RAAs, ASTM Method D6522-00[7], as modified below, shall be followed. ASTM D6522-00 applies to the measurement of NO_x (NO and NO_2), CO, and O_2 concentrations in emissions from natural gas-fired combustion systems using electrochemical analyzers. The method was developed based on studies sponsored by the Gas Research Institute (GRI)[8]. It has also been peer-reviewed, approved by ASTM Committees D22.03 and D22, and accepted by EPA as a conditional test method (CTM-030). ASTM D6522-00 prescribes analyzer design specifications, test procedures, and instrument performance requirements that are similar to the checks in EPA's instrumental test methods (e.g., Methods 7E and 20). These checks include linearity, interference, stability, pre-test calibration error, and post-test calibration error.

Based on the results of EPA's portable analyzer study[9], the following modifications to ASTM D6522-00 are required to make the method more practical without sacrificing accuracy: (a) NO_x analyzers must provide readings to 0.1 ppm to improve the likelihood of passing the performance specifications for sources with low NO_x levels; (b) an alternative performance specification (e.g., $\pm$ 1 ppm difference from reference value) will be applied to take account of sources with low concentrations of NO_x; and (c) the measurement system must be purged with ambient air between gas injections during the stability check, to reduce degradation of electrochemical cell performance (see footnote 10, below).

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[7]ASTM D6522-00, "Standard Test Method for Determination of Nitrogen Oxides, Carbon Monoxide, and Oxygen Concentrations in Emissions from Natural Gas-Fired Reciprocating Engines, Combustion Turbines, Boilers, and Process Heaters Using Portable Analyzers".

[8]GRI (Gas Research Institute), "Topical Report, Development of an Electrochemical Cell Emission Analyzer Test Method", July, 1997.

[9]"Evaluation of Portable Analyzers for Use in Quality Assuring Predictive Emission Monitoring Systems for NOx", The Cadmus Group, Inc., September 8, 2004.

The measurement system performance specifications as modified by the EPA portable analyzer study are shown in the following table.

ASTM Method D6522-00 Measurement System Performance Specifications (as Modified by EPA Portable Analyzer Study)

Performance Check	Gas	Acceptance Criteria
Zero Calibration Error	NO, NO_2	≤ 3 percent of span gas value or ± 1.0 ppm difference, whichever is less restrictive
	O_2	≤ 0.3 percent O_2
Span Calibration Error	NO, NO_2	≤ 5 percent of span gas value or ± 1.0 ppm difference, whichever is less restrictive
	O_2	≤ 0.5 percent O_2
Interference	NO, NO_2, O_2	≤ 5 percent of average stack NO concentration for each test run (using span gas checks)
Linearity	NO, O_2	≤ 2.5 percent of span gas concentration or ± 1.0 ppm difference, whichever is less restrictive
	NO_2	≤ 3.0 percent of span gas concentration or ± 1.0 ppm difference, whichever is less restrictive
Stability [10]	NO, NO_2 O_2	≤ 2.0 percent of span gas concentration or ± 1.0 ppm max-min difference, whichever is less restrictive, for 30-minute period ≤ 1.0 percent of span gas concentration or ± 1.0 ppm max-min difference, whichever is less restrictive, for 15-minute period

[10] When conducting this check for three cells in an analyzer, the system must be purged with ambient air between gas injections to minimize the possibility of problems with the electrochemical cells. Otherwise, the cells will be exposed to high NO and NO_2 concentrations for prolonged periods of time, which can cause degradation in the cell's performance (i.e., the so-called "O_2-starved exposure").

Cell Temperature	± 5 °F from initial temperature

(g) If a RAA or a RATA is failed due to a problem with the PEMS, or if changes occur that result in a significant change in NO_x emission rate relative to the previous PEMS training conditions (e.g., turbine aging, process modification, new process operating modes, or changes to emission controls), the following tests and procedures shall be performed to recertify the PEMS, in this order:

(1) Ensure that the Sensor Validation System meets the requirements of paragraph (c).

(2) Re-train the PEMS according to the manufacturer's recommendations.[11]

(3) Ensure that the requirements in paragraph (d) are met.

(4) Ensure that requirements in paragraph (e) are met.

(5) Perform a RATA, following the procedures in Part 75, Appendix A, section 6.5, except use three different operating levels (low, mid, and high) as defined in section 6.5.2.1 of Part 75, Appendix A. However, because the PEMS is only approved for use at 70 to 100 percent load, use 70 percent load as the lower boundary of the range of operation and 100 percent load as the upper boundary of the range of operation. Use paired PEMS and reference method data to calculate the results on a lb NO_x/mmBtu basis. Calculations shall be based on a minimum of 30 runs at each operating level. MeadWestvaco shall apply to each operating level the RATA performance specifications contained in the "PEMS Ongoing QA/QC Tests" table in paragraph (b). Report the RATA data and results of only the normal operating level in EDR record types 610 and 611 and keep the data and results for the other two operating levels on-site, available for inspection. The RATA result for the normal operating level determines when the next RATA is due.

(6) Conduct an F-test, and a correlation analysis using Part 75, Subpart E equations at low, mid, and high operating levels. The F-test is to be applied to data at each operating level separately. The correlation analysis shall be performed using all data collected at the three operating levels combined. If the standard deviation of the reference method NO_x data at any operating level is less than either 3 percent of the span or 5 ppm, a reference method standard deviation of either 3 percent of span or 5 ppm may be used at that operating level when applying the F-test. At any operating level, if the mean value of the reference method NO_x data is less than 5 ppm, the correlation analysis (r-test) may be performed at the remaining operating levels combined rather than at all three operating levels combined. Report the F-test and r-test results in record type 641.

(7) Perform a bias test (one-tailed t-test) at the normal operating level according to Part 75, Appendix A, section 7.6. If the bias test is failed, calculate and apply a bias adjustment factor (BAF) to the subsequent NO_x emission rate data. Report the bias test results in record type 611.

[11] If a reference method is used to provide training data for the PEMS, the training data may be used to calculate the relative accuracy at each operating level and the normal level bias, and to set up the alarm system.

(8) The tests and procedures in this paragraph (g) shall be completed by the earlier of 60 unit operating days (as defined in §72.2) or 180 calendar days after the failed RAA or failed RATA or after the change that caused a significant change in NO_x emission rate. MeadWestvaco shall use the appropriate Part 75 missing data procedures (see section 5 below), starting from the hour of the failed RAA or RATA and ending the hour of successful passage or completion of the tests and procedures, as required above. MeadWestvaco shall report the maximum potential NO_x emission rate (MER) from paragraph (h) and shall use a Method of Determination Code of "55", i.e., "Other substitute data approved through petition by EPA", in RT 320 for reporting lb NO_x/mmBtu emission rate, starting with the hour of the change that caused a significant change in NO_x emission rate and ending the hour of successful passage or completion of the tests and procedures in steps (1) through (7) above. Notification of recertification of the PEMS shall be provided according to §75.61.

(h) For any hour or partial hour of startup, shutdown, or lean/lean turbine operation (burner modes 0 or 1, in other words, if dry low-NO_x is not operating), or when Unit X022 fires any oil, MeadWestvaco must report the NO_x MER, as defined in §72.2. For the purposes of this approval, the MER shall be 0.700 lb/mmBtu when X022 is firing only gas, and 1.200 lb/mmBtu when X022 fires any oil. A Method of Determination Code "55", i.e., "Other substitute data approved through petition by EPA", shall be used in RT 320 when reporting the MER.

(i) For each unit operating hour in which natural gas is combusted and the turbine and duct burners are in operation, MeadWestvaco shall report the NO_x alternative substitute data value of 0.116 lb/mmBtu. MeadWestvaco shall use Method of Determination Code "55 Other substitute data approved through petition by EPA" in RT 320 for reporting lb NO_x/mmBtu emission rate for the situation described in this paragraph.

5. Missing Data Substitution

Under §75.46, the owner or operator must demonstrate that all missing data can be accounted for in a manner consistent with the applicable missing data procedures in Subpart D (except where alternate procedures are required in this final approval). In the June 17, 2002 petition, MeadWestvaco stated that the PEMS meets the Subpart D requirements, including the initial missing data procedures, determination of monitor data availability, standard missing data procedures, and that the PEMS and the data acquisition and handling system meet the missing data requirements in Part 75, Appendix D, section 2.4. According to MeadWestvaco, the PEMS determines monitor data availability, assesses the operating times for which data must be substituted, and recovers historical data from the PI data historian. The elapsed out-of-control time of the PEMS is monitored, allowing the PEMS to retrieve the data necessary to perform the substitution. Once the data has been retrieved, the required calculations are performed. To assist in analyzing missing data, the software provides data managing reports that allow the user to monitor the out-of-control time (or monitor data availability), data gap analysis, recovered data queries, substituted data usage, and the standard reporting requirements.

6. Additional Requirements

MeadWestvaco shall submit the operating envelope for Unit X022 to the Alabama

Department of Environmental Management and to EPA Region 4 for inclusion in the hardcopy monitoring plan. Any time changes are made to the PEMS operating envelope, the complete, revised PEMS operating envelope shall be submitted in a hardcopy monitoring plan by the applicable deadline in §75.62(a)(2). More information on monitoring plan submittals, revisions and other submittals can be found at: http://www.epa.gov/airmarkets/monitoring/http://www.epa.gov/airmarkets/monitoring/submissions/monplan.html.

MeadWestvaco shall follow the EDR version 2.2 reporting instructions, found at: http://www.epa.gov/airmarkets/reporting/edr21/, in conjunction with the required PEMS record types, and the supplementary EDR reporting instructions attached to this petition response, to report data from the PEMS. Monitoring Data Checking (MDC) software that can be used to quality assure the electronic reports prior to submission is found at: http://www.epa.gov/airmarkets/reporting/index.html.

BASIC EDR REPORTING FOR PREDICTIVE EMISSIONS MONITORING SYSTEMS (PEMS)

I. Introduction

Table A-15, below includes the essential EDR record types for units that have received approval under Subpart E of Part 75 to use PEMS to report NO_x emissions. The scope of Table A-15 is limited to affected oil and gas-fired units (i.e., boilers and combustion turbines) that:

- Have a single unit-single stack exhaust configuration; and

i. Use Part 75, Appendix D methodology to quantify unit heat input; and
- Use Part 75, Appendices D and G to account for SO_2 and CO_2 mass emissions (if the units are in the Acid Rain Program); and
- Do not co-fire oil and gas.

For PEMS reporting, EDR version 2.2 must be used, since fuel-specific missing data substitution for NO_x emission rate is required. For hourly NO_x emission rate reporting, RT 320 is used. Hourly 200-level records are <u>not</u> reported for either NO_x concentration or diluent gas (O_2 or CO_2) concentration.

For units that burn more than one fuel type, separate PEMS are required for each fuel. Each PEMS should be reported as a separate monitoring system with a unique monitoring system ID in RT 510. Each PEMS will require its own set of certification, recertification, and quality assurance tests.

II. Interpreting Table A-15

In Table A-15, the first column identifies the record type. The second column gives a brief description of the record type. The third, fourth, and fifth columns indicate whether the record type must be reported for a particular type of submittal. The third column header, "MP," refers to monitoring plan submittals. The fourth column header, "CT," stands for certification or recertification applications. The fifth column header, "QT," refers to electronic data report submittals. The letter codes in columns 3 through 5 are defined as follows:

Y This record type is required for this type of submittal (monitoring plan, certification/recertification application or electronic data report)

N This record type is not appropriate for this type of submittal.

O This record type is appropriate, but optional for this type of submittal.

A This record type <u>may</u> be required for this submittal. If any doubt exists as to the need to submit this record type, consult the appropriate EDR instructions.

T This record type is required each time a quality assurance test (e.g., a RATA) is performed.

Column 6 identifies the units covered by the record type as units subject to the Acid Rain Program ("ARP") or units subject to Part 75, Subpart H ("Subpart H").

Table A-15
EDR RECORD TYPES FOR UNITS WITH PEMS

Record Type	Description	MP	CT	QT	Program Applicability and Comments
100	Facility Identification	Y	Y	Y	ARP, Subpart H
	Record Types Submitted				ARP, Subpart H
	Facility Location and Identification Information				ARP, Subpart H
300	Operating Data	N	N	Y	ARP, Subpart H • Report one RT 300 for each hour in the quarter, except when a unit does not operate during the entire quarter. • For each operating hour, report the fuel combusted in column 64.
301	Quarterly Cumulative Emissions	N	N	Y	ARP • Quarterly NO_x emission rate is the arithmetic average of the RT 320, col 42 values
302	Oil Fuel Flow	N	N	Y	ARP, Subpart H • For ARP units, must be paired with RT 313 when reporting SO_2 mass emissions.
303	Gas Fuel Flow	N	N	Y	ARP, Subpart H • For ARP units, must be paired with RT 314 when reporting SO_2 mass emissions.
307	Cumulative NO_x Mass Emissions	N	N	Y	Subpart H
	SO_2 Mass Emissions (Oil)				ARP
	SO_2 Mass Emissions (Gas)				ARP
	NO_x Emission Rate Estimation	N	N	Y	ARP, Subpart H • See supplementary reporting instructions.
328	NO_x Mass Emissions	N	N	Y	Subpart H • See supplementary reporting instructions.
330	CO_2 Mass Emissions Data	N	N	A	ARP • Report RT 330 for hours in which Equation G-4 is used to determine hourly CO_2 mass emissions for gas or oil-fired units.
331	CO_2 Mass Emissions Estimation Parameters	N	N	A	ARP • Report RT 331 if you estimate CO_2 mass emissions using fuel sampling and Equation G-1
504	Unit Information	Y	Y	Y	ARP, Subpart H
	Program Indicator for Report				ARP, Subpart H
	EIA Cross Reference Information				ARP, Subpart H
	Peaking Unit or ARP Gas-Fired Unit Qualification Data				ARP

	Subpart H Reporting Frequency Change				Subpart H
	Monitoring Systems/Analytical Components Table				ARP, Subpart H • See supplementary reporting instructions.
520	Formula Table	Y	Y	Y	ARP, Subpart H • Report formulas for SO_2 and CO_2 mass emissions (ARP units,only), NO_x mass emissions (Subpart H units), and unit heat input rate.
531	Defaults and Constants	Y	Y	Y	ARP, Subpart H • See supplementary reporting instructions.
535	Unit and Stack Operating Load Data	Y	Y	Y	ARP, Subpart H Required for any unit using load-based missing data procedures for NO_x or fuel flow rate.
536	Range of Operation, Normal Load, and Load Usage	Y	Y	Y	ARP, Subpart H • Report RT 536 to define operating range and normal load for RATA testing
540	Fuel Flowmeter Data	Y	Y	Y	ARP, Subpart H
	Reasons for Monitoring System Downtime or Missing Parameter				ARP, Subpart H • See supplementary reporting instructions.
556	Monitoring System Recertification, Maintenance, or Other Events	N	Y	A	ARP, Subpart H • Report RT 556 for recertification of the PEMS or fuel flowmeters • See supplementary reporting instructions.

585	Monitoring Methodology Information	Y	Y	Y	ARP, Subpart H • See supplementary reporting instructions.
586	Control Equipment Information	A	A	A	ARP, Subpart H
	Unit Fuel Type				ARP, Subpart H
	RATA and Bias Test Data				ARP, Subpart H • Report RTs 610 each time a RATA is performed for certification, recertification or for on-going QA/QC. • See supplementary reporting instructions.
611	RATA and Bias Test Results	N	Y	T	ARP, Subpart H • Report RT 611 each time a RATA is performed for certification, recertification or for on-going QA/QC. • See supplementary reporting instructions.
624	Other QA Activities	N	N	Y	ARP, Subpart H • Report RT 624 for PEMS daily QA/QC and for PEMS periodic accuracy checks using a reference method, or a portable analyzer. • See supplementary reporting instructions.
627	Fuel Flowmeter Accuracy Test	N	A	T	ARP, Subpart H • Report only for fuel flowmeters that are certified and quality assured by periodic accuracy tests according to Part 75, Appendix D, section 2.1.5.1 or 2.1.5.2.
628	Fuel Flowmeter Accuracy Test for Orifice, Nozzle and Venturi Flowmeter	N	A	T	ARP, Subpart H • Report only for orifice, nozzle and venturi-type flowmeters that are quality assured by periodic transmitter/transducer calibrations.
629	Fuel Flow-to-load Ratio Test Baseline Data	N	N	A	ARP, Subpart H • Report if quarterly fuel flow-to-load ratio test in Part 75, Appendix D, section 2.1.7 is used to extend fuel flowmeter accuracy test deadlines.

630	Quarterly Fuel Flow-to-load Ratio Test Results	N	N	A	ARP, Subpart H • Report if quarterly fuel flow-to-load ratio test in Part 75, Appendix D, section 2.1.7 is used to extend fuel flowmeter accuracy test deadlines.
640	Alternative Monitoring System Approval Petition Data	N	Y	A	ARP, Subpart H • Report when certifying a PEMS
641	Alternative Monitoring System Approval Petition Results and Statistics	N	Y	A	ARP, Subpart H • Report when certifying or recertifying a PEMS
696	Fuel Flowmeter Accuracy Test Extension	N	N	A	ARP, Subpart H • Use RT 696 to claim allowable extensions of fuel flowmeter accuracy test deadlines.
697	RATA Deadline Extension or Exemption	N	N	A	ARP, Subpart H • Report when claiming a RATA deadline extension under Part 75, Appendix B, section 2.3.3.
699	QA Test Extension Based on Grace Period	N	N	A	ARP, Subpart H • Report when claiming a QA test deadline extension under Part 75, Appendix B, section 2.2.4.
900	Certifications	Y	Y	Y	ARP
	Certifications				ARP
	Comments				ARP, Subpart H • See supplementary reporting instructions.
920	Comments	O	O	O	ARP, Subpart H
	Certifications				Subpart H
941	Certifications	Y	Y	Y	Subpart H
999	Contact Information	O	O	O	ARP, Subpart H

SUPPLEMENTARY EDR REPORTING
INSTRUCTIONS FOR PEMS

For a unit with an approved petition to use a predictive emissions monitoring system (PEMS), use the following supplementary instructions, in conjunction with the EDR version 2.2 Reporting Instructions document, to prepare the required EDR submittals.

RT 320

Monitoring System ID (10). Report the monitoring system ID (from RT 510, column 13) of the PEMS used to determine the NO_x emission rate during the hour.

F-Factor (26). Leave this field blank.

Average NO_x Emission Rate for the Hour (36). Report the average unadjusted NO_x emission rate for the hour (lb/mmBtu), rounded to three decimal places, as determined by the PEMS. For hours in which you use missing data procedures, leave this field blank.

Adjusted Average NO_x Emission Rate for the Hour (42). For each hour in which you report NO_x emission rate in column 36, apply the appropriate adjustment factor (1.000 or the BAF) to the unadjusted average emission rate, and report the result rounded to three decimal places. For each hour in which you use missing data procedures, report the appropriate substitute value.

Formula ID (50). Leave this field blank.

Method of Determination Code (53). Report "03" when you use the PEMS to determine the NO_x emissions rate. Report "12" when you report the fuel-specific maximum NO_x emission rate (e.g., during hours of startup or shutdown or when NO_x controls (if any) are not functioning properly). During hours when you use other missing data procedures, report the appropriate MODC listed in the EDR instructions.

RT 328

NOx Methodology for the Hour (45). Report "NOXR-PEMS".

RT 510

The PEMS monitoring system consists of either one or two data acquisition and handling system (DAHS) components. For single-component PEMS systems or for systems where the PEMS software and standard DAHS software have the same manufacturer/provider, model or version number, report one RT 510 for the PEMS system. If the PEMS software and the standard DAHS software have different manufacturer/providers, model or version numbers, report each as a separate RT 510 with the same PEMS monitoring system ID.

Component ID (10). Report the three-character alphanumeric ID for each DAHS component.

Monitoring System ID (13). Create a unique three-character alphanumeric ID for each PEMS monitoring system. Define a separate NO_x PEMS system for each fuel type. For sources switching from NO_x CEMS or Part 75, Appendix E to PEMS, do not re-use the CEMS or Appendix E system ID numbers.
System Parameter Monitored (17). If your PEMS is approved for NO_x emission rate (lb/mmBtu) and if you use the NO_x emission rate to calculate NO_x mass emissions, report "NOX" for the system parameter monitored. If your PEMS is approved for NO_x concentration (ppm) and if you calculate NO_x mass emissions as the product of NO_x concentration times flow rate, report "NOXC" for the system parameter monitored.

Primary/Backup Designation (21). Report "PE" to indicate that this is a predictive emissions monitoring system.

Component Type Code (23). Report "DAHS" as the component type code.

Sample Acquisition Method (27). Leave this field blank.

Manufacturer (30). Report the name of the manufacturer or developer of the software component.

Model/Version (55). Report the model/version of the software component.

Serial Number (70). Report the serial number, if applicable—otherwise leave blank.

RT 531

Parameter (10). Report "NORX" as the parameter monitored. (You should report one 531 record for each fuel type.)

Default Value (14). Report the fuel-specific maximum potential NO_x emission rate (MER), in units of lb/mmBtu.

Units of Measure (27). Report "LBMMBTU".

Purpose or Intended Use (34). Report "MD" for missing data.

Type of Fuel (37). Report the fuel type code for the fuel. (See the EDR Instructions for RT 531 for the list of available codes.)

Indicator of Use (40). Report "A" for any hour.

Source of Value (41). Report "DEF" for default value.

RT 550

Parameter (10). Report "NOX".

Monitoring System ID (14). Report the monitoring system ID, from RT 510, of the NO_x PEMS system.

RT 556

Component ID (10). Report the PEMS component ID subject to recertification/diagnostic testing, if a specific component is involved. If the event is system, not component, specific, leave this field blank.

Monitoring System ID (13). Report the monitoring system ID, from RT 510, of the NO_x PEMS system.

Event Code (16). Report code "99" (i.e., "Other").

Code for Required Test (19). Codes for PEMS systems are:

80 PEMS sensor validation system (minimum data capture check), train or retrain (if manufacturer recommends), sensor validation system (alarm system set-up and failed sensor alert check), daily QA/QC, 3 operating level RATA, statistical tests, and normal operating level bias test;

81 PEMS daily QA/QC, and PEMS check with reference method or portable analyzer;

Beginning of Conditionally Valid Period (31, 39). If conditional data validation is used, report the date and hour that the probationary PEMS daily QA/QC test was successfully completed according to the provisions of §75.20(b)(3)(ii).

Note: For PEMS, you may only use conditional data validation if the "event" in column 16 requires RATA testing. If you elect to use conditional data validation, you must complete the RATA within the allotted time in §75.20(b)(3)(iv).

RT 585

Parameter (10). If your PEMS is approved for NO_x emission rate (lb/mmBtu) and if you use the NO_x emission rate to calculate NO_x mass emissions, report "NOXR" as the parameter code associated with the PEMS. If your PEMS is approved for NO_x concentration (ppm) and if you calculate NO_x mass emissions as the product of NO_x concentration times flow rate, report "NOXM" as the parameter code associated with the PEMS. Report one RT 585 for each generic fuel type combusted.

Monitoring Methodology (14). Report "PEMS" as the monitoring methodology for the PEMS.

Missing Data Approach for Methodology (28). Report "FSP75" for the fuel-specific missing data approach for the PEMS methodology.

RT 610

Units of Measure (33). Report "2" (lb/mmBtu) as the units of measure.

Value from CEM System Being Tested (34). Report the average value recorded by the PEMS, for each RATA run.

RT 611

Units of Measure (34). Report "2" (lb/mmBtu) as the units of measure.

Arithmetic Mean of CEM Values (35). Report the arithmetic mean of all the RTs 610 PEMS values associated with the RATA.

Number of Load Levels Comprising Test (133). Report "1" or "3" (if certification or recert).

BAF for a Multiple-Load RATA (134). Leave this field blank.

RT 624

Component ID (10). Report the PEMS software component ID from RT 510.

Monitoring System ID (13). Report the NO_x monitoring system ID from RT 510.

Parameter (16). Report "NOX".

QA Test Activity Description (30). Fill in appropriately.

Reason for Test (51). Report "Q".

QA Test Code (53). Report one of the following codes, as appropriate:

04 PEMS daily QA/QC

05 Periodic check of PEMS accuracy with a portable analyzer, or reference method

RT 640

Submit RT 640 only with the Subpart E application for initial certification of the PEMS. Do not submit RT 640 for PEMS recertification.

Component ID (10). Report the PEMS software component ID from RT 510.

Monitoring System ID (13). Report the NO_x monitoring system ID from RT 510.

RT 641

Submit RT 641 with the Part 75, Subpart E application for initial certification of the PEMS and for all recertifications of the PEMS. For initial certification, fill in all applicable data fields in RT 641. For PEMS recertification, report only the data elements in start columns 1 through13, column 95 (the F-statistic), column 108 (Critical value of F at 95% confidence level for sample size), and column 121 (Coefficient of correlation (Pearson's r) of CEM and AMS data).

Component ID (10). Report the PEMS software component ID from RT 510.

Monitoring System ID (13). Report the NO_x monitoring system ID from RT 510.

RT 910

Text (4). Briefly describe the PEMS.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
AIR AND RADIATION

ATTACHMENT B

Mr. Timothy M. Becraft
Authorized Account Representative
MeadWestvaco Coated Board, Inc. - Mahrt Mill
P.O. Box 940
Phenix City, Alabama 36868-0940

Re: Consolidated Compliance Requirements for a NO_x Predictive Emissions Monitoring System Installed on Unit Z008 at the Mahrt Paper Mill (Facility ID (ORISPL) 54802)

Dear Mr. Becraft:

To facilitate implementation of the compliance requirements for the NO_x PEMS installed on MeadWestvaco's Unit Z008 at the Mahrt Paper Mill (Mahrt), this Attachment consolidates the provisions of EPA's March 1, 2004 conditional approval of the PEMS, and the June 3, 2004 amendment to the conditional approval, with the additional quality assurance (QA) tests that EPA is requiring based on the results of its PEMS[12] and portable analyzer[13] field studies.

Background

On April 30, 2003, MeadWestvaco Corporation (MeadWestvaco) petitioned for approval of a Pavilion Technologies *Software CEM*® NO_x PEMS, which is a neural network based computer software system that utilizes computerized boiler sensor inputs to estimate NO_x emissions. The PEMS is installed on Unit Z008 which is a 428 mmBtu/hr, Babcock and Wilcox dry bottom, wall-fired, pressurized furnace industrial (PFI) boiler at the Mahrt Paper Mill in Cottonton, Alabama. Unit Z008 is used to produce steam for the mill. Pipeline natural gas is the primary fuel, and No.2 fuel oil (diesel fuel) is the secondary fuel. The unit has no emission controls for NO_x. The Mahrt Paper Mill is owned and operated by MeadWestvaco. The PEMS was installed on the boiler in January 2003.

[12] "Evaluation and Field Testing of Nitrogen Oxide (NO_x) Predictive Emission Monitoring Systems (PEMS) for Gas-fired Combustion Turbines - Synthesis Report", The Cadmus Group, Inc., December 29, 2004 .
[13] "Evaluation of Portable Analyzers for Use in Quality Assuring Predictive Emission Monitoring Systems for NOx", The Cadmus Group, Inc., September 8, 2004.

Unit Z008 is subject to the NO_x Budget Trading Program under Alabama Department of Environmental Management (ADEM) Code R. 335-3-8, which requires MeadWestvaco to continuously monitor and report NO_x mass emissions and heat input for this unit in accordance with Subpart H of 40 CFR Part 75, beginning on May 1, 2003. Code R. 335-3-8 further requires MeadWestvaco to hold NO_x allowances equal to the ozone season[14] NO_x mass emissions from Unit Z008, beginning on May 31, 2004[15]. Pursuant to discussions with MeadWestvaco, EPA agreed that installation of the PEMS, completion of initial certification testing of the PEMS, and submission of a petition for approval of the PEMS as an alternative monitoring system (AMS) under Subpart E of Part 75 by May 1, 2003 would effectively satisfy these requirements.

MeadWestvaco subsequently hired a contractor to perform EPA Reference Method (RM) testing for NO_x concentration (ppmvd, using RM 7E), O_2 concentration (dry % O_2, using RM 3A) and the resulting NO_x emission rate (lb/mmBtu, calculated using Equation F-5 in Appendix F of Part 75). The testing was conducted at normal representative unit operating levels while the boiler combusted pipeline natural gas. The testing produced 850 valid, hourly paired RM and PEMS values. On April 30, 2003, MeadWestvaco submitted a petition for approval of the PEMS, as required.

EPA's Determination

Under Subpart E, the owner or operator of a unit applying to the Administrator for approval of an AMS must demonstrate that the AMS has the same or better precision, reliability, accessibility, and timeliness (PRAT) as provided by a CEMS. The demonstration must be made by comparing the AMS to a contemporaneously operating, fully certified CEMS. Sections 75.41 through 75.46 discuss the criteria for evaluating PRAT, daily quality assurance, and missing data substitution for the AMS. Section 75.48 details the information that must be included in the application in order to demonstrate that the criteria in §§75.41-46 are met.

The following paragraphs describe how MeadWestvaco meets the requirements of a Subpart E AMS petition. As detailed below, EPA's approval applies only to PFI boiler, Unit Z008 at the Mahrt Paper Mill when firing natural gas, and only for PEMS output of NO_x emission rate (lb/mmBtu). If a PEMS input parameter value goes below certain minimum or above certain maximum values, MeadWestvaco shall report the maximum potential NO_x emission rate (MER). During startups, shutdowns, or if the PEMS alarms, MeadWestvaco must report the NO_x MER. For every hour that Unit Z008 fires oil (diesel fuel), MeadWestvaco shall use a default GCV, the fuel flow meter output and the NO_x MER to calculate and report NO_x mass emissions.

1. Precision

Under §75.41, for the normal unit operating level, the owner or operator must provide paired AMS and fully certified CEMS hourly data for at least 90 percent of the hours during 720 unit operating hours for the primary fuel supply and for at least 24 successive unit operating hours for all alternative fuel supplies that have significantly different sulfur content. Missing data procedures must not be used to provide sample data. The data may be adjusted to account for any lognormality and time dependency autocorrelation. Three statistical tests must be passed, i.e., a linear correlation coefficient (r) $\geq$ 0.8, an F-test, and a one-tailed t-test for bias described in Appendix A to Part 75. Further, the owner or operator must provide two separate time series plots for AMS and CEMS data. Each data plot must have a horizontal axis representing the clock hour and calendar date of the readings and must contain a separate data point for every hour for the duration of the test. One data plot must show percentage difference vs. time, and the other data plot must show AMS and CEMS readings vs. time. Finally, a plot of the paired AMS (on the vertical axis) and CEMS (on the horizontal axis) concentrations must be provided.

MeadWestvaco collected 917 hours of historical, paired RM vs. PEMS data while natural gas was being combusted in Unit Z008. Data from 65 hours during this time period was invalidated due to various problems unrelated to PEMS performance. Therefore, 852 hours of valid paired RM and PEMS data were collected. Only 850 hours of valid data were submitted to EPA. However, as explained in a July 23, 2003 letter (submitted in a July 25, 2003 e-mail) from MeadWestvaco's testing company, Advanced Industrial Resources, Inc., inclusion of these two hours of data does not significantly affect the test results. According to MeadWestvaco, the 850 hours submitted represent more than 90% of the unit operating hours in the data collection period, thereby satisfying the requirement in §75.41(a)(6). According to MeadWestvaco, all 850 hours of data were quality-assured, i.e., no missing data substitution procedures were applied.

[14]The ozone season ends on September 30 and, for 2005 and thereafter, starts on May 1.
[15]A court decision has mandated that the 2004 ozone season will begin on May 31 rather than May 1 in certain states (including Alabama).

The table below shows the results of the statistical tests for the PEMS output.[16]

PEMS (lbs NO_x /mmBtu)
t-test: mean difference d = 0.0325 abs. value of confidence coefficient cc = 0.0017 **Evaluation:** Since |cc| < d, the model failed.[17] **BAF** = 1 + |davg| / $PEMS_{avg}$ = 1.161
r-coefficient correlation: r = 0.951 **Evaluation:** Since r ≥ 0.8, the model passed.
F-test: variance of PEMS = 0.006818 variance of RM = 0.006542 F = 1.042 $F_{critical}$ = 1.12 **Evaluation:** Since $F_{critical}$ ≥ F, the model passed.

The PEMS output of NO_x emission rate in lb/mmBtu passed the r correlation and F-test, but failed the t-test for bias. Therefore, a bias adjustment factor (BAF) was calculated according to Part 75, Appendix A, §7.6.5. This BAF shall be applied to the PEMS output until the next relative accuracy test audit (RATA), at which time a new BAF will be determined if the t-test is failed (see paragraphs (f), (g) and (h)).

Further, MeadWestvaco supplied the appropriate data plots concerning the paired AMS and CEMS data under §§75.41(a)(9) and (c)(2)(i).

2. Reliability

According to §75.42, the owner or operator must demonstrate that the PEMS is capable of providing valid 1-hr averages for 95.0 percent or more of unit operating hours over a 1-year period, and that the system meets the applicable quality-assurance requirements of Part 75, Appendix B. EPA finds that the percent monitoring data availability for the PEMS NO_x output over a period greater than one year exceeds 95.0 percent. EPA therefore finds that the PEMS meets the §75.42 requirements for monitoring system data availability. By meeting the QA/QC requirements described in this letter, MeadWestvaco will also meet the applicable Appendix B quality assurance and quality control (QA/QC) requirements.

3. Accessibility and Timeliness

According to §§75.43 and 75.44, the owner or operator must demonstrate that the PEMS meets the recordkeeping and reporting requirements of Subparts F and G of Part 75. According to MeadWestvaco, the PEMS meets the Subpart F and G requirements. For example, the PEMS, coupled with the DAHS, generates monitoring data in accordance with EPA's electronic data reporting (EDR) format, version 2.2, and "will provide a continuous, quality assured permanent record of certified emissions data on an hourly basis", and "will be capable of issuing a record of data for the previous day within 24 hours." The software also provides a continuous display of real-time emissions data to the operator.

[16]Under §75.41(b), in preparation for conducting the required statistical tests, the data may be screened for lognormality and time dependency autocorrelation. If either is detected, certain calculation adjustments are allowed. According to MeadWestvaco, no lognormality was detected. Although the data set met the autocorrelation criteria, application of the time dependent autocorrelation test is not appropriate for this data set since the hourly averages are influenced by drastic boiler load changes. Even if an autocorrelation adjustment was applied, the adjusted data set would not have been significantly affected. Therefore, consistent with §75.41(b), no calculation adjustments were made to the data.

[17]If the t-test is failed, the PEMS must apply a bias adjustment factor (BAF) as described in Part 75, Appendix A, §7.6.5.

4. Quality Assurance

Under §75.45, the owner or operator must demonstrate either that daily tests equivalent to those in Appendix B of Part 75 can be performed on the PEMS or that such tests are unnecessary for providing quality-assured data. Sections 75.48(a)(8)-(11) require the following information to be submitted: a detailed description of the process used to collect data, including location and method of ensuring an accurate assessment of operating hourly conditions on a real-time basis; a detailed description of the operation, maintenance, and quality assurance procedures for the AMS as required in Part 75, Appendix B; a description of methods used to calculate diluent gas concentration; and results of tests and measurements necessary to substantiate the equivalency of the AMS to a fully certified CEMS. EPA finds that the Unit Z008 PEMS will satisfy these requirements if the following QA procedures are implemented:

(a) The PEMS shall use the following input parameters: natural gas flow, oxygen concentration in the exhaust gas, number of burners fired, and absolute humidity. The PEMS input parameters must stay within the minimum and maximum values (inclusive) in the below table (referred to as "the PEMS operating envelope"), unless the PEMS is retrained according to paragraph (g) below, in which case, the new training values will supercede the values in the below table. If any PEMS input parameter value goes below the minimum or above the maximum table values by 5 percent or more, the PEMS shall be considered out-of-control, and the NO_x MER shall be used, calculated according to paragraph (h), starting with the hour in which the sensor value goes outside of the PEMS operating envelope and ending with the hour in which the sensor value is back within the PEMS operating envelope. Data from each PEMS input parameter shall be maintained on site in a form suitable for inspection for at least three (3) years from the date of each record.

PEMS Operating Envelope

PEMS Input Parameter	Minimum Value	Maximum Value
Natural gas flow (kscfh)	1.51	341.65
O_2 (%)	0.10	21.13
Number of burners fired	1	4
Inlet air absolute humidity (grains H_2O/lb dry air)	0.00	140.00[18]

(b) Ongoing QA/QC tests of the PEMS shall be performed according to the following table:

PEMS Ongoing QA/QC Tests

Test	Performance Specification	Frequency
Daily QA/QC	PEMS output - PEMS output = 0.000 lb NO_x/mmBtu (see paragraph (e))	Daily

[18]The PEMS precision test data has a maximum absolute humidity of 120.7 grains of water per pound of dry air. However, a requested maximum value of 140.00 grains of water per pound of dry air absolute humidity is being allowed based on data submitted on 7/31/03 that indicates a linear relationship between absolute humidity and PEMS NO_x concentration output.

3-run RAA	• Accuracy ≤ 10.0% or • For a low emitting source[19], results are acceptable if the mean value for the PEMS is within ± 0.020 lb/mmBtu of the reference mean value	Monthly during ozone season and possibly in quarters 1 and 4 (see paragraph (f))

RATA	For semiannual RATA frequency: • RA > 7.5% and ≤ 10.0% or • For a low emitting source[19], results are acceptable if the mean value for the PEMS is within ± 0.020 lb/mmBtu of the reference method mean value. For annual RATA frequency: • RA ≤ 7.5% or • For a low emitting source[19], results are acceptable if the mean value for the PEMS is within ± 0.015 lb/mmBtu of the reference method mean value	Semiannual or annual (depending on the RATA results) for routine QA. Recertification RATA is required when a RAA or a RATA is failed or when operating conditions change. ≥ 9 test runs are required at normal operating level for annual or semiannual QA. ≥ 30 test runs are required at each of 3 operating levels for recertification. (see paragraphs (f) and (g)
Sensor validation system (minimum data capture)	Check for production of at least 1 valid data point per 15 minutes (see paragraph (c))	Before each RATA (see paragraphs (f) and (g))
Sensor validation system (failed sensor alert)	Alert operator of any failed sensors (see paragraphs (c) and (d))	Hourly
Bias adjustment factor	If $d_{avg} \leq \lvert cc \rvert$, bias test is passed	After each RATA. Perform bias test at the normal operating level (see paragraphs (f) and (g))
PEMS training (Linear correlation and F-test)	$r \geq 0.8$, and $F_{critical} \geq F$	According to paragraph (g)
Sensor validation system (alarm system set-up)	(see paragraphs (c) and (d))	After each PEMS training (see paragraph (g))

The sensor alarm system validation procedure is described in paragraphs (c) and (d). The daily QA/QC test is described in paragraph (e). The RATAs, 3-run RAAs, and bias adjustment factor are discussed in paragraphs (f) and (g). Recertification, including training, of the PEMS is discussed in paragraph (g).

[19]The unit is a low-emitting source if the mean reference value during the RATA or RAA is ≤ 0.200 lb/mmBtu NO_x

(c) The sensors for the PEMS' input parameters must be maintained in accordance with the manufacturer's recommendations. A sensor validation system is required to identify sensor failures hourly to the operator and to reconcile failed sensors by: comparing each sensor to several other sensors, determining, based on the comparison, if a sensor has failed, and calculating a reasonable substitute value for the parameter measured by the failed sensor. MeadWestvaco must ensure that the sensor validation system validates sensor data in this way every minute of PEMS operation. To comply with §75.10(d)(1), hourly averages must be computed using at least one valid data point in each fifteen minute quadrant of an hour in which the unit operates. All valid data recorded by the PEMS during the hour must be used to calculate the hourly averages.

(d) The sensor validation system shall include an alarm to inform the operator when sensors need repair and to indicate that the PEMS is out-of-control. In setting up the alarm system, a demonstration shall be performed at a minimum of four different PEMS training conditions, which must be representative of the entire range of expected boiler operations. For each of the four or more training conditions, the demonstration shall consist of the following:

(1) For all of the sensors used in the PEMS model, input a set of reference sensor values that were recorded either during the training of the PEMS or during a RATA of the PEMS (these values will all be within the PEMS operating envelope). Verify that these reference inputs produce the expected PEMS output, i.e., the expected NO_x emission rate;

(2) Perform one-sensor failure analysis, as follows. Artificially fail one of the sensors and then, using the calculated replacement value for that sensor (see paragraph (c), above), assess the effect on the accuracy of the PEMS. Calculate the percent difference between the reference NO_x emission rate from step (1) and the PEMS output. Repeat this procedure for each sensor, individually;

(3) Identify the sensor failure in step (2) that results in the worst accuracy. If the highest percent deviation exceeds $\pm$ 10.0%, then set up the PEMS to alarm when any single sensor fails. If none of the percent difference values exceeds 10.0%, then set up the PEMS to alarm with two sensor failures.

The results of this demonstration shall be maintained on site in a form suitable for inspection. For every hour of PEMS operation, the PEMS shall check for failed sensors and provide an alarm to alert the operator of any sensors needing repair. When the PEMS alarms, the PEMS is out-of-control, and MeadWestvaco shall report the NO_x MER, calculated according to paragraph (h), starting with the hour after the sensor validation alarm system alarms and ending with the hour after the sensor value is back within the expected range.

(e) A daily QA/QC test must be performed whenever the unit operates for any portion of the day. MeadWestvaco shall input to the PEMS a set of boiler operating parameters used by the PEMS during a passed PEMS RATA or the most recent PEMS training. (Note: It is important that the same number of decimal places for the PEMS inputs be used here as was used in the passed PEMS RATA or most recent PEMS training) The resulting PEMS NO_x lb/mmBtu output divided by the BAF (this resets the BAF to 1.000 as it was during the passed PEMS RATA or most recent PEMS training) shall be compared to the corresponding PEMS NO_x lb/mmBtu output produced at the time of the passed PEMS RATA or most recent PEMS training (with no BAF applied). If the difference between the two PEMS NO_x

outputs is within ± 0.002 lb NO_x/mmBtu, the daily QA/QC test is passed. If a daily QA/QC test is failed or not performed, the PEMS is out-of-control. Subpart D missing data procedures shall be followed starting with the hour of the failed test or, if the test was not performed, the hour after the test due date, and ending with the hour in which a daily QA/QC test is passed. No grace periods are allowed. The results of this check (pass/fail) shall be reported in RT 624 in EDR version 2.2. (Note: Use code "04" in start column 53 (QA test code) for the daily QA/QC check.)

(f) Ongoing semiannual or annual RATAs shall be performed at the normal operating level according to the procedures in Part 75, Appendix B, section 2.3.1 and shall be calculated on a lb/mmBtu basis. The reference method traverse point selection shall be consistent with Part 75, Appendix A, section 6.5.6. Notification of ongoing RATAs shall be provided according to §75.61(a)(5). Immediately prior to a RATA, the BAF shall be set to 1.000. Before each RATA, MeadWestvaco shall ensure that the sensor validation system is set to provide at least one valid data point per 15 minute period, as discussed in paragraph (c). After the RATA, MeadWestvaco shall calculate and apply a bias adjustment factor at the normal operating level according to Part 75, Appendix A, section 7.6. Report the RATA data and results in EDR record types 610 and 611 and report the bias test results in record type 611.

Ozone season, monthly, 3-run (minimum) relative accuracy audits (RAAs), described below, shall commence in May 2006. An RAA shall be performed in every calendar month of the ozone season (May through September) in which the unit operates for at least 56 hours, except for a month in which a full 9-run RATA or PEMS recertification is performed. Justification for these ozone season RAAs is provided in Attachment C.

Commencing on January 1, 2008, if Unit Z008 is affected under the Clean Air Interstate Rule (CAIR), two additional RAAs are required to provide year round QA for the PEMS because of the year round monitoring requirements of CAIR. The RAAs are required in the first and fourth calendar quarters of each year, except for quarters in which: (a) the unit operates for less than 168 hours; (b) a full 9-run RATA is performed; or (c) the PEMS is recertified. Further justification for these two quarterly RAAs is provided in Attachment C.

The RAAs shall be done on a lb NO_x/mmBtu basis, and shall be performed using either EPA Reference Methods 7E and 3A in Part 60, Appendix A-4 or a portable analyzer. To the extent practicable, each RAA shall be done at different operating conditions from the previous one. Follow the portable analyzer manufacturer's recommended maintenance procedures.

The minimum time per RAA run shall be 20 minutes. The reference method traverse point selection shall be consistent with Part 75, Appendix A, section 6.5.6. Alternatively, a single measurement point located at least 1.0 meter from the stack or duct wall may be used without performing a stratification test.

Results of the RAA shall be calculated using Equation 1-1 in Appendix F to Part 60. Bias-adjusted data from the PEMS (using the bias adjustment factor from the most-recent RATA) shall be used in the calculations. The results of the RAA are acceptable if the performance specifications in the "PEMS Ongoing QA/QC Tests" table in paragraph (b) are met. If the RAA is failed, follow the provisions in paragraph (g). No grace periods are allowed.

Report the results of all RAAs in the appropriate quarterly electronic data report. Use EDR

record type 624, and report the results of each test as either "pass" or "fail". Report the QA test code in column 53 of RT 624 as "05".

If a portable chemiluminescent NO_x analyzer is used to perform the required RAAs, the procedures of Method 7E in Part 60, Appendix A-4 shall be followed. The analyzer performance specifications in Method 7E for calibration error, system bias, and calibration drift shall be met.

If a portable electrochemical analyzer is used to perform the required RAAs, ASTM Method D6522-00[20], as modified below, shall be followed. ASTM D6522-00 applies to the measurement of NO_x (NO and NO_2), CO, and O_2 concentrations in emissions from natural gas-fired combustion systems using electrochemical analyzers. The method was developed based on studies sponsored by the Gas Research Institute (GRI)[21]. It has also been peer-reviewed, approved by ASTM Committees D22.03 and D22, and accepted by EPA as a conditional test method (CTM-030). ASTM D6522-00 prescribes analyzer design specifications, test procedures, and instrument performance requirements that are similar to the checks in EPA's instrumental test methods (e.g., Methods 7E and 20). These checks include linearity, interference, stability, pre-test calibration error, and post-test calibration error.

Based on the results of EPA's portable analyzer study[22], the following modifications to ASTM D6522-00 are required to make the method more practical without sacrificing accuracy: (a) NO_x analyzers must provide readings to 0.1 ppm to improve the likelihood of passing the performance specifications for sources with low NO_x levels; (b) an alternative performance specification (e.g., $\pm$ 1 ppm difference from reference value) will be applied to take account of sources with low concentrations of NO_x; and (c) the measurement system must be purged with ambient air between gas injections during the stability check, to reduce degradation of electrochemical cell performance (see footnote 23, below).

The measurement system performance specifications as modified by the EPA portable analyzer study are shown in the following table.

ASTM Method D6522-00 Measurement System Performance Specifications (as Modified by EPA Portable Analyzer Study)

Performance Check	Gas	Acceptance Criteria
Zero Calibration Error	NO, NO_2	$\leq$ 3 percent of span gas value or $\pm$ 1.0 ppm difference, whichever is less restrictive
	O_2	$\leq$ 0.3 percent O_2
Span Calibration Error	NO, NO_2	$\leq$ 5 percent of span gas value or $\pm$ 1.0 ppm difference, whichever is less restrictive
	O_2	$\leq$ 0.5 percent O_2
Interference	NO, NO_2, O_2	$\leq$ 5 percent of average stack NO concentration for each test run (using span gas checks)

[20]ASTM D6522-00, "Standard Test Method for Determination of Nitrogen Oxides, Carbon Monoxide, and Oxygen Concentrations in Emissions from Natural Gas-Fired Reciprocating Engines, Combustion Turbines, Boilers, and Process Heaters Using Portable Analyzers".

[21]GRI (Gas Research Institute), "Topical Report, Development of an Electrochemical Cell Emission Analyzer Test Method", July, 1997.

[22]"Evaluation of Portable Analyzers for Use in Quality Assuring Predictive Emission Monitoring Systems for NOx", The Cadmus Group, Inc., September 8, 2004.

Linearity	NO, O_2	≤ 2.5 percent of span gas concentration or ± 1.0 ppm difference, whichever is less restrictive
	NO_2	≤ 3.0 percent of span gas concentration or ± 1.0 ppm difference, whichever is less restrictive
Stability [23]	NO, NO_2 O_2	≤ 2.0 percent of span gas concentration or ± 1.0 ppm max-min difference, whichever is less restrictive, for 30-minute period ≤ 1.0 percent of span gas concentration or ± 1.0 ppm max-min difference, whichever is less restrictive, for 15-minute period
Cell Temperature		± 5 °F from initial temperature

(g) If a RAA or a RATA is failed due to a problem with the PEMS, or if changes occur that result in a significant change in NO_x emission rate relative to the previous PEMS training conditions (e.g., boiler aging, process modification, new process operating modes, or changes to emission controls), the following tests and procedures shall be performed to recertify the PEMS, in this order:

(1) Ensure that the Sensor Validation System meets the requirements of paragraph (c).

(2) Re-train the PEMS according to the manufacturer's recommendations.[24]

(3) Ensure that the requirements in paragraph (d) are met.

(4) Ensure that requirements in paragraph (e) are met.

(5) Perform a RATA, following the procedures in Part 75, Appendix A, section 6.5, except use three different operating levels (low, mid, and high) as defined in section 6.5.2.1 of Part 75, Appendix A. However, because the PEMS is only approved for use within the operating envelope, use the operating envelope minimums and maximums to determine the lower and upper boundaries of the range of operation. Use paired PEMS and reference method data to calculate the results on a lb NO_x/mmBtu basis. Calculations shall be based on a minimum of 30 runs at each operating level. MeadWestvaco shall apply to each operating level the RATA performance specifications contained in the "PEMS Ongoing QA/QC Tests" table in paragraph (b). Report the RATA data and results of only the normal operating level in EDR record types 610 and 611 and keep the data and results for the other two operating levels on-site, available for inspection. The RATA result for the normal operating level determines when the next RATA is due.

(6) Conduct an F-test, and a correlation analysis using Part 75, Subpart E equations at low, mid, and high operating levels. The F-test is to be applied to data at each operating level separately. The correlation analysis shall be performed using all data collected at the three operating levels combined. If the standard deviation of the reference method NO_x data at any operating level is less than either 3 percent of the span or 5 ppm, a reference method standard deviation of either 3 percent of span or 5 ppm may be used at that operating level when applying the F-test. At any operating level, if the mean value of the reference method NO_x data is less than 5 ppm, the correlation analysis (r-test) may be performed at the remaining operating levels combined rather than at all three operating levels combined. Report the F-test and r-test results in record type 641.

(7) Perform a bias test (one-tailed t-test) at the normal operating level according to Part 75,

[24]If a reference method is used to provide training data for the PEMS, the training data may be used to calculate the relative accuracy at each operating level and the normal level bias, and to set up the alarm system.

Appendix A, section 7.6. If the bias test is failed, calculate and apply a bias adjustment factor (BAF) to the subsequent NO_x emission rate data. Report the bias test results in record type 611.

(8) The tests and procedures in this paragraph (g) shall be completed by the earlier of 60 unit operating days (as defined in §72.2) or 180 calendar days after the failed RAA or failed RATA or after the change that caused a significant change in NO_x emission rate. MeadWestvaco shall use the appropriate Part 75 missing data procedures (see section 5 below), starting from the hour of the failed RAA or RATA and ending with the hour of successful passage or completion of the tests and procedures, as required above. MeadWestvaco shall report the maximum potential NO_x emission rate (MER) from paragraph (h) and shall use a Method of Determination Code of "55", i.e., "Other substitute data approved through petition by EPA", in RT 320 for reporting lb NO_x/mmBtu emission rate, starting with the hour of the change that caused a significant change in NO_x emission rate and ending the hour of successful passage or completion of the tests and procedures in steps (1) through (7) above. Notification of recertification of the PEMS shall be provided according to §75.61.

(h) For any hour or partial hour of startup or shutdown operation, or when Unit Z008 fires any oil, MeadWestvaco must report the NO_x MER, as defined in §72.2. For the purposes of this approval, the MER shall be 1.500 lb/mmBtu when Z008 is firing only gas, and 2.000 lb/mmBtu when Z008 fires any oil. A Method of Determination Code "55", i.e., "Other substitute data approved through petition by EPA" shall be used in RT 320 when reporting the MER.

(i) MeadWestvaco must perform monthly diesel GCV sampling during each ozone season, starting in the 2004 ozone season and continuing indefinitely thereafter. If the results of any monthly sample exceed the 20,000 Btu/lb default GCV value, MeadWestvaco shall use that higher GCV value as the new default value to determine heat input and NO_x mass emissions. For every hour that Unit Z008 fires diesel fuel, MeadWestvaco shall use the default GCV, the fuel flow meter output and the NO_x MER to calculate and report NO_x mass emissions. Whenever the GCV value is updated, MeadWestvaco shall report the new GCV in RT 302 of the electronic data report (EDR) for the quarter in which the change in GCV occurs.

5. Missing Data Substitution

Under §75.46, the owner or operator must demonstrate that all missing data can be accounted for in a manner consistent with the applicable missing data procedures in Subpart D (except where alternate procedures are required in this final approval). In the April 30, 2003 petition, MeadWestvaco stated that the PEMS meets the Subpart D requirements, including the initial missing data procedures, determination of monitor data availability, standard missing data procedures, and that the PEMS and the data acquisition and handling system meet the missing data requirements in Part 75, Appendix D, section 2.4. According to MeadWestvaco, the PEMS determines monitor data availability, assesses the operating times for which data must be substituted, and recovers historical data from the PI data historian. The elapsed out-of-control time of the PEMS is monitored, allowing the PEMS to retrieve the data necessary to perform the substitution. Once the data has been retrieved, the required calculations are performed. To assist in analyzing missing data, the software provides data managing reports that allow the user to monitor the out-of-control time (or monitor data availability), data gap analysis, recovered data queries, substituted data usage, and the standard reporting requirements.

6. Additional Requirements

MeadWestvaco shall submit the operating envelope for Unit Z008 to the Alabama Department of Environmental Management and to EPA Region 4 for inclusion in the hardcopy monitoring plan. Any time changes are made to the PEMS operating envelope, the complete, revised PEMS operating envelope shall be submitted in a hardcopy monitoring plan by the applicable deadline in §75.62(a)(2). More information on monitoring plan submittals, revisions and other submittals can be found at: http://www.epa.gov/airmarkets/monitoring/http://www.epa.gov/airmarkets/monitoring/submissions/monplan.html.

MeadWestvaco shall follow the EDR version 2.2 reporting instructions, found at: http://www.epa.gov/airmarkets/reporting/edr21/, in conjunction with the required PEMS record types, and the supplementary EDR reporting instructions attached to this petition response, to report data from the PEMS. Monitoring Data Checking (MDC) software that can be used to quality assure the electronic reports prior to submission is found at: http://www.epa.gov/airmarkets/reporting/index.html.

12/13/05

BASIC EDR REPORTING FOR PREDICTIVE EMISSIONS MONITORING SYSTEMS (PEMS)

I. Introduction

Table A-15, below includes the essential EDR record types for units that have received approval under Subpart E of Part 75 to use PEMS to report NO_x emissions. The scope of Table A-15 is limited to affected oil and gas-fired units (i.e., boilers and combustion turbines) that:

- Have a single unit-single stack exhaust configuration; and

i. Use Part 75, Appendix D methodology to quantify unit heat input; and
- Use Part 75, Appendices D and G to account for SO_2 and CO_2 mass emissions (if the units are in the Acid Rain Program); and
- Do not co-fire oil and gas.

For PEMS reporting, EDR version 2.2 must be used, since fuel-specific missing data substitution for NO_x emission rate is required. For hourly NO_x emission rate reporting, RT 320 is used. Hourly 200-level records are <u>not</u> reported for either NO_x concentration or diluent gas (O_2 or CO_2) concentration.

For units that burn more than one fuel type, separate PEMS are required for each fuel. Each PEMS should be reported as a separate monitoring system with a unique monitoring system ID in RT 510. Each PEMS will require its own set of certification, recertification, and quality assurance tests.

II. Interpreting Table A-15

In Table A-15, the first column identifies the record type. The second column gives a brief description of the record type. The third, fourth, and fifth columns indicate whether the record type must be reported for a particular type of submittal. The third column header, "MP," refers to monitoring plan submittals. The fourth column header, "CT," stands for certification or recertification applications. The fifth column header, "QT," refers to electronic data report submittals. The letter codes in columns 3 through 5 are defined as follows:

Y This record type is required for this type of submittal (monitoring plan, certification/recertification application or electronic data report)

N This record type is not appropriate for this type of submittal.

O This record type is appropriate, but optional for this type of submittal.

A This record type <u>may</u> be required for this submittal. If any doubt exists as to the need to submit this record type, consult the appropriate EDR instructions.

T This record type is required each time a quality assurance test (e.g., a RATA) is performed.

Column 6 identifies the units covered by the record type as units subject to the Acid Rain Program ("ARP") or units subject to Part 75, Subpart H ("Subpart H").

Table A-15
EDR RECORD TYPES FOR UNITS WITH PEMS

Record Type	Description	MP	CT	QT	Program Applicability and Comments
100	Facility Identification	Y	Y	Y	ARP, Subpart H
	Record Types Submitted				ARP, Subpart H
	Facility Location and Identification Information				ARP, Subpart H
300	Operating Data	N	N	Y	ARP, Subpart H • Report one RT 300 for each hour in the quarter, except when a unit does not operate during the entire quarter. • For each operating hour, report the fuel combusted in column 64.
301	Quarterly Cumulative Emissions	N	N	Y	ARP • Quarterly NO_x emission rate is the arithmetic average of the RT 320, col 42 values
302	Oil Fuel Flow	N	N	Y	ARP, Subpart H • For ARP units, must be paired with RT 313 when reporting SO_2 mass emissions.
303	Gas Fuel Flow	N	N	Y	ARP, Subpart H • For ARP units, must be paired with RT 314 when reporting SO_2 mass emissions.
307	Cumulative NO_x Mass Emissions	N	N	Y	Subpart H
	SO_2 Mass Emissions (Oil)				ARP
	SO_2 Mass Emissions (Gas)				ARP
	NO_x Emission Rate Estimation	N	N	Y	ARP, Subpart H • See supplementary reporting instructions.
328	NO_x Mass Emissions	N	N	Y	Subpart H • See supplementary reporting instructions.
330	CO_2 Mass Emissions Data	N	N	A	ARP • Report RT 330 for hours in which Equation G-4 is used to determine hourly CO_2 mass emissions for gas or oil-fired units.
331	CO_2 Mass Emissions Estimation Parameters	N	N	A	ARP • Report RT 331 if you estimate CO_2 mass emissions using fuel sampling and Equation G-1
504	Unit Information	Y	Y	Y	ARP, Subpart H
	Program Indicator for Report				ARP, Subpart H
	EIA Cross Reference Information				ARP, Subpart H
	Peaking Unit or ARP Gas-Fired Unit Qualification Data				ARP

	Subpart H Reporting Frequency Change				Subpart H
	Monitoring Systems/Analytical Components Table				ARP, Subpart H • See supplementary reporting instructions.
520	Formula Table	Y	Y	Y	ARP, Subpart H • Report formulas for SO_2 and CO_2 mass emissions (ARP units,only), NO_x mass emissions (Subpart H units), and unit heat input rate.
531	Defaults and Constants	Y	Y	Y	ARP, Subpart H • See supplementary reporting instructions.
535	Unit and Stack Operating Load Data	Y	Y	Y	ARP, Subpart H Required for any unit using load-based missing data procedures for NO_x or fuel flow rate.
536	Range of Operation, Normal Load, and Load Usage	Y	Y	Y	ARP, Subpart H • Report RT 536 to define operating range and normal load for RATA testing
540	Fuel Flowmeter Data	Y	Y	Y	ARP, Subpart H
	Reasons for Monitoring System Downtime or Missing Parameter				ARP, Subpart H • See supplementary reporting instructions.
556	Monitoring System Recertification, Maintenance, or Other Events	N	Y	A	ARP, Subpart H • Report RT 556 for recertification of the PEMS or fuel flowmeters • See supplementary reporting instructions.

585	Monitoring Methodology Information	Y	Y	Y	ARP, Subpart H • See supplementary reporting instructions.
586	Control Equipment Information	A	A	A	ARP, Subpart H
	Unit Fuel Type				ARP, Subpart H
	RATA and Bias Test Data				ARP, Subpart H • Report RTs 610 each time a RATA is performed for certification, recertification or for on-going QA/QC. • See supplementary reporting instructions.
611	RATA and Bias Test Results	N	Y	T	ARP, Subpart H • Report RT 611 each time a RATA is performed for certification, recertification or for on-going QA/QC. • See supplementary reporting instructions.
624	Other QA Activities	N	N	Y	ARP, Subpart H • Report RT 624 for PEMS daily QA/QC and for PEMS periodic accuracy checks using a reference method, or a portable analyzer. • See supplementary reporting instructions.
627	Fuel Flowmeter Accuracy Test	N	A	T	ARP, Subpart H • Report only for fuel flowmeters that are certified and quality assured by periodic accuracy tests according to Part 75, Appendix D, section 2.1.5.1 or 2.1.5.2.
628	Fuel Flowmeter Accuracy Test for Orifice, Nozzle and Venturi Flowmeter	N	A	T	ARP, Subpart H • Report only for orifice, nozzle and venturi-type flowmeters that are quality assured by periodic transmitter/transducer calibrations.
629	Fuel Flow-to-load Ratio Test Baseline Data	N	N	A	ARP, Subpart H • Report if quarterly fuel flow-to-load ratio test in Part 75, Appendix D, section 2.1.7 is used to extend fuel flowmeter accuracy test deadlines.

630	Quarterly Fuel Flow-to-load Ratio Test Results	N	N	A	ARP, Subpart H • Report if quarterly fuel flow-to-load ratio test in Part 75, Appendix D, section 2.1.7 is used to extend fuel flowmeter accuracy test deadlines.
640	Alternative Monitoring System Approval Petition Data	N	Y	A	ARP, Subpart H • Report when certifying a PEMS
641	Alternative Monitoring System Approval Petition Results and Statistics	N	Y	A	ARP, Subpart H • Report when certifying or recertifying a PEMS
696	Fuel Flowmeter Accuracy Test Extension	N	N	A	ARP, Subpart H • Use RT 696 to claim allowable extensions of fuel flowmeter accuracy test deadlines.
697	RATA Deadline Extension or Exemption	N	N	A	ARP, Subpart H • Report when claiming a RATA deadline extension under Part 75, Appendix B, section 2.3.3.
699	QA Test Extension Based on Grace Period	N	N	A	ARP, Subpart H • Report when claiming a QA test deadline extension under Part 75, Appendix B, section 2.2.4.
900	Certifications	Y	Y	Y	ARP
	Certifications				ARP
	Comments				ARP, Subpart H • See supplementary reporting instructions.
920	Comments	O	O	O	ARP, Subpart H
	Certifications				Subpart H
941	Certifications	Y	Y	Y	Subpart H
999	Contact Information	O	O	O	ARP, Subpart H

INSTRUCTIONS FOR PEMS

For a unit with an approved petition to use a predictive emissions monitoring system (PEMS), use the following supplementary instructions, in conjunction with the EDR version 2.2 Reporting Instructions document, to prepare the required EDR submittals.

RT 320

Monitoring System ID (10). Report the monitoring system ID (from RT 510, column 13) of the PEMS used to determine the NO_x emission rate during the hour.

F-Factor (26). Leave this field blank.

Average NO_x Emission Rate for the Hour (36). Report the average unadjusted NO_x emission rate for the hour (lb/mmBtu), rounded to three decimal places, as determined by the PEMS. For hours in which you use missing data procedures, leave this field blank.

Adjusted Average NO_x Emission Rate for the Hour (42). For each hour in which you report NO_x emission rate in column 36, apply the appropriate adjustment factor (1.000 or the BAF) to the unadjusted average emission rate, and report the result rounded to three decimal places. For each hour in which you use missing data procedures, report the appropriate substitute value.

Formula ID (50). Leave this field blank.

Method of Determination Code (53). Report "03" when you use the PEMS to determine the NO_x emissions rate. Report "12" when you report the fuel-specific maximum NO_x emission rate (e.g., during hours of startup or shutdown or when NO_x controls (if any) are not functioning properly). During hours when you use other missing data procedures, report the appropriate MODC listed in the EDR instructions.

RT 328

NOx Methodology for the Hour (45). Report "NOXR-PEMS".

RT 510

The PEMS monitoring system consists of either one or two data acquisition and handling system (DAHS) components. For single-component PEMS systems or for systems where the PEMS software and standard DAHS software have the same manufacturer/provider, model or version number, report one RT 510 for the PEMS system. If the PEMS software and the standard DAHS software have different manufacturer/providers, model or version numbers, report each as a separate RT 510 with the same PEMS monitoring system ID.

Component ID (10). Report the three-character alphanumeric ID for each DAHS component.

Monitoring System ID (13). Create a unique three-character alphanumeric ID for each PEMS monitoring system. Define a separate NO_x PEMS system for each fuel type. For sources switching from NO_x CEMS or Part 75, Appendix E to PEMS, do not re-use the CEMS or Appendix E system ID numbers.
System Parameter Monitored (17). If your PEMS is approved for NO_x emission rate (lb/mmBtu) and if you use the NO_x emission rate to calculate NO_x mass emissions, report "NOX" for the system parameter monitored. If your PEMS is approved for NO_x concentration (ppm) and if you calculate NO_x mass emissions as the product of NO_x concentration times flow rate, report "NOXC" for the system parameter monitored.

Primary/Backup Designation (21). Report "PE" to indicate that this is a predictive emissions monitoring system.

Component Type Code (23). Report "DAHS" as the component type code.

Sample Acquisition Method (27). Leave this field blank.

Manufacturer (30). Report the name of the manufacturer or developer of the software component.

Model/Version (55). Report the model/version of the software component.

Serial Number (70). Report the serial number, if applicable—otherwise leave blank.

RT 531

Parameter (10). Report "NORX" as the parameter monitored. (You should report one 531 record for each fuel type.)

Default Value (14). Report the fuel-specific maximum potential NO_x emission rate (MER), in units of lb/mmBtu.

Units of Measure (27). Report "LBMMBTU".

Purpose or Intended Use (34). Report "MD" for missing data.

Type of Fuel (37). Report the fuel type code for the fuel. (See the EDR Instructions for RT 531 for the list of available codes.)

Indicator of Use (40). Report "A" for any hour.

Source of Value (41). Report "DEF" for default value.

RT 550

Parameter (10). Report "NOX".

Monitoring System ID (14). Report the monitoring system ID, from RT 510, of the NO_x PEMS system.

RT 556

Component ID (10). Report the PEMS component ID subject to recertification/diagnostic testing, if a specific component is involved. If the event is system, not component, specific, leave this field blank.

Monitoring System ID (13). Report the monitoring system ID, from RT 510, of the NO_x PEMS system.

Event Code (16). Report code "99" (i.e., "Other").

Code for Required Test (19). Codes for PEMS systems are:

80 PEMS sensor validation system (minimum data capture check), train or retrain (if manufacturer recommends), sensor validation system (alarm system set-up and failed sensor alert check), daily QA/QC, 3 operating level RATA, statistical tests, and normal operating level bias test;

81 PEMS daily QA/QC, and PEMS check with reference method or portable analyzer;

Beginning of Conditionally Valid Period (31, 39). If conditional data validation is used, report the date and hour that the probationary PEMS daily QA/QC test was successfully completed according to the provisions of §75.20(b)(3)(ii).

Note: For PEMS, you may only use conditional data validation if the "event" in column 16 requires RATA testing. If you elect to use conditional data validation, you must complete the RATA within the allotted time in §75.20(b)(3)(iv).

RT 585

Parameter (10). If your PEMS is approved for NO_x emission rate (lb/mmBtu) and if you use the NO_x emission rate to calculate NO_x mass emissions, report "NOXR" as the parameter code associated with the PEMS. If your PEMS is approved for NO_x concentration (ppm) and if you calculate NO_x mass emissions as the product of NO_x concentration times flow rate, report "NOXM" as the parameter code associated with the PEMS. Report one RT 585 for each generic fuel type combusted.

Monitoring Methodology (14). Report "PEMS" as the monitoring methodology for the PEMS.

Missing Data Approach for Methodology (28). Report "FSP75" for the fuel-specific missing data approach for the PEMS methodology.

RT 610

Units of Measure (33). Report "2" (lb/mmBtu) as the units of measure.

Value from CEM System Being Tested (34). Report the average value recorded by the PEMS, for each RATA run.

RT 611

Units of Measure (34). Report "2" (lb/mmBtu) as the units of measure.

Arithmetic Mean of CEM Values (35). Report the arithmetic mean of all the RTs 610 PEMS values associated with the RATA.

Number of Load Levels Comprising Test (133). Report "1" or "3" (if certification or recert).

BAF for a Multiple-Load RATA (134). Leave this field blank.

RT 624

Component ID (10). Report the PEMS software component ID from RT 510.

Monitoring System ID (13). Report the NO_x monitoring system ID from RT 510.

Parameter (16). Report "NOX".

QA Test Activity Description (30). Fill in appropriately.

Reason for Test (51). Report "Q".

QA Test Code (53). Report one of the following codes, as appropriate:

04 PEMS daily QA/QC

05 Periodic check of PEMS accuracy with a portable analyzer, or reference method

RT 640

Submit RT 640 only with the Subpart E application for initial certification of the PEMS. Do not submit RT 640 for PEMS recertification.

Component ID (10). Report the PEMS software component ID from RT 510.

Monitoring System ID (13). Report the NO_x monitoring system ID from RT 510.

RT 641

Submit RT 641 with the Part 75, Subpart E application for initial certification of the PEMS and for all recertifications of the PEMS. For initial certification, fill in all applicable data fields in RT 641. For PEMS recertification, report only the data elements in start columns 1 through13, column 95 (the F-statistic), column 108 (Critical value of F at 95% confidence level for sample size), and column 121 (Coefficient of correlation (Pearson's r) of CEM and AMS data).

Component ID (10). Report the PEMS software component ID from RT 510.

Monitoring System ID (13). Report the NO_x monitoring system ID from RT 510.

RT 910

Text (4). Briefly describe the PEMS.

Attachment C

JUSTIFICATION FOR RAA TESTING OF THE PEMS

A. Background

A NO_x PEMS is a piece of software that provides an indirect determination of NO_x emissions. It can provide an accurate indication of NO_x levels if it is properly developed, trained, and quality-assured. Normally, a PEMS is trained over a one week (or longer) time period and over a wide range of source operating conditions. However, even the best training regimen cannot include all possible operating conditions, e.g., upsets, sticky valves, or other unforeseen events, that can affect emissions but are not reflected in the PEMS output.

One safeguard against this is to implement a PEMS algorithm that identifies potentially failed sensors and PEMS input parameters that are outside of the expected range of values, by comparing the readings from each sensor to several other sensors and determining expected sensor values based on the historical sensor relationships developed during PEMS training. When unacceptable sensor values are identified, an alarm is activated, the PEMS is considered out of control, and the maximum potential NO_x emission rate must be reported until the sensor is fixed or the PEMS is retrained. Reporting standard missing data values or allowing a substitute sensor value calculated by the PEMS is not a complete solution because the PEMS cannot determine whether the abnormal input parameter value is caused by a failed sensor or by some new region of operation not represented in the PEMS training data.

An even better safeguard against unforeseen events that can affect NO_x emissions but may not be reflected in the PEMS output is to periodically compare the PEMS output to a quality assured, direct measurement of stack emissions, e.g., by performing a RATA. However, RATAs are costly and are generally performed only once or twice a year. Therefore, other, less-expensive accuracy checks should be done in-between the RATAs, to provide ongoing assurance of data quality. For continuous emission monitoring systems (CEMS), the RATAs are supplemented by daily calibration error checks and quarterly linearity checks, which use calibration gases. However, these tests cannot be done on a PEMS, because calibration gas cannot be injected into a PEMS. Therefore, some other type of periodic accuracy check suitable for a PEMS is needed to supplement the RATAs, in order to adequately quality assure the PEMS data for use in a cap and trade program.

In paragraphs (e) and (j) of EPA's January 28, 2003 conditional PEMS approval for Mahrt Unit X022, and in paragraphs (e) and (g) of EPA's March 1, 2004 conditional PEMS approval for Mahrt Unit Z008, the Agency reserved the right to require the owner or operator of Units X022 and Z008, i.e., MeadWestvaco, to use portable NO_x and diluent gas (CO_2 or O_2) analyzers to perform periodic assessments of the accuracy of the PEMS, if and when EPA determined that portable NO_x analyzers can provide adequate PEMS accuracy checks. EPA stated that it would provide MeadWestvaco with the necessary performance specifications, sampling frequency, methodology, and reporting guidance, should this become a requirement. EPA also stated that over the next few months, it would test several portable electrochemical and chemiluminescent NO_x analyzers at combustion turbine sites to determine how well these analyzers work. Finally, EPA indicated that if periodic, direct checks of PEMS accuracy with portable analyzers should become a requirement, it would be implemented in such a way that the unit would be tested at different operating levels from check-to-check.

Since issuing the January 28, 2003 and March 1, 2004 conditional PEMS approvals, EPA has completed a field study of portable NO_x monitors, analyzed the results, and performed a cost assessment[25]. For the two natural gas-fired combustion turbines tested, the accuracy of the portable analyzers at NO_x concentration levels of 3 ppm and higher was found to be comparable to that of a certified Part 75 CEMS and to EPA Reference Method 7E. Thus, portable analyzers are suitable for periodic accuracy tests of a PEMS.

B. Monthly 3-Run Relative Accuracy Audits in the Ozone Season

EPA believes that monthly 3-run relative accuracy audits (RAAs) performed during the ozone season using a portable analyzer will provide the necessary additional QA for the PEMS installed on Mahrt Units X022 and Z008 under the NO_x Budget Trading Program. The monthly frequency was chosen by EPA as a compromise between a daily and a quarterly check of the PEMS against a direct emission measurement. Because the NO_x Budget Trading Program is concerned with controlling ozone, EPA decided that performing monthly RAAs on the PEMS during the ozone season (May through September) is an appropriate level of quality assurance.

[25] "Evaluation of Portable Analyzers for Use in Quality Assuring Predictive Emission Monitoring Systems for NOx", The Cadmus Group, Inc., September 8, 2004.

C. Quarterly 3-Run RAAs in First and Fourth Quarters

Starting on January 1, 2008, Units X022 and Z008 may need to comply with the monitoring requirements of the Clean Air Interstate Rule (CAIR). Under CAIR, certain sources in Alabama are controlled out of concern for both ozone and fine particulate concentrations. The previously discussed monthly RAAs in the ozone season cover the second and third quarters only. However, fine particulate is a year round problem. Therefore, for whichever unit(s) are affected under CAIR, two additional RAAs are required to provide year round QA for the PEMS. One of these RAAs is required in the first quarter and the other in the fourth quarter. For the first and fourth quarters, EPA has decided to provide the greater flexibility of quarterly rather than monthly RAAs out of safety concerns of performing stack tests during winter months.

D. Cost Analysis

EPA has assessed the potential cost associated with an RAA requirement. The Agency estimates that performing the additional five monthly RAAs during the ozone season and two RAAs during the non-ozone season using a portable analyzer with trained in-house staff would bring the total annual cost of operating, maintaining and quality-assuring two PEMS at one site (such as the PEMS on Units X022 and Z008) to approximately $51,700. (If outside contractors are used, instead of in-house staff, the total annual cost would be $88,750). This cost includes $6,000 annualized equipment cost for a portable analyzer plus $15,700 operation and maintenance (O&M) costs associated with QA testing (including an annual 9-run RATA for each of the two PEMS performed by an outside test contractor, and seven 3-run RAAs performed by in-house staff using a portable analyzer), and $30,000 for PEMS O&M. This represents an annualized increase of about $13,700 above the cost without the seven RAAs.

EPA believes that the cost of the additional RAAs is reasonable. According to EPA's CEM Cost Model, the next least costly option for two units at the same site to comply with Subpart H of Part 75 would be NO_x-diluent CEMS. The total annual cost of operating and maintaining two CEMS is estimated at $125,400. This cost includes $15,000 annualized equipment cost per CEMS plus $47,700 O&M costs per CEMS (including an annual RATA per CEMS). Thus, even with the additional RAA requirement, the estimated annual cost of operating and maintaining two PEMS at the Mahrt mill using trained in-house staff and a portable analyzer would be less than half the cost associated with CEMS. Even if outside contractors are used instead of in-house staff, the annual cost for two PEMS would be significantly less ($36,650 less) than the annual cost associated with two CEMS.

E. Additional Statistical Tests and 3-Load RATAs

In paragraph (k) of EPA's January 28, 2003 conditional PEMS approval for Mahrt Unit X022 and in paragraph (j) of EPA's March 1, 2004 conditional PEMS approval for Mahrt Unit Z008, the Agency reserved the right to require new statistical procedures or to change the ones currently required. Since issuing the conditional PEMS approvals, EPA has completed a field study of a hybrid neural network based PEMS at two gas-fired combustion turbines[26]. The study suggested that application of the Part 75, Subpart E statistics to a smaller data set, when coupled with a three-level RATA to evaluate the PEMS predictions across the PEMS "operating envelope", is a good measure of PEMS performance.

EPA performed a Subpart E statistical analysis of 720 hours of matched pairs of PEMS and CEMS data for one participating combustion turbine and 830 matched data pairs for another, and then performed the same statistics on 30-point subsets of these data. The results of these analyses showed that most of the 30-point subsets passed the same combination of statistical tests as the full data set. The field test data also illustrated the importance of testing the PEMS over the full operating range of the unit because of the strong correlation between NO_x emissions to certain unit operating parameters. Based on this evaluation, EPA believes that whenever the PEMS is recertified, a three load RATA (with a minimum of 30 paired data points at each load level) should be required in conjunction with input sensor failure checks and certain abbreviated Subpart E statistical tests; in particular, the F-test, the correlation analysis, and the t-test.

[26] "Evaluation and Field Testing of Nitrogen Oxide (NO_x) Predictive Emission Monitoring Systems (PEMS) for Gas-fired Combustion Turbines - Synthesis Report", The Cadmus Group, Inc., December 29, 2004 .