QUALITY ASSURANCE & QUALITY CONTROL PLAN PARTICULATE MATTER CONTINOUS EMISSION MONITORING SYSTEM (PM-CEMS)

MONTROSE – UNIT 1, 2, AND 3
ORIS 02080
July 24, 2006

Prepared by:

Teledyne Monitor Labs, Inc • 35 Inverness Drive East • Englewood, CO 80112

Revision Number:_____
Date of Revision:_____

APPENDICES

SECTION 1 – THE QUALITY ASSURANCE PLAN

This Quality Assurance (QA) Plan is the basis for assessing and maintaining the quality of particulate matter continous emission monitoring system (PM-CEMS) data. This QA Plan has been prepared for Kansas City Power and Light, operators of three (3) particulate matter continous emission monitoring systems at the Montrose Generating Station. Section 1 of this plan is intended to outline the basic requirements with more detailed procedures for compliance included in Section 2. Each PM-CEMS output will be used to provide a reasonable level of compliance assurance by indicating electrostatic precipitator (ESP) performance.

Table I below illustrates the PM-CEMS that have been installed at the facility.

Table I. PM-CEMS installed and certified at KCP&L Montrose Station

Mfr/Model	Serial Number	Measurement Range	Location	Correlation Test Date
Teledyne Monitor Labs / LaserHawk 360	TBD	TBD	Unit 1	TBD
Teledyne Monitor Labs / LaserHawk 360	TBD	TBD	Unit 2	TBD
Teledyne Monitor Labs / LaserHawk 360	TBD	TBD	Unit 3	TBD

The PM-CEMS are installed to comply with 10 CSR 10-3.060, Maximum Allowable Emission of Particulate Matter from Fuel Burning Equipment Used for Indirect Heating. The emission limit is 0.20 lb lb/MMBTU on a station-wide average basis, except during periods of startup, shutdown and malfunction per 40 CFR 60.8(c). The PM-CEMS will provide emissions data to help in the operation and maintenance of the ESPs installed at this facility. This QA Plan was developed from guidelines by the State of Missouri Department of Natural Resources (MDNR) and the U.S. Environmental Protection Agency.

1.1 QUALITY ASSURANCE POLICY, GOAL, AND OBJECTIVES

Quality Assurance can be defined as the system of activities to provide assurance that the QC is performing adequately.

A QA Plan has two functions:

(1) QA – the assessment of the quality of the data (accuracy and precision) and, (2) QC – activities that maintain or improve data quality. Both functions form a control loop. When accuracy or precision is unacceptable, QC must increase until the quality of data is acceptable.

Quality control functions are usually a series of frequent internal checks, such as system inspections, periodic calibrations, and routine maintenance. Quality assurance, on the other hand, involves less frequent external checks on data quality. These external checks may include independent system audits, third party sampling and analysis for accuracy and precision, comparison to known calibration standards or inter-laboratory audits. This Quality Assurance Plan encompasses both QA and QC functions, and whenever possible, specific activities are identified by the function that is fulfilled by the activity.

The goal of this QA program is the ongoing assessment of the particulate matter limit set in the Montrose Station Title V Operating Permit.

1.2 DISTRIBUTION AND DOCUMENT CONTROL

This QA Plan will be reviewed whenever changes are made to the ESP and/or PM monitoring installation as well as on an annual basis.

A revision tracking system will be provided on the front page of this document and will include:

Revision Number:_____
Date of Revision:_____

1.2.1 MAINTENANCE OF THE QA/QC PLAN

To properly maintain the QA Plan, the following activities are monitored:

(1) The current list of QA/QC plan holders.

(2) A continuous listing of revisions and updates of the QA/QC Plan as a result of the following:
- Changes in regulations;
- Modifications or improvements of QA/QC procedures;
- Changes in responsible personnel or organization;
- Replacement of PM-CEMS components;
- Modifications to operating permit.

1.3 ORGANIZATION AND RESPONSIBILITY

Specific facility personnel are assigned responsibility for the PM-CEMS operational status instrument maintenance and system control. The following are provided as a

guideline, which organize responsibilities for the operation and maintenance of a PM-CEMS.

1.3.1 PLANT MANAGER

Is responsible for reviewing and signing all quarterly reports. The Plant Manager has the ultimate responsibility for all violations.

1.3.2 ENVIRONMENTAL COMPLIANCE ADMNISTRATOR (ECA)

Has overall responsibility for the operation of the PM-CEMS, generation of appropriate reports, and correspondence with the regulatory agencies.

The ECA works closely with maintenance, operations, and instrument technicians to ensure that each PM-CEMS is operated and maintained as required. Reports all major problem associated with the PM-CEMS to the Plant Manager and the Environmental Services Department.

1.3.3 INSTRUMENTATION TECHNICIAN (IT)

The IT is responsible for regular inspection, maintenance/repair and associated documentation of each PM-CEMS. Communicates to facility management all PM-CEMS performance and maintenance problems. Ensures all preventive maintenance checks are performed and documented. Has responsibility for the calibration of the PM-CEMS.

1.4 FACILITIES, EQUIPMENT, AND SPARE PARTS INVENTORY

Each unit is equipped with an ESP to control particulate emissions. Units 2 and 3 exhaust through a common stack and Unit 1 exhausts through a dedicated stack. Continuous particulate matter monitoring will be performed on the exhaust duct of each unit following the ESP.

The PM-CEMS is wired to a programmable logic controller located in the control room and will record data in the existing Data Acquisition System as well as in the Continuous Emission Monitoring System (DAS) in the CEMS building.

1.4.1 PARTICULATE MATTER CONTINOUS EMISSION MONITORING SYSTEM

The particulate monitoring systems utilized are Teledyne Monitor Labs 360 particulate monitors, located on Units 1, 2, and 3 exhaust duct to the stack(s). Measurement of particulate concentration is accomplished by passing a beam of laser light into the duct and measuring the intensity of the backscattered light.

1.4.2 RECOMMENDED SPARE PARTS AND STACK DRAWINGS

A list of spare parts is included in the instrument operations manual. Stack drawings and process diagrams are also kept on site and available for review.

1.5 METHODS AND PROCEDURES – ANALYSIS AND DATA ACQUISITION

The PM-CEMS data acquisition system (DAS) is an automated system that records PM-CEMS data and provides readouts as one-minute averages, which are used in subsequent calculations and report preparation. Reports prepared by the system include alarm, calibration, and emission reports.

The DAS is capable of reading all values over the full range of each measurement device and creates a permanent record of all required measured and calculated data for storage, review, and reporting. A continuous readout in PM lb/mmBtu and boiler operating time are recorded in the CEMS software.

1.6 CALIBRATION AND QUALITY CONTROL CHECKS

The set of operation and maintenance manuals for all systems components is maintained in the CEMS shelter. These manuals provide complete descriptions of the PM-CEMS including theory, installation, operation, and maintenance.

Factory supplied filter standards are used to calibrate the instrument at a reference zero and upscale span value. These calibration standards will be maintained in accordance with the manufacturer's recommendations. Following this calibration an internal "zero-span" cycle will be initiated, thus establishing initial values for future reference. Daily "zero-span" cycles will follow with the results stored in the data system and compared with the initial values. Should either of the "zero or span" value error exceed ± 4% of the starting value, an alarm will be initiated to signal the need for recalibration of the instrument to the factory standards.

In addition a quarterly reference calibration will be performed as described in the instrument operations manual. The factory standards will be used to measure instrument response at a zero and upscale value. Should either of these readings exceed the factory standard by more than ± 4% of the full-scale measurement range, the instrument will be reset to the factory standard values. Finally, routine scheduled maintenance procedures will be established in accordance with the manufacturer's recommendations.

1.7 MAINTENANCE - PREVENTIVE

The preventive maintenance program for the PM-CEMS is based on the equipment manufacturer's recommended procedures.

1.8 SYSTEMS AUDITS

A systems audit involves a general inspection of the monitoring system. It is intended as a walk through audit and used to provide a quick assessment of the availability of data, general effectiveness of operation and maintenance, and the completeness of recordkeeping procedures. Systems audit involves the following areas:

- Administrative
  - Maintenance logs – timely, complete
  - Recordkeeping – completeness, available
  - Verify correct range values entered into the data acquisition system

- Technical
  - Printer – operational, legible printouts consistent with process conditions
  - Data system – cabinets clean, areas maintained
  - Monitor enclosure – clean, all systems operational
  - Purge air blowers – operational

1.9 PERFORMANCE AUDITS

The purpose of Procedure 2 is to establish the minimum requirements for evaluating the effectiveness of quality control (QC) and quality assurance (QA) procedures and the quality of data produced by the particulate monitor continuous monitoring system. Procedure 2 applies to PM-CEMS used for continuously determining compliance with emission standards or operating permit limits as specified in an applicable regulation or permit. Montrose Station is using the PM-CEMS as an indicator of PM emissions and therefore will meet the frequency requirements for relative response and response correlation audits as stated below. Montrose will complete the daily zero and upscale drift checks, absolute correlation audit as suggested in Procedure 2.

1.9.1 ABSOLUTE CORRELATION AUDIT (ACA)

An Absolute Correlation Audit is required once each calendar quarter but no sooner than 2 months after the previous ACA. ACAs are not required in quarters in which a Response Correlation Audit (RCA) is performed.

- Challenge the PM-CEMS three times at each audit point and use the average of the three responses in determining accuracy at each audit point. Audit points are audit filters that produce particulate levels of known values.

Audit Point	Audit Range
1	0 - 20 percent of measurement range
2	40 -60 percent of measurement range
3	70 -100 percent of measurement range

- Operate the PM-CEMS in the mode, manner, and range specified by the manufacturer.
- Challenge the PM-CEMS at each audit point for a sufficient period of time to ensure that the PM-CEMS response has stabilized.
- Alternate filter insertions so that no filter is measured twice in succession during the audit.
- The difference between the actual known value of the audit standard and the response of the monitor is used to assess the accuracy of the PM-CEMS.
- The beginning of the out of control period is the time corresponding to the completion of an unsuccessful ACA. The end of the out of control period is the time corresponding to the completion of the subsequent successful audit.
- During an out of control period the CEMS data may not be used in calculating emission compliance nor be counted towards meeting minimum data availability.
- The PM-CEMS is considered out of control if the required quarterly absolute correlation audit is not conducted during a calendar quarter.
- A Response Correlation Audit conducted during any calendar quarter can take the place of an ACA required for that quarter.

The criteria for excessive inaccuracy are:

- >± 10% of the average audit value or 7.5% of the applicable standard, whichever is greater (PM-CEMS is out of control).
- Two consecutive ACA failures (i.e., out of control conditions) indicates the QC procedures are inadequate or that the CEMS is incapable of providing quality data.
- Whenever excessive inaccuracies occur for two consecutive quarters, the QC procedures must be revised, modified, or the monitor replaced.

NOTE: The ACA must be conducted using the calibration kit with the same serial number as the particulate monitor.

1.9.2 RELATIVE RESPONSE AUDIT (RRA)

Perform a Relative Response Audit (RRA) annually. Perform a RRA by collecting three (3) sets of simultaneous Reference Method data and Particulate Monitor data. Determine compliance with the RRA using the criteria specified in 40CFR60, Appendix F.

The PM-CEMS is considered out of control if the required RRA is not performed at the interval as specified in the operating permit or regulation.

The RRA will be performed annually and will replace the Response Correlation Audit in the quarter when both audits are due.

1.9.3 RESPONSE CORRELATION AUDIT (RCA)

Perform a RCA by collecting a minimum of twelve (12) sets of simultaneous Reference Method data and Particulate Monitor data once every permit renewal (5 years). To pass an RCA the following criteria must be met

- For all 12 data points, the PM-CEMS response value can be no greater than the greatest PM-CEMS response value used to develop the correlation curve;
- For 9 of the 12 data points, the PM-CEMS response value must lie within the PM-CEMS output range used to develop the correlation curve.

The criteria for excessive inaccuracy are:

- At least 75% of a minimum number of 12 sets of PM-CEMS/reference method measurements from the test must fall within a specified area on a graph developed by the calibration relation regression line over the calibration range and the tolerance interval set at ± 25% of the emission limit.
- The specified area on a graph is (a) bounded by two lines parallel with the calibration regression line, and offset at a distance ±25% of the numerical emission limit from the calibration regression line on the y-axis and (b) traversing across the calibration range bounded by the lowest and the highest CEMS reading of the calibration test on the x-axis.

The PM-CEMS is considered out of control if the required RCA is not performed at the permit renewal interval (once every 5 years). See 2.6.2 Relative Correlation Audit for details on failure of an RCA. The RCA will replace the Absolute Correlation Audit and Relative Response Audit when done in the same quarter.

See 10.3(8) ...perform the RCA according to the procedures for the PM CEMS correlation test described in PS-11, section 8.6, except that the minimum number of runs required is 12 in the RCA instead of 15 as specified in PS-11.

1.10 CORRECTIVE ACTION PROGRAM

Whenever the PM-CEMS is found to be "out of control" the data generated from the system will not be used to demonstrate compliance with permit limits or data capture requirements. Corrective action is performed "as soon as possible" after determining the PM-CEMS is not operating within 40 CFR 60, Appendix F specifications.

Corrective action is defined as the resolution of problems that occur on a non-routine basis.

1.10.1 SUGGESTED CORRECTIVE ACTION

References to specific PM-CEMS troubleshooting procedures are listed in the Instrument's Operation Manual.

1.10.2 REQUIRED NOTIFICATIONS

Immediately after learning a PM-CEMS is non-operational, the following individuals will be notified:

- Control Room Operator – who will notify the Environmental Compliance Administrator (ECA) and/or Instrument Technician (IT);
- Instrumentation Technician – will make the PM-CEMS operational;
- ECA – will notify Environmental Services Department and regulatory agency (as required).

1.11 REPORTS

Documentation of QA/QC data and information is an integral part of any QA Plan. This section describes reports and other records that provide adequate documentation of QA/QC activities. The two primary means of documentation used are:

- Data Acquisition System (DAS).
- Manually prepared QA/QC forms, logs and reports.

During QA audits, the DAS will be operated to collect data in a normal fashion, and will be able to print one-minute emission values for real time comparison with audit standards. The DAS is used not only to document QA/QC data and information, but also serves as the PM-CEMS data acquisition and processing system.

A number of written QA/QC reports are needed to provide supporting documentation of the continued operation of the PM-CEMS in an acceptable manner. All reports are used to notify individuals of problems related to operation of the PM-CEMS. Completion of these reports is intended to assist in identifying the need for remedial maintenance, training, or supply action, as well as the need to revise operating procedures for this QA Plan.

SECTION 2 – STANDARD OPERATING PROCEDURES

Quality control checks may be defined as those checks performed on a routine basis such as system inspections, periodic calibrations and routine maintenance.

LASER SAFETY WARNING: Any person working on or auditing the particulate monitoring equipment must be adequately trained in Laser Safety and have thoroughly reviewed the operations manual due to the inherent dangers in working with Laser equipment.

2.1 START-UP AND OPERATION

The Shift Foreman maintains a detailed written procedure for start-up of the equipment at the facility. The document contains the step-by-step procedures for starting up and shutting down all equipment at the facility.

2.2 PM-CEMS INSPECTION AND PREVENTIVE MAINTENANCE

A CEMS maintenance log is maintained in the CEMS shelter to document system operational status and record any maintenance performed. The DAS electronic file contains a record of the PM-CEMS calibration activities.

The routine inspection begins with a visual inspection of the electrical and plumbing systems and components, which includes air-lines, and support bundles, as applicable. This procedure allows early detection of accidental damage to the PM-CEMS.

The Instrument Technician will examines the data acquisition system's computer printouts to verify the computer printouts have the correct time, date, and settings as applicable. A printout of the calibrations is reviewed for excessive calibration drift on a daily basis (Monday through Friday, excepting Monday holidays). A copy of the printout is filed in the CEMS files in the shelter.

Indicator lights and alarms on the system or monitor control panel are examined next. The system indicator lights notify the technician of out-of-range conditions or other potential problems associated with the PM-CEMS. Action is initiated immediately if an indicator light is illuminated; subsequent data acquired may be suspect and will be flagged accordingly.

2.3 CALIBRATION PROCEDURES

The 360 calibration cycle automatically checks and corrects zero and span drift. The calibration cycle can be programmed to activate at selectable hourly intervals, manually

activated from the stack, or externally activated from the programmable logic controller or data acquisition system.

2.3.1 DAILY CALIBRATION CHECK

A daily calibration is performed for the PM-CEMS that is measuring and reporting particulate concentration. Typically the zero and span calibration are programmed to be performed once every 24-hours. The zero calibration is conducted at a measurement level between zero and twenty (0 – 20) percent of instrument measurement range. The span calibration is conducted at a measurement level between fifty and one hundred (50 – 100) percent of instrument measurement range. A printed copy of the daily calibration for the PM-CEMS will be filed or electronically archived. Table II below illustrates calibration ranges of the PM-CEMS.

Table II. Recommended zero and high level calibration levels

Emission Point	ZERO VALUE (0 – 20% RANGE)	SPAN VALUE (50 – 100% RANGE)
Unit 1	TBD	TBD
Unit 2	TBD	TBD
Unit 3	TBD	TBD

2.3.2 DAILY PM-CEMS DRIFT ASSESSMENT AND CORRECTIVE ACTION

The PM-CEMS performs a calibration once every 24 hours. The PM-CEMS shall be adjusted when the drift exceeds twice the performance specification. The PM-CEMS are considered out-of-control when:

(1) Either the zero or span calibration drift exceeds 4 percent the applicable performance specification in 40 CFR 60 for five (5) consecutive days, or

(2) Either the zero or span calibration drift exceeds 8 percent the applicable performance specification in 40 CFR 60 for any single calibration.

Table III below illustrates out-of-control calibration drift criteria for the PM-CEMS.

Table III. Calibration Drift Criteria

Monitor	Level at which CEM shall be adjusted	Level at which CEM is Out-of-Control	
		Any one day	Any five consecutive days
Unit 1	4%	8%	4%
Unit 2	4%	8%	4%
Unit 3	4%	8%	4%

If an out-of-control condition exists, corrective action will be initiated immediately. Corrective action steps are identified in the Teledyne Monitor Labs Operation and Maintenance Manual or the Analyzer Operator Manual. Corrective action steps may include: adjustment of the electronics and potentiometers, care of the optics, replacement of the dessicator and/or purge blower air filter. Calibration drift checks will be repeated following corrective action to verify the PM-CEMS meets calibration requirements and is no longer out-of-control.

During an out-of-control period, the data collected by the PM-CEMS will not be used in determining particulate emissions compliance; nor will it be counted toward meeting the minimum data availability requirements.

2.4 PREVENTIVE MAINTENANCE PROCEDURES

The recommended maintenance schedule is used initially as a guideline and then adjusted for the application following actual field experience. Preventive maintenance checks and procedures are identified in the Maintenance and Trouble Shooting Section of the analyzer Operator Manual.

Some items in the recommended periodic maintenance chart, such as filter changes, will not exhibit a failure condition until probable damage to other components has resulted. These items require special attention for determining replacement frequency. Close and continuous observation of the operating characteristics of the system, with particular notation of any shift, either sudden or prolonged, in one direction of any of the many visual indicators in the system, should prompt a maintenance response and prevent loss of data and/or equipment damage.

The system's equipment alarms are indications that maintenance is required. They do not necessarily indicate the data is invalid. However, they do indicate that the system is operating outside of a design tolerance and inaccurate data and equipment damage will occur if the system is allowed to continue operation with the problems. For this reason, the alarms are exercised on a regular basis to assure that they are operational.

One of the best indications of system performance is the validity of the data it is generating. Daily scrutiny of the daily calibration results will indicate whether or not there is a need for maintenance.

2.5 CORRECTIVE MAINTENANCE PROCEDURES

A trouble-shooting section is included in each analyzer Operator Manual.

Zero and calibration drift checks will be conducted immediately prior to any maintenance, if possible. Additionally, zero and calibration drift checks will be conducted immediately following any maintenance. If the post-maintenance zero or calibration drift checks show drift in excess 4 percent of the applicable performance specifications, recalibration is conducted in accordance with the Operator Manual.

2.6 PERFORMANCE AUDIT PROCEDURES

2.6.1 ABSOLUTE CORRELATION AUDIT (ACA)

ACAs are required on a quarterly basis, unless an RCA is conducted in that quarter. The ACA is completed and the results are determined using the procedures and calculations contained in 40 CFR 60, Appendix F (Equation 2-1, to this document). Acceptable ranges for the ACA filters are included in Table IV.

TABLE IV. ACA Audit Filters

Emission Point	LOW (0 – 20% of Range)	MID (40 – 60% of Range)	HIGH (70 – 100% of Range)
Unit 1	TBD	TBD	TBD
Unit 2	TBD	TBD	TBD
Unit 3	TBD	TBD	TBD

For EACH Audit

1. Record the requested data in the appropriate blocks on the data sheet(s) for the analyzer(s) being checked. Each analyzer should have its own data sheet.

2. Open the optical head on the particulate monitor.

3. Install the calibration jig onto the optical head.

4. Alternately insert each of the 3 known particulate standards into the calibration jig. Leave each filter in place for 5 minutes to ensure stable readings. Repeat this process until 3 readings have been made with each filter.

5. Uninstall the calibration jig from the optical head.

6. Close the optical head so that the instrument is reading process conditions again.

7. Calculate and record, to the hundredth decimal place, the average of the monitor's responses (A) for each level of calibration filter (high-, mid- and low-)

8. Using the equations in Appendix F, Equation 2-1, calculate the mean value and correlation accuracies for each particulate level.

The monitor passes the ACA if, at all three levels of filters, the percentage difference is ± 10.0 percent of the average audit value or the percentage difference ± 7.5 percent of the applicable particulate standard, whichever is greater. If these criteria are not met at

any level, the monitor is considered out-of-control. Indication will be made on the data sheet(s) whether the monitor(s) passed or failed the calibration error test.

2.6.2 RELATIVE RESPONSE AUDIT (RRA)

The Relative Response Audit requires the support of an independent stack sampling team. Three (3) simultaneous measurements are taken by the contracted test team and the particulate monitor in accordance with the reference methods specified in 40CFR60, Appendix B, Performance Specification 11. It is recommended that the test team perform duplicate measurements to ensure the maximum accuracy of the sampling.

The RRA will be conducted annually unless an RCA is completed during that same period then an RRA will not be required.

The monitor passes the RRA if all of the following occur:

(1) The response from all three measurements is less than the highest response used to generate the correlation curve,
(2) At least two of the three responses lie within the PM-CEMS output range used to develop the correlation curve, and
(3) At least two of the three responses fall within the area specified in the correlation curve and defined as the regression line ± 25% of the numerical emission limit.

2.6.3 RELATIVE CORRELATION AUDIT (RCA)

The Relative Response Audit requires the support of an independent stack sampling team using procedures for the PM-CEMS correlation test described in PS-11, section 8.6. The RCA will be conducted once every permit renewal (5 years) period. The RCA will replace the RRA and ACA when required in the same period.

The correlation test includes:

(1) paired reference method trains for collecting manual PM data to identify and screen the reference method data for imprecision and bias;

(2) test runs may be shorter than 60 minutes in duration (e.g., 20 to 30 minutes);

(3) convert the reference method results to units consistent with the conditions of the PM CEMS measurements (e.g., mg/acm);

(4) during each test run coordinate process operations, reference method sampling and PM CEMS operations to ensure that the process is operating at the targeted conditions

a. coordinate the start and stop times of each run between the reference method sampling (if batch sampling start the reference method at the same time as the PM CEMS sampling);
b. note the times for port changes (and other periods when the reference method sampling may be suspended) on the data sheets (to make any required adjustments);
c. properly align the time periods for the PM CEMS and the reference method measurements to account for the PM CEMS response time;
    i. conduct a minimum of 12 sets of CEMS and reference method measurements – additional measurements may be completed and rejected but a minimum of 12 sets is required;
    ii. report all data, including rejected data;
    iii. up to five test runs may be rejected without explanation;
    iv. explicit explanations are required for greater than five rejected runs;

(5) simultaneous PM CEMS and reference method measurements must be performed in a manner to ensure that the range of data that will be used to establish the correlation for the PM CEMS is maximized. First attempt to maximize the correlation range by following the procedures described in 5 (i) through (iv) (this section). If the three levels described in (i) through (iv) cannot be achieved, use the procedures in section 8.6(5);
    i. attempt to obtain the three different levels of PM mass concentration by varying process operating conditions, varying PM control device conditions, or by means of PM spiking;
    ii. the three PM concentration levels used in the correlation tests must be distributed over the complete operating range experienced by the source;
    iii. at least 20 percent of the minimum 12 measured data points should be contained in each of the following levels:

Correlation Test /RCA	
Level 1	from no PM (zero concentration) emissions to 50 percent of the maximum PM concentration
Level 2	25 to 75 percent of the maximum PM concentration
Level 3	50 to 100 percent of the maximum PM concentration

    iv. although the above levels overlap, only apply individual run data to one level;

(6) if three distinct levels of PM concentration cannot be obtained, perform correlation testing over the maximum range of PM concentrations that is practical for the PM CEMS;

(7) ensure that the range of the data used to establish the correlation for the PM CEMS is maximized by the following:
a. zero point data for in-situ instruments is obtained by removing the instrument from the stack and monitoring ambient air on a test bench or

b. perform a manual reference method measurement when the flue gas is free of PM emissions or contains very low PM concentrations (e.g., when the process is not operating, but the fans are operating) or
c. if neither of the steps are possible, estimate the monitor response when no PM is in the flue gas (e.g., 4 mA =) mg/acm).

(8) Failure of an RCA requires the following actions:
a. Combine RCA data with data from the active PM-CEMS correlation and perform the mathematical evaluations defined in PS-11 for development of a PM-CEMS correlation, including examination of alternate correlation models (i.e., linear, polynomial, logarithmic, exponential, and power). If the expanded data base and revised correlation meet PS-11 statistical criteria use the revised correlation;
b. If the criteria specified above (in a. above) are not achieved, develop a new PM-CEMS correlation based on revised data. The revised data set must consist of the test results from only the RCA. The new data must meet all requirements of PS-11 to develop a revised PM-CEMS correlation for 12 sets. The PM-CEMS is considered to be back in controlled status when the revised correlation meets all of the performance criteria specified in section 13.2 of PS-11;
c. If the actions specified above (in a. and b.) do not result in an acceptable correlation, evaluate the cause(s) and comply with the actions below within 90 days after the completion of the failed RCA:
    i. Completely inspect the PM CEMS for mechanical or operational problems, repair the PM CEMS and repeat the RCA;
    ii. If you must relocate the PM CEMS to a more appropriate measurement location perform a new correlation test according to the procedures specified in PS-11;
    iii. The characteristics of the PM or gas in the flue gas stream may have changed such that the PM CEMS technology is no longer appropriate. If this is the case, install a PM CEMS with measurement technology that is appropriate for the flue gas characteristics. Perform a new correlation test according to the procedures specified in PS-11;
    iv. If the corrective actions above (3i through 3iii) were not successful, petition the regulators for approval of alternative criteria or an alternative for continuous PM monitoring.

2.7 SYSTEM AUDIT PROCEDURES

System audits will be performed and recorded in the maintenance logbook. The following checks will be recorded during the system audit:

(1) Multiday calibration reports for the previous seven (7) days for all PM-CEMS. Check for trends in drift.
(2) Verification that correct span values are entered into the computer.

(3) Examination of the PM-CEMS, noting any alarms displayed and/or that the readings are consistent with monitor operation.

Quarterly system audits will be performed to:

(1) Check maintenance logbooks for timely and completed repairs;
(2) Determine the printer is operational and printout is legible, readings are consistent with process conditions;
(3) Acknowledge that the computer and monitor areas are clean and well maintained;
(4) Determination that the purge air blower is operational and alignment of opacity monitor is correct.

2.8 DATA BACKUP PROCEDURES

The PM-CEMS data are retained on a data acquisition and handling system (DAS). Particulate Emissions Data is backed up as part of the network or tape backup procedures used for all emissions data collected at the facility. The DAS printouts are stored in a secure area.

2.9 TRAINING PROCEDURES

Training is an essential element of a successful QA/QC program.

2.9.1 QUALITY ASSURANCE PLAN

All employees directly involved in the PM-CEMS program must review this QA/QC Plan, and the applicable EPA requirements (i.e., 40 CFR 60). As with the QA Plan, all effected employees must, at a minimum, be familiar with and review appropriate standard operating procedures .

2.10 DATA REPORTING PROCEDURES

The results from each audit or the routinely generated particulate data are reviewed prior to it being included into a summary report.

As part of the operating permit requirements, all PM-CEMS data are made available for review, in the form of a computerized database or printed PM lb/mmBtu logs, for 36 months. Quarterly compliance reports are submitted to the MDNR within 30 days of the ending quarter as defined in the operating permit. All data will be maintained for the life of the current Title V Operating Permit (5 years).

III. APPENDICES

APPENDIX A

PM-CEMS SPECIFICATIONS

APPENDIX B

PERFORMANCE SPECIFICATION 11

APPENDIX C

CALCULATIONS

(1) Plot each of the PM CEMS and reference method data sets from an RCA or RRA on a graph based on the PM CEMS correlation line to determine if the criteria in 10.4(5) or (6) have been met
(2) Equation 2-1 is to be used to calculate ACA accuracy for each of the three audit points
(3) Equation 2-2 and 2-3 are to be used to calculate daily upscale and zero drift.

Eq 2-1 ACA Accuracy

$$\text{ACA Accuracy} = \frac{|R_{CEM} - R_V|}{R_V} \times 100$$

where:

ACA Accuracy	=	The ACA accuracy at each audit point in percent
R_{CEM}	=	PM CEMS response to the reference standard
R_V	=	The reference standard value

EQ 2-2 Upscale Drift

$$UD = \frac{|R_{CEM} - R_U|}{R_U} \times 100$$

where:

UD	=	The upscale drift of PM CEMS in percent
R_{CEM}	=	PM CEMS response to the upscale check value
R_U	=	The upscale check value

Eq 2-3 Zero Drift

$$ZD = \frac{|R_{CDM} - R_L|}{R_U} \times 100$$

where:

ZD	=	The zero (low-level) drift of PM CEMS in percent
R_{CEM}	=	PM CEMS response of the zero check value
R_L	=	The zero check value
R_U	=	The upscale check value

August 8, 2005 Proposed Procedure 2 – Quality Assurance Requirements for Particulate Matter Continuous Emission Monitoring Systems at Stationary Sources, Equation 2-1a and 2-1b not included as they are still only proposed.

APPENDIX D

BLANK FORMS

Note that appendices A, B, and D were not included in the CAM Test Plan above, since this information is available elsewhere.

Prepared by:

Cheryl Steffan
Environmental Engineer