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| STATE OF OREGON DEPARTMENT OF ENVIRONMENTAL QUALITy |
| DRAFT POINT SOURCE CONTINUOUS MONITORING MANUAL |
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## 1.0 Introduction

This manual provides guidance and direction to point source emitters that are responsible for continuously monitoring air emissions, operating parameters, or opacity from their facilities.

For purposes of this manual, continuous monitoring systems (CMS) are divided into three (3) main subgroups:

* Continuous Emission Monitoring Systems (CEMS),
* Continuous Parameter Monitoring Systems (CPMS), and
* Continuous Opacity Monitoring Systems (COMS).

Standards applying to CMS that are required by permit condition, but not subject to federal regulations may be found within this guidance document. In addition, this manual applies to continuous monitoring systems (CMS) that are subject to:

* New Source Performance Standards (NSPS) 40 CFR Part 60,
* National Emissions Standards for Hazardous Air Pollutants (NESHAP) 40 CFR Part 63, and
* Acid Rain Program, 40 CFR Part 75.

To ensure reported data are complete and of high quality, CMS operators are required to implement the practices of this manual. Operators may choose more rigorous specifications or more sophisticated procedures appropriate for their purposes.

## 2.0 Monitoring Objectives

### 2.1 Program Objectives

**Monitoring program objectives are as follows:**

* Measure air contaminant concentrations and operating parameters as required by permit or regulation.
* To ensure high quality data is collected to determine continuous compliance with permit or regulation, preventing possible adverse environmental effects.
* To determine emissions improvements and trends in conjunction with process changes.
* To provide accurate and reliable data as part of an integrated emissions inventory program.

###  Data Quality Objectives

Each monitoring program must meet specific data quality objectives. These are data completeness, representativeness, accuracy, precision, and comparability. A brief description of each objective is provided below.

* Completeness is the measure of the number of valid data points collected over the possible number of data points in a period of time.
* Representativeness refers to measurements which accurately depict the condition of interest. One aspect of representativeness involves the method chosen to perform the monitoring; it must be accurate in both a qualitative and quantitative sense.
* Accuracy describes how close the measurement is to the "true value" of the quantity being measured.
* Precision is a measure of variability, or scatter, of the system’s response to repeated challenges by the same standard. Precision is a measure of repeatability, how close multiple measurements agree.
* Comparability is a measure of how data sets are similar or different. It determines how data sets can be used collectively.

## 3.0 Continuous Monitoring Plans

The source operator shall prepare and maintain written standard operating procedures (SOP) and a quality assurance plan (QAP) for each continuous monitoring system used at a source. The SOP and QAP shall be submitted by the permittee, and approved by the DEQ, prior to operation of a CMS. These documents shall be revised as necessary based on operator experience with the CMS. The SOP and QAP shall contain detailed, complete, step-by-step written procedures. Both documents shall be made available to DEQ personnel for inspection upon request.

### 3.1 Standard operating procedures

Standard operating procedures (SOP) shall be written for each CMS. The contents of the SOP shall include, as a minimum, the following information:

a. Source owner or operator name and address.

b. Identification, description, and location of monitors in the CMS.

c. Description and location of the sample interface (i.e. sample probe).

d. Manufacturer and model number of each monitor in the CMS.

e. Equipment involved in sample transport, sample conditioning, analysis, and data recording.

f. Procedures for routine operation checks, including daily zero and span calibration drift (CD) check.

g. Procedures for routine preventive maintenance. Initially, these procedures can be taken from the manufacturer's installation and operation manuals. However, as the CMS operators gain more experience with the CMS, it may be necessary or desirable to modify these procedures to increase or decrease frequency of maintenance and add or delete some procedures.

h. Routine maintenance spare parts inventory.

i. Procedures for calculating and converting CMS data into the reporting units of the standard.

j. Documentation of the activities described in 1.3.1 a – i.

### 3.2 Quality Control/Quality Assurance Plan

Prior to initiating a continuous monitoring system, a written quality assurance and quality control (QA/QC) control plan (QAP) must be submitted to DEQ for review and approval. For these purposes, the terms "Quality Assurance" (QA) and "Quality Control" (QC) are defined as follows:

* "Quality Control" refers to an activity carried out during routine internal operations to ensure that the data produced are within known limits of accuracy and precision. Examples of QC activities include periodic calibrations, routine zero and span checks, routine leak checks, routine check of optical alignment, etc. QC represents the core activity in a Quality Assurance program.
* "Quality Assurance" refers to all of the planned and systematic ac­tivities carried out externally and independent of routine operation to document data quality. QA activities include written documentation of operation, calibration, and QC procedures; independent system and perfor­mance audits; data validation; evaluation of QC data; etc. QA requires documentation of all aspects of the CMS effort, from the respon­sibilities of each person involved to how the data are reported.

The contents of the QA/QC plan are dependent on the applicable regulation or permit condition. Some systems may be subject to multiple regulations, and therefore multiple plan requirements. The plan should be reviewed annually and updated when there are changes to equipment and procedures. Plan updates should be submitted to DEQ for review. In general, a satisfactory QAP plan includes the following:

1. Data quality objectives.
2. Chain of responsibility for CMS operation, corrective action, and training program.
3. Procedure for measuring the CMS accuracy and precision including the following:
* CMS calibrations
* Zero and span drift checks
* Performance audits
* System audits
1. Quality control activities
2. Quality control documentation
3. Procedures for data recording, calculations, and reporting
4. Criteria for taking corrective actions
5. Procedures for corrective action

Monitoring plan requirements for various regulations are summarized in the following table.

|  |  |
| --- | --- |
| **REGULATIONS**  | **QA/QC PROGRAM PLAN REQUIREMENTS** |
| New Source Performance Standards | 40CFR Pt. 60, Appendix F, Section 3. |
| Acid Rain Program | 40CFR Pt. 75, Appendix B, Section 1. |
| National Emission Standards for Hazardous Air Pollutants | 40 CFR Pt 63, Subpart A, Section 63.8  |

\* This table may not include all references to applicable monitoring plan requirements.

## 4.0 Continuous Emission Monitoring Systems

### 4.1 CEMS Equipment and Installation Specifications

Equipment specifications, installation, and measurement location are defined according to the applicable performance specification. Refer to the following reference table for equipment specifications, installation, and measurement location requirements.

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| --- | --- |
| **REGULATIONS** | **EQUIPMENT SPECIFICATIONS, INSTALLATION, & MEASUREMENT LOCATION REQUIREMENTS** |
| New Source Performance Standards | 40CFR Pt. 60, Subpart A  |
| 40CFR Pt. 60, App. A  |
| Acid Rain Program | 40CFR Pt. 75, Subpart A - H |
| 40CFR Pt. 75, App A-J  |
| National Emission Standards for Hazardous Air Pollutants | 40 CFR Pt 63, Subpart A  |
| Oregon DEQ Requirements | Appendix A of DEQ CMM  |

\*This table may not include all references to applicable equipment and installation requirements.

### 4.2 Performance Assessments for CEMS

Performance assessments are utilized to determine quality of monitored data. They are generally performed upon installation and periodically during operation. Most regulations generally divided the assessments into four (4) separate activities:

* Initial performance specifications
* Daily performance assessments
* Quarterly performance assessments, and
* Annual performance assessments.

The requirement of each assessment depends on the applicable performance specifications and the QA/QC requirements. Performance assessments requirements are detailed below.

|  |  |
| --- | --- |
| **REGULATIONS** | **PERFORMANCE ASSESSMENTS** |
| New Source Performance Standards  | 40CFR Pt. 60, App. B & F  |
| Acid Rain Program  | 40CFR Pt. 75, Subpart A - H  |
| 40CFR Pt. 75, App A & B  |
| National Emission Standards for Hazardous Air Pollutants | 40 CFR Pt 63, Subpart A  |
| Oregon DEQ Requirements | Appendix A of DEQ CMM  |

\*This table may not include all references to applicable performance assessment requirements.

## 5.0 Continuous Parameter Monitoring Systems

A continuous parameter monitoring system (CPMS) continuously monitors source or pollution control device operating parameters. These may include, but are not limited to:

* Fuel consumption rates;
* Production rates;
* Oxygen concentration;
* Moisture content;
* Process temperatures;
* Pollution control device parameters (e.g., pressure drop, voltages, water flow and pressure, etc.)

There are three basic types of CPMS:

* CPMS used for the purpose of determining pollutant emissions rates (PEMS);
* CPMS used for the purpose of monitoring pollution control device operations; and,
* CPMS used for the purpose of monitoring source operations.

It is not the intention of this manual to cover each and every possible CPMS. Requirements for CPMS that are used for determining pollutant emissions rates are generally found within applicable federal regulation. CPMS requirements are detailed below.

|  |  |
| --- | --- |
| **REGULATIONS** | **CPMS REQUIREMENTS** |
| New Source Performance Standards | 40CFR Pt. 60, Applicable Subparts  |
| 40CFR Pt. 60, App. B & F  |
| Acid Rain Program | 40CFR Pt. 75, Subpart E  |
| 40CFR Pt. 75, App. D & E |
| National Emission Standards for Hazardous Air Pollutants | 40 CFR Pt 63  |
| Oregon DEQ Requirements | Appendix B of DEQ CMM  |

\*This table may not include all references to applicable CPMS performance requirements.

## 6.0 Continuous Opacity Monitoring Systems (COMS)

This section addresses specific requirements for the operation of continuous opacity monitoring systems (COMS). These requirements do *not* supersede any requirements specified by rule, regulation, or by permit condition.

Existing COMS installed prior to 6/1/91 shall be maintained and operated in accordance with permit requirements; and, unless otherwise specified, are not subject to the requirements of this manual. If the COMS system is not subject to federal regulation and is installed, replaced, relocated or substantially refurbished after 6/1/91, then the COMS must satisfy 40 CFR Part 60, Spec. 1 requirements that existed at the time of the change.

All continuous opacity monitoring systems (COMS) shall complete a minimum of one cycle of sampling and analyzing for each successive 10-second period (15 seconds for non-NSPS sources if approved by the DEQ).

Requirements for COMS that must meet NSPS and/or Part 75 can be found within the applicable federal regulations cited below.

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| --- | --- |
| **REGULATIONS** | **COMS REQUIREMENTS** |
| New Source Performance Standards | 40CFR Pt. 60, Subpart A  |
| 40CFR Pt. 60, App. B, Spec. 1  |
| Acid Rain Program -Optional Emissions Protocols | 40CFR Pt. 75, Subpart B  |

\*This table may not include all references to applicable COMS performance requirements.

## 7.0 Recordkeeping and Reporting

This section addresses specific requirements for recordkeeping and reporting requirements for CMS. If inconsistencies exit, these requirements do not supersede any requirements specified by rule, regulation, or by permit condition.

The source owner or operator shall maintain records of all CMS activities in a file and/or log book. This record shall be used by the CMS operator to ensure that the CMS is operating correctly. The record must also be made available to DEQ personnel upon request

Recordkeeping and reporting requirements for various regulations are cited below.

|  |  |
| --- | --- |
| **REGULATIONS**  | **RECORDKEEPING & REPORTING REQUIREMENTS** |
| New Source Performance Standards | 40CFR Pt.60, Subpart A  |
| 40CFR Pt.60, App. F  |
| Acid Rain Program | 40CFR Pt.75, Subparts E, F, & G  |
| 40CFR Pt.75, App. B, D & E  |
| National Emission Standards for Hazardous Air Pollutants | 40CFR Pt 63, Subpart A  |
| Oregon DEQ Requirements | Appendix C of DEQ CMM |

\*This table may not include all references to applicable recordkeeping and reporting requirements.

## APPENDIX A: DEQ CONTINUOUS EMISSION MONITORING REQUIREMENTS

General continuous emissions monitoring requirements are outlined below. These requirements do not supersede any requirements specified by rule, regulation, or by permit condition. Refer to Section 4.0 of this monitoring manual.

###### A.1 CEMS Not Required by Federal Program and Installed after 6/1/91:

1. The CEMS shall continuously monitor and record the concentration of gaseous pollutant emissions on a wet or dry basis discharged into the atmosphere. The CEMS shall consist of subsystems for sample extraction, conditioning, detection, analysis, and data recording/processing.
2. All CEMS must meet the requirements of 40 CFR 60 (7-1-12); performance specifications of Appendix B and the QA/QC procedures of Appendix F. (7-1-12).
3. All continuous emissions monitoring systems (CEMS) shall complete a minimum of one cycle of sampling and analyzing for each successive 15-minute period unless the DEQ has specified a different frequency (i.e. Medford AQMA requires one minute cycle).

###### A.2 CEMS Not Required by Federal Program and Installed Prior to 6/1/91:

1. If the CEMS system is not subject to federal regulation and is installed, replaced, relocated or substantially refurbished after 6/1/91, then the CEMS is not applicable to the requirements of this section and must comply with section A.1 of this appendix.
2. As an alternative to complying with conditions 3 through 11 of this section, the owner/operator may choose to comply with the requirements of section A.1 of this appendix.
3. The CEMS shall continuously monitor and record the concentration of gaseous pollutant emissions discharged to the atmosphere from any stationary source using CEMS approved by the Department of Environmental Quality.
4. The span of the CEMS shall be set:

a. At 200% of the permit require­ment concentration or the emission standard, whichever is lower. The span may be set at alternative values with DEQ approval.

b. The CEMS must be capable of recording down-scale drift below zero.

5. The CEMS shall be pollutant specific and free from interferences. (e.g.: For TRS CEMS, the measured TRS shall exclude SO2)

6. The CEMS analyzer must be maintained in an environment conducive to analyzer stability.

7. Extractive CEMS operating procedures shall include automatic back-flushing of sample line and probe to purge condensed moisture and particulate material.

8. If the emissions must be corrected for diluent oxygen, periodically test and record the concentration of oxygen in the exhaust gases using an oxygen CEMS, Orsat Analyzer, or equivalent.

a. An Oxygen CEMS, if used, must be calibrated according to written procedur­es, approved by the Department, at least twice each year using two calibration gases having oxygen concentrations of approximately 5 and 15 percent by volume, accurate to within 0.5% oxygen.

b. Oxygen must be measured at least semi-annually, after any major main­tenance/­repair on duct work, and frequently enough to be representa­tive of average oxygen concentration.

9. The zero and span drift of CEMS must be measured and recorded daily when the CEMS is in operation. Span gases used for this procedure need not be NIST traceable. However, the concentration of the gases should be verified by an analyzer calibrated with certifiable calibration gases. It may be necessary to periodically certify the concentration of the zero and span drift check gases.

10. A cylinder gas audit (CGA) of the CEMS shall be performed weekly with successive CGAs performed no closer than six days apart. The CGA shall include a "zero" gas and a minimum of one upscale gas concentra­tion at approximately 60 percent of analyzer full-scale. The CGA results must satisfy the audit specifications outlined within 40 CFR 60, Appendix F.

a. If 4 consecutive weekly CGAs result in the CEMS being within the allowable specifications, the frequency of the CGAs may be reduced to once each month with successive CGAs performed no closer than 21 days apart.

b. If three consecutive monthly CGAs result in the CEMS being within specifications, the frequency of the CGAs may be reduced to once each quarter with successive CGAs performed no closer than two months apart.

c. If two consecutive quarterly CGAs result in the CEMS being within specifications, the CGA frequency may be reduced to once every six months with successive CGAs no closer than five months apart.

d. The minimum CGA frequency shall be once every six months with successive CGAs no closer than five months apart.

e. The CGA frequency shall revert back to a weekly frequency if a CGA results in the CEMS failing to meet the performance specifications of 40 CFR Part 60, Appendix F.

i. The concentration of the cylinder audit gases must be traceable to National Institute of Standards and Technology (NIST) standard reference materials (SRM) or EPA certified reference materials (CRM) and reanalyzed every 6-months using EPA Reference Methods (40 CFR 60, Appendix A). Gases may be analyzed at less frequent intervals if the manufacturer guarantees their certified con­centration for longer time periods.

ii. Cylinder gases must be introduced to include as much of the monitoring system as feasible, in no case shall gas conditioning subsystems (i.e. SO2 scrubbers for TRS CEMS) be excluded or by-passed.

11. A Relative Accuracy Audit (RAA) shall be performed at least once each year. The RAA may satisfy one of the CGA requirements. RAA must satisfy the audit specifications outlined within 40 CFR 60, Appendix F.

12. Data shall be recorded in units of the standard.

## APPENDIX B: DEQ CONTINUOUS PARAMETER MONITORING REQUIREMENTS

General continuous parameter monitoring requirements are outlined below. These requirements do not supersede any requirements specified by rule, regulation, or by permit condition. Refer to Section 5.0 of this manual.

###### B.1 CPMS General Requirements:

1. CPMS shall be installed in a location that is representative of the monitored process and free from interferences.

2. CPMS shall be installed and maintained in an environment conducive to CPMS stability and data reliability.

3. CPMS shall be calibrated and certified by the manufacturer prior to installation. (Applies to CPMS installed after 6/1/91).

4. All continuous parameter monitoring systems (CPMS) shall complete a minimum of one cycle of sampling and analyzing for each successive 15-minute period unless the DEQ has specified a different frequency (i.e. Medford AQMA requires one minute cycle).

###### B.2 Pollutant Emissions Related CPMS

1. CPMS for the purpose of determining emission rates (i.e. stack gas flow monitoring devices) require the highest level of QA/QC. If CPMS system is installed to satisfy 40CFR Parts 60 and 75, then requirements specified by those regulations must be followed.

 a. CPMS installed after 6/1/91 must meet 40 CFR Part 60 Appendix B performance specification 6. The reference methods for determining relative accuracy (RA) shall be EPA or DEQ methods 1 through 4.

 b. Performance audits shall be conducted quarterly in conjunction with the CEMS audits. It may not be possible to conduct audits on some CPMS. Exemption from this requirement must be approved by the DEQ.

2. Stack Gas Flow Monitoring

 CPMS data are necessary for converting emission concentrations to units of the standard. This is accomplished by continuously monitoring stack gas flow rates to calculate the emissions as a rate (pounds per hour) in addition to the CEMS output (percent or parts per million).

 There are several acceptable alternatives for measuring flow rates (ultrasonic sensors, pitot tubes, process rates - steam, air flows, etc.). The CPMS shall include the capability to measure and/or assume the following variables for determining the stack gas flow rate.

* Stack gas temperature,
* Stack absolute pressure,
* Stack gas moisture content,
* Stack gas molecular weight,
* Stack gas velocity, and
* Cross-sectional area of the stack at the point of velocity measurements.

 Flow rate metering systems generally measure and record the velocity, or velocity pressure (#5 above). Other parameters are either directly or indirectly measured. In some circumstances parameters can be accurately assumed based on historical data collected from the source.

###### B.3 Pollution Control Device Related CPMS.

1. Pollution control device related CPMS include but are not limited to:
* Operating pressure and/or temperature,
* Water flow rate, temperature, and/or pressure
* Electrical current and voltage, and
* Cycle time.

2. Calibration checks shall be performed in accordance with the manufacturer's procedures at least once per month. Depending on the CPMS, an exemption from this requirement may be obtained from the DEQ upon written request. For example, water flow devices are typically calibrated only once, prior to installation.

###### B.4 Source Operation Related CPMS.

Source related CPMS include but are not limited to:

* Steam flow & pressure meters,
* Fuel flow meters,
* Operating temperatures & pressures,
* Excess air levels,
* Hour meters and cycle time.

At a minimum, source related CPMS shall meet the general CPMS requirements listed above. Depending on the CPMS, an exemption from this requirement may be obtained from the DEQ upon written request. Temperature CPMS shall be calibrated during each planned maintenance outage or annually, whichever is more frequent.

## APPENDIX C: DEQ RECORDKEEPING AND REPORTING REQUIREMENTS

General DEQ CMS recordkeeping and reporting requirements are outlined below. These requirements do not supersede any requirements specified by rule, regulation, or by permit condition. Refer to Section 7.0 of this monitoring manual.

###### C.1 Recordkeeping:

The source owner or operator shall maintain records of all CMS activities in a file and/or log book. This record shall be used by the CMS operator to ensure that the CMS is operating correctly. The record must also be made available to DEQ personnel upon request. The record shall include as a minimum the following information:

1. Records of routine observation checks.

2. Records of routine maintenance and adjustments.

3. Records of parts that are replaced.

4. Spare parts inventory for the CMS.

5. Records of CMS calibrations.

6. Records of CMS daily calibration drift.

7. Records of CMS audits.

8. Records of corrective action taken to bring an “out-of- control” (40CFR60 App F) CMS into control.

9. Records of date and time when CMS is inoperative or “out-of-control” (40CFR60 App F).

###### C.2 Reporting Requirements

The source owner or operator may be required, by permit condition, to submit monitoring reports to the DEQ. These reports shall include as a minimum the following information:

1. Reporting period (determined by permit condition).
2. CMS type, manufacturer, serial number, and location.
3. Monitoring data shall be reduced and reported as follows (unless otherwise specified by permit or rule):
4. For opacity monitoring systems (COMS):
5. 6-minute (clock) averages (NSPS sources only)
6. Hourly (clock) averages
7. Averages of 10 or 15-second data that exceed the emission limit when the aggregate period is greater than 3-minutes in any 1-hour period.
8. Monthly average of the hourly averages.
9. For emissions monitoring systems (CEMS):
10. Hourly (clock) averages.
11. Monthly average of the hourly averages.
12. Data completeness information. The following completeness requirements are essential for a CMS data average to be accepted (unless otherwise specified by permit or rule):
* For a 6-minute or 1-hour reporting period, a minimum of 75% of the data must be included in the average.
* For a 24-hour or monthly reporting period, a minimum of 90% of the data must be included in the average.

Insufficient data completeness, excluding CMS downtime due to daily zero and span checks and performance audits, will void that data period. All data collected shall be reported. Non-valid data shall be highlighted. Data recorded during periods of CMS breakdowns, repairs, audits, calibration checks, and zero and span adjustments shall not be included in the data averages.

1. The magnitude of excess emissions computed in accordance with any conversion factor(s), and the date and time of commencement and completion of each period of excess emissions.
2. Specific identification of each period of excess emissions that occurs during startups, shutdowns, and malfunctions of the affected source. The nature and cause of any malfunction (if known), the corrective action taken or preventative measures adopted.
3. The date and time identifying each period during which the CMS was inoperative (out-of-control as per 40CFR60 App F) except for zero and span checks and the nature of the CMS repairs or adjustments.
4. Results of all CMS audits conducted during the reporting period.
5. DEQ approved reporting forms are provided upon request. Additional reporting requirements may be stipulated in an Air Contaminant Discharge Permit or DEQ communication.