

**SAMPLE SPECIFICATIONS
CONTINUOUS MONITORING SYSTEM
(Insitu)**

PART 1 - GENERAL

A. RELATED DOCUMENTS

Federal, State, and local requirements as applicable.
Attached Permit
Attached drawings

B. SUMMARY

1. Provide a Continuous Emission Monitoring System (CEMS) as specified below. The system must meet all the requirements of 40CFR60 and 40CFR75, as well as all applicable permit requirements.
2. Part 2 of this section of the Specification contains the technical and performance requirements of the analyzer and other components of the continuous emission monitoring system. The configuration as specified includes but is not limited to:
 - a. Individual component accuracy.
 - b. Performance of the analyzers.
 - c. Performance of the Data Acquisition, Reporting, and System Controller functions.
3. Part 3 of this section contains the requirements of services to be provided for each individual CEMS system. This includes but is not limited to:
 - a. Provide on-site instruction and guidance to the contractor installing the equipment.
 - b. Provide on-site and factory training to the Owners personnel on the operation and maintenance of the equipment.
 - c. Perform inspection and initial energization of the equipment.
4. Work and material by others:
 - a. Installation of equipment and components.
 - b. Installation of all access ways, platforms, and elevators.
 - c. Installation of all stack and duct connections to be used as attachments for equipment furnished by this contract.

B. SUMMARY: continued

- d. Installation of all cable and conduit exterior to any analyzer/cabinet or shelter furnished by this contract.
- e. Calibration gases for initial operation, certification and performance testing, quarterly audits and daily operation will be provided by the owner.

C. EXPERIENCE

1. All suppliers of equipment supplied by this specification shall have an acceptable history of supplying satisfactory, reliable systems of the type specified herein for a period of at least five years.
2. Acceptable bidders must be analyzer manufactures as well as system suppliers.
3. Acceptable bidders must have ISO 9001:2008 quality certification.

D. DELIVERY

1. Deliver equipment to the project site in accordance with manufacturer's shipping requirements.

PART 2 - PRODUCTS

A. GENERAL

1. The Continuous Emissions Monitoring System (CEMS) shall be Probe type insitu type. Pollutant gas measurement techniques using Fourier Transform Infrared spectroscopy (FTIR), Differential absorption, DOAS, Electrochemical analysis or "Hot and Wet" type systems are specifically excluded as being non-responsive to this specification.
2. The CEMS shall be designed and installed to ensure reliable operation with a minimum frequency and duration of system outages for maintenance and repair.
3. All system components shall be industrial quality and suitable for the type of plant environmental conditions to be encountered. Such conditions will include temperature, humidity, dust, air pollutants, wind and vibration. The system will be installed outside and should be capable of being operated in normal outdoor ambient conditions.
4. Provide all necessary prefabricated signal cables requiring special connectors.

A. GENERAL - continued

5. The CEMS shall provide one linear isolated 4-20 ma dc output for each measured parameter and each of the calculated values listed below. The outputs shall represent zero to full scale reading for the parameter. These outputs will be for the owners use in addition to any required for CEMS operation. Outputs from either the analyzer(s) or the DAS are acceptable.
 - a. Sulfur Dioxide (SO₂) ppm Track and hold (for control purposes)
 - b. Nitrogen Oxide (NO_x) ppm Track and hold (for control purposes)
 - c. Nitrogen Oxide (NO_x) Emission rate in pounds per million BTU.
 - d. Nitrogen Oxide (NO_x) Emission rate in pounds per hour.
 - e. Sulfur Dioxide (SO₂) Emission rate in pounds per million BTU.
 - f. Sulfur Dioxide (SO₂) Emission rate in pounds per hour.

6. Gas sensing devices shall show no significant interference by a two order-of-magnitude concentration change of any single or combination of constituents of the gas stream except the monitored gas. The sensor shall respond to a minimum of two percent (2%) of full scale change in the gas of interest.

B. GAS ANALYZERS

1. General

All gas analyzers shall be probe-type insitu. All gas analyzers shall have both analog and digital outputs. All analyzers shall be microprocessor based with full diagnostics. The analyzer manufacturer shall maintain an ISO 9001 quality system and submit a copy of this certification with the proposal.

2. Nitric Oxide (NO) / Sulfur Dioxide (SO₂) Analyzer

- a. The insitu analytical technique shall be 2nd derivative UV absorption spectroscopy. Differential absorption, DOAS or any IR technique is not acceptable.
- b. The insitu monitor must simultaneously measure SO_x, & NO compounds.
- c. The in-situ monitor must use a deuterium light source with the frequency band filtered to 200-230nm.
- d. Mounting of the transceiver must utilize a 4" 150lb mounting flange.

- e. The measurement cavity of the monitor must be mounted inside a porous diffused alumina ceramic filter to block particulate interference.
- f. The in-situ monitor must support input from an in-situ O₂ monitor for diluents measurements.
- g. The in-situ monitor must utilize a photodiode array (PDA) detector system to simultaneously measure the spectra.
- h. Dual thermoelectric coolers shall be utilized to ensure temperature stability of the PDA over operating temperature ranges.
- i. The optical bench of the spectrometer shall be temperature controlled for stability.
- j. An electro-optical cell of SO₂, and NO shall be included to enable span calibrations to be conducted.
- k. Dynamic calibration shall be included to permit bottled cal gas to be used for zero air and span calibrations.
- l. The transceiver and probe assemblies of the monitor shall be purged with instrument air.
- m. Readings must be temperature and pressure compensated.
- n. 3-point look-up tables and 5th degree correlation curve-fit routines shall be utilized to aid in calibration.
- o. Data acquisition and archiving shall be included within the monitor to enable 7-days of 1 minute gas measurement values to be stored.
- p. Automatic calibration adjustments shall be quantified and stored.
- q. A Local User Interface keypad and display shall be included in the transceiver head (no external units permitted) for viewing measurements, control, and changing of parameters.
- r. A 3-point Calibration Gas Audit (CGA) box shall be supplied to automate three-point gas audits.
- s. A cal gas heater shall be supplied in very cold environments.
- t. Optional hardware must be available to expand the I/O to-or-from the plant.

- u. The analyzer shall utilize a Remote Panel connected to the stack mounted units via two twisted shielded pairs of wire using a network protocol.
- v. The Remote Panel shall be included for placement in the CEM cabinet or control room.
- w. The Remote Panel shall provide at least, four analog outputs, eight digital inputs, eight dry contacts; 232, and 422 or 485.
- x. The Remote Panel shall be capable of displaying data, buffering data, controlling calibration, and displaying diagnostic information.
- y. Ethernet communication shall be included in the Remote Panel and be browser compatible.
- z. Modbus TCP shall be included within the Ethernet communication module for data acquisition and control.

3. Oxygen Analyzer

The measurement principle shall be zirconium oxide. The analyzer shall be probe type insitu requiring access to only one side of the stack or duct. The O₂ analyzer shall have the following features:

- a. LCD Touch screen for ease of operation
- b. Built in field replaceable probe heater assembly
- c. Micro Processor design
- d. Automatic Calibration controlled by the CEM system

Performance requirements:

- 1. Range: 0-25%
- 2. Zero Drift: 24 hours - Less than 2%fs
- 3. Span Drift: 24 hours - Less than 2.5%fs

PART 3 - FIELD SERVICE AND PERFORMANCE TESTING

- A. Installation Verification and Start - up
- B. Provide instruction and guidance to the installing contractor for the equipment supplied under this specification.
- C. Inspect the installed CEMS equipment after the installation is complete.

- D. Provide the owner with confirmation that the equipment is properly installed and is ready for energization.
 - E. Perform start up and verify correct operation of all equipment supplied under this specification.
- B. Certification Testing
- 1. Perform initial certification testing including Drift tests, Response tests, and Relative Accuracy testing as required. Notify owner prior to scheduling any testing.
 - 2. Provide prepared Reports suitable for submission to regulatory agency.
- C. Maintenance Services
- 1. Provide a 1 year maintenance contract to commence upon successful completion of the certification testing:
 - a. Perform 4 quarterly scheduled maintenance visits.
 - b. Provide 4 emergency site visits.
 - c. Provide telephone and modem support available 24hrs/day, 365 days per year
- D. Training Services
- 1. Provide on-site classroom training and instruction for operations and maintenance personnel for each plant site.
 - 2. Provide factory training for () of the owners technicians. Training shall be for a minimum of 24 classroom hours and cover the operation and maintenance of all components furnished.