

Ohio EPA

Division of Air Pollution Control

Engineering Section

Engineering Guide #52

Question:

When and how should a continuous emission monitoring system (CEMS) be required? (This question was originated by the Engineering Section of the Division of Air Pollution Control to fulfill a federal grant commitment.)

Answer:

There are several categories of emissions units which are required by federal regulations to install, operate and maintain a CEMS. Monitoring systems may be required to measure and record the flow of exhaust gas streams and the concentrations of particulates (opacity), SO₂, NO_x, CO, O₂, CO₂, VOC, H₂S, HCl, THC or TRS. Please check the appropriate appendix or subpart for specific emission unit requirements.

CEMS INSTALLATIONS REQUIRED BY FEDERAL REGULATIONS

(A) Emissions units subject to the monitoring requirements under 40 CFR Part 51, Appendix P:

EMISSIONS UNIT CATEGORY	40 CFR PART 51 APPENDIX P SECTION	REQUIRED EMISSION MONITORING
Fossil-fuel fired steam generator > 250 MMBTU/HR	2.1	opacity, SO ₂ [*] , NO _x and O ₂ or CO ₂

Nitric acid plant > 300 TPD production capacity	2.2	NOx
Sulfuric acid plant > 300 TPD production capacity	2.3	SO ₂
Petroleum refinery FCCU catalyst regeneration > 20,000 barrels/day fresh feed capacity	2.4	opacity

* only for emission units which have installed SO₂ control equipment

(B) Emissions units subject to the New Source Performance Standards under 40 CFR Part 60:

EMISSIONS UNIT CATEGORY	40 CFR PART 60 SUBPART	REQUIRED EMISSION MONITORING
Fossil fuel fired steam generators	D	opacity, SO ₂ , NOx & O ₂ or CO ₂
Electric utility steam generating units	Da	opacity, SO ₂ , NOx & O ₂ or CO ₂
Industrial-commercial-institutional steam generating units	Db	opacity, SO ₂ , NOx & O ₂ or CO ₂
Small industrial-commercial-institutional steam generating units	Dc	opacity, SO ₂ & O ₂ or CO ₂
Municipal waste combustors	Ea	opacity, SO ₂ , NOx, CO
Portland cement plants	F	opacity
Nitric acid plants	G	NOx
Sulfuric acid plants	H	SO ₂ , O ₂ , CO ₂
Petroleum refineries	J	opacity, SO ₂ , CO, H ₂ S, O ₂
Sewage treatment plants	O	O ₂
Primary copper smelters	P	opacity, SO ₂
Primary zinc smelters	Q	opacity, SO ₂
Primary lead smelters	R	opacity, SO ₂
Ferroalloy production facilities	Z	opacity
Steel plants: electric arc furnaces	AA	opacity

Steel plants: electric arc furnaces and argon-oxygen decarburization vessels	AAa	opacity
Kraft pulp mills	BB	opacity, TRS, O ₂
Glass manufacturing plants (with modified processes)	CC	opacity
Lime manufacturing plants	HH	opacity
Phosphate rock plants	NN	opacity
Rubber tire manufacturing industry	BBB	VOC
Flexible vinyl and urethane coating and printing	FFF	VOC

EMISSIONS UNIT CATEGORY	40 CFR PART 60 SUBPART	REQUIRED MONITORING
Synthetic organic chemical manufacturing industry air oxidation unit processes	III	VOC
Onshore natural gas processing: SO ₂ emissions	LLL	SO ₂ , TRS, acid gas flow
Synthetic organic chemical manufacturing industry distillation operations	NNN	VOC
Petroleum refinery wastewater systems	QQQ	VOC
Magnetic tape coating facilities	SSS	VOC
Polymeric coating of supporting substrates facilities	VVV	VOC

(C) Emissions Units subject to the National Emission Standards for Hazardous Air Pollutants under 40 CFR Part 61:

EMISSIONS UNIT CATEGORY	40 CFR PART 61 SUBPART/SECTION	Control Device	REQUIRED MONITORING
	N		

Ethylene dichloride purification systems, vinyl chloride plants and polyvinyl chloride plants	F 61.68	all control devices	vinyl chloride
Department of Energy facilities	H 61.93	type not specified	radionuclides and flowrate
Nuclear Regulatory Commission-licensed and other non-DOE facilities	I 61.107	type not specified	radionuclides and flowrate
Inorganic arsenic emissions from glass manufacturing plants	N 61.163	type not specified	opacity
Inorganic arsenic emissions from primary copper smelters	O 61.175	type not specified	opacity
Inorganic arsenic emissions from arsenic trioxide and metallic arsenic production facilities	P 61.183	type not specified	opacity
Benzene transfer operations	BB 61.303(d)	carbon adsorption	VOC from each carbon adsorber bed

EMISSIONS UNIT CATEGORY	40 CFR PART 61 SUBPART/SECTION	CONTROL DEVICE	REQUIRED MONITORING
Benzene waste operations	FF 61.354(a)(1) and 61.354 (a)(2)	all systems not complying with 61.348(d)	benzene (parameter monitoring option available)
	FF 61.354(c)(6)	condenser	VOC <u>or</u> benzene (parameter monitoring option available)
	FF 61.354(c)(7)	fixed-bed carbon adsorption	VOC <u>or</u> benzene (parameter monitoring option available)
	FF 61.354(c)(8)	vapor recovery system other than condenser or carbon adsorption	VOC <u>or</u> benzene
	FF 61.354(d)	carbon canister system	VOC <u>or</u> benzene

(D) Emissions Units subject to the National Emission Standards for Hazardous Air Pollutants under 40 CFR Part 63:

EMISSIONS UNIT CATEGORY	40 CFR PART 63 SUBPART/SECTION	CONTROL DEVICE	REQUIRED MONITORING
Synthetic organic chemical manufacturing industry process vent provisions (TRE index value > 1.0 with product recovery devices)	G 63.114(b)	use of product recovery device(s)	VOC (parameter monitoring option available)
Synthetic organic chemical manufacturing Industry transfer operations provisions	G 63.127(b)	use of product recovery device(s)	VOC (parameter monitoring option available)
Synthetic organic chemical manufacturing Industry process wastewater provisions	G 63.139(e) 63.143(e)(2)	control devices used to comply with 63.133 through 63.139	VOC CEMS at the outlet of the control device (parameter monitoring option available)
Coke oven batteries	L 63.305(f)(4)(i) 63.305(f)(4)(ii)	specific device not specified	COMS or: certified Method 9 observer
Dry cleaning facilities	M 63.322(g)(2) 63.323(b)	carbon adsorber used to comply with 63.322(a)(2) or 63.322(b)(3) upon machine door opening	perchloroethylene

EMISSIONS UNIT CATEGORY	40 CFR PART 63 SUBPART/SECTION	CONTROL DEVICE	REQUIRED MONITORING
Dry cleaning facilities	M 63.322(g)(2) 63.323(c)	carbon adsorber used to comply with 63.322(b)(3) prior to machine door opening	perchloroethylene
Ethylene oxide commercial sterilization and fumigation operations	O 63.364(e)(1)	control device type not specified	ethylene oxide
	O 63.364(e)(2)	control device type not specified	ethylene oxide

	O 63.364(f)	manifolding emissions from the chamber exhaust vent to a control device for another vent type	ethylene oxide (parameter monitoring option available)
Gasoline distribution (stage I)	R 63.427(a)(1) 63.427(b)	carbon adsorption	VOC
	R 63.427(a)(2) 63.427(b)	refrigeration condenser system	VOC (parameter monitoring option available)
Halogenated solvent cleaning	T 63.466(e) 63.466(f)(1)	carbon adsorber	halogenated HAP
Epoxy resins and non-nylon polyamides production Basic liquid resins manufacturing	W 63.525(a)(3)	carbon adsorber	VOC and the outlet flow rate
	W 63.525(a)(5)	wastewater treatment system	<u>daily measurements:</u> pH HAP concentration inlet flow rate <u>bi-weekly measurements:</u> total suspended solids and biological oxygen demand
Epoxy resins and non-nylon polyamides production Wet strength resins manufacturing	W 63.525(b)(3)	carbon adsorber	VOC and the outlet flow rate
	W 63.525(b)(4)	wastewater treatment system	<u>daily measurements:</u> pH HAP concentration inlet flow rate <u>bi-weekly measurements:</u> pH and biological oxygen demand

EMISSIONS UNIT CATEGORY	40 CFR PART 63 SUBPART/SECTION	CONTROL DEVICE	REQUIRED MONITORING
Secondary lead smelters (blast furnace)	X 63.548(h)(2)	type not specified	THC
	Y 63.564(a) 63.564(e)(1)	combustion device, except flare	VOC

Marine tank vessel loading operations	Y 63.564(a) 63.564(g)(1)	carbon adsorber	VOC (parameter monitoring option available)
	Y 63.564(a) 63.564(h)(2)	condenser/ refrigeration unit	VOC (parameter monitoring option available)
	Y 63.564(a) 63.564(i)(1)	absorber	VOC (parameter monitoring option available)
Petroleum refineries (wastewater provisions for process wastewater streams meeting the definition of 63.641)	CC 63.647 63.653(a)	control devices as per 40 CFR Part 61.354	VOC <u>or</u> benzene (parameter monitoring option available)
Petroleum refineries (gasoline loading rack provisions)	CC 63.650(a) 63.653(a)	carbon adsorption	VOC
		refrigeration condenser	VOC (parameter monitoring option available)
Petroleum refineries (marine tank vessel loading operation provisions)	CC 63.651(a) 63.653(a)	combustion device, except flare	VOC
		carbon adsorber	VOC (parameter monitoring option available)
		condenser/ refrigeration unit	VOC (parameter monitoring option available)
		absorber	VOC (parameter monitoring option available)
Magnetic tape manufacturing operations	EE 63.704(a) 63.704(b)(1)(i) 63.704(b)(11)	add-on control device used to control solvent HAP emissions	total HAP or VOC (parameter monitoring option available)
	EE 63.704(a) 63.704(b)(10)(ii) 63.704(b)(11)	steam stripper or any other control technique used to comply with 63.703(g)	total VOHAP

(E) Emissions units subject to the Acid Rain Provisions for Continuous Emission Monitoring under 40 CFR Part

75:

EMISSIONS UNIT CATEGORY	40 CFR PART 75* SUBPART/SECTION	REQUIRED MONITORING
Electric generating facilities designated as phase I or II affected units under the acid rain program (see exemptions listed in section 75.2)	B 75.10	general operating requirements for SO ₂ , NO _x , CO ₂ , O ₂ , flow and opacity
	B 75.11	SO ₂ , flow
	B 75.12	NO _x and O ₂ or CO ₂
	B 75.13	CO ₂ , flow
	B 75.14	opacity
	B 75.15	SO ₂ and O ₂ or CO ₂ as a diluent
	B 75.16	SO ₂
	B 75.17	NO _x
	B 75.18	opacity
	E 75.40-75.48	alternative SO ₂ , NO _x and/or flow systems as approved by Administrator
Gas-fired and oil-fired units	Appendix D	SO ₂
Gas-fired and oil-fired peaking units	Appendix E	NO _x

* The Ohio EPA has not been delegated authority for this federal rule. 40 CFR Part 75 terms and conditions will only appear on the federal side of Title V permits.

(F) Emissions units subject to the Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities under 40 CFR Part 264:

EMISSIONS UNIT CATEGORY	40 CFR PART 264* SUBPART/SECTION	REQUIRED MONITORING
Hazardous waste incinerators	O 264.347	CO CEMS (parameter monitoring also required)

* The Ohio EPA has not been delegated authority for this federal rule. 40 CFR Part 264 terms and conditions will only appear on the federal side of Title V permits.

(G) Emissions units subject to the Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities under 40 CFR Part 266:

EMISSIONS UNIT CATEGORY	40 CFR PART 266* SUBPART/SECTION APPENDIX/SECTION	REQUIRED MONITORING
Hazardous waste burned in boilers and industrial furnaces (BIF regulations)	H 266.103(c) 266.103(d) 266.104	CO, O ₂ and THC
Certain exemptions apply per 266.100	Appendix IX section 2.1	CO and O ₂
	Appendix IX section 2.2	THC

* The Ohio EPA has not been delegated authority for this federal rule. 40 CFR Part 266 terms and conditions will only appear on the federal side of Title V permits.

(H) Emissions units subject to the Standards for the Use or Disposal of Sewage Sludge under 40 CFR Part 503:

EMISSIONS UNIT CATEGORY	40 CFR PART 503* SUBPART/SECTION	REQUIRED MONITORING
Sewage sludge incinerator	E 503.45(a) 503.46(b)	THC
	E 503.45(b) 503.46(b)	O ₂
	E 503.45(c) 503.46(b)	moisture

Sewage sludge incinerator	E 503.40(c)	CO or THC
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* 40 CFR Part 503 is under a proposed revision which will affect monitoring requirements. The Ohio EPA has not been delegated authority for this federal rule. 40 CFR Part 503 terms and conditions will only appear on the federal side of Title V permits.

CEMS INSTALLATIONS REQUIRED BY STATE REGULATIONS

(A) Emissions units subject to OAC Chapter 3745-21:

EMISSIONS UNIT CATEGORY	OAC CHAPTER 3745-21 SECTION	CONTROL DEVICE	REQUIRED MONITORING
Coating line complying with a pounds of VOC per gallon of solids limitation	3745-21-09 (B)(3)(j)(viii) (B)(3)(n)	carbon adsorber	VOC
coating or printing line which complies with the applicable capture and control efficiency requirements or overall control efficiency requirements of 21-09(B)(6),(H),(Y),(NN),(PP), or (XX)	3745-21-09 (B)(1)(iv) (B)(3)(n)	carbon adsorber	VOC
an emissions unit, other than a coating or printing line that employs control equipment and is subject to 21-09(O), (W),(X),(CC),(EE),(KK),(LL),(MM),(SS),(TT),(UU),(VV),(YY),(ZZ),(AAA) or (BBB)	3745-21-09 (B)(4)(b)(iv) (B)(4)(b)(vi) (B)(4)(b)(viii) (B)(4)(d)	absorber, carbon adsorber, or condenser	VOC (option available to monitor control device parameters)

Ashland Petroleum Co. (FCC unit regenerator)	3745-21-09(VV)(1)(e)	none	O ₂
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**(B) Emissions units subject to OAC Chapter 3745-57
(Incinerators):**

EMISSIONS UNIT CATEGORY	OAC CHAPTER 3745-57 SECTION	CONTROL DEVICE	REQUIRED MONITORING
Hazardous waste incinerator	3745-57-47(A)(2)	type not specified	CO

**(C) Emissions units subject to OAC Chapter 3745-73 (Total
Reduced Sulfur):**

EMISSIONS UNIT CATEGORY	OAC CHAPTER 3745-73 SECTION	CONTROL DEVICE	REQUIRED MONITORING
Kraft pulp mill: recovery furnaces digester systems evaporator systems lime kilns condensate stripper smelt dissolving tank	3745-73-04(B)	types not specified	TRS

**(D) Emissions units subject to OAC Chapter 3745-75 (Infectious
Waste Incinerator Limitations):**

EMISSIONS UNIT CATEGORY	OAC CHAPTER 3745-75 SECTION	CONTROL DEVICE	REQUIRED MONITORING
Infectious waste incinerators (>1000 lb/hr)	3745-75-04(B)	types not specified	CO
Infectious waste incinerators	3745-75-04(C)	types not specified	radioactivity

Infectious waste incinerators (>1000 lb/hr)	3745-75-04(F)	types not specified	opacity
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For any emissions unit not included in the above-mentioned categories, CEMS should be required by the field office whenever such monitoring is necessary to ensure that the emissions unit is routinely operating in compliance with an applicable mass emission limitation. The following are examples of situations that could necessitate the use of a CEMS for compliance monitoring purposes:

- (1) The emissions unit has demonstrated marginal compliance with the allowable mass rate of emission. (The DAPC considers marginal compliance to be greater than 80% of the allowable mass rate of emission.)
- (2) Method 9 readings are not feasible due to the nature of the operation of the emissions unit.
- (3) Very low visible emission levels must be maintained for the emissions unit to ensure compliance with a very stringent allowable mass rate of emission.
- (4) The emissions unit has a history of periodic, possibly unexplained, violations of OAC rule 3745-17-07.
- (5) The use of a CEMS for a coating line or printing line, or a group of such lines, is more reasonable (both technically and economically) than detailed, daily, line-by-line recordkeeping and reporting for the coatings or printing inks employed. (This approach has been successfully used in situations where several emissions units are located within a permanent total enclosure and vented to a control system.)
- (6) The emissions unit is suspected of emitting excessive emissions after the normal working

hours of the field office.

- (7) The emissions unit consistently operates at or near its equivalent visible emission limitation (EVEL).
- (8) The emissions unit has control equipment that is expected to degrade in efficiency over a short time period (e.g., less than 2 years).

Authority to require a facility to install a CEMS is provided in Ohio Revised Code (ORC) 3704.03(I), ORC 3704.031, Ohio Administrative Code (OAC) rule 3745-15-04(C), and OAC rule 3745-35-02(C)(2). These sections of the ORC and OAC, among other things, give the Director of the Ohio EPA the authority to require the person(s) responsible for any emissions unit to install, employ, maintain and operate any equipment, instrumentation or sensing devices that are reasonable and necessary to determine the amount and content of emissions and other information about the operation of the emissions unit or any violation or potential violation of Chapter 3704. of the Revised Code, or the regulations or orders promulgated thereunder.

Whenever a CEMS is required to be installed, there are several procedures which must take place to ensure the collection of useful data. Prior to installation, a facility must submit information concerning the following:

- a. emissions unit and process involved;
- b. monitoring location details;
- c. monitor detection principle(s); and
- d. data acquisition and handling system (DAHS) operation.

40 CFR Part 60, Appendix B, Performance Specification 1, section 4 and Performance Specification 2, section 3 provide installation and measurement location specifications which must be achieved. Location approval/disapproval will be issued by the Ohio EPA Central Office based on the information submitted. A site visit by Central Office personnel may or may not be necessary at this point.

After approval of the intended location, a certification test must be completed to evaluate the performance of the installed CEMS. Recertification testing must be performed according to the frequency stated in the regulation pertaining to the emission unit or at a frequency determined to be acceptable in the Quality Assurance plan that is approved by the field office and Central Office. An intent to test (ITT) must be submitted at least 30 days prior to the intended test date to allow OEPA personnel the opportunity to witness the test(s). The ITT must include, as a minimum, the following information:

- a. proposed test date;
- b. pre-test meeting date (if desired);
- c. facility contact;
- d. testing contractor information;
- e. emissions unit and testing information;
- f. operating load during test;
- g. USEPA reference method modifications; and
- h. test protocol.

Field office and/or Central Office personnel should coordinate efforts to ensure that CEMS certification tests are witnessed. Specific test procedures are detailed in the appropriate sections of 40 CFR Part 60, Appendix B, Performance Specifications 1 through 9.

Within 30 days of the test date, or other reasonable amount of time, a certification test report must be submitted to the appropriate field office and the Central Office. This test report will be reviewed by the field office and the Central Office to ensure that the test protocol has been implemented properly. A letter of certification approval will be issued by the Central Office after any problems with the report have been resolved.

Recordkeeping and reporting requirements should be effective upon installation of a CEMS and should be accomplished in accordance with 40 CFR Part 60.7(c) and 60.13(h). Quarterly excess emission reports (EER) are required for all facilities performing monitoring activities by way of CEMS. These reports are due to the appropriate field office by the 30th day following the end

of each calendar quarter (i.e., January 30, April 30, July 30, and October 30). The format for these reports is currently determined by the field offices. Each field office must review the EER and provide a summary to the Central Office by the 45th day following the end of each calendar quarter, using appropriate EER summary forms.

A CEMS which is intended for compliance purposes must be operated with sufficient quality assurance/quality control (QA/QC) procedures and an approved QA/QC plan to ensure the measuring and recording of accurate and precise data, with minimal downtime. These procedures are described in the following documents and should be incorporated in permit language as appropriate:

- a. 40 CFR Part 51, Appendix M, Method 203 (when promulgated);
- b. 40 CFR Part 60, Appendix F;
- c. 40 CFR Part 75, Appendix B; and
- d. 40 CFR Part 266, Appendix IX, sections 2.1 and 2.2 (after delegation of authority).

For additional information on continuous emission monitoring and reporting requirements, consult the following references:

- (1) Handbook: Continuous Air Pollution Source Monitoring Systems, (EPA 625/6-79-005);
- (2) Technical Guidance of Review and Use of Excess Emission Reports, (EPA 340/1-84-615); and
- (3) CEM Manual, by Ohio EPA, Division of Air Pollution Control.

BW/TH/DM

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