APPENDICES

Title V monitoring EXAMPLES

The following appendices contain examples of title V monitoring for several different types of emission sources. The majority of the examples focus on uncontrolled sources; for more information on monitoring approaches for sources with active control devices (e.g., scrubbers, baghouses, thermal or catalytic oxidizers, or electrostatic precipitators), please refer to the Compliance Assurance Monitoring (CAM) technical guidance document. The CAM document is located on our web site at www.epa.gov/ttn/emc/cam.html.

The examples were developed based on actual operating permits. In some cases, modifications were made to the monitoring contained in the permits; such changes are noted in each example. The examples are intended to provide illustrations of monitoring that meet title V monitoring criteria, but they do not represent all of the types of sources that will be required to implement title V monitoring or all applicable requirement formats. These examples present only one possible monitoring approach for each situation and are not intended to be prescriptive. Depending on source-specific factors (e.g., size, unit type, fuel, margin of compliance, and variability of emissions) other monitoring approaches may be appropriate for these and similar emissions units. Chapters 4, 5, and 6 provide information to assist you with developing case-specific monitoring approaches.

The examples provide the following information:

1. Source type;
2. Applicable requirements;
3. Monitoring approach; and
4. Basis for selecting the monitoring approach.

The following Table of Contents provides a list of the examples included in Appendices A through E. We will periodically update these appendices with new examples as they are developed, and post the updates on the Emissions Measurement Center (EMC) web site (www.epa.gov/ttn/emc). Appendix F contains definitions of acronyms and abbreviations used throughout the document. Appendix G contains information on various Regional, State, and local agency permitting web sites.

This document provides guidance to EPA Regional and State permitting authorities, as well as to industry and the general public, on how EPA intends to exercise its discretion in implementing the statutory and regulatory provisions regarding monitoring emissions from Title V sources.

The statutory provisions and EPA regulations described in this document contain legally binding requirements. This document does not substitute for those provisions or regulations, nor is it a

regulation itself. Thus, it does not impose legally binding requirements on EPA, States, or the regulated community, and may not apply to a particular situation based upon the circumstances. We and State decision makers retain the discretion to adopt approaches on a case-by-case basis that differ from this guidance where appropriate. Any decisions regarding a particular facility will be made based on the statute and regulations. Therefore, interested parties are free to raise questions and objections about the substance of this guidance and the appropriateness of the application of this guidance to a particular situation. We will, and States should, consider whether or not the recommendations or interpretations in the guidance are appropriate in that situation. This guidance is a living document and may be revised periodically without public notice. EPA welcomes public comments on this document at any time and will consider those comments in any future revision of this guidance document.

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APPENDIX A. COMBUSTION SOURCE EXAMPLES

Title V monitoring Example No. A.1

1. Emissions Unit

1.1 Process/Emissions Unit: 40 mmBtu coal-fired boiler.
1.2 Pollutant(s): Opacity, PM, and SO_2.
1.3 Emissions control technique: Use of low sulfur coal and good operating practices.

2. Applicable Requirements

Opacity: 30 percent opacity (average of 24 consecutive readings)
PM: 0.5 lb/mmBtu
SO_2: 6 lb/mmBtu, 249 tons per year; coal sulfur content limited to 3.5 weight percent, coal usage limited to 3,775 tons per 12 months.

3. Monitoring Approach

Applicable Requirement	Opacity/PM limits	SO_2 limits
General Monitoring Approach	Continuous opacity monitoring.	Continuous monitoring of quantity of fuel burned in boiler. Sampling and analysis of coal sulfur content, heat content.
Monitoring Methods and Location	COMS in boiler exhaust. Corrective action taken if opacity exceeds established indicator range.	Fuel feed rates are based on daily mass totalizer. Representative coal samples prepared according to ASTM D2013, and analyzed according to ASTM D2015 (or D3286) and D3177 (or D4239)
Indicator Range	#25 percent opacity.	Coal use: <3,775 tons per 12 months. Coal sulfur content: <3.5 percent.
Data Collection Frequency	Continuous.	Daily fuel use totals based on weigh scale totalizer. Coal sampling 3 times per day; samples composited and analyzed at the end of each month.
Averaging Period	6 minutes.	Fuel use: Rolling 12-month totals calculated monthly. Fuel analysis: Per lot (i.e., the monthly composite).

Recordkeeping	Data acquisition system stores COMS data. All exceedances and corrective actions are recorded in boiler operating log.	Total fuel use recorded daily. Results of fuel analyses recorded manually and maintained in a log. SO_2 emissions in tons and lb/mmBtu estimated monthly based on fuel use, sulfur content, and heat content of coal burned.
QA/QC	Install and operate COMS according to 40 CFR, Appendix B, Performance Specification 1and general provisions 60.13.	Follow QA/QC procedures in the ASTM methods. Mass totalizer zeroed monthly.

4. Basis

The available emissions information from this facility is limited. The most recent emissions data indicate the plant emissions are about 80 percent of the emission limit. The permit record indicates the facility has periodically exceeded the opacity limit in the past. In an effort to solve the opacity problems, the plant recently updated operating controls and implemented revised operating procedures to maintain a more steady base load. The impact of these changes on emissions is unknown. The results of two performance tests are available. The results of a performance test conducted in 1982 include an average particulate matter emission rate of 0.21 lb/mmBtu (range of 0.158 to 0.255 lb/mmBtu) and opacity measurements ranging from 10 to 25 percent. The measured particulate matter emissions during a 1988 performance test are 0.40 lb/mmBtu (range of 0.34 to 0.44 lb/mmBtu); no opacity measurements were provided with these test results. Because the available performance test data show that the boiler meets the particulate limit of 0.5 lb/mmBtu when the opacity is below 25 percent, opacity is monitored as an indicator that the boiler is continuing to operate properly. It would be helpful to have more information available (e.g., additional opacity data) to assist with the evaluation of appropriate title V monitoring. If this were a new boiler, it would be subject to NSPS subpart Dc, which requires opacity monitoring using a COMS. A COMS is the recommended monitoring for the boiler in this example.

Available data show the coal used in this boiler has a sulfur content at the limit of 3.5 percent. Estimating the SO_2 emission rate based on this value and the one available heat content analysis results in a margin of compliance of about 20 percent relative to the 6 lb/mmBtu limit. The limits on the fuel use and fuel sulfur content serve to limit the boiler's potential to emit to less than 250 tons per year. Actual emissions historically have been around 100 tons per year (because usage has been well below the limit of 3,775 tons/yr, not because other coal samples have a lower sulfur content). Monthly analyses and associated calculations are considered sufficient to ensure the SO_2 emission limits are not exceeded.

5. Additional Comments

The permit reviewed for this example specified a daily visible emissions observation for "normal" visible emissions. However, because this approach (determining whether visible emissions are "normal") is not enforceable and the available data indicate that the unit has had problems complying with the opacity limit in the past (low margin of compliance), the monitoring was changed to COMS for this example. In addition, if the boiler were subject to 40 CFR 60, Subpart Dc, the required monitoring for opacity would be a COMS.

Without additional information on the variability of opacity emissions at this facility, it is difficult to assess whether periodic Method 9 opacity determinations, in lieu of a COMS, will provide a reasonable assurance of compliance with the opacity and PM limits. Another approach that might be considered, in lieu of a COMS, is a combination of parametric monitoring (e.g., monitoring load and combustion efficiency) and periodic visible emissions monitoring; this approach might be more cost effective than a COMS.

6. References/Information Source

1. Title V operating permit conditions for a boiler.
2. ASTM D2013-86, Standard Method of Preparing Coal Samples for Analysis.
3. ASTM D2015-85, Standard Test Method for Gross Calorific Value of Solid Fuel by the Adiabatic Bomb Calorimeter.
4. ASTM D3286-85, Standard Test Method for Gross Calorific Value of Coal and Coke by the Isothermal Jacket Bomb Calorimeter.
5. ASTM D3177-84, Standard Test Methods for Total Sulfur in the Analysis Sample of Coal and Coke.
6. ASTM D4239-85, Standard Test Methods for Sulfur in the Analysis Sample of Coal and Coke Using High Temperature Tube Furnace Combustion Methods.
7. Method 9 – Visual determination of the opacity of emissions from stationary sources.
8. Performance Specification 1 – Specifications and test procedures for opacity continuous emission monitoring systems in stationary sources.

Title V monitoring Example No. A.2

1. Emissions Unit

1.1 Process/Emissions Unit: 99 mmBtu/hr boiler fired with blended fuel oil
1.2 Pollutant: Opacity, SO_2
1.3 Emissions Control Technique: Good combustion practices, use of low-sulfur fuel.

2. Applicable Requirements

Opacity: 20 percent, except for one 6-minute period per hour of not more than 27 percent.
SO_2: Limit of 100 tons per any 12 consecutive months; 0.5 percent fuel oil sulfur content limit.

3. Monitoring Approach

Applicable Requirement	Opacity limit.	SO_2 limit.
General Monitoring Approach	Continuous opacity monitoring.	Monitor fuel use and fuel sulfur content.
Monitoring Methods and Location	COMS in boiler exhaust stack.	Automatic fuel sampling system on fuel feed line. Fuel flowmeter on fuel feed line.
Indicator Range	Less than 20 percent opacity.	Fuel sulfur content less than 0.5 percent by weight. Calculated SO_2 emissions less than 100 tons per 12 months.
Data Collection Frequency	One cycle of sampling and analyzing for each successive 10-second period and one cycle of data recording for each successive 6-minute period. (40 CFR 60.13(e)(1)).	Fuel analysis: One cycle of sampling and analysis per day. Fuel firing rate: Daily total.
Averaging Period	6 minutes.	None for sulfur analysis. 12-month rolling total for annual emissions.

Recordkeeping	The 6-minute average opacity readings are recorded electronically by the data acquisition system. Time and duration of any opacity excursions and corrective actions taken are logged.	Daily flow total is recorded electronically by the data acquisition system. Results of daily fuel analyses are recorded, and fuel analyses in excess of sulfur weight percent limits are logged. SO_2 emissions are calculated daily using measured fuel use and fuel sulfur content.
QA/QC	The COMS is installed and operated according to 40 CFR 60, Appendix B, Performance Specification 1and daily calibration checks of 40 CFR 60.13.	Fuel sulfur analysis conducted in accordance with ASTM D4294; automatic sampling equipment shall conform to ASTM D4177.

4. Basis

This boiler is subject to NSPS subpart Dc. Subpart Dc requires a COMS for units with a capacity >10 mmBtu/hr and fired with oil. The COMS satisfies the title V monitoring criteria for this source for the opacity applicable requirement. The indicator range for the COMS is the established emission limit (20 percent opacity).

Fuel analysis is required to verify compliance with the fuel sulfur content limits. The facility blends fuel oil onsite; the boiler is fed from the blended oil storage tank. Consequently, daily sampling and analysis of the blended fuel oil is required to provide a reasonable assurance of compliance with the fuel oil sulfur content limit and the annual SO_2 limit. Fuel firing rates, in addition to fuel sulfur analyses, are required to calculate annual SO_2 emission rates to monitor compliance with the annual SO_2 limit.

5. Additional Comments

If this facility was not subject to NSPS (as a result of construction date), similar monitoring requirements would be recommended.

6. References/Information Source

1. Title V operating permit conditions for a boiler.
2. 40 CFR 60, Subpart Dc.
3. ASTM D4294, Standard Test Method for Sulfur in Petroleum Products by Energy Dispersive X-Ray Fluorescence Spectroscopy.
4. ASTM D4177, Standard Practice for Automatic Sampling of Petroleum and Petroleum Products.

5. Performance Specification 1 – Specifications and test procedures for opacity continuous emission monitoring systems in stationary sources.

Title V monitoring Example No. A.3

1. Emissions Unit

1.1 Process/Emissions Unit: 77 mmBtu/hr boiler fired with natural gas
1.2 Pollutant: PM, Opacity
1.3 Emissions Control Technique: Good operating practices.

2. Applicable Requirements

PM: 0.2 lb/mmBtu
Opacity: 20 percent, except one 6-minute period per hour of not more than 27 percent

3. Monitoring Approach

Applicable Requirements	PM limit, opacity limit.
General Monitoring Approach	Records of fuel use to show boiler was fired with natural gas only.
Monitoring Methods and Location	
Data Collection Frequency	
Averaging Period	
Recordkeeping	
QA/QC	

4. Basis

Since the boiler is only equipped to be fired with natural gas, there should be no significant PM emissions or visible emissions. Therefore, while there is an applicable requirement, the Permittee can demonstrate that the source is and will continue to operate such that emissions are well below the emission limits by certifying that natural gas is the only fuel fired in the boiler. The AP-42 emission factor for total PM from natural gas-fired boilers is 7.6 lb/mmscf, which converts to 0.0075 lb/mmBtu (less than 5 percent of the emission limit).

5. Additional Comments

None.

6. References/Information Source

1. Title V operating permit conditions for a natural gas-fired boiler.

Title V monitoring Example No. A.4

1. Emissions Unit

1.1 Process/Emissions Unit: Stationary 150 MW turbine firing natural gas or fuel oil
1.2 Pollutant: NO_x, SO_2, CO, PM, Opacity
1.3 Emissions Control Technique: Water injection

2. Applicable Requirements

Pollutant	When firing natural gas	When firing fuel oil
NO_x	25 ppm	42 ppm
SO_2	150 ppmvd at 15% O_2 0.08% sulfur in fuel	150 ppmvd at 15% O_2 0.05% sulfur in fuel oil
CO	25 ppm	25 ppm
PM	0.0064 lb/mmBtu	0.0156 lb/mmBtu
Opacity	10 percent	10 percent

3. Monitoring Approach

Applicable Requirement	NO_x limits	SO_2 limit	CO limit, load limit	PM/Opacity limits
General Monitoring Approach	Nitrogen content of fuel oil, fuel consumption, and water-to-fuel ratio.	Sulfur content of fuel.	Monitor turbine load.	No monitoring. See Basis section.

Monitoring Methods and Location	N_2 content: ASTM Method D3228 or D4629. Fuel consumption: fuel flow meter. Water-to-fuel ratio: fuel flow meter and water flow meter.	Fuel oil: 40 CFR 60, Appendix A, Method 19. Natural gas: Fuel supplier certification.	Turbine instrumentation.	NA
Indicator Range	N_2 content of fuel oil: <0.04% by weight. Water-to-fuel ratio: See table below.	Fuel oil: <0.05% Natural gas: <0.08%	Operate above 50 percent load.	NA
Data Collection Frequency	N_2 content: per shipment of fuel oil. Fuel consumption and water-to-fuel ratio: continuous.	Fuel oil: Each day fuel oil is fired. Natural gas: Semi-annual.	Hourly.	None.
Averaging Period	N_2 content: None. Fuel consumption and water-to-fuel ratio: Hourly.	None.	3 hours.	NA
Recordkeeping	N_2 content of fuel: Records of fuel oil analyses. Fuel consumption and water-to-fuel ratio: DAS stores hourly averages.	Records of fuel oil analyses, natural gas supplier certification.	DAS records turbine load.	Initial performance test results.
QA/QC	Flow meters have a minimum accuracy of 5 percent; annual calibration.	Follow procedures in Method 19 for fuel oil sulfur content.	None.	NA

Indicator Ranges for Water-to-Fuel Ratio

Load, percent	Water-to-Fuel Ratio Indicator Range	
	When Firing Distillate Fuel Oil	When Firing Natural Gas
50	>1.13	>1.12
51-75	>1.16	>1.22
76-90	>1.23	>1.32
91-100	>1.29	>1.37

4. Basis

The injection of water into the combustor lowers the flame temperature and thereby reduces thermal NO_x formation. The water injection rate usually is described by a water-to-fuel ratio (lb/lb) recommended by the turbine manufacturer for optimum NO_x reduction without an increase in CO emissions. NO_x reduction efficiency increases as the water-to-fuel ratio increases. Reductions of 70 to 90 percent are common. Subpart GG of 40 CFR 60 requires an initial performance test to determine the water-to-fuel ratio required to comply with the NO_x standard at four loads in the normal operating range, including minimum and maximum load (see Table 1). Therefore, measuring the flow of water and fuel to the turbine and maintaining the proper water-to-fuel ratio will assure that the turbine is operating in a manner that will achieve a reduction in NO_x emissions without an increase in CO emissions.

The nitrogen content of the fuel oil fired also affects NO_x emissions. Fuels with high nitrogen contents result in significant fuel NO_x emissions. Therefore, the fuel-bound nitrogen is monitored to ensure the nitrogen content is maintained below the indicator range.

Emissions of SO_2 are affected by the amount of sulfur in the fuel burned. The permit specifies a fuel oil sulfur limit lower than the limit in 40 CFR 60, Subpart GG. Therefore, when fuel oil is burned, the sulfur content of the oil must be measured each day. Natural gas sulfur content is not expected to vary significantly; therefore, only a semi-annual fuel supplier certification of the sulfur content is required.

Emissions of CO increase as load decreases. Performance tests were conducted at four load levels from 50 to 100 percent. The CO emissions limit was not exceeded when firing either natural gas or fuel oil. In addition, the turbine is expected to operate only at peak load when in use. Therefore, the title V monitoring to show compliance with the CO limit is

maintained is to document the turbine operates above 50 percent of full load. During these performance tests, the turbine also showed compliance with the particulate limit for both fuels. Tests conducted while the turbine was firing fuel oil showed particulate emission rates less than 20 percent of the limit. In addition, opacity during all tests for all fuels was zero. Therefore, no monitoring is conducted to comply with the PM and opacity limits since the turbine is restricted to the operating range of 50 to 100 percent load to comply with the CO limit.

5. Additional Comments

This example was based on a title V permit and supporting information for a stationary turbine. The only change made to the monitoring contained in the permit was the addition of QA/QC criteria for the water and fuel flow monitors.

6. References/Information Source

1. 40 CFR 60, Subpart GG.
2. *Alternative Control Techniques Document – NOx Emissions from Stationary Gas Turbines*, EPA-453/R-93-007, January 1993.
3. Title V permit, review documentation, and emissions test results for a turbine.
4. ASTM D3228, Standard Test Method for Total Nitrogen in Lubricating Oils and Fuel Oils by Modified Kjeldahl Method.
5. ASTM D4629, Standard Test Method for Trace Nitrogen in Liquid Petroleum Hydrocarbons by Syringe/Inlet Oxidative Combustion and Chemiluminescence Detection.
6. Method 19 – Determination of sulfur dioxide removal efficiency and particulate, sulfur dioxide, and nitrogen oxides emission rates.

APPENDIX B. FUGITIVE SOURCE EXAMPLES

Title V monitoring Example No. B.1

1. Emissions Unit

1.1 Process/Emissions Unit: Manufacturing facility with pumps in volatile organic liquid service
1.2 Pollutant: VOC
1.3 Emissions Control Technique: Leak detection and repair (LDAR)

2. Applicable Requirement

Inspection and maintenance:

Implement and maintain a program for liquid leak detection and correction for processing equipment in volatile organic compound service. Corrections of leaks shall be recorded in a form suitable for inspection by or submittal to the Agency and shall be maintained for at least 5 years from the date of last entry.

3. Monitoring Approach

Applicable Requirement	Implement a leak detection and repair program.
General Monitoring Approach	An inspection and maintenance program is conducted to detect leaks of VOC from pumps.
Monitoring Methods and Location	Visual inspections and portable instrument used to detect VOC leaks at pump seals. Method 21 (40 CFR 60, Appendix A) is used to determine the presence of leaks. If an instrument reading of 10,000 ppm or greater is measured, a leak is detected.
Data Collection Frequency	• Monthly instrumental monitoring for leaks; • Weekly visual inspections for drips.
Averaging Period	None.
Recordkeeping	Maintain written log as documentation of instrumental monitoring using Method 21 and visual inspections. Tag leaking pumps for repair and record date leak detected. Record repair methods and date repaired.
QA/QC	Method 21 procedures used for instrumental monitoring (contains performance criteria, including calibration, for monitor).

4. Basis

Recordkeeping is the appropriate monitoring for an LDAR program. The monitoring and recordkeeping procedures established in 40 CFR 60, Subpart VV, are adequate title V monitoring for this source. Weekly visual inspections for observable drips from pump seals will identify excessive leakage. Monthly checks using a portable VOC monitoring instrument will provide a more sensitive means of identifying small leaks and will prompt repair of those leaks before they become excessive.

5. Additional Comments

Subpart VV also allows for use of pump with dual mechanical seal with leak detection by visual inspection, seal sensor system, and barrier fluid failure criteria.

6. References/Information Source

1. 40 CFR 60, Subpart VV.
2. Title V operating permits.
3. 40 CFR 60, Appendix A, Method 21, "Determination of Volatile Organic Compounds Leaks."

Title V monitoring Example No. B.2

1. Emissions Unit

1.1 Process/Emissions Unit: Fugitive dust emission sources at a particleboard manufacturing facility
1.2 Pollutant: PM
1.3 Emissions Control Technique: Maintenance and cleaning

2. Applicable Requirements

Work practices, inspection and maintenance:

Reduce fugitive dust by performing the following activities:

Daily:

- Clean all accessible paved areas with street sweeper or hose.
- Remove all spillage from material transfer or baghouse/cyclone maintenance.
- Inspect all storage piles to insure material is confined to the designated area.
- Inspect all truck dump enclosures.

Weekly:

- Inspect all roofs and hose down or clean as necessary.

Quarterly:

- Inspect and maintain all doors, silo hatches, and diverter systems such that they are in proper operating condition.
- Inspect and repair as necessary all transfer points, conveyor belts, drag chains, drop points, screws, loaders, and disc scalps.

2. Monitoring Approach

Applicable Requirement	Inspection and maintenance, work practices.
General Monitoring Approach	Documentation of work practices and inspections performed.
Monitoring Methods and Location	Recordkeeping.
Data Collection Frequency	Daily.
Averaging Period	NA

Recordkeeping	Records are maintained of all inspections and maintenance activities performed. Operators record activities on maintenance log sheets, initial, and date.
QA/QC	None.

4. Basis

Checking enclosures, watering surfaces, and removing material spills are effective ways of controlling fugitive dust emissions. The applicable requirement is the conduct of the work practices and inspections. Keeping a daily work practice/maintenance log provides documentation that the work practices were performed and satisfies title V monitoring for this applicable requirement.

5. Additional Comments

None.

6. References/Information Source

1. Title V operating permit for a particleboard manufacturing facility.

Title V monitoring Example No. B.3

1. Emissions Unit

1.1 Process/Emissions Unit: Ore crushing operation at a non-metallic minerals processing plant subject to NSPS subpart OOO.
1.2 Pollutant: Opacity
1.3 Emissions control technique: Good operating practices

2. Applicable Requirements

Crushing operations: Opacity must not exceed 15 percent.

3. Monitoring Approach

Applicable Requirement	Opacity limit.
General Monitoring Approach	Conduct daily visible emissions (VE) observations, and determine opacity if VE are observed.
Monitoring Methods and Location	VE: Method 22 for 1 minute by observer at the crusher. Opacity: Method 203C by trained observer at the crusher.
Data Collection Frequency	VE: Daily, unless no VE for 7 consecutive days, then weekly. If VE are observed during a weekly observation, the frequency reverts back daily, until no VE are observed for 7 consecutive days. Opacity: Whenever VE are observed. Six-minute observation.
UAveraging Period	VE: None. Opacity: None.
Recordkeeping	Visible emissions: Record in a log the time of day, operating rate of equipment, description of visual background during the observation, and results of observation. Opacity: As specified in Method 203C.
QA/QC	Visible emissions: Observer trained per Method 22. Opacity: Observer certified per Method 203C.

4. Basis

Daily observations that reveal no VE provide reasonable assurance of compliance with the opacity limit. Detecting VE is an indicator of operating problems and gives the owner or operator a chance to take corrective actions before exceeding the opacity limit. Conducting opacity observations after the observation of VE determines whether the emissions exceed the opacity limit, or confirms that corrective action has restored proper operation. A tiered

monitoring frequency for VE observations was specified to reduce the VE observation frequency if the unit routinely operates with no VE.

5. Additional Comments

The permit used to develop this example specified only biweekly 30-second opacity observations. A biweekly opacity observation is not adequate title V monitoring because it does not provide a reasonable assurance of compliance with the opacity limit over the anticipated operating range. Therefore, a 1-minute daily observation was added, with a tiered frequency that reduces to weekly if no visible emissions are detected for 7 days. In addition, since the source is never to exceed 10 percent opacity, Method 203C is referenced instead of Method 9.

6. References/Information Source

1. General permit for nonmetallic mineral processing plant.
2. Method 22 – Visual determination of fugitive emissions from material sources and smoke emissions from flares.
3. Draft Method 203C – Visual determination of opacity of emissions from stationary sources for instantaneous limitation regulations.

Title V monitoring Example No. B.4

1. Emissions Unit

1.1 Process/Emissions Unit: Unpaved access and mine roads
1.2 Pollutant: Opacity
1.3 Emissions Control Technique: Water spray

2. Applicable Requirement

Work practices:

2.1 The haul road length must not exceed 2.5 miles.
2.2 Spray water at a minimum of 0.25 gallons per square yard at least every 2 hours during operation unless daily rainfall exceeds 0.10 inches, the road is muddy or covered with snow, or if the ambient temperature is below freezing.
2.3 Opacity must not exceed 20 percent.

3. Monitoring Approach

Applicable Requirement	Haul road length not to exceed 2.5 miles.	Spray water on roads.	Opacity limit.
General Monitoring Approach	Measure road length.	Documentation of spraying or reason water was not sprayed.	Conduct weekly visible emissions (VE) observations. Determine opacity if VE are observed.

Monitoring Methods and Location	Length of the road must be measured using vehicle odometer to the nearest 0.1 mile.	- Quantity applied: Monitor initial and final levels of water in the tank truck and, based on dimensions of tank, calculate the volume of water discharged. - Application rate: Calculate from quantity of water applied and predetermined maximum treatable area. - Ambient temperature: Onsite thermometer. - Description of roads: Visual observation. - Amount of rainfall: Onsite rain gauge.	VE: One-minute Method 22 observation. Opacity: Six-minute Method 203C observation by trained observer at haul road.
Indicator Range	#2.5 miles.	NA	VE: no VE. Opacity: <20 percent.
Data Collection Frequency	During the first 10 days of each calendar quarter.	Every 2 hours.	VE: Weekly. Opacity: Whenever VE are observed.
Averaging Period	None.	None.	VE: None. Opacity: None.

Recordkeeping	Maintain measurements in a log book.	The following are recorded: - Date and time of each application or explanation for not applying. - Application rate and quantity applied (or ambient temperature, if below freezing). - Amount of rainfall received during preceding 24 hours, if any. - Description of roads, if muddy or wet.	VE: Record in log the time of day, description of visual background during observation, and results of observation. Opacity: As specified in Method 203C.
QA/QC	None.	Documentation of water truck capacity.	Opacity: Observer certified per Method 203C.

4. Basis

Spraying water is an effective way of controlling fugitive dust from roads. The applicable work practice requires application of water at a specified rate and frequency. The records of the date and time of each application will provide the necessary information to determine that the applicable requirement is being met (e.g., the plant measures the amount of water applied and already knows the surface area of the treated area). The records also document the existence of weather conditions under which spraying is not required.

The road length is a factor affecting the overall emissions; i.e., the number of vehicle miles traveled affects the total emissions. The permit limits the length of the road to no more than 2.5 miles. Quarterly monitoring of the road length is adequate to provide a reasonable assurance of compliance with the limit.

Weekly observations that reveal no VE provide a reasonable assurance of compliance with the opacity limit. Conducting opacity observations if VE are observed determines whether the visible emissions exceed the opacity limit.

5. Additional Comments

An alternative to measuring the water level in the tank truck before and after treatment to calculate the amount of water applied would be to always fill the tank truck and empty it

completely during treatment so the quantity applied is always the same (i.e., equal to the volume of the tank truck, which the facility is required to document).

The operating permit reviewed for this example also contains an applicable requirement stating that the speed of heavy vehicles and haul trucks must not exceed 25 miles per hour. The speed of light trucks must not exceed 40 miles per hour provided the opacity readings are below 20 percent; otherwise, light vehicles must not exceed 25 miles per hour. The monitoring requires the facility to post speed limit signs at the entrance to the haul road and shift supervisors are to observe the speed of the vehicles and to correct any violations. At least once each quarter, the presence of speed limit signs must be verified. The facility is required to log the results of the quarterly inspections of the speed limit signs. The speed limit applicable requirement was not included in the example because the monitoring is not practical (e.g., the supervisor cannot monitor the speed limit of every truck that travels down the road).

6. References/Information Source

1. Operating permit for mineral products facility.

Title V monitoring Example No. B.5

1. Emissions Unit

1.1 Process/Emissions Unit: Ore conveying and crushing operations at a phosphate rock mining and processing plant.
1.2 Pollutant: Opacity
1.3 Emissions Control Technique: Water spray

2. Applicable Requirements

Work practices:

2.1 Cover all ore conveyor transfer points.
2.2 Operate water sprays at ore conveyor transfer points whenever the ore (as loaded onto the conveyor at the ore dump bin) has a moisture content less than 3 percent by weight, except when the ambient temperature is below freezing.
2.3 Operate water sprays at the base of the stacker whenever the ore (at the base of the stacker) has a moisture content less than 4 percent by weight, except when the ambient temperature is below freezing.
2.4 Length of the conveyor must not exceed 18,000 feet.
2.5 Visible emissions (VE) must not exceed 10 percent opacity.

3. Monitoring Approach

Applicable Requirement	Cover transfer points.	Water sprays.	Length of conveyor.	Opacity limit.
General Monitoring Approach	Inspect the integrity of the cover at each transfer point.	Monitor ore moisture content. Document water spray operation when ore moisture content is below the limit and the ambient temperature is above freezing. Inspect spray bars for proper operation.	Measure length of the conveyor.	Conduct weekly visible emissions (VE) observations; determine opacity if VE are observed.

Monitoring Methods and Location	Visually inspect the integrity of the cover at each transfer point.	Measure the moisture content of the ore at the loading operations, at any point on the conveyor within 500 feet of ore loading, and at base of stacker within 100 feet of the base of the stacker. Moisture content: ASTM methods D2216, D4643, or D4959. Ambient temperature: Onsite thermometer. Visually inspect spray bars.	Measure with measuring tape or similar method.	VE: Method 22 for 1 minute at each transfer point. Opacity: Six-minute Method 203 C observation by a certified observer at each transfer point.
Indicator Range	NA	Moisture content: $3 percent at conveyor, $4 percent at base of stacker.	#18,000 feet.	VE: no VE. Opacity: <10 percent.
Data Collection Frequency	Quarterly.	Moisture content: Once per month. Ambient temperature: Once per shift (8 hours), when spraying is required but temperature is below freezing. Spray bar inspection: Daily, when spraying is required.	Quarterly.	VE: Weekly. Opacity: Whenever VE are observed.
Averaging Period	NA	None.	NA	VE: None. Opacity: None.

Recordkeeping	Document the results of the inspection and any necessary corrective action in a log.	Record moisture content determinations and the method used. If spraying is required but ambient temperature is below freezing, record ambient temperature readings every 8 hours. When spraying is required, document spray bar inspections and corrective actions in a log.	Record conveyor length in a log.	VE: Record in a log the time of day, operating rate of equipment, description of visual background during the observation, and results of observation. Opacity: As specified in Method 203C.
QA/QC	None.	Moisture content: As specified in the ASTM methods. Ambient temperature: None. Spray bar inspections: None.	None.	VE: Observer trained per Method 22. Opacity: Observer certified per Method 203 C.

4. Basis

Fugitive dust emissions from the conveyor transfer points are less likely when the ore is damp and the transfer points are covered. Typically, the moisture content of the raw ore at this plant is expected to be above the required level of 3 percent. Historical data support this expectation. Over a 1-year period, only one sample was less than 3 percent; in a subsequent sample (taken before the next scheduled monthly sample), the moisture content was again above 3 percent. Another reason more frequent moisture content determinations are not considered necessary is that no visible emissions have been observed during the weekly observations. In those instances when the natural ore moisture content is below 3 percent, the plant operates a spray system that is designed to provide more than enough water to raise the moisture content above 3 percent. To ensure that the system operates as designed, daily inspections of the spray bars (followed by corrective action, as necessary) provide reasonable assurance that they always operate as designed when spraying is required.

The fact that no visible emissions have been detected in the weekly observations for a year suggests that the margin of compliance for the opacity limit is high. The referenced permit,

however, did not specify a test method to use. Method 22 is appropriate for fugitive emissions. Method 203C is appropriate for visual determination of the opacity of emissions. Weekly observations are considered sufficient because of the data history. In the absence of such data, daily observations should be performed for two weeks during a dry period of the year to show the large margin of compliance; the VE observations then could be scaled back to weekly. If the ore moisture content was frequently below the limit, either more frequent visible emissions observations (e.g., daily) or more frequent moisture content determinations would be necessary to provide a reasonable assurance that water is applied when required and that the opacity limit is not exceeded.

5. Additional Comments

One of the requirements for title V monitoring is that the frequency of data collection must be specified. The permit reviewed for this example did not specify the required frequency of temperature measurements. Checking the temperature at least once per shift (every 8 hours) during periods when the moisture content is below 3 percent and the water spray is not being operated provides a reasonable assurance that the sprays are activated or reactivated within a short time after the ambient temperature climbs above freezing.

The permit reviewed for this example did not specify any monitoring associated with the requirement to cover the ore transfer points. Because the covers are permanent structures, adding a requirement for quarterly inspections to confirm that they are intact or in place as designed provides a reasonable assurance that they are always in place.

6. References/Information Source

1. Title V operating permit for a phosphate rock mining and processing plant.
2. ASTM D2216, Standard Test Method for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass.
3. ASTM D4643, Standard Test Method for Determination of Water (Moisture) Content of Soil by the Microwave Oven Method.
4. ASTM D4959, Standard Test Method for Determination of Water (Moisture) Content of Soil by Direct Heating Method.
5. Method 22 – Visual determination of fugitive emissions from material sources and smoke emissions from flares.
6. Draft Method 203C – Visual determination of opacity of emissions from stationary sources for instantaneous limitation regulations.

APPENDIX C. COATING SOURCE EXAMPLES

Title V monitoring Example No. C.1

1. Emissions Unit

1.1 Process/Emissions Unit: Surface coating line
1.2 Pollutants: VOC and HAP
1.3 Emissions Control Technique: Limit the VOC/HAP content of coating and amount of coating used.

2. Applicable Requirements

Emissions limits:

The amount of VOC and HAP delivered to the coating applicator plus the amount of cleaning solvent used is not to exceed 8.2 tons of VOC per month and 0.78 tons of any single HAP or 2 tons of any combination of HAP per month.

3. Monitoring Approach

Applicable Requirement	Limit total monthly quantity of VOC and HAP delivered to the coating applicator and used for cleaning.
General Monitoring Approach	Coating and thinner usage and VOC/HAP contents are used to calculate tons of emissions per month.
Monitoring Methods and Location	Records are kept of coating and solvent use and coating and solvent VOC/HAP content. The amount used and the VOC and HAP content of each coating material and solvent used is recorded. Coating and cleaning solvent usage for each month, and weight of VOC and each HAP emitted for each compliance period are logged.
Data Collection Frequency	Monthly.
Averaging Period	None.
Recordkeeping	1. The amount and VOC and HAP content of each coating and solvent used each month. Records shall include purchase orders, inventory, or coating/solvent usage records, and either certified product data sheets, manufacturer's formulation data, or Method 24/Method 311 test results. Solvent usage records shall differentiate between solvent added to coatings and solvent used for cleanup. 2. A log of the dates of use. 3. The cleanup solvent usage for each month. 4. The total VOC and HAP usage for each month.
QA/QC	None unless Method 24/311 used. If Method 24/311 analyses are performed, the specific QA/QC procedures outlined in the method are followed.

4. Basis

All coatings used at this facility have low VOC and HAP contents. The facility routinely operates well below the VOC and HAP limits. The facility has a limited number of coatings that they use, and the coatings do not change often. Therefore, a recordkeeping approach provides a reasonable assurance of compliance over all operating conditions.

5. Additional Comments

Limiting VOC and HAP coating content and coating usage limits the emissions of VOC and HAP and ensures compliance with a monthly emission limit. This method assumes 100 percent of the VOC and HAP in the coatings and cleanup solvents is emitted to the atmosphere. As a facility's margin of compliance decreases, the accuracy of the method used to determine each coating's VOC/HAP content should increase. Therefore, if historical data indicate that the facility is operating just below their emission limit, acceptable title V monitoring might include periodic Method 24 or Method 311 analyses to verify coating VOC/HAP content and supplement the recordkeeping. Since this facility routinely operates with a large margin of compliance, use of product data sheets that give the coating VOC/HAP content based on the manufacturer's formulation data or a Method 24/Method 311 analysis performed by the manufacturer is adequate. Although the facility's permit allowed the use of MSDS to document VOC/HAP content, because the quality of MSDS varies among manufacturers and products, we have specified certified product data sheets, manufacturer's formulation data, or test data in this example.

6. References/Information Source

1. Operating permit and technical support document for a coating facility.
2. Method 24 – Determination of volatile matter content, water content, density, volume solids, and weight solids of surface coatings.
3. Method 311 – Analysis of hazardous air pollutant compounds in paints and coatings by direct injection into a gas chromatograph.

Title V monitoring Example No. C.2

1. Emissions Unit

1.1 Process/Emissions Unit: Surface coating line
1.2 Pollutant: VOC
1.3 Emissions Control Technique: Limit VOC content of coatings

2. Applicable Requirement

Material content limit:

Limit average as-applied VOC content of coatings per calendar month to 2.9 lb/gal, as applied, excluding water and exempt compounds.

3. Monitoring Approach

Applicable Requirement	Coating VOC limit.
General Monitoring Approach	Records kept of the as-applied VOC content of all coatings used.
Monitoring Methods and Location	The VOC content and applicable physical properties are determined using Method 24, 40 CFR 60, Appendix A at 1-hour bake time. Coating manufacturer's test results as determined by Method 24 may also be used.
Indicator Range	Coating VOC content less than 2.9 lb/gal, minus water and exempt compounds.
Data Collection Frequency	Upon use of a new low-VOC coatings and whenever changes are made in coating constituents or coating formulation.
Averaging Period	None.
Recordkeeping	For each coating: supplier, name and color, type, ID number, density (lb/gal), total volatile content (weight %), water content (weight %), exempt solvent content (weight %), VOC content (weight %), solids content (vol. %). For coating operations that use diluents: diluent name and ID, diluent solvent density (lb/gal), diluent VOC content (weight %), diluent exempt solvent content (weight %), volume of diluent VOC (gal), diluent ratio (gal diluent solvent/gal coating).
QA/QC	Per Method 24.

4. Basis

The facility uses Method 24 results to assure that the VOC content of all coatings used is below the limit.

5. Additional Comments

None.

6. References/Information Source

1. Coating facility Title V permit.
2. Method 24 – Determination of volatile matter content, water content, density, volume solids, and weight solids of surface coatings.

APPENDIX D. OTHER VOC SOURCE EXAMPLES

Title V monitoring Example No. D.1

1. Emissions Unit

1.1 Process/Emissions Unit: External floating roof tank equipped with a mechanical shoe primary rim seal and storing petroleum liquid.
1.2 Pollutant: VOC
1.3 Emissions Control Technique: Equipment maintenance

2. Applicable Requirements

Work practices, equipment standards:

- Do not store any liquid with a maximum true vapor pressure (TVP) greater than 11.1 psia.
- Equip the tank with both a primary and secondary rim seal.
- The accumulated area of gaps between the tank wall and the primary rim seal must not exceed 212 cm^2 per meter of tank diameter (10 in^2/ft) and the width of any portion of any gap shall not exceed 3.81 cm (1.5 in).
- The accumulated area of gaps between the tank wall and the secondary rim seal must not exceed 21.2 cm^2 per meter of tank diameter (1.0 in^2/ft) and the width of any portion of any gap shall not exceed 1.27 cm (0.5 in).
- There are to be no holes or tears in the seal fabric.

3. Monitoring Approach

Applicable Requirement	Maximum TVP of 11.1 psia.	Rim seal requirements.
General Monitoring Approach	Keep records of liquids stored.	Tank inspection and maintenance.

Monitoring Methods and Location	Determined maximum TVP using standard reference texts or ASTM Method D2879-83.	Measure the seal gaps per 40 CFR 60.113(a) and inspect the roof and seal for the following defects: • The floating roof is not resting on the surface of the liquid; • There is petroleum liquid accumulated on the surface of the floating roof; • The seal is detached from the floating roof; or • There are tears or holes in the seal fabric. Repair within 45 days or remove tank from service.
Data Collection Frequency	Each storage period.	Annually for the secondary seal, every 5 years for the primary seal.
Averaging Period	NA	NA
Recordkeeping	Records are kept for each liquid stored that document the liquid stored, period of storage, and the maximum true vapor pressure of the liquid during that period.	Records are kept of all rim seal inspection and maintenance activities in a tank maintenance log.
QA/QC	None, unless ASTM Method used.	None.

4. Basis

The maximum true vapor pressure of the liquid stored affects the emissions from the tank. Limiting the maximum true vapor pressure of the liquid limits the emissions expected from the tank. Inspection of the seals and roof fittings ensure that excess evaporative emissions are not occurring, the correct equipment is being used, and that the equipment is not deteriorating.

6. Additional Comments

None.

7. References/Information Source

1. 40 CFR 60, Subpart Ka.
2. Operating permit for a facility with a tank farm.

3. ASTM D2879, Standard Test Method for Vapor Pressure-Temperature Relationship and Initial Decomposition Temperature of Liquids by Isoteniscope.

Title V monitoring Example No. D.2

1. Emissions Unit

1.1 Process/Emissions Unit: Internal floating roof tank storing petroleum liquid
1.2 Pollutant: VOC
1.3 Emissions Control Technique: Equipment maintenance

2. Applicable Requirements

Equipment standard:

- Equip and operate each storage vessel that contains a liquid with a true vapor pressure (TVP) of 1.5 psia or more with a fixed roof tank with an internal floating roof meeting the specifications in 40 CFR 60.112a (a)(2).

Material content limitation:

- Keep records of liquid stored and maximum true vapor pressure during the storage period. Do not store liquids with a true vapor pressure greater than 11.1 psia.

3. Monitoring Approach

Applicable Requirement	Maximum TVP of 11.1 psia.	Equipment standards.
General Monitoring Approach	Keep records of liquids stored.	Tank inspection and maintenance.
Monitoring Methods and Location	Maximum TVP determined using standard reference texts or ASTM Method D2879-83.	Measure the seal gaps per 40 CFR 60.113(a) and inspect the roof and seal for the following defects: • The floating roof is not resting on the surface of the liquid; • There is petroleum liquid accumulated on the surface of the floating roof; • The seal is detached from the floating roof; or • There are tears or holes in the seal fabric. Repair within 45 days or remove tank from service.
Data Collection Frequency	Each storage period.	Annual and 10-yr inspections for tanks with primary seal only. For tanks with primary and secondary seal, annually for the secondary seal, every 5 years for the primary seal.

Averaging Period	NA	NA
Recordkeeping	Records are kept that document the liquid stored, period of storage, and the maximum true vapor pressure of the liquid during that period.	Records are kept of all rim seal inspection and maintenance activities in a tank maintenance log.
QA/QC	None unless ASTM method used.	None.

4. Basis

The maximum true vapor pressure of the liquid stored affects emissions from the tank. Limiting the maximum true vapor pressure of the liquid limits the emissions expected from the tank. Inspections of the seals and fittings ensure that excess evaporative emissions from the floating roof are not occurring, the equipment is not deteriorating, and the correct equipment is being used.

5. Additional Comments

None.

6. References/Information Source

1. 40 CFR 60, Subpart Ka.
2. General operating permit for petroleum storage tanks.
3. ASTM D2879, Standard Test Method for Vapor Pressure-Temperature Relationship and Initial Decomposition Temperature of Liquids by Isoteniscope.

Title V monitoring Example No. D.3

1. Emissions Unit

1.1 Process/Emissions Unit: Process vents, transfer operations, equipment leaks and other sources at SOCMI, other chemical manufacturing, and petroleum refining facilities
1.2 Pollutant: VOC and organic HAP
1.3 Emissions Control Technique: Flare

2. Applicable Requirements

Emissions control:

- Reduce emissions of organic HAP using a flare.

Equipment standard:

- Flares must be designed and operated according to the specifications in 40 CFR 60.18.
    1. The flare must be designed and operated with no visible emissions;
    2. The flare must be operated with a flame present at all times; and
    3. The flare must be operated at all times when emissions may be vented to it.

3. Monitoring Approach

Applicable Requirement	Operate flare with no visible emissions (VE).	Operate flare with pilot flame present at all times.	Ensure no bypass of the flare is occurring.
General Monitoring Approach	Visible emissions observation	Monitor temperature of pilot flame.	Inspect bypass valve seals.

Monitoring Methods and Location	Visible emissions observation via remote viewing system, supplemented by recordkeeping of instances in which unable to correct visible emissions problem and duration of VE. Perform a VE inspection as soon as any intentional or unintentional release of vent gas to the flare occurs (no later than one hour after event).	Thermocouple (or other temperature sensing device) and alarm system.	Perform a visual inspection of the seal or closure of the seal or closure mechanism to ensure that the valve is maintained in the closed position and that the gas flow is not diverted through the bypass line.
Indicator Range	No visible emissions.	Presence of flame.	Closed valve.
Data Collection Frequency	Continuous.	Continuous.	At least once every month.
Averaging Period	None.	None.	None.
Recordkeeping	Log all observations of visible emissions of more than a few seconds (control response time) and the duration of the event.	Note in logbook all alarm activation incidents and record whether each alarm activation indicates the pilot flame is extinguished.	Maintain records of all inspections and any corrective action taken.

QA/QC	Periodic inspection of camera to check working condition.	Calibration, maintenance, and operation of thermocouples or other temperature/flame sensing devices will be performed following procedures that take into account manufacturer's specifications.	None.

4. Basis

Visible emissions: A smoking flare indicates incomplete combustion. Use of a video camera located in the control room gives the operator the opportunity to observe the flare at any time and take corrective action if needed.

Presence of pilot flame: Presence of pilot flame indicates that the flare is operating. A thermocouple or other temperature sensing device that provides continuous data and is connected to an alarm system will ensure corrective action is taken immediately if the pilot light is extinguished.

5. Additional Comments

4. A source also could perform daily visual observations to verify there are no visible emissions from the flare.
5. Some sources have proposed the use of video cameras or infrared cameras as the sole monitor of the flare pilot flame, but this approach provides less assurance that the flare pilot flame is present at all times unless the device can be linked to some kind of alarm (the camera will not be observed continuously).
6. Bypass of the flare also can be monitored using a device that senses flow in the bypass line after the bypass valve.

6. References/Information Sources

1. 40 CFR 60.18.
2. Monitoring approach submitted by a facility.

APPENDIX E. OTHER PM SOURCE EXAMPLES

Title V monitoring Example No. E.1

1. Emissions Unit

1.1 Process/Emissions Unit: Mineral processing operations - milling, screening, conveying, and dry product storage.
1.2 Pollutant: PM, Opacity
1.3 Emissions Control Technique: Baghouse

2. Applicable Requirement

Opacity: 7 percent
PM: 0.02 gr/dscf

3. Monitoring Approach

Applicable Requirement	Opacity and PM limits.
General Monitoring Approach	Visible emissions checks and inspection and maintenance program.
Monitoring Methods and Location	Visible emissions (VE) checks and baghouse inspections are performed to ensure equipment is operating properly and bags are not deteriorating. If visible emissions are observed, a Method 9 observation is performed to determine if the unit is in compliance with the opacity standard.
Indicator Range	VE: < 7 percent.
Data Collection Frequency	- Daily checks: Visible emissions observations (6 min.). - Weekly checks: Record the pressure drop across each baghouse. Check the cleaning system for proper operation. Check hoppers and conveying systems for proper operation.
Averaging Period	None.
Recordkeeping	Records kept of daily VE observations and all inspections and any maintenance performed. Spare parts inventory maintained on site.
QA/QC	VE observer trained per Method 22. Opacity observer trained and certified per Method 9.

4. Basis

A frequent inspection of a baghouse and its components will insure that it continues to operate properly and achieve the desired PM control efficiency. The absence of visible emissions also is a good indicator of low emissions. If visible emissions are observed, a Method 9 observation will ensure compliance with the opacity standard.

5. Additional Comments

Note that the pre-control emissions from this unit are less than 100 tons per year, so CAM does not apply.

6. References/Information Source

1. Operating permit for a clay processing facility.
2. Method 9 – Visual determination of the opacity of emissions from stationary sources.
3. Method 22 – Visual determination of fugitive emissions from material sources and smoke emissions from flares.

Title V monitoring Example No. E.2

1. Emissions Unit

1.1 Process/Emissions Unit: Veneer Dryer
1.2 Pollutant: PM, Opacity
1.3 Emissions Control Technique: Control operating parameters of dryer

2. Applicable Requirements

PM limits: 0.3 lb/MSF dried, 4.9 lb/hr.
Opacity: 5 percent average and 10 percent maximum.

3. Monitoring Approach

Applicable Requirement	PM limit	Opacity limit
General Monitoring Approach	Dryer operating parameters monitored.	Visible emissions checks performed.
Monitoring Methods and Location	- Species, thickness, quantity dried, redry: veneer dryer operating records. - Temperatures: thermocouples in green and dry ends of dryer. See below for indicator ranges. - Drying time: timer on dryer. See below for indicator ranges.	A visible emissions observation is performed while the dryer is operating. If visible emissions are detected, a Method 9 opacity observation is performed to ensure the source is meeting the opacity limit.
Data Collection Frequency	Per drying cycle.	Daily for 6 minutes.
Averaging Period	Per run, or hourly if run longer than one hour.	None.
Recordkeeping	All dryer operating parameters are recorded by the DAS for each run (or hourly if the run is longer than one hour).	Documentation that observation was performed and presence/absence of visible emissions (yes/no, duration).
QA/QC	Thermocouples are calibrated annually according to manufacturer's recommendations.	Visible emissions observers are trained per Method 22 or Method 9.

Periodic Testing	Annual performance test using Method 5.	Record results of Method 9 opacity observations during annual performance test.

The indicator ranges for wood thickness, drying temperatures, and drying time are as follows when drying Douglas Fir:

Species	Thickness, in.	Maximum temperatures		Maximum drying time, min.
		Green end, °F	Dry end, °F	
Douglas Fir	0.100	320	320	15
Douglas Fir	>0.228	345	345	50

4. Basis

Emissions from dryers are composed of wood dust, combustion products, fly ash, and organic compounds evaporated from the wood. The composition of the wood dryer effluents is significantly affected by the wood species, dryer temperatures, dryer loading rate, previous drying of the wood, and other factors. The rate of aerosol formation is lower at lower dryer temperatures; small increases in the inlet dryer temperature can result in large increases in the PM mass emission rate. Dryer residence time also effects emissions, because if particles are held in the dryer too long, the surfaces volatilize, resulting in visible emissions from the dryer.

Data from five annual emissions tests are available for this facility:

Year	PM Emissions		Opacity, percent
	(lb/hr)	(lb/msf)	
1996	1.0	0.109	0 to 5
1994	0.93	0.099	0 to 5
1993	5.7	0.99	0 to 15
1992	4.0	0.45	NA
1991	1.1	0.21	NA

Three of the five emissions tests (including the two most recent tests) indicate the facility operates well within the emissions limits. One test indicates the facility meets the lb/hr limit, but exceeds the lb/msf limit. The 1993 test indicates the source was not in compliance with the limit on either basis. However, the results of this test are suspect. The measured PM concentrations for this test were consistent with the reported values for all the other tests, but the measured flow rates were significantly higher. The opacity measurements taken during the performance tests indicate the unit is in compliance with the opacity limit (except for one 15-second observation that exceeded the maximum limit during the 1993 test). Based on this information (and disregarding the anomalous 1993 results), maintaining dryer operating parameters within the established ranges provides a reasonable assurance of compliance. A daily visible emissions observation is included in the title V monitoring as an evaluation of performance of the dryer and to monitor compliance with the opacity limit. Because the parametric relationship between emissions and dryer operating parameters is not well known, an annual source test also is included in the monitoring approach to verify that the relationship has not changed and the parametric monitoring remains valid.

5. Additional Comments

In some cases, a tiered source testing frequency can be incorporated into the title V monitoring approach. For example, if consecutive source tests continue to show operation at less than 50 percent of the PM emissions limit, the test frequency could be reduced to biannual (or once per permit term). If the biannual source test showed operation at greater than 50 percent of the PM emissions limit, the frequency would revert to yearly.

6. References/Information Source

1. Title V permit for a plywood manufacturing facility.
2 Method 5 – Determination of particulate emissions from stationary sources.
3. Method 9 – Visual determination of the opacity of emissions from stationary sources.
4. Method 22 – Visual determination of fugitive emissions from material sources and smoke emissions from flares.