



Internal Management Directive

Subject:		IMD Number:	
Emission Factor Guidance for NSR Regulated Pollutants		AQ.00.020	
Effective Date:	May 1, 2012	Pages:	9
Revision Date:			
Approval:	<i>Signature on file</i> Andrew Ginsburg - Air Quality Administrator		

Intent / Purpose / Statement of Need

This Internal Management Directive describes the procedure the Air Quality Division of DEQ will use to establish a consistent approach when using emission factors to calculate emissions for permitted sources. After review of concerns raised by EPA in their national enforcement priority focus, DEQ has determined that changes should be made in choosing emission factors.

Directive to Air Quality Permit Writers

This directive applies to Air Quality permit writers who are establishing or correcting baseline emission rates, netting bases and Plant Site Emission Limits for Air Contaminant Discharge Permits and Title V permits. Permit writers should make corrections whenever they discover that a baseline emission rate or PSEL has not been calculated consistent with this IMD. Sources determine compliance with their PSELs each month, frequently by using emission factors included in their permits along with the recorded monthly process parameters for the preceding month. This IMD provides direction on selecting or calculating emission factors; it does not address other emission calculation methods such as mass balance.

Fundamental PSEL concepts

PSELs and baseline emission rates are annual values, and the goal of the emission calculations is to best estimate these annual rates. Process emissions may vary from day to day, and for any given day, an emission factor based on the average emission rate may over- or underestimate the actual emissions. However, the average emission rate will be a better estimator of emissions over the longer term; for this reason, emission factors should normally use an average value rather than a value that is closer to the short-term worst case.

Calculating Emissions

There are a number of options for selecting an emission factor but it is ultimately a case-by-case determination. Permit writers must select the method that best approximates “actual emissions” as defined by OAR 340-200-0020(2). The following list is a presumptive hierarchy of the types of information that should best approximate actual emissions but each individual case may be different:

1. Continuous Monitoring System data
2. Source test data
3. Source test data from similar equipment
4. Trade or technical association data (e.g., National Council for Air and Stream Improvement, National Particleboard Association, etc.)

5. DEQ emission factors
6. Compilation of Air Pollutant Emission Factors (AP-42)
7. Airs Facility Subsystem (AFS) Source Classification Codes and Emission Factor Listing
8. Engineering judgment based on sound assumptions about the source type, industry, or site-specific conditions

When emission factors are used to calculate emissions, the following approach explains the above hierarchy in more detail and should be used to improve the consistency and correctness of the baseline emission rates and current actual emissions:

- Use all site specific source test data whenever available, even if it is only one test, provided that it is representative of the process during the time period under consideration. If there is only one test, that test result (that is, the average of the three test runs) should be used for the emission factor. If there is more than one test, the average of all the test results should be used. No correction, cushion (20%), or standard deviation should be added to the emission factor.
 - Past practice was to add a 20% cushion or a standard deviation to source test data in the calculation of baseline emission rates and PSELS to account for process and test method variability, although this was not done consistently. In recent years, this practice has not been used, although some permits still exist where average emission factors were augmented.
 - Removal of a cushion may require re-review of old source test reports.
 - The number of permits that have cushions built into their baseline emission rates and PSELS is unknown but is estimated to be less than 20.
 - Removing the cushion from the calculation of these values should lower both the baseline emission rate and the PSEL proportionately but there may be implications for previous applicability determinations.
 - The removal of the cushion would lower the fees that are assessed for Title V sources if they pay on their PSELS rather than actual emissions.
- If representative source-specific data cannot be obtained, emissions information from equipment vendors, particularly emission performance guarantees or actual test data from similar equipment is typically a better source of information for permitting decisions than AP-42, trade or technical association data or DEQ emission factors.
- If no emissions information from equipment vendors or actual test data from similar equipment is available, emission factors from AP-42, trade or technical association data or DEQ should typically be used. Whenever emission factors are used, permit writers should be aware of their limitations in accurately representing a particular facility. The risks of using emission factors in such situations should be evaluated against the costs of further testing or analyses. See the documents in the References section below for discussion of emission factor variability.
- If emission factors are available from AP-42, trade or technical association data or DEQ, the source should propose whichever they believe is most representative of their process. If a range of emission factors is provided, use the average of the range to set the baseline emission rate and the PSEL.
 - The permit writer should question emission factors where published emission factors from different literature sources are very different from one another, especially if the use of one or the other results in an inflated baseline emission rate.
 - If the source does propose an emission factor that appears to be out of line, then it should be backed up with additional technical support or source test data.

- The concept of “freezing” the baseline emission rate was taken out of the rules in 2011 and replaced with this, from the definition of “baseline emission rate” in division 200: “(e) Once the baseline emission rate has been established or recalculated in accordance with subsection (d) of this section, the production basis for the baseline emission rate may only be changed if a material mistake or an inaccurate statement was made in establishing the production basis for baseline emission rate.” In effect, the production basis is frozen (except for material mistakes or inaccurate statements) but correcting emission factors is allowed.
- When setting the baseline emission rate, the same emission factor should be used for the baseline period and the PSEL as long as no changes were made to the emissions unit after the baseline period.
- It is not always possible to tell what changes have been made to the emissions unit since baseline to know whether the source test data after the baseline date is applicable to the baseline period. If available information indicates the baseline emission rate was set incorrectly, the permit writer should make corrections.
 - Often emissions units have been changed enough that subsequent source tests would not represent baseline emissions and therefore, should not be used to set the baseline emission rate.
 - If a control device has been added, inlet/outlet source testing could be required to establish the baseline and current emission factors. The inlet data would be used to establish the baseline emission rate and the outlet data would be used to establish current emissions.
 - In cases where changes have been made since the baseline period, AP-42 or literature data may have to be used to set the baseline emission rate. Source test data since the modification can then be used to set the PSEL.

How to Use Source Test Data

As with calculating emissions, there are a number of options for using source test data, and ultimately it is ultimately a case-by-case determination. The following procedures are recommended for most situations, but an individual case may be different:

- Emission factor verification testing is not recommended for all emissions units due to the cost of testing. There may be little value in testing smaller emissions units.
- If the baseline emission rate or PSEL is set from source test data, the average of all source test data that is truly representative of the period should be used. No correction, cushion (20%), or standard deviation should be added to the average emission factor.
- Over time, the emissions from an emissions unit may change due to ongoing routine maintenance, improved operation or degradation due to aging. Even though the emissions unit has not been physically modified since the baseline period, current emissions may be different enough from baseline emissions that earlier source tests are more applicable to the baseline period and later source tests are more applicable to current operations.
- If new source test data is significantly different than existing data, taking into consideration the uncertainty of emissions data¹, the burden should typically be on the source to prove why the source test data should be used.
- If there isn't any data that is representative of the current configuration of the emissions unit, then the source should conduct at least 3 emission factor verification tests to establish an

¹ Refer to AP-42 for a discussion on emission factor uncertainty in the introduction of AP-42, Volume I or the New Source Performance Standard method for determining whether a physical change increased emissions (40 CFR 60.14 and Part 60 Appendix C)

emission factor for purposes of the PSEL. More testing may be necessary if the emission data is highly variable. The emission factor would be the average of all source tests.

- Process variations (i.e., different products) and seasonal variations (i.e., wet fuel versus dry fuel in a wood fired boiler) that significantly affect the emissions rate should be considered when requiring emission factor verification testing.
- For sources that have to do additional compliance testing (not EF verification testing), this data should be evaluated to see if the emission factor should be updated.
- Changes to the emission factors establishing the baseline emission rate, netting basis and the PSEL should typically be done at permit renewal unless an applicability determination such as NSR/PSD changes the source's status.

Emission Factor Verification Source Test Frequency

Table 1 at the end of this IMD lists emissions units² and the recommended source test frequency for emission factor verification testing. Source testing is not recommended for emissions units with less than 10 tons per year (or 5 tons per year for particulate matter), unless there is reason to believe the emissions unit is not operating in compliance with an emission limit or could contribute to an exceedance of regulatory program thresholds. Once three source tests are complete, additional source testing is strongly recommended at the frequency in Table 1 if there is any reason to believe an emissions unit has changed or degraded.

Special Case: When “Actual Emissions” are Equal to Potential to Emit

In the special case when ‘actual emissions equal PTE’ is used to establish the *baseline emission rate* (very few existing sources) or netting basis (per OAR 340-200-0020, definition of “actual emissions”), a different approach is recommended. In this case, the netting basis is subject to both the embargo and reset provisions of the rules. To provide for operational flexibility, the initial netting basis (and baseline emission rate in some cases) should be based on the maximum emission rate. When the netting basis is reset, the calculations should be done as recommended in the rest of this IMD.

For this special case, the emission factor used to set PTE should represent the maximum emission rate the source could reasonably achieve. In this case, the emission factor should represent the maximum hourly emissions rate based on the best available information. For emissions units that are subject to a source specific emission limit, such as BACT, RACT, NSPS, or NESHAP limit, the emission limit is considered to be the maximum hourly emission rate. In rare cases, actual source test data may be available from similar emissions units to establish an emission factor for purposes of PTE. If so, that data should be used, but the uncertainty of the emissions data should be taken into consideration. In some cases, it may be appropriate to use the maximum test result instead of the average to establish the maximum hourly emission rate. If the emission factor comes from AP-42, and there is a range of factors, the high end of the range is probably more representative of the maximum hourly emission rate.

- In general, PTE calculations are based on 8,760 hours of operation and the maximum hourly emission rate.
- Restraints limiting an emissions unit's operation at less than 8,760 hours should be taken into consideration in setting PTE.

² Emissions units for Title V sources, emissions point for ACDP sources

Applicability Determinations

If DEQ receives a new source test with an emission factor that is higher than the existing emission factor, the permit writer should reevaluate previous applicability determinations such as:

- New Source Review/Prevention of Significant Deterioration;
- NESHAP;
- NSPS;
- Permit type; or
- PSEL modeling analysis.

If the emission factor shows that an applicable requirement is triggered, DEQ should determine whether or not the owner or operator violated terms of the permit or regulations in effect at the time of construction or modification. Unless otherwise directed, staff should not refer the case to enforcement solely on the basis of a new emission factor established in accordance with this directive, provided that the existing factor was set in accordance with accepted practices in place at the time of the modification.

Example

Emissions from two boilers that existed in the baseline period (1977/78) were established using source test data:

- Boiler A, wood fired, modified in 1985 (rebuilt boiler); and
- Boiler B, residual oil, modified in 1990 and converted to natural gas fired.

Boilers A and B were not source tested prior to being modified, but were tested several times afterwards. There is a reasonable amount of source test data after the modifications, but none before. There is some variability in the source test results but there does not appear to be any correlation with fuel usage or steam production.

Problem 1

A very high emission factor, based on a source test(s) from another facility, was used for the baseline emission rate for Boiler A which resulted in a very high baseline emission rate. The factor is well outside the range of AP-42 emission factors. This high baseline emission rate potentially shielded the source from triggering PSD. DEQ agrees that the EF is unjustifiably high and needs to be reset with better information. Since there are no source specific test results prior to the modifications, DEQ believes using AP-42 is appropriate. Since AP-42 provides a range of emission factors and there is no basis for using the high or low end of the range, the average of the range was chosen. This results in the baseline emission rate considerably lower than that included in the review report.

Problem 2

Question: Was the source subject to PSD because of the modifications they made to Boilers A and B?

Make use of all of the source test information

- Average all the source test results for Boiler A for 1986, 1989, 1995, 2000 and 2008
- Average all the source test results for Boiler B for 1993, 1996, 2000 and 2008
- Using these average emission factors and actual fuel usage rates, calculate the actual emissions to determine whether PSD was triggered

Answer: The calculated actual emissions are below the PSD trigger levels for every year suggesting PSD was never triggered.

Background

EPA's 2008 national enforcement priority focused on three industry sectors: glass, cement and acid production. During their review EPA found inconsistencies with how DEQ has historically established baseline emission rates and requested we establish clear instruction for permitting staff. In addition, EPA had concerns specifically over the practice of adding a cushion to emission level calculations.

Because emission factors are not source-specific permit limits and essentially represent an average of a range of emission rates, some sources may have emission rates greater than the emission factor and others may have emission rates less than the factor. As such, a permit limit using an emission factor could result in some sources being in noncompliance. Therefore, source testing should be required to verify emission factors for larger emissions units but not as a compliance tool. Emission factors will be changed if warranted with new, more accurate data. Any change in emission factors will require an analysis of the applicability of any regulatory program, such as NSR/PSD or the PSEL rule requiring an air quality analysis.

Applicability

Plant Site Emission Limits - OAR 340, division 222

New Source Review - OAR 340, division 224

Definitions

Actual emissions

Baseline emission rate

Emission factor

Netting basis

Plant Site Emission Limit

References

AP - 42 Vol. I Introduction, www.epa.gov/ttnchie1/ap42/c00s00.pdf

Recommended Procedures for Development of Emissions Factors and Use of the WebFIRE Emissions Factor Database, EPA-454/R-XX-XXX REVISED DRAFT REPORT,

http://www.epa.gov/ttn/chief/efpac/procedures/procedures_draft122010.pdf

40 CFR Part 60 Standards of Performance for New Stationary Sources Subpart A – General Provisions; 60.14 Modification.

http://edocket.access.gpo.gov/cfr_2010/julqtr/pdf/40cfr60.14.pdf

40 CFR Part 60 Appendix C—Determination of Emission Rate Change,

http://edocket.access.gpo.gov/cfr_2004/julqtr/pdf/40cfr60.c.pdf

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Internal Management Directive

This document is an internal management directive that is intended only as direction to DEQ staff in the absence of different direction provided by DEQ management. This internal management directive does not establish policy or legal interpretations that may be relied upon by permittees or other third parties.

Table 1, Emission Factor Verification Source Test Frequency³

Facility Category	Emission Unit Category	Pollutant	Uncontrolled emission units		Controlled emissions unit	
			<10 tons*	>10 tons**		
Wood Products	Boiler – wood (existing ⁴)	PM/PM ₁₀ /PM _{2.5} , SO ₂ , NO _x , CO, VOC	EF	EF ₁	EF ₁	
	Boiler – wood (new ⁵)	NO _x , CO	CEM	CEM	CEM	
		PM/PM ₁₀ /PM _{2.5} , SO ₂ , VOC	EF	EF ₁	EF ₁	
	Boiler – natural gas (existing and new <100 mmBtu/hr heat input)	PM/PM ₁₀ /PM _{2.5} , CO, NO _x , VOC, SO ₂	EF ^{***}	EF ^{***}	EF ₁	
	Boiler – natural gas (new >100 mmBtu/hr heat input)	NO _x , CO, CO ₂	CEM – See NSPS			
		PM/PM ₁₀ /PM _{2.5} , SO ₂ , VOC	EF ^{***}	EF ^{***}	EF ₁	
	Boiler - oil and coal (existing)	PM/PM ₁₀ /PM _{2.5} , CO, NO _x , VOC - same as wood fired boiler				
		SO ₂	EF	FSA ₁	EF ₁	
	Boiler - oil and coal (new)	SO ₂ , CO ₂ , NO _x , CO CEM – See NSPS				
		PM/PM ₁₀ /PM _{2.5} , VOC - same as wood fired boiler				
	Boiler - sanderdust and mixed fuels	PM/PM ₁₀ /PM _{2.5} , CO, NO _x , SO ₂ , VOC - same as for wood fired boilers				
	Dryers - steam and boiler exhaust gas	PM/PM ₁₀ /PM _{2.5} , VOC - same as wood fired boilers				
	Press Vents	PM/PM ₁₀ /PM _{2.5}	EF	EF ₁	EF ₁	
		VOC	EF	EF ₁	EF ₁	
	Material handling	PM/PM ₁₀ /PM _{2.5}	EF	EF ₁	EF ₁	
Surface coating	VOC	EF	MB	MB		
Fugitive emissions - chip and fuel piles	PM/PM ₁₀ /PM _{2.5}	EF	EF	NA		
Fugitive emissions - road dust	PM/PM ₁₀ /PM _{2.5}	EF	EF	NA		
Food processing	Boilers, dryers, fryers, cookers	PM/PM ₁₀ /PM _{2.5} , CO, NO _x , SO ₂ , VOC - same as Wood Products				
Asphalt plants	Drum dryers	PM/PM ₁₀ /PM _{2.5}	EF	EF ₁	EF ₁	
		CO, NO _x , SO ₂ , VOC - same as for Wood Products boilers				
	Silos	PM/PM ₁₀ /PM _{2.5}	EF	EF ₁	EF ₁	
		VOC	EF	EF ₁	EF ₁	
Fugitives - material handling and road dust	PM/PM ₁₀ /PM _{2.5}	EF	EF	NA		

³ Modified from Table 2 of the February 2003 **Oregon Title V Monitoring and Testing Guidance**

⁴ Existing and new are defined in the applicable New Source Performance Standard for the emissions unit. Wherever CEMs are listed in this table (excluding pulp and paper emissions units), monitoring requirements included in the applicable NSPS or acid rain rules should be reviewed.

⁵ New biomass boilers that emit more 200 tons or any boiler that has NO_x controls, such as a selective non-catalytic reduction (SNCR) system, must have NO_x CEMS as a DEQ requirement.

Facility Category	Emission Unit Category	Pollutant	Uncontrolled emission units		Controlled emissions unit
			<10 tons*	>10 tons**	
Electric generating combustion turbines	Simple cycle and combined cycle	NO _x , CO, CO ₂	CEMS		
		PM/PM ₁₀ /PM _{2.5}	EF***	EF***	EF ₁
		SO ₂	EF***	EF***/ST ₁	EF ₁
		VOC	EF***	EF***/ST ₁	NA
Gas Turbines	Gas Turbines - natural gas (for oil combustion- see wood fired boilers)	PM/PM ₁₀ /PM _{2.5}	EF***	EF***	EF ₁
		CO	EF***	EF***/ST ₁	EF ₁
		NO _x	EF***	EF***/ST ₁	EF ₁
		VOC	EF***	EF***/ST ₁	NA
		SO ₂	FSA ₁	FSA ₁	NA
Pulp and Paper	Recovery furnaces	PM/PM ₁₀ /PM _{2.5}	EF ₁	EF ₁	EF ₁
		CO, VOC - same as Wood Products' wood fired boiler			
		NO _x - same as Wood Products' sanderdust boiler			
		SO ₂	EF	EF ₁	EF ₁
	Recovery furnace	TRS	CEM	CEM	CEM
	Lime Kiln	PM/PM ₁₀ /PM _{2.5}	EF ₁	EF ₁	EF ₁
		CO, NO _x , VOC - same as Wood Products' boilers			
		SO ₂	EF	EF ₁	EF ₁
		TRS	CEM	CEM	CEM
	Smelt dissolving tank vents	PM/PM ₁₀ /PM _{2.5}	EF	EF ₁	EF ₁
		TRS	EF	EF ₁	EF ₁
	Misc. vents	TRS	EF	EF ₁	EF ₁
	Non-condensable gas incinerator	PM/PM ₁₀ /PM _{2.5}	EF	EF	EF
		CO, NO _x , VOC - same as Wood Products' boilers			
		SO ₂ - same as lime kilns			
		TRS	EF	EF	NA
	Paper Machines	PM/PM ₁₀ /PM _{2.5}	EF	EF	NA
		CO, NO _x , VOC, SO ₂	EF	EF	NA
		TRS	EF	EF	NA
	Bleach Plants	VOC	EF	EF ₁	MB
Boilers	see Wood Products' boilers				
Incinerators	Municipal waste combustors	See OAR 340-230-0340			
	Hospital waste	See OAR 340-230-0410			
	Sewage sludge	PM/PM ₁₀ /PM _{2.5} , CO, NO _x , VOC, SO ₂ - same as Wood Products' boilers			
Primary and secondary smelting of metals	Dryers	see asphalt plants			
	Electric arc furnace	PM/PM ₁₀ /PM _{2.5}	EF	EF ₁	EF ₁
		CO, NO _x , VOC, SO ₂ - see Wood Products' boilers			
	Reheat furnace	PM/PM ₁₀ /PM _{2.5} , CO, NO _x , VOC, SO ₂ - see Wood Products' natural gas fired boiler			
	Pot rooms/roof vents	PM/PM ₁₀ /PM _{2.5}	EF	EF	EF
		Fluoride	EF	EF	EF
CO, NO _x , VOC, SO ₂ - see Wood Products' boiler					
Fugitives	see Wood Products				
Surface	entire process	VOC	EF	MB	MB

Facility Category	Emission Unit Category	Pollutant	Uncontrolled emission units		Controlled emissions unit
			<10 tons*	>10 tons**	
coating					
Chemical manufacturing	valves and flanges	VOC	EF	EF	NA
Printing	presses and dryers	VOC	EF	EF ₁	MB
Asphalt roofing	converters	VOC	EF	EF ₁	MB
Soil remediation units		VOC	EF	EF ₁	MB
Electronics	entire process	VOC	EF	MB	MB

* <5 tons for particulate matter

** >5 tons for particulate matter

*** Emissions categories are for individual pieces of equipment within the emissions unit.

Abbreviations and acronyms used in Table 1

Abbreviation/

Acronym Complete word/phrase

CEM Continuous emissions monitoring

CO Carbon monoxide

CO₂ Carbon dioxide

EF Emission factors that are not expected to be verified during the life of the permit.

EF₁ Emission factors that should be tested once during the permit term unless there are three source tests for individual pieces of equipment in an emissions unit that are representative of the current configuration of the emissions unit, then DEQ may consider reducing the frequency of required tests. If there is no previous data, two source tests are required during the permit term until three tests are complete. If there is any reason to believe an emissions unit has changed or degraded, additional source testing is required at the frequency stated above until at least three tests are complete. The source test would be used to verify the emission factor and could be the basis for adjusting the emission factor by administrative amendment to the permit or revised during permit renewal. The permittee would have to notify DEQ of source tests that result in a measured emission factor greater than the emission factor approved for demonstrating compliance. This notification should occur within 60 days of completing the source test. DEQ would evaluate the request to increase the emission factor and PSEL and either amend the permit or wait until the permit is renewed. In some cases, DEQ may request additional test data; especially if the new factor is significantly different than the one used in the permit and there are extenuating circumstances or actual increases in emissions.

FSA₁ Fuel sampling and analysis - based on supplier's certificate

MB Material balance determined annually

NA Not applicable

NO_x Nitrogen oxides

PM Particulate matter

PM₁₀ Particulate matter less than 10 microns

PM_{2.5} Particulate matter less than 2.5 microns

SO₂ Sulfur dioxide

ST₁ Source test conducted once in 5 years (life of permit)

VOC Volatile organic compound