



Air Permits 301: Emissions – Real or Imaginary!

**Louisiana Department of Environmental Quality
Fall 2014
Baton Rouge, LA**





Air Permits

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Where do the Emissions come from?



Those that are for the application.

- New Sources
- Existing Sources

How that differs when PSD is involved

How to calculate for ERIC submittals



Air Permits Focus



The primary items that enforceable within an air permit or other action are:

- The regulation requirements consisting of
 - Specific enforceable standards (Limits) that apply
 - Specific monitoring, recordkeeping and reporting requirements
- Specific Maximum Hourly emission rates and Annual Tons per year that apply.
- Note: [Inclusion of Short Term Hourly Limits in Air Permits.doc](#)





Air Permit Application

Download the detailed guidance from LDEQ website:

http://www.deq.louisiana.gov/portal/Portals/0/permits/air/r05_Louisiana%20Guidance%20for%20Air%20Permitting%20Actions.zip

Every consultant needs to read this document from the front to the back. This is not the application set of instructions.



From the Air Permitting Guidance



The most common sources of information are as follows. (Listed from least accurate to most accurate)

1. Best Engineering Judgment
2. AP-42
3. Technical documentation
4. Mass Balance calculations
- ❖ Which are dependent on a chemical analysis of the constituents contained in the product which is being affected.
 - Either a determination of the amount of contaminant contained in the raw material being introduced into the chemical process and the assumption that all of that contaminant is being emitted into the air; or
 - A determination of the amount of the contaminant in the raw material and another determination of the amount in the finished product. The differential is assumed to be emitted to the air.
5. Manufacturer's testing
6. Stack testing performed by the applicant
7. CEMS or COMS, or other continuous monitoring system.





Before you Start

You must understand which source of emission factors is best suited for your needs and when to use which source

In addition you must understand the limitations of the information provided

Third – you must understand what types of pollutants are considered and whether additional information is necessary to meet new regulations





1. Best Engineering Judgment

- Most processes, especially if Chemical in nature are designed by a Chemical Engineer.
- Their focus is on the main raw materials and the end product being sold.
- However, the air permit in many cases is looking for other releases



1. Best Engineering Knowledge

A detailed knowledge of the chemicals and the nature of those chemicals within each piece of equipment or apparatus is also necessary as a means to identify what emissions can occur.

- Material safety data sheets (MSDS) should be utilized
- Standard reference books or industry specific technical books can also be used
- Contaminants may occur in the raw materials
- Raw materials and End products



1. Best Engineering Knowledge



Material safety data sheets (MSDS)

These provide ranges of chemicals found in the product.

If a chemical is listed at 0-5 %, for the application based upon PTE, the 5% should be used.

Data elements such as Vapor Pressure are listed at standard conditions

- Many chemicals have different properties depending on the temperature and pressure. **Emissions need to be evaluated for releases at those field conditions.**

- Standard reference books or industry specific technical books can be used to obtain the information at those conditions.

My copy of the CRC Handbook of Chemistry and Physics has vapor pressure of either 100% or 90% Nitric Acid from 0°C to 100°C on page D-224



1. Best Engineering Knowledge



Contaminants may occur in the raw materials

- Most raw materials do not come in a 100% pure state.
 - a) Phosphoric rock contains a portion of hydrogen fluoride.
 - b) Oil and Gas producing wells usually contain hydrogen sulfide gas
 - c) Mechanical separators of oil producing wells into condensate and water usually allow a small portion of the oil to be sent to the water storage tank. As such, the oil floats to the top and various organic chemicals are released to the atmosphere.
 - d) A dust suppressant is sprayed on coal as it is conveyed to a combustion furnace. The MSDS sheet for the dust suppressant indicates that a measurable portion of the dust suppressant is sulfur. This would affect the amount of sulfur dioxide emitted under the acid rain program.



1. Best Engineering Knowledge



Raw materials and End products

Incomplete Chemical Reaction products

- Most chemical processes involve a chemical reaction to produce an end product.
- Some of the products entering the process may be emitted.
- An intermediate chemical from a multistage chemical reaction may be emitted
- The end products may be emitted.
- Since not all chemical reactions are 100 percent, some portion of all three may be available for emission.
- Some chemical reactions create side products that need to be separated from the main reaction. These streams may be emitters.



1. Best Engineering Knowledge



Indirect emitters

- When a chemical or physical reaction that take place, even when a reactor has no direct vent, pollutants of concern may carry through with the product and find a release point further downstream in the process equipment.
- Exhaust streams may be routed through several tanks or vessels before being vented
- Exhaust streams may be vented through a control device that then changes the final emissions. (Ex: Caustic Scrubber)
- Emissions may be created within a building with no direct vent. However, the building may have exhaust fans or large open doorways that would allow the pollutants to enter the atmosphere.



2. Emissions Factors & AP 42, Compilation of Air Pollutant Emission Factors

AP-42 is a commonly accepted source of air pollutant emission factors for point and area sources.

AP-42 describes and details emission factors from activities producing both criteria and toxic air pollutant emissions.

Emission factor data found in AP-42 is obtained from source tests, material balance studies, engineering estimates, etc.

These factors are simply averages of all available data of acceptable quality

These factors can be used to estimate emissions when no source specific data is available.

AP-42 also contains examples of emission calculations.

<http://www.epa.gov/ttn/chief/ap42/>



3. Technical documentation



- Various industries have performed tests or analysis similar to those developed or utilized by EPA for the AP-42 emission factors, such as:
 - American Petroleum Institute (API)
 - Gas Research Institute (GRI)
 - National Council for Air and Stream Improvement, Inc. (NCASI)
- EPA Developed the Tanks 4.09 computer program
<http://www.epa.gov/ttn/chief/software/tanks/index.html>
- For a more detailed listing of technical sources see Section 1.2.3 of the Louisiana Guidance for Air Permitting Actions.



3. Technical documentation– Tanks 4.09

- A common error with Tanks 4.09 is forgetting to adjust the vapor pressure or the temperature when the tank is heated.
- The vapor pressure database in Tanks 4.09 only goes from 40°F up to 100°F. For tanks that are heated above those temperatures – adjusted VP's need to be input.
 - Vapor Pressure at (x) degrees F Enter the vapor pressure at this temperature. Filling in all seven vapor pressure fields is mandatory for this option. Otherwise, the record will not be saved. Note that you do not have to fill in these values if any of the other options (ex. Antoine's Coefficient) are used.



3. Technical documentation

The LDEQ web page has a guidance document called “Inclusion of Short-Term Limits in Air Permits”.

Within that document is the following: Examples of Emissions Units that Generally Do Not Require Maximum Pound per Hour Limits

Storage vessels. Consider a fixed roof tank storing a low vapor pressure product, or alternatively, an external floating roof storage tank subject only to seal gap measurements and visual inspection requirements. Neither vessel is subject to a regulation which specifies a maximum amount of emissions that can be emitted over a given time period.

This exclusion would not apply during the following:

- Pigging operations that cause a sudden vapor release in the fixed tank.
- Routing of pressurized liquids into a fixed roof tank where it depressurizes.
- Landing and Refilling losses for floating roof tanks.





4. Mass Balance calculations

A material balance is a relationship based upon the amount of material entering a process versus the amount of material leaving a process. Material balance calculations utilize specific information relevant to an individual system to estimate emissions.

Commonly, such information may involve the use of production rates, purchasing records and shipping documents. This method cannot be used where the inaccuracies in the measurement are equal to or greater than the absolute magnitude of the losses.





4. Mass Balance calculations

Don't forget that mass balances may have several permutations.

Example: For a coke calcining operation the Sulfur could come out as:

Sulfur Trioxide (SO_3)

Sulfuric Acid (H_2SO_4)

Sulfur Dioxide (SO_2)

Hydrogen Sulfide (H_2S)

Carbonyl Sulfide (COS)

Carbon Disulfide (C_2S)

The sulfur also remains in the Calcined Coke, but flue gases are exhausted through the Waste Heat Boiler Exhaust and the Cooler Exhaust.





5. Manufacturer's testing

This is data that comes from the manufacturer for their pieces of equipment.

Example can include Engine mnfr's with emission factor values set at 50%, 75% and 100% of rated load.

Note that the highest emission factor per Hp is usually the 50% load

Another example is Dust filters rated at 0.05 gr/dscf.

Essentially the Vendor is guaranteeing that no matter what particulate matter mass is sent to the filter, only that amount will make it through the filter.

NSCR with a vendor guaranteed BACT limit.





5. Manufacturer's testing

These values from the manufacturer are really useful when generating emissions from equipment that has not yet been built or for which no post construction testing will be performed.

Always check these emissions against any pertinent regulation limit.

For example – AP-42 engine EF's are not longer valid when the engine is subject to NSPS IIII or JJJJ.

When an older engine is reconstructed, the old EF may no longer be valid. That engine would now need to meet the appropriate NSPS limit.





5. Manufacturer's testing

Other items to take into consideration

- Boiler burner assemblies may deteriorate over time creating less efficient combustion – possible more CO emissions.
- Manufacturer's fuel may be different:
 - Ammonia Reformer tested with natural gas – how do injected ammonia and methanol from a low pressure condensate stripper affect the types and amounts of pollutants?
 - Adding Tire Derived fuels to a hogged fuel boiler
 - Reworking an older boiler with enhanced air that creates a hotter flame/combustion such that thermal NO_x is increased.
- Adding control devices



5. Stack testing performed by the applicant



Actual test data from a stack test is usually the best data, but using it properly is very complicated!

The purpose of stack testing includes:

- Verification of compliance with permitted Emission Rates
 - Maximum lbs/hr
 - Establishing average lbs/hr which is used to generate tpy
- Compliance with NSPS or NESHAP limits.
- Compliance with BACT or NNSR limits
- Determining what pollutants actually exist (that maybe were not previously known)
- Verifying that control devices are working properly
 - Establishing acceptable parameters of the control device
 - pH or scrubber flow or RTO min. Temp., etc.
- Establishing a BACT box or Operating Box for Parameter monitoring
- Engineering studies





5. Stack testing performed by the applicant

What are some of the constraints of using stack test data for establishing permit limits.

A Stack test is a snap shot in time.

It is dependent on how the equipment is operating at that moment.

- Fuel type(s)
- Contaminant levels within the process
 - Sulfur content for Carbon Black oil
- Fuel flow
- Air flow
- Other streams introduced
 - To be combusted or destroyed
 - To assist with control catalyst
- Production level
- Cyclonic Flow characteristics



5. Stack testing performed by the applicant



If a source combusts multiple fuels, then stack testing may need to perform tests at each scenario.

Stack test results need to compare the actual air flow versus the value that was recorded on the EIQ sheet.

Stack test data needs to be evaluated for two different cases:

- Since a stack test consists of 3 separate 1 hr runs – one value shall always be above the average. This highest value should be used to establish the maximum lbs/hr.
- The average of the 3 runs should be used to establish the annual TPY value.
- If the test is run at a production level less than 95%, the permitted emission rates need to be adjusted to correspond to 100% production level.

For permitting purposes, a “safety factor” can be used to adjust the Avg / Max and Tpy values.

For tests associated with BACT limits, the Maximum of the three 1-hr runs cannot exceed the BACT limit. And no safety factor for BACT limits can be added. BACT limits are the Max lbs/hr limits as appropriate.

When BACT limits are not tied directly to lbs/hr, the application calculation must show what that equivalency is.



5. Stack testing performed by the applicant



Stack testing may not show the highest emission rate

- Control devices such as SCR may not control NO_x until the proper temperature range is reached
- Product tested may not contain the highest concentration of contaminant
 - For example, Carbon black tested at 3% sulfur but permit limit is 4%
- Fuel combusted may be more wet or dry than when tested. Ex.: Causing more fuel to be used to generate a given amount of steam or ,
 - Product may be more wet or dry such as clay that is being dried
- All these factors need to be considered when establishing a permit emission limit.



CEMS or COMS, or other continuous monitoring system



These should be considered the best data for emission rates and the most comprehensive.

These can be used to establish permit emission rates and can also be used to generate actual emissions.



Real or Imaginary Emissions



All permitted emission rates are imaginary

They are intended to be the maximum limit that the source is capable of achieving or allowed to achieve.

For example, a new engine has to meet the NSPS limits from JJJJ. However, the manufacturer's build them to a emission rate that is lower than that limit.

Actual emissions may be higher if the engine is tuned improperly, or if the catalyst fails.

So what are real emissions?



Real emissions are actual emissions based upon real production levels and any actual control efficiencies as they occur.

- Actual emissions would be those recorded by a CEMS.
- If an annual stack test is performed it would be based upon the actual average hourly emission rate times the number of hours of actual operation and possibly adjusted for production levels.
- It may be a Tanks 4.09 run based upon actual vapor pressure and throughput.



Example Tanks calculation.

[TANKS 4 as permitted.docx](#)



[TANKS 4 adjusted throughput.docx](#)

For this example the emissions are

Permitted

Components	Losses(lbs)		
	Working Loss	Breathing Loss	Total Emissions
Tank1-Mixture	5,494.76	1,447.97	6,942.73
Benzene	4,228.91	1,114.39	5,343.31
Toluene	1,265.85	333.57	1,599.42

Actual

Components	Losses(lbs)		
	Working Loss	Breathing Loss	Total Emissions
Tank1-Mixture	3,885.21	1,447.97	5,333.18
Benzene	2,990.16	1,114.39	4,104.55
Toluene	895.05	333.57	1,228.63

Example Flare set of Calculations (Pilot)



Industrial Flares - Pilot fuel consumption

Calculate MM Btu/hr:

Operating Schedule (hr/yr):

8760

Fuel Consumption (scf/hr):

630.00

(scf)

Heat Value (Btu/scf)

1020

Default = 1020 Btu/scf (Modify as required)

Heat Input (MM Btu/hr):

0.64

(HeatValue * Fuel Consumption)/1.0E6

Pollutant	Emission Factor (lb/ MM Btu)	Emission Rates		Source Reference
		lb/hr	TPY	
PM ₁₀	0.011	0.007	0.03	AP-42 T13.5-1
NO _x	0.068	0.044	0.19	AP-42 T13.5-1
CO	0.370	0.238	1.04	AP-42 T13.5-1
CO ₂ (lbs/scf 10 ⁶)	120000.000	75.600	331.13	AP-42 T1.4-2-1
N ₂ O {GHG} (lbs/scf 10 ⁶)	2.200	0.001	0.01	AP-42 T1.4-2-1
THC	0.140	0.090	0.39	AP-42 T13.5-1
VOC	0.052	0.033	0.15	AP-42 T13.5-2
Methane	0.077	0.049	0.22	AP-42 T13.5-2
Ethane	0.011	0.007	0.03	AP-42 T13.5-2
Benzene	0.011	0.007	0.03	AP-42 T13.5-2

Methane Unflared	12.60	scf
CO ₂ e factor	21.000	
Methane weight	0.042	lb/scf
CO ₂ e emissions	49.17	tpy
CO ₂ percent in gas stream	3.500	
CO ₂ weight	0.117	lb/scf
CO ₂ e emissions	11.30	tpy

CO₂ is normally found
at Oil and Gas
Production facilities

Total CO₂e	4,092.99	tpy
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Example Flare set of Calculations (continuous stream)



Industrial Flares - Waste gas combusted

Calculate MM Btu/hr:

Operating Schedule (hrs):

8760

Waste gas flow rate (scf/hr):

6896.00

Heat Value (Btu/scf)

1513

Heat Input (MM Btu/hr):

7.03

$(HeatValue * Fuel Consumption)/1.0E6$

Ethylene = 13.412 scf/lb; heat value = 1513 BTU/scf

Example: [LHV]

flare rate = 1000 scf/hr

Pollutant	Emission Factor (lb/ MM Btu)	Emission Rates		Source Reference
		lb/hr	TPY	
PM ₁₀	0.011	0.077	0.339	AP-42 T13.5-1
NO _x	0.138	0.971	4.252	1983 CMA doc. Titled "A Report on a Flare Efficiency Study"
CO	0.276	1.941	8.503	1983 CMA doc. Titled "A Report on a Flare Efficiency Study"
CO ₂ (lbs/scf 10 ⁶)	120000.000	827.52	3624.54	AP-42 T1.4-2-1
N ₂ O {GHG} (lbs/scf 10 ⁶)	2.200	0.015	0.07	AP-42 T1.4-2-1
THC	0.140	0.985	4.313	AP-42 T13.5-1
VOC	0.052	0.366	1.602	AP-42 T13.5-2
Methane	0.077	0.542	2.372	AP-42 T13.5-2
Ethane	0.011	0.077	0.339	AP-42 T13.5-2

Example Flare set of Calculations (intermittent stream)



Industrial Flares - Waste gas combusted

Calculate MM Btu/hr:

Operating Schedule (hrs):

450

Waste gas flow rate (scf/hr):

18665.00

Heat Value (Btu/scf)

4016

Heat Input (MM Btu/hr):

74.96

$(HeatValue * Fuel Consumption)/1.0E6$

Example: Ethylene = 13.412 scf/lb; heat value = 1513 BTU/scf [LHV]

flare rate = 1000 scf/hr

Pollutant	Emission Factor (lb/ MM Btu)	Emission Rates		Source Reference
		lb/hr	TPY	
PM ₁₀	0.011	0.825	0.186	AP-42 T13.5-1
NO _x	0.138	10.344	2.327	1983 CMA doc. Titled "A Report on a Flare Efficiency Study"
CO	0.276	20.689	4.655	1983 CMA doc. Titled "A Report on a Flare Efficiency Study"
CO ₂ (lbs/scf 10 ⁶)	120000.000	2,239.80	503.96	AP-42 T1.4-2-1
N ₂ O {GHG} (lbs/scf 10 ⁶)	2.200	0.041	0.18	AP-42 T1.4-2-1
THC	0.140	10.494	2.361	AP-42 T13.5-1
VOC	0.052	3.898	0.877	AP-42 T13.5-2
Methane	0.077	5.772	1.299	AP-42 T13.5-2
Ethane	0.011	0.825	0.186	AP-42 T13.5-2



Example Flare set of Calculations: Summary



<u>Pollutant</u>	Pilot			Continuous			Intermittent		
	Avg. lbs/hr	Max lbs/hr	Tpy	Avg. lbs/hr	Max lbs/hr	Tpy	Avg. lbs/hr	Max lbs/hr	Tpy
PM ₁₀	0.007	0.007	0.03	0.077	0.077	0.34	-	0.83	0.19
NO _x	0.044	0.044	0.19	0.971	0.971	4.25	-	10.34	2.33
CO	0.238	0.238	1.04	1.941	1.941	8.50	-	20.69	4.66
VOC	0.033	0.033	0.15	0.366	0.366	1.60	-	3.90	0.88

Values Transferred to EIQ Sheet.

<u>Pollutant</u>	Avg. lbs/hr	Max lbs/hr	Tpy
PM ₁₀	0.084	1.05*	0.56
NO _x	1.015	13.06*	6.77
CO	2.179	26.30*	14.20
VOC	0.399	4.94*	2.63

* Note that the Max lbs/hr was totaled and then multiplied by a 1.15 safety factor. [Permitted]



Example: Loading of Gasoline



Note that hours are of actual operation

Gasoline RVP 13

Annual Production (barrels)	565,000	Loading rate (gpm)	250	40°F		50°F		60°F		70°F		80°F		90°F		100°F	
Annual Production (gallons)	23,730,000	Projected Time	1,582	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY	lb/hr	TPY
Tank trucks and rail tank cars	Submerged loading of a clean cargo tank			14.88	8.13	17.70	9.66	21.01	11.47	24.80	13.54	29.03	15.85	33.68	18.39	39.02	21.31
	Submerged loading: dedicated normal service			17.86	9.75	21.24	11.60	25.21	13.77	29.76	16.25	34.84	19.02	40.42	22.07	46.82	25.57
	Submerged loading: dedicated vapor balance service			29.77	16.25	35.39	19.33	42.02	22.94	49.59	27.08	58.06	31.70	67.37	36.78	78.04	42.61
	Splash loading of a clean cargo tank			43.16	23.57	51.32	28.02	60.93	33.27	71.91	39.26	84.19	45.97	97.68	53.33	113.16	61.78
	Splash loading: dedicated normal service			43.16	23.57	51.32	28.02	60.93	33.27	71.91	39.26	84.19	45.97	97.68	53.33	113.16	61.78
	Splash loading: dedicated vapor balance service			29.77	16.25	35.39	19.33	42.02	22.94	49.59	27.08	58.06	31.70	67.37	36.78	78.04	42.61
Marine vessels	Tank Condition: Volatile 0.86			3.53	1.925	3.53	1.925	3.53	1.925	3.53	1.925	3.53	1.925	3.53	1.925	3.53	1.925
	Volatile 0.46			1.89	1.03	1.89	1.03	1.89	1.03	1.89	1.03	1.89	1.03	1.89	1.03	1.89	1.03
	Volatile 0.33			1.35	0.739	1.35	0.739	1.35	0.739	1.35	0.739	1.35	0.739	1.35	0.739	1.35	0.739
	Nonvolatile 0.33			1.35	0.739	1.35	0.739	1.35	0.739	1.35	0.739	1.35	0.739	1.35	0.739	1.35	0.739



Example: Filterable versus condensable for bagfilters



Natural Gas Combustion

	Hours	Days	Weeks
Operating Schedule:	24	7	52
Heat Input (MM Btu/hr):	650.00		
Heat Value (Btu/scf)	1020	Verify Fuel heating Value - change as needed.	
Fuel Consumption (scf/hr):	637254.90		

Pollutant	Emission Factor (lb/MM scf)	Emission Rates		Source Reference
		lb/hr	TPY	
PM _{TOTAL}	7.6	4.843	21.155	AP-42 T1.4-2
PM _{COND}	5.7	3.632	15.87	AP-42 T1.4-2
PM _{FILT}	1.9	1.211	5.29	AP-42 T1.4-2

If a filter is installed with an efficiency of 99%, the condensable emissions would become 15.87 tpy

If a filter is installed with an efficiency of 99%, the filterable emissions would become 0.05 tpy

Some applicants when using AP-42 are using the 7.6 lbs/MMscf. Then a filter is installed with 99% control and calculating a total PM of 0.21 tpy not the correct 15.92 tpy of PM₁₀.

Filters DO NOT REMOVE condensable particulate matter.



Example: Bagasse Boiler with 10% Natural Gas Limit



State of Louisiana - Emissions Inventory Questionnaire (EIQ) for Air Pollutants												Date of Submission Mar 2010			
Emission Point ID No. (Designation) 1-86		Descriptive Name of the Emissions Source (Alt. Name) Sugar Mill Boiler 06				Approximate Location of Stack or Vent (see instructions)				Revised Yes		LOUISIANA			
Tempo Subject Item ID No. EQT 0015						Method 28."GPS-Unspecified"		Datum NAD83							
		Diameter (ft) or Stack Discharge Area (ft ²) 7.58 ft		Height of Stack Above Grade (ft) 93 ft	Stack Gas Exit Velocity 39.78 ft/sec	Stack Gas Flow at Conditions, <u>not</u> at Standard (ft ³ /min) 110,210	Stack Gas Exit Temperature (°F) 195 °F	Normal Operating Time (hours per year) 2640 hr/yr		Date of Construction or Modification May 16 1986		Percent of Annual Throughput Through This Emission Point			
Stack and Discharge Physical Characteristics Change? (yes or no) no						ft ²	in				Jan-Mar		Apr-Jun	Jul-Sep	Oct-Dec
Type of Fuel Used/Heat Input (see instructions)				Operating Parameters (include units)											
Fuel	Type of Fuel	Heat Input (MMBTU/hr)	Gas Well w/ Hydraulic Fracturing	Normal Operating Rate/Throughput			Parameter	Description							
a	Bagasse	245	<input type="checkbox"/>	150,000			150,000	lbs/hr Steam							
b	Natural Gas	76	<input type="checkbox"/>	245			245	MM Btu/hr							
c			<input type="checkbox"/>	Design Capacity/Volume/Cylinder Displacement											
Notes				Fracturing Begun on or after Jan 1, 2015	<input type="checkbox"/>	Shell Height (ft)									
				Carbon Adsorption System (Control Code 048)	Tanks:	<input type="checkbox"/>	Fixed Roof	<input type="checkbox"/>	Floating Roof	<input type="checkbox"/>	External	<input type="checkbox"/>	Internal	<input type="checkbox"/>	Internal
				Regenerable	<input type="checkbox"/>	Date Engine Ordered					Engine Model Year				
				Non-regenerable	<input type="checkbox"/>	Date Engine Was Built by Manufacturer					Remote(RICE)	<input type="checkbox"/>	Yes	<input type="checkbox"/>	No
				SI Engines:	<input type="checkbox"/>	Rich Burn	<input type="checkbox"/>	Lean Burn	<input type="checkbox"/>	2 Stroke	<input type="checkbox"/>	4 Stroke	<input type="checkbox"/>		
Emission Point ID No. (Designation) 1-86		Control Equipment Code	Control Equipment Efficiency	HAP / TAP CAS Number	Proposed Emission Rates			Permitted Emission Rate (Current)	Add, Change, Delete, or Unchanged	Continuous Compliance Method	Concentration in Gases Exiting at Stack				
Pollutant					Average (lb/hr)	Maximum (lbs/hr)	Annual (tons/yr)	Annual (tons/yr)							
Particulate matter (PM ₁₀)		009, 002	50% / 85%		53.28	62.68	80.56		U		gr/std ft ³				
Particulate matter (PM _{2.5})		009, 002	50% / 85%		25.41	29.89	38.42		U		gr/std ft ³				
Sulfur dioxide					0.05	0.06	0.08		U		ppm by vol				
Nitrogen oxides					78.98	92.92	119.42		U		ppm by vol				
Carbon monoxide					44.71	52.60	67.60		U		ppm by vol				
Total VOC (including those listed below)					2.75	3.24	4.16		U		ppm by vol				
Lead									U		ppm by vol				
Polycyclic Organic Matter (POM)					0.03	0.04	0.05		U		ppm by vol				



Example: Bagasse Boiler with 10% Natural Gas Limit



Permittee shall operate boiler at an Annual capacity factor ≤ 10 percent for natural gas fuel to meet the exemption from 40 CFR 60.44b (Subpart Db) Standards of Performance for Industrial - Commercial - Institutional Steam Generating Units, Standard for Nitrogen Oxides. Annual Capacity Factor is defined in 40 CFR 60.41(b). [40 CFR 60.44b(d)]

- (Has to have a federally enforceable requirement limiting operation)

Annual capacity factor means the ratio between the actual heat input to a steam generating unit from the fuels listed in §60.42b(a), §60.43b(a), or §60.44b(a), as applicable, during a calendar year and the potential heat input to the steam generating unit had it been operated for 8,760 hours during a calendar year at the maximum steady state design heat input capacity.

Potential heat input is 245 MMBtu/hr times 8760 hours = 2,146,200 MMBtu/yr

Natural Gas heat input – Potential for reality of Sugar Mill season of 2,640 hours per year =

76 MM Btu/hr times 2640 hours = 200,640 MMBtu/yr

So how was the Natural gas limit enforceable without going out for public Notice?



Example: Bagasse Boiler with Cyclone and Wet Scrubber Controls



- From the EIQ, it was observed that the boiler flue was controlled by a cyclone and a wet scrubber in series. Below are typical requirements that are added:

Opacity \leq 20 percent, except during the cleaning of a fire box or building of a new fire, soot blowing or lancing, charging of an incinerator, equipment changes, ash removal or rapping of precipitators, which may have an opacity in excess of 20 percent for not more than one six-minute period in any 60 consecutive minutes. [LAC 33:III.1101.B]

Cyclone vents: Visible emissions monitored by visual inspection/determination daily. [LAC 33:III.507.H.1.a]

Cyclone vents: Visible emissions recordkeeping by electronic or hard copy daily. [LAC 33:III.507.H.1.a]

Scrubber Flow rate \geq 200 gallons/min maintained for primary and auxiliary nozzles combined. [LAC 33:III.501.C.6]

Scrubber Flow rate monitored by flow rate monitoring device once every four hours for primary and auxiliary nozzles. [LAC 33:III.507.H.1.a]

Scrubber Flow rate recordkeeping by electronic or hard copy once every four hours for primary and auxiliary nozzles. [LAC 33:III.507.H.1.a]

Which requirements don't make sense?



Where are actual emissions used?



- ERIC Submittals – Direct Reporting
- Annual Fee Assessments – Billed against actuals
- Inspections – Actuals compared against Permitted
- Enforcement actions - Exceedances
- Generating Permitted Emissions
 - Reconciliations – such as:
 - newly permitted PM_{2.5}
 - Engineering Studies
 - Stack testing of pollutants not previously tested
- PSD/NNSR Evaluations





4.4 What is an Emissions Path?

The Emissions Path is a detailed representation of the path of a pollutant from the point where the emissions are created or generated to the point when the emissions are released into the atmosphere. The Emissions Path is composed of the following components:

- A **Source** that represents the equipment, unit, or activity that generates the emission(s);
- A **Process** that describes the specific operational mode, material, throughput, or activity that forms the basis for the emissions calculation for the source;
- A **Control System** (if present) to which the emissions are routed for control; and
- A **Release Point** is the location where the emissions are released to the atmosphere.

An Emissions Path **MUST** include the Source, Process, and Release Point. A Control System record should only be included if present and active in controlling the pollutant(s) emitted.

Permitting Sources and Path



So for permitting, as seen in the example of the Bagasse Boiler, From the EIQ, the Source is identified, the control devices are identified and the stack parameters are documented. The process comes from the application where they are required to describe the facility process.

So all of the elements are there, but ERIC and Permitting treat the information differently.

Permitting's focus is to establish requirements that need to be complied with. Eric's focus is to establish actual emissions associated operations that follow a format established by EPA



Permitting Sources and Path



Permitting: Bagasse Boiler example

The boiler is the source of the emissions

The boiler uses two different processes to generate those emissions

- The combustion of Bagasse
- The combustion of Natural Gas

The boiler has two control devices in the exhaust path that are in series

- A cyclone
- A wet scrubber

The flue gases exit from the stack.



Permitting Sources and Path



Permitting could require four separate EIQ's, but allows for one EIQ.

One for the boiler requirements, one for the cyclone requirements, one for the scrubber requirements and a final one for the Opacity from the Stack.

The boiler has applicable NSPS Db requirements such as daily fuel rate monitoring and recordkeeping. These requirements are strictly for the boiler.

Typically a cyclone would have visible emissions monitoring at the outlet of the cyclone. However, there is no means to observe the outlet of the cyclone in this example as the outlet is also the inlet to the scrubber.

For wet scrubbers, LA Policy is to monitor the flow of water to the spray nozzles that are removing particulate matter in the flue gas. This could be placed on the scrubber.

The easiest way to identify this requirement is to just call it out as the scrubber flow to distinguish it from a boiler steam flow. So normally this is placed on the boiler SI.

As for the opacity, it is self evident that opacity is from the stack.

Therefore, Permitting can just have the one EIQ and all the requirements on the boiler.



Permitting Sources and Path versus ERIC



ERIC requires several separate submittal items.

The boiler is identified as the source.

However, the boiler has three different processes that must be specified.

- First the process of combusting bagasse during normal operation.
- Second, the process of using natural gas to start the bagasse - identified as a Startup process.
- Third, the process for very wet bagasse, the facility may need to operate the natural gas combustion to assist in the bagasse combustion to generate the required amount of steam to heat the molasses and dry the sugar crystals. Normal operation.

Typically the two control devices are added since they both continuously operate during all modes of operation.

Finally a release point is identified. In this example, all emissions come from the same stack.

Therefore ERIC will require three separate submittal emission records for each pollutant.



Permitting Sources and Path



Phosphoric Acid Train Example.

In this example the train uses a multi stage system to create the phosphoric Acid. At each of the stages, a vent is located that is controlled by a scrubber system.

The train as a whole has an emission limitation and P_2O_5 feed monitoring. Each scrubber has NESHAP Subpart AA requirements for flow rate ranges and scrubber pressure drop monitoring, as well as annual stack testing.

For permitting, EIQ's are required for each scrubber so that Subject items can be created and the appropriate requirements added.

An EIQ is not required for the entire train. However, LDEQ establishes a group for that train, so that the limitation and feed monitoring requirements are added.

Emissions from each stack are added together to compare against the limitation.





Permitting Sources and Path versus ERIC

For ERIC, the source would be the Train.

The process is the creation of the phosphoric acid.

Each scrubber would be identified as separate control devices.

Each vent stack from each scrubber would receive a separate identification as a release point.

If the annual test is conducted in the summer, then the following would occur.

- From January to the test date, the previous years stack test emission rate from each scrubber would be used to calculate emissions from each scrubber. Note that the emission rate is expressed as Total fluorides in lbs per ton of equivalent P_2O_5 feed.
- After the stack test, the rest of the year would be calculated based upon the new emission rate factor.

The P_2O_5 feed is recorded daily, so each separate daily rate shall be used to calculate the final emissions.

ERIC does not require a total number from the train as a whole.



Permitting Sources and Path



For Hire Terminal Examples

Each tank requires a separate EIQ with calculations based upon either the worst case product stored in that tank; or if it is dedicated to a specific product, then calculations based upon that product.

This information is important so that LDEQ can ensure that the correct regulations are entered into the permit. NSPS Kb breaks the regulations into tank size and vapor pressure subsets.

Let's assume that many of the tanks have the working and breathing losses collected and routed to a flare.

Each tank will have a requirement to: VOL storage data recordkeeping by electronic or hard copy at the approved frequency. Records consist of the VOL stored, the period of storage, and the maximum true vapor pressure of that VOL during the respective storage period. Keep copies of all records for at least two years. Subpart Kb. [40 CFR 60.116b(c)]



Permitting Sources and Path



For Hire Terminal Examples (cont.)

You may recall from an earlier slide that I showed continuous gases being vented to a flare. For permitting, the total anticipated throughput can be entered into the calculation, using the highest anticipated vapor pressure product.

However, in accordance with §919.F.1.b, Actual emissions must be reported to ERIC.

You may also recall the Tanks 4.09 run showing actual throughput on a monthly basis. That example was for the same mixture. However, in the case of a for hire terminal, those mixtures may be different over time. Since the terminal is required to record the VOL data, those actual products and actual time frames shall be used to calculate actual gases going to the flare.

In the case of 10 tanks with different products venting, the heating value used should be the volumetric weighted average.



Permitting Sources and Path



So from an ERIC submittal standpoint a true representation should be as follows.

- From F Table Section IV: Information describing the point at which the emissions are generated. That means each tank has to be included.
- Table Section V: Name of material used by the process and the average annual throughput of that material. Each separate product stored is a separate material which requires a unique record.

In the case of a terminal with 100+ tanks and 100+ products per year this would run into the thousands of unique calculations and records.

For this specific example where all working and breathing losses go to a flare, ERIC will allow the use of a rule of thumb: For more than 25 separate calculations –

The facility may characterize the “Source” as the set of all tanks and combined header. However, all calculations must be performed to generate for Table Section X, the total emissions on a per pollutant basis.



Permitting Sources and Path versus ERIC



So how does this work.

The flare emissions come from the combustion of the mixture of gases that are present in the header system.

That mixture can only be calculated by knowing all the various gases that enter the header system.

From the standpoint of averaging period, that depends totally on how often the products remain in the tanks and how wildly the products vary over time.

- If a tank only handles condensate with roughly the same vapor pressure, then the averaging period could be established on a monthly basis.
- If a tank handles very different products every two weeks, then the averaging period could be every two weeks.
- Emissions from landing losses would be treated as an adjusted daily volumetric weighted average.

From a permitting viewpoint, the header can be thought of as the Operational Flexibility CAP – usually a GRP Subject Item.



PSD /NNSR Actual Emissions



So ERIC submittals need the very best Actual emissions that can be determined from the monitoring data and actual operations.

How does this differ from PSD/NNSR actual emissions?

It doesn't!

When EPA defines Actual Emissions – it means Actual Emissions.

So when applications involving PSD/NNSR reviews are submitted; the calculations used to generate actual emissions for ERIC should be the exact same calculations used to provide actual emissions for PSD or NNSR purposes.





RESOURCES, DEFINITIONS, AND ACRONYMS





Resources

Louisiana Environmental Regulatory Code (LAC)

Title 33 :Part III.Air

Part I. Office of the Secretary

<http://www.deq.louisiana.gov/portal/tabid/96/Default.aspx>

The Code of Federal Regulation (CFR)

NSPS (40 CFR 60)

NESHAP (40 CFR 61)

<http://www.gpoaccess.gov/cfr/retrieve.html>

The Clean Air Act (CAA)

The Clean Air Act Amendments (CAAA)

<http://www.epa.gov/air/caa/peg/>





Resources

DEQ Website

<http://www.deq.louisiana.gov/portal/tabid/36/Default.aspx>

The Air Permitting Manual (Essential Reading)

http://www.deq.louisiana.gov/portal/Portals/0/permits/air/r05_Louisiana%20Guidance%20for%20Air%20Permitting%20Actions.zip

A weekly list of permit applications received

<http://www.deq.louisiana.gov/portal/tabid/2824/Default.aspx>

A list of permits on public notice

<http://www.deq.louisiana.gov/apps/pubNotice/default.asp>

EDMS – Can be accessed on-line

<http://www.deq.louisiana.gov/portal/tabid/2604/Default.aspx>

Public Participation Group

<http://www.deq.louisiana.gov/portal/tabid/2198/Default.aspx>





Definitions and Acronyms

- APD Air Permits Division
- BACT Best Achievable Control Technology
- BART Best Available Retrofit Technology
- BMP Best Management Practices (Plan)
- CAA Clean Air Act
- CAAA Clean Air Act Amendments
- CEMS Continuous Emission Monitoring System
- CFR Code of Federal Regulations
- CMS Continuous Monitoring System
- CO Carbon monoxide
- Criteria Pollutants These are nitrogen oxide (NO_x), sulfur dioxide (SO₂), Particulate Matter (PM), Carbon Monoxide (CO), Volatile Organic Compounds (VOC), and Lead (Pb).
- DEQ Department of Environmental Quality
- EPA Environmental Protection Agency
- EDMS Electronic Documents Management System : The repository for all official records created or received by the Department





Definitions and Acronyms

- HAP Hazardous Air Pollutant
- HON Hazardous Organic NESHAPS
- LAC Louisiana Administrative Code
- LAER Lowest Achievable Emission Rate
- Major Source Facilities with emissions of criteria emissions that equal or exceed 100 tons per year (TPY) or emissions of any one federally-regulated HAP that equals or exceeds 10 TPY or if total HAP emissions for the facility equal or exceed 25 TPY. Lower emission thresholds for a criteria pollutant may apply in nonattainment areas. A facility which has emissions of one or more criteria pollutants above 100 tpy.
- MACT Maximum Achievable Control Technology
- MER Minimum Emission Rate
- Minor Source Facilities with emissions of criteria emissions that are less than 100 tons per year (TPY) or emissions of any one federally-regulated HAP is less than 10 TPY or if total HAP emissions for the facility are less than 25 TPY.
- MM Million
- MMBTU Millions of British thermal units



Definitions and Acronyms



- NAA Nonattainment area
- NAAQS National Ambient Air Quality Standards
- PM2.5 Particulate Matter of 2.5 microns or less aerodynamic diameter
- PM-10 Particulate matter, 10 microns or less in size
- NESHAP National Emission Standards for Hazardous Air Pollutants
- NSPS New Source Performance Standards
- NSR New Source Review
- NNSR Non-attainment New Source Review
- Pb Lead
- PPB Parts per Billion
- PPM Parts Per Million
- PSD Prevention of Significant Deterioration
- PTE Potential To Emit is the emissions from a facility if it is run at maximum all year long.
- SCF Standard Cubic Foot
- SCFH Standard Cubic Feet per Hour
- SCFM Standard Cubic Feet per Minute





Definitions and Acronyms

- SCM Standard Cubic Meter
- SIC Standard Industrial Classification
- SIP State Implementation Plan
- SO₂ Sulfur dioxide
- SOCMI Synthetic Organic Chemical Manufacturing Industry
- SOP Standard Operating Procedures
- Synthetic minor source A facility that would be major source except that the emissions are being controlled below the major source emission level. The facility is permitted as a minor source.
- Title V Operating Permit Program authorized by Title V of the Clean Air Act
- TPY Tons per year
- VOC Volatile Organic Compound
- TEMPO Tools for Environmental Management and Protection Organizations.: The Department's official database into which all data for every facility is entered.





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