

Title V Operating Permit

Insignificant Activities

TA-50 Thermal Evaporation Unit

Activity Summary

LANL uses a gas-fired thermal evaporator to evaporate treated wastewater at the TA-50 Radioactive Liquid Waste Treatment Facility. LANL applied for a No Permit Required (NPR) determination regarding 20.2.72 NMAC permit requirements for this unit. The NPR application contains a full description of the activity. NMED issued in September 2010 NPR 2195-U determining a permit under 20.2.72 NMAC was not required.

Potential to Emit

As shown in the NPR application, assuming the evaporator operated at full capacity every hour of the year, all organic and metal emissions are several orders of magnitude below Title V insignificant activity thresholds. However, the NPR application indicated the potential to emit for NO_x and CO were 1.9 and 1.6 tons per year respectively. These emission estimates were based on AP-42 emission factors for a gas-fired boiler. As stated in the NPR application, those estimates took no credit for the installed low-NO_x burner or any deration for altitude. The AP-42 factor for a low-NO_x burner is 50% less than the factor used in the emission estimate.

For this Title V insignificant activity review, emission factors were obtained from the burner vendor to estimate emissions of criteria pollutants. Using the vendor factors, the potential to emit for NO_x and CO is 0.14 and 0.52 tons per year respectively. Without any altitude deration, the potential to emit values are 0.20 and 0.74 tons per year. All emission estimates are shown in the attachment.

There are no Title V applicable requirements which apply to the evaporator. The NMED List of Insignificant Activities does not have a categorical activity for an evaporator. In this case, the list criteria at 1.a and 1.b are applied. As shown on the attachment, all regulated pollutants are below the respective emission thresholds in 1.a and 1.b.

Conclusion

Potential to emit for each regulated pollutant are below Title V insignificant activity thresholds. The evaporation unit is an insignificant activity for Title V purposes.

ENCON Thermal Evaporator Emission Estimate for Title V Insignificant Activity

Basis

Fuel			
Natural gas			
Heat Content			1030 Btu/scf
Sulfur Content			2 grains/100 scf
ENCON Thermal Evaporator			
Rated capacity heater			4.54 MMBtu/hr
Altitude deration			30.00 %
Heater capacity derated			3.18 MMBtu/hr
Maximum fuel input			0.004 MMscf/hr
Maximum evaporation rate			400 gallons/hr

Notes

- 1 Altitude deration specified by LANL Engineering Standards for a gas-fired heater.
- 2 Sulfur content of pipeline natural gas is 2 gr/100 scf as specified by PNM.

Criteria Pollutants

Emission Factors - lb/MMBtu

NOx	CO	SOx	PM	PM ₁₀	PM _{2.5}	VOC
0.01	0.037	0.0035	0.0048	0.0048	0.0048	0.025

Notes

- 1 All factors specified by vendor.
- 2 2 grain S = 33.8 ppm S/100 scf = 0.00338% S.

Potential to Emit - Heater

	NOx	CO	SOx	PM	PM ₁₀	PM _{2.5}	VOC
lb/hr	0.03	0.12	0.0113	0.02	0.02	0.02	0.08
ton/year	0.14	0.52	0.0494	0.07	0.07	0.07	0.35
	0.20	0.74	Ton per year without altitude deration				

Notes

- 1 Vendor emission factor is total hydrocarbon not VOC only.

Total VOC TPY Emissions - natural gas combustion plus process evaporation

Evaporative Max Conc (ppm)	lb/hr	tpy	Total tpy Both
5.46E-02	1.82E-04	7.98E-04	0.35

Notes

- 1 Evaporative VOC from maximum TTO (ppm) from 2007 RLWTF Annual Report.

Hazardous Air Pollutants

ENCON Thermal Evaporator - Combustion

HAP	Emission Factor lb/MMscf	Emission Estimate	
		lb/hr	tpy
Organics			
POM	8.82E-05	3.89E-07	1.70E-06
Benzene	2.10E-03	9.26E-06	4.06E-05
Dichlorobenzene	1.20E-03	5.29E-06	2.32E-05
Formaldehyde	7.50E-02	3.31E-04	1.45E-03
Hexane	1.80E+00	7.94E-03	3.48E-02
Naphthalene	6.10E-04	2.69E-06	1.18E-05
Toluene	3.40E-03	1.50E-05	6.57E-05
Metals			
Arsenic	2.00E-04	8.82E-07	3.86E-06
Beryllium	1.20E-05	5.29E-08	2.32E-07
Cadmium	1.10E-03	4.85E-06	2.13E-05
Chromium	1.40E-03	6.18E-06	2.71E-05
Cobalt	8.40E-05	3.71E-07	1.62E-06
Lead	5.00E-04	2.21E-06	9.66E-06
Manganese	3.80E-04	1.68E-06	7.34E-06
Mercury	2.60E-04	1.15E-06	5.02E-06
Nickel	2.10E-03	9.26E-06	4.06E-05
Selenium	2.40E-05	1.06E-07	4.64E-07
Total		8.33E-03	3.65E-02

Notes

- 1 All emission factors from AP-42, 7/98, Section 1.4-Natural Gas Combustion, Tables 1.4-2, 1.4-3, and 1.4-4.
- 2 Hourly values based on maximum hourly fuel capacity.
- 3 Annual ton/yr values based on operation of 8,760 hr/year

ENCON Thermal Evaporator - Evaporation Process

HAP	Max Conc (ppm)	lb/hr	tpy
Arsenic	3.00E-02	1.00E-04	4.38E-04
Beryllium	4.00E-03	1.33E-05	5.84E-05
Cyanide	3.00E-03	1.00E-05	4.38E-05
Lead	1.00E-02	3.34E-05	1.46E-04
Mercury	1.10E-04	3.67E-07	1.61E-06
Nickel	3.00E-02	1.00E-04	4.38E-04
Phosphorus	1.50E-01	5.00E-04	2.19E-03
Selenium	2.20E-03	7.34E-06	3.21E-05
Total		7.65E-04	3.35E-03

ENCON Thermal Evaporator - Combustion and Evaporation Total

HAP	lb/hr	tpy
	9.10E-03	3.98E-02

Toxic Air Pollutants

ENCON Thermal Evaporator

TAP	Combustion Emissions		Evaporative Emissions		Total lb/hr	TAP Threshold lb/hr
	EF lb/MMscf	lb/hr	Max Conc (ppm)	lb/hr		
Aluminum			5.40E-02	1.80E-04	1.80E-04	1.3E-01
Ammonia			10.1	3.37E-02	3.37E-02	1.2E+00
Barium	4.40E-03	1.94E-05	3.00E-03	1.00E-05	2.94E-05	3.3E-02
Copper	8.50E-04	3.75E-06	2.30E-02	7.67E-05	8.05E-05	6.7E-02
Fluoride			0.34	1.13E-03	1.13E-03	1.7E-01
Nickel	2.10E-03	9.26E-06	3.00E-02	1.00E-04	1.09E-04	6.7E-02
Selenium	2.40E-05	1.06E-07	2.20E-03	7.34E-06	7.45E-06	1.3E-02
Silver			4.00E-03	1.33E-05	1.33E-05	6.7E-04
Uranium			8.00E-03	2.67E-05	2.67E-05	1.3E-02

Notes

- 1 Evaporative emissions based on maximum concentration (ppm) from 2007 RLWTF Annual Report.
- 2 Evaporative emission (lb/hr) = max conc (ppm) x max flow rate (gal/hr) x 8.34 lb/gal (density water).
- 3 Combustion emission factors from AP-42, 7/98, Section 1.4-Natural Gas Combustion, Table 1.4-4.

NMED Insignificant Activity 1.a

1.a. Any emissions unit, operation or activity that has the potential to emit no more than one (1) ton per year of any regulated air pollutant, excluding 112(b) hazardous air pollutants (see item 1.b), but including 112(r) flammable and toxic regulated pollutants that are not listed in Sections 500 – 502 of 20.2.72 NMAC. Regulated 112(r) pollutants that are listed in Sections 500 – 502 of 20.2.72 NMAC are insignificant if they are emitted in quantities less than the threshold (pound per hour) of that regulation.

	112r	TAP	1.a Threshold (tpy)	PTE (tpy)
Nitrogen oxides	no	no	1.0	0.14
Carbon Monoxide	no	no	1.0	0.52
Sulfur Oxides	no	no	1.0	0.0494
Particulate Matter	no	no	1.0	0.07
VOC	no	no	1.0	0.35
Aluminum	no	yes	1.0	0.001
Ammonia	no	yes	1.0	0.15
Barium	no	yes	1.0	0.0001
Copper	no	yes	1.0	0.0004
Fluoride	no	yes	1.0	0.005
Nickel	no	yes	1.0	0.0005
Selenium	no	yes	1.0	0.00003
Silver	no	yes	1.0	0.0001
Uranium	no	yes	1.0	0.0001

NMED Insignificant Activity 1.b

1.b. Any emissions unit, operation or activity that has the potential to emit no more than the lesser of either one (1) ton per year or the de minimis level of any 112(b) hazardous air pollutants listed in the U.S. EPA document "Documentation of De Minimis Rates for Proposed 40 CFR part 63 subpart B", EPA-453/R-93-035 or de minimis levels established under subsequent rulemaking for 112(g).

	HAP	EPA de minimis level (tpy)	1.b threshold (tpy)	PTE (tpy)
POM	x	0.01	0.01	0.000002
Benzene	x	2	1.0	0.00004
Dichlorobenzene	x	3	1.0	0.00002
Formaldehyde	x	2	1.0	0.001
Hexane	x	10	1.0	0.03
Naphthalene	x	10	1.0	0.00001
Toluene	x	10	1.0	0.00007
Arsenic	x	0.005	0.005	0.0004
Beryllium	x	0.008	0.008	0.0001
Cadmium	x	0.01	0.01	0.00002
Chromium	x	5	1.0	0.00003
Cobalt	x	0.1	0.1	0.000002
Lead	x	0.01	0.01	0.0002
Manganese	x	0.8	0.8	0.00001
Mercury	x	0.01	0.01	0.00001
Nickel	x	1	1.0	0.0005
Selenium	x	0.1	0.1	0.00003
Cyanide	x	5	1.0	0.00004
Phosphorous	x	0.1	0.1	0.002



Typical Flue Product Emissions Data for Power Flame Burners

	Natural Gas	# 2 Fuel Oil (1)
Carbon Monoxide - CO	.037 lb CO per 10 ⁶ BTU input (50 PPM)	.037 lb per 10 ⁶ BTU INPUT (50 PPM)
Sulfur Dioxide - SO ₂	(1.05) x (% Sulphur by weight in fuel) = lb SO ₂ per 10 ⁶ BTU Input	
Particulate Matter	.0048 lb PM per 10 ⁶ BTU input	.0143 lb PM per 10 ⁶ BTU input
Hydrocarbons	.025 lb HC's per 10 ⁶ BTU input	.038 lb HC's per 10 ⁶ BTU input
CO ₂	9 % to 10%	10% to 13%

Nitrogen Oxides - NO_x

Standard C, J Burners	.088 lb NO _x per 10 ⁶ BTU input (75 PPM)	.159 lb NO _x per 10 ⁶ BTU Input (120) PPM
LNIAC burner	.029 lb NO _x per 10 ⁶ BTU input (25 PPM)	.12 lb NO _x per 10 ⁶ BTU Input (90) PPM
CM burner	.070 lb NO _x per 10 ⁶ BTU input (60 PPM)	.146 lb NO _x per 10 ⁶ BTU Input (110) PPM
IFGR LNIC NO _x Burners	.029 lb NO _x per 10 ⁶ BTU input (25 PPM)	.126 lb NO _x per 10 ⁶ BTU Input (110) PPM
LNICM burner	.029 lb NO _x per 10 ⁶ BTU input (25) PPM	.12 lb NO _x per 10 ⁶ BTU Input (90) PPM
NPM Premix burner	.029 lb NO _x per 10 ⁶ BTU input (25) PPM	N/A
Nova Plus Burner	.010 lb NO _x per 10 ⁶ BTU input (9) PPM	N/A

ENCLOSURE
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(1) NO_x emissions at 3.0 % O₂ will vary based on the percent of fuel bound nitrogen and boiler configurations.

These emission rates are general estimates and do not constitute guarantees by Power Flame Inc.

In instances where guarantees are required, please consult the factory with the specific application information.

3.5 Gas-Fired Equipment

- A. Determine natural gas consumption (cfh) by dividing the Btu/h input rating at sea level by the gas heating value of 1000 Btu/ft³.⁵
-  B. Derate gas-fired heating units and atmospheric boilers catalog output rating by 30 percent.⁶
- C. Specify gas fired units that will be operating at 7500 feet altitude (see Chapter 1, Z1010 Constants, for altitude exceptions) so the manufacturer can factory install the correct gas orifices.
- D. For forced-draft boilers, consult with manufacturer for derating criteria.

3.6 Motors

- A. Refer to the Motors subsection below for deration and selection criteria.

4.0 CHEMICAL WATER TREATMENT

- A. Clean, flush, and chemically-treat process water in HVAC systems, e.g., steams, hot water, heating, cooling systems, etc. to address LANL's higher-than-neutral pH and silica scaling problems.
 - 1. Consult the ESM Mechanical POC for specific requirements, such as type of treatment system, chemicals, etc. *For existing facilities the LANL System Engineer will be consulted to determine preferred chemicals.*
- B. Provide biocide products that are registered with the EPA, with the registration number clearly shown on the drum.
- C. Chemical supplier personnel using biocide products shall have a New Mexico Department of Agriculture (NMDA) pesticide applicator license.
- D. Chemical formulations used in water treatment require LANL Water Quality Group (ENV-RCRA) approval.⁷
- E. Provide an emergency eyewash per OSHA 10CFR 1910.151 and 1450 if required after an evaluation/analysis by LANL IHS-IP. Consult IHS-IP Industrial Hygiene and Safety for additional emergency equipment requirements.
 - 1. *Guidance Note: Potable eye station may be acceptable in lieu of permanent.*

⁵ Per LANL Utilities & Infrastructure Group Gas Representative, "By contract, the gas supplier must furnish natural gas with a minimum heating value of 1,000 btu/ft³."

⁶ Carrier publication "Engineering Guide for Altitude Effects." (derate 4 percent for each 1,000 feet above sea level.) (EMref-9)

⁷ The LANL Water Quality Group (ENV-RCRA) is responsible for submittal of compliance data to the EPA and NMED as required for NPDES permits.

Sulfur Measurement Handbook



Sulfur Concentration Conversion Factors

Galvanic

1 Grain	= 0.0648 grams	
1cu ft.	= 28.316 liters	= 0.28316m ³
Molecular wt. H ₂ S	= 34.08	
Molecular wt. S	= 32.064	
1 gram mole gas	= 22.414 litres	@0°C & 14.75 PSI @-STP
1 gram mole gas	= 23.718 litres	@60° & 14.73 ST(commonSTP)
1 grain H ₂ S/100 SCF	= 22.88 mg/m ³	
1 grain H ₂ S/100 SCF	= 15.05 ppmv H ₂ S	@0°C & 14.75 PSI @ STP
1 grain H ₂ S/100 SCF	= 15.26 ppmv H ₂ S	@ 60°F & 14.73 PSI @STP
1 grain Sulf/100 SCF	= 15.99 ppmv/Sulfur	@ 0°C & 14.75 PSI @STP
1 grain Sulf/100 SCF	= 16.92 ppmv/ Sulfur	@ 60°F & 14.73 PSI @ STP
1 grain H ₂ S/100 SCF(Methane)	= 32 ppm wt./wt.	@ 0°C & 14.75 PSI @STP
1 grain H ₂ S/100 SCF(Methane)	= 33.9 ppm wt./wt.	@ 60°F & 14.73 PSI @ STP

Dow Gas Conditioning Fact Book

Multiply U.S.	By	To Obtain
Grains per Gallon	17.1	Parts per Million by weight
Grains H ₂ S per 100 SCF	0.001588	Mole percent H ₂ S
Grains H ₂ S per 100 SCF	1588 X 10 ⁻⁸	Mole Fraction
Grains H ₂ S per 100 SCF	15	ppm (w/v)
Mole Percent H ₂ S	615	Grains H ₂ S per 100 SCF

Conversion Factors Commonly used by pipeline transmission companies for H₂S in Natural Gas

ppm to mg/m ₃	multiply by 1.4331
mg/m ₃ to grains/100SCF	multiply by 0.0437
ppm to grains/100 SCF	multiply by 0.0626285
grains/100 SCF to mg/m ³	multiply by 22.88277
mg/m ³ to ppm	multiply by 0.69778
grains/100SCF to ppm	multiply by 15.967

Specification for Sulfur Levels

Tariff Limits - H₂S

TCPL	23mg/m ³ OR 1 grain/100 SCF/100 SCF OR 16 ppm
NOVA	23mg/m ³ OR 1 grain/100 SCF/100 SCF OR 16 ppm
TRANS GAS	6mg/m ³ OR .26grain/100 SCF OR 4.2 ppm

Tariff Limits - Total Sulfur

TCPL	460 mg/m ³ OR 20.1 grains or 321 ppm
NOVA	115 mg/m ³ OR 5.03 grains OR 80 ppm
TRANS GAS	23mg/m ³ OR 1.00 grains OR 16 ppm

Total Sulfur Limits by Environment Canada

Gasoline	360 ppm,	Recommended interim measure as of January 1, 1997
	30 ppm by 2005	Canadian Environmental Protection Act, Registration SOR/97-110
Diesel	0.05 wt%	

Total Sulfur Limits by United States Environmental Protection Agency

Code of Federal Regulations, Title 40, Part 79, Section 79.55

Methane Base Fuel Specification	16 ppmv
Propane Base Fuel Specification	123 ppmw
Methanol Base Fuel Properties	40 ppmw
Ethanol Base Fuel Properties	40 ppmw
Gasoline Base Fuel Properties	339 ppmw
Diesel Base Fuel Properties	0.05 wt%

