

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT STATIONARY SOURCE COMPLIANCE DIVISION PERMIT APPLICATION PROCESSING AND CALCULATIONS	PAGES 7	PAGE 1
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Permit to Construct (New Construction)

Applicant Eastern Municipal Water District (EMWD) –San Jacinto Valley Regional Water Reclamation Facility (SJVRWRF)

Mailing Address 2270 Trumble Road
P.O. Box 8300
Perris, CA 92572

Equipment Location 770 N Sanderson Avenue
San Jacinto, CA 92582

Equipment Description
APPLICATION 504377, FACILITY ID 019159

BOILER, HURST, MODEL S5-X-125-125W, FIRE TUBE TYPE, DIGESTER GAS AND NATURAL GAS FIRED, 5,400,000 BTU/HR MAXIMUM HEAT INPUT RATE, WITH ULTRA LOW NOX BURNER, POWER FLAME, MODEL LNINVC5-GG-30.

Background/Process Description

The above application was submitted on December 10, 2009 as a New Construction (Permit to Construct) application type for a natural gas or digester gas fired 5.4 mmBtu/hr boiler (firetube). The boiler will be used to provide hot water to heat up the sewage sludge in the digesters of the facility. The operating schedule for this equipment is 24 hours/day, 7 days/week, 52 weeks/ year. Eastern Municipal Water District (EMWD) San Jacinto Valley Regional Water Reclamation Facility (SJVRWRF) is a municipal water district which accepts and treats municipal sewage and produces recycled water for residents, farmers, and businesses in the area. The facility uses primary and secondary treatment processes. There is no school within 1000 feet of emission source. NOV #P55906 was issued October 6, 2010 for operating a water reclamation plant (A/N 448181) in violation of permit condition 4, failure to operate a Title V facility and all equipment in compliance with all terms, requirements, and conditions specified in the Title V permit at all times. There was one complaint on April 19, 2009 from the facility indicating they had received several complaints against their facility for odors per Variance Case No. 4934-34 in the last three years.

Emission Calculations

Maximum heat input rate: 5.4 mmBtu/hr
Natural gas HHV: 1,050 Btu/scf
Digester gas HHV: 630 Btu/scf
Assume O2 concentration at outlet = 5.28% (based on A/N 503050, ID 19159 evaluation)
Digester gas F-Factor 9172 dscf/mmBtu

Fuel consumption (NG) = 5,400,000 Btu/hr x scf/1,050 Btu
= 5143 scfh = 86 scfm
= 86 scfm natural gas x 13.5 scfm combustion products/scfm gas
= 1,161 scfm

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Fuel consumption (DG) = 5,400,000 Btu/hr x scf/630 Btu
= 8,571 scfh = 143 scfm
= 143 scfm natural gas x 13.5 scfm combustion products/scfm gas
= 1,931 scfm (maximum exhaust flow rate)

Emissions in **bold** will be used for maximum potential emissions for this equipment and NSR.

CO emissions

AER Emission Factors (NG): 84.00 lb/mmscfNG
84.00 lb/mmscfNG x mmscfNG/1E6scfNG x 5143 scfhNG
= 0.43 lbs/hr = 10.46 lbs/day (NSR)

Rule 1146 requirement: 400 ppmvd @ 3% O2 (using F-Factor)
NG: 400 ppmvd @ 3% O2 x 7.27E-8 lb/ppm-scf x 8710 dscf/mmBtu x 20.9/(20.9-3) x 5.4 mmBtu/hr
= 1.60 lbs/hr = 38.93 lbs/day (NSR)

DG: 400 ppmvd @ 3% O2 x 7.27E-8 lb/ppm-scf x 9172 dscf/mmBtu x 20.9/(20.9-3) x 5.4 mmBtu/hr
= 1.68 lbs/hr = 40.09 lbs/day (NSR)

OR
0.30 lbs/mmBtu(NG) x 5.4 mmBtu/hr = 1.62 lbs/hr = 39.42 lbs/day (NSR)

Rule 1303 BACT requirement (DG): 100 ppmvd @ 3% O2 (using F-Factor)
100 ppmvd @ 3% O2 x 7.27E-8 lb/ppm-scf x 9172 dscf/mmBtu x 20.9/(20.9-3) x 5.4 mmBtu/hr
= **0.42 lbs/hr** = **10.22 lbs/day (NSR)**

Rule 1303 BACT requirement (NG): 50 ppmvd @ 3% O2 (using F-Factor)
50 ppmvd @ 3% O2 x 7.27E-8 lb/ppm-scf x 8710 dscf/mmBtu x 20.9/(20.9-3) x 5.4 mmBtu/hr
= 0.20 lbs/hr = 4.87 lbs/day (NSR)

Rule 1303 Modeling requirement (>5 < 10mmBTU), CO: 25.9 lbs/hr > 2.99 lbs/hr, 0.75 lbs/hr and 0.22 lbs/hr

NOx emissions (as NO2)

AER Emission Factors (NG): 100.00 lb/mmscfNG
100.00 lb/mmscfNG x mmscfNG/1E6scfNG x 5,143 scfhNG
= 0.51 lbs/hr = 12.41 lbs/day (NSR)

Rule 1146 requirement: 30 ppmvd @ 3% O2 (using F-Factor)
NG: 30 ppmvd @ 3% O2 x 1.194E-7 lb/ppm-scf x 8710 dscf/mmBtu x 20.9/(20.9-3) x 5.4 mmBtu/hr
= 0.20 lbs/hr = 4.87 lbs/day (NSR)

DG: 30 ppmvd @ 3% O2 x 1.194E-7 lb/ppm-scf x 9172 dscf/mmBtu x 20.9/(20.9-3) x 5.4 mmBtu/hr
= 0.21 lbs/hr = 5.11 lbs/day (NSR)

Rule 1303 BACT requirement (DG): 30 ppmvd @ 3% O2 (using F-Factor)
30 ppmvd @ 3% O2 x 1.194E-7 lb/ppm-scf x 9172 dscf/mmBtu x 20.9/(20.9-3) x 5.4 mmBtu/hr
= **0.21 lbs/hr** = **5.11 lbs/day (NSR)**

Rule 1303 BACT requirement (NG): 12 ppmvd @ 3% O2 (using F-Factor)
12 ppmvd @ 3% O2 x 1.194E-7 lb/ppm-scf x 8710 dscf/mmBtu x 20.9/(20.9-3) x 5.4 mmBtu/hr

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= 0.08 lbs/hr = 1.95 lbs/day (NSR)

Rule 1303 Modeling requirement (>5 < 10mmBTU), NOx: 0.47 lbs/hr > 0.37 lbs/hr and 0.09 lbs/hr

PM10 emissions

AER Emission Factors (DG): 7.60 lb/mmscfDG (assume emission factor for NG is the same for DG)

7.60 lb/mmscfNG x mmscfNG/1E6scfNG x 8,571 scfhDG x 0.97PM10/PM*
= **0.06 lbs/hr** = **1.46 lbs/day (NSR)**

AER Emission Factors (NG): 7.60 lb/mmscfNG

7.60 lb/mmscfNG x mmscfNG/1E6scfNG x 5,143 scfhNG x 0.97PM10/PM*
= 0.04 lbs/hr = 0.97 lbs/day (NSR)

Rule 1303 BACT requirement (DG): 0.1 grain/scf @ 12% CO2 (Rule 409)

0.1 grain/scf @ 12% CO2 x 1,931 scfm x 60 min/hr x 11b/7000grains x 0.97PM10/PM*
= 1.61 lbs/hr = 38.64 lbs/day (NSR)

*Based on Weight Fraction for PM Category by Size Distribution for Utility Boilers-Residual

Rule 1303 BACT requirement (NG): Using natural gas

Rule 1303 Modeling requirement (>5 < 10mmBTU), PM10: 2.80 lbs/hr > 0.04 lbs/hr and 0.06 lbs/hr

Rule 404 requirement (DG): Exhaust flow rate: 1,931 dscfm, 0.147 grains/dscf

0.147 grains/dscf x 1,931 scfm x 60min/hr x 11b/7000grains = 2.43 lbs/hr > 0.06 lbs/hr

Rule 404 requirement (NG): Exhaust flow rate: 1,161 dscfm, 0.177 grains/dscf

0.177 grains/dscf x 1,161 scfm x 60min/hr x 11b/7000grains = 1.76 lbs/hr > 0.04 lbs/hr

ROG emissions

AER Emission Factors (DG): 5.50 lb/mmscfDG (assume emission factor for NG is the same for DG)

5.50 lb/mmscfNG x mmscfNG/1E6scfNG x 8,571 scfhDG
= **0.05 lbs/hr** = **1.22 lbs/day (NSR)**

AER Emission Factors (NG): 5.50 lb/mmscfNG

5.50 lb/mmscfNG x mmscfNG/1E6scfNG x 5,143 scfhNG
= 0.03 lbs/hr = 0.73 lbs/day (NSR)

SOx emissions

Applicant SOx emission estimate:

200 ppmvH2S(inDG) x 8,571 scfhDG x lb-moleH2S/379x10⁶ ft³ x lbmoleSO2/lbmoleH2S x 64.07
 lbsSO2/lbmole SO2 = **0.29 lbs/hr** = **7.06 lbs/day (NSR)**

AER Emission Factors (DG): 5.50 lb/mmscfDG (assume emission factor for NG is the same for DG)

0.60 lb/mmscfNG x mmscfNG/1E6scfNG x 8,571 scfhDG
= 0.01 lbs/hr = 0.24 lbs/day (NSR)

AER Emission Factors (NG): 0.60 lb/mmscfNG

0.60 lb/mmscfNG x mmscfNG/1E6scfNG x 5,143 scfhNG

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= 0.003 lbs/hr = 0 lbs/day (NSR)

Rule 1303 BACT requirement (NG): Using natural gas

BACT requirement: Rule 431.1 compliance: 1) Natural gas ≤ 16 ppmv, 2) Facility wide emission < 5 lbs/day

- 1) 16 ppmv x 1,161 scfm x 60 min/hr x lb-moleH₂S/379x10⁶ ft³ x lbmoleSO₂/lbmoleH₂S x 64.07 lbsSO₂/lbmole SO₂ = 0.19 lbs/hr SO_x (as SO₂)
- 2) 5 lbs/day H₂S x lb-mole/34.08 lbsH₂S x 64.07 lbsSO_x/lb-mole = 9.40 lbs/day SO_x (as SO₂)
= 0.39 lbs/hr SO_x (as SO₂)

Annual Emissions (AER 2009) SO_x emission: 0.319 tons/yr
0.319 tons/yr x 2,000lbs/ton x 1yr/365days = 1.75 lbs/day SO_x
= 0.07 lbs/hr SO_x

Toxic Risk Analysis

Nearest Residential Receptor Distance: 3032 ft. (924 m)
Nearest Commercial Receptor Distance: 653 ft. (199 m)
Stack height: 30 ft. (9.15 m)
Stack inner diameter: 14.0 in. (0.36 m)
Rain cap: Yes
Exhaust flow rate: 1,840 acfm (per Form 400-PS)
Exhaust temperature: 375 F (per Form 400-PS)
Building height: 26 ft. (7.93 m)
Building dimensions 57.0 ft. (17.4 m) x 65.0 ft. (19.8 m),
3,705 sq.ft. (344.5 sq.m)

Compound	MW (lbs/lbmole)	Outlet emission (DG fired) (lb/hr)	Outlet emission (NG fired) (lb/hr)
Acetaldehyde	44.06	3.69E-05	2.21E-5
Acrolein	56.06	2.31E-05	1.39E-5
Ammonia	17.03	2.74E-02	9.26E-2
Benzene	78.11	6.86E-05	4.11E-5
Ethylbenzene	106.16	8.14E-05	4.89E-5
Formaldehyde	30.03	1.46E-04	8.74E-5
Hexane	86.18	5.40E-05	3.24E-5
Naphthalene	128.17	2.57E-06	1.54E-6
PAHs	92.13	8.57E-07	5.14E-7
Toluene	106.2	3.14E-04	1.88E-4
Xylenes	44.06	2.33E-04	1.40E-4

The emission rates for the toxic air contaminants (TACs) for digester gas and natural gas firing are based on 2008 Reporting Procedures for AB2588 Facilities Reporting their Quadrennial Air Toxic Emission Inventory in the Annual Emission Reporting Program Table B-7 Default Emission Factors for Digester Gas Combustion (boiler) (lb/mmscf) and Table B-1 Default Emission Factors for Natural Gas Combustion (boiler) (lb/mmscf) respectively.

Tier III analysis was used since the exhaust stack does have a rain cap. Tier III risk analysis was based on the emission rates listed in the above table. Building downwash calculations were based on a building

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dimensions listed above. The MICR values are determined to be 2.17×10^{-8} for residential and 1.21×10^{-8} for commercial receptors for digester firing and 1.30×10^{-8} for residential and 7.26×10^{-9} for commercial receptors for natural gas firing. HIA and HIC were less than 1. Cancer Burden was less than 0.5.

Emissions Summary

Emission Total (based on NSR lbs/day values)

A/N 504377 (Boiler (5-20 mmBtu.hr) Other Fuel)

CO	= 0.42 lbs/hr	= 10.22 lbs/day
NOx	= 0.21 lbs/hr	= 5.11 lbs/day
PM10	= 0.06 lbs/hr	= 1.46 lbs/day
ROG	= 0.05 lbs/hr	= 1.22 lbs/day
SOx	= 0.29 lbs/hr	= 7.06 lbs/day

Rules Evaluation

Rule 212: Rule 212 (c)(1)- There is no school within 1000 feet of the facility.
Rule 212 (c)(2)- On-site emission increases does not exceed the following:

Volatile Organic Compounds	30 lbs/day
Nitrogen Oxides	40 lbs/day
PM10	30 lbs/day
Sulfur Dioxide	60 lbs/day
Carbon Monoxide	220 lbs/day
Lead	3 lbs/day

Rule 212(c)(3)(A)(i)- MICR is below 1 in a million.

Public Notice is not required.

Rule 401: Visible Emissions
No violations are expected, limits are listed under Rule 401(b)(1).

Rule 402: Nuisance
Nuisance is not expected with proper operation, monitoring and maintenance.
Compliance is expected.

Rule 404: Particulate Matter
No violations are expected. PM limits are listed under Rule 404 Table 404(a).

Rule 407: Liquid and Gaseous Air Contaminants
Rule 407 (c)- Provisions of this subsection (a)(2) shall not apply to equipment which is subject to the emission limits and requirements of source specific rules in Reg XI.

Rule 409: Combustion Contaminants
Combustion contaminants are not expected to exceed 0.1 grain per cubic foot of gas calculated to 12% CO2 at standard conditions averaged over a minimum of 15 consecutive minutes. Compliance is expected.

Rule 431.1: Sulfur Content of Gaseous Fuels

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Rule 431.1(c)(1)- Natural gas contains ≤ 16 ppmv sulfur compounds as H₂S.
Rule 431.1(g)(8)- Any facility which emits less than 5 pounds per day total sulfur compounds, calculated as H₂S from the burning of gaseous fuels other than natural gas (not applicable to (c)(1)). Compliance is expected.

Rule 53A: Riverside County – Specific Contaminants (Contained in Addendum to Reg IV)
Rule 53(a)- Sulfur compound emission limit, as SO₂ 50,000 ppmv. Compliance can be expected based on other similar category permits issued in SCAQMD.
Rule 53(b)- Fluorine compounds to be controlled to the maximum degree technically feasible. No fluorine potential emission from this equipment. Compliance is expected.

Reg IX: Part 63, Chapter I, Title 40 of Code of Federal Regulations, Subpart DDDDD- National Emissions Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers and Process Heaters
This subpart has been vacated by court action.

Rule 1146: Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers
Rule 1146(a)- Rule applicable to boiler ≥ 5 mmBtu/hr in all industrial, institutional, and commercial operations. Equipment is applicable to this rule.
Rule 1146(c)(1)(A)- All gaseous fuel fired units, NO_x emission limit: 30 ppmd 3%O₂.
Rule 1146(c)(4)- Heat input capacity ≥ 5 mmBtu/hr, shall exceed CO 400 ppmd 3%O₂ or 0.30 lbs/mmBtu for natural gas.
Rule 1146(d)(4)- NO_x and CO emission requirements shall be determined using District approved contractor under the LAP.
Rule 1146(d)(6)(B)- Compliance determination with NO_x emission requirements shall be conducted once every 5 years ($5.4 \leq 10$ mmBtu/hr).
Rule 1146(d)(8)(A)- Shall check NO_x emissions with a portable NO_x, CO and O₂ analyzer according to the Protocol for the Periodic Monitoring of Nitrogen Oxides, Carbon Monoxide, and Oxygen from Units Subject to SCAQMD Rules 1146 and 1146.1 at least monthly or every 750 unit operating hours, whichever occurs later. If a unit is in compliance for three consecutive emission checks, without any adjustments to the oxygen sensor set point, then the unit may be checked quarterly or every 2,000 unit operating hours, whichever occurs later, until there is an emission check indicating noncompliance.
Rule 1146(d)(8)(C)- Records shall be maintained for 5 years and shall be made available to SCAQMD personnel upon request.
Rule 1146(d)(8)(D)- Portable analyzer tests shall only be conducted by a person who has completed District approved training program in the operation of portable analyzers and has received a certification issued by the District.
Rule 1146(d)(9)- Comply with requirements as applied to CO in (d)(8) or (d)(6)(B). Compliance with all applicable requirements of this Rule is expected.

Rule 1147 NO_x Reductions From Miscellaneous Sources
Rule 1147(a)- Applicability: not applicable to boilers subject to SCAQMD Rule 1146.

Reg XIII: Rule 1303(a)- LAER/BACT is required (major source). The boiler is equipped with an ultra low NO_x burner.
BACT Natural gas: CO: 50 ppmvd 3%O₂(firtube), NO_x: 12 ppmvd 3%O₂, SO_x & PM₁₀: Natural gas.

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BACT Digester gas: CO: 100 ppmvd @ 3%O₂, NO_x: 30 ppmvd @ 3%O₂, PM₁₀: 0.1 gram/scf @ 12%CO₂.

Rule 1303(b)(1)- Modeling for VOC and SO_x is not required (1303 Appendix A). NO_x, CO and PM₁₀ are less than the allowable emissions in Table A-1, no further analysis is required (1303 Appendix A).

Rule 1303(b)(2)- Since the facility is an essential public service, any required offsets shall be provided through priority reserve.

- Rule 1401: Toxic Air Contaminants
Rule 1401(d)(1)(A)- MICR less than 1.0×10^{-6} .
Rule 1401(d)(1)(C)- Cancer burden is less than 0.5.
Rule 1401(d)(2) and Rule 1401(d)(3)- HIC and HIA values are estimated to be less than 1 respectively.
Compliance is expected.
- Rule 1401.1: Rule 1401.1(b)- Equipment is exempt since it is located at an existing facility.
- Reg. XXX: The installation of the digester gas and natural gas boiler and modification of two engines to replace the catalytic converters to ensure compliance with Rule 1110.2 limits is considered a Title V De Minimis Significant permit revision under Rule 3000(b)(6), since the cumulative emission increases of non-RECLAIM pollutants or HAPs do not exceed the emissions in Table 5-4 of the Draft Title V TDG March 2005 and does not result in new or additional NSPS or NESHAP requirements and will be subject to an EPA review (Rule 3003(j)). A public notice is not required.
Compliance is expected.

Conclusions & Recommendations

The equipment is in compliance with the Rules and Regulations of the AQMD. A Permit to Construct is recommended for application 504377. For Permit Conditions please see Sample Permit. A revised Title V permit is recommended after EPA review.