

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 (Alteration/Modification)

Applicant Eastern Municipal Water District (EMWD) –Moreno Valley
Regional Water Reclamation Facility (MVRWRF)

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

Equipment Location 17140 Kitching Street
Moreno Valley, CA 92551

Equipment Description
APPLICATION 510438, FACILITY ID 013088

ALTERATION OF:

DIGESTER GAS FLARING SYSTEM CONSISTING OF:

1. HYDROGEN SULFIDE REMOVAL VESSEL.
2. SEDIMENT TRAP.
3. FLAME ARRESTER.
4. ENCLOSED FLARE, BEKAERT, MODEL CEB 50, 1,700,000 BTU/HR, 1'-5" DIA. X 14'-0" H.

BY ADDITION OF:

1. CONDENSATE KNOCKOUT TANK UPSTREAM OF THE HYDROGEN SULFIDE REMOVAL VESSEL.
2. BLOWER. [ITEM NO. 4] FOR THE FLARE.
4. NATURAL GAS SUPPORT TRAIN, AUTOMATIC COMBUSTION AIR CONTROL AND AUTOMATIC GAS SHUTOFF VALVE FOR THE FLARE

Background/Process Description

The above application was submitted on May 4, 2010 as a Proposed Alteration/Modification to Permitted Equipment application type to alter the equipment include a natural gas assist to a digester gas fired flare, update the equipment description, alter permit conditions, and re-evaluate the emission limits.

The facility is a municipal water district which accepts and treats municipal sewage at Eastern Municipal Water District Moreno Valley Regional Water Reclamation Facility (EMWD-MVRWRF). The sewage treatment plant utilizes a three stage treatment system. Digester gas is produced from the secondary treatment during anaerobic digester of the sewage sludge, which is to be used in the fuel cell system. The sewage treatment plant is in the process of expanding under Permit to Construct A/N 474814 to include acid phase digestion. Acid phase digestion will produce low quality digester gas that is not usable in the fuel cell system and is to be sent to the flare and combusted. Natural gas may be required to assist in effectively combusting the low Btu value digester gas, therefore it is proposed to install a natural gas support train to the flare for natural gas assisted combustion. The composition of the raw acid-phase digester gas prior to adding any natural gas is approximately 15-30% methane content or 157.5-315 Btu/scf, with 60-70% carbon dioxide, and a flow rate of 15-45 cfm. Bekaert indicated that the range for

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the average Btu content for the mixed gas should be 250-300 Btu/scf. Natural gas consumption rates are estimated to range from 0 to 2.5 scfm, but may vary. Natural gas is to be used when the methane content of the digester gas is less than 25% or 262.5 Btu/scf. The natural gas support train has a modulating valve that is controlled by flame temperature. Therefore the CEB support gas train will regulate the support gas supply based on the waste gas gross heating value fluctuations. The applicant indicated the maximum exhaust flow rate is expected to be 324.6scfm at 300 Btu/scf gas and 61 scfm gas (5.32 scfm exhaust / scfm DG expansion).

In the last three years two Notices to Comply were issued to the above facility. Notice to Comply D14829 was issued on April 8, 2008 to provide the following: 1) copies of source test (cover page & results page only) for ICE permits F68934, F63608, and F68132, 2) Ignition timing inspection report for ICE permits F36089, F36095, F66584, and F68933, 3) oxygen concentration at the outlet for ICE permits F63608 and F68933. The above facility has received one complaint for odors in the last three years.

Emission Calculations

Assume R1 = R2. Emissions are based on operating schedule of 24 hrs/day, 7 day/week, 52 weeks/year. Assume digester gas is 300 Btu/scf and the flare will operate with 2.5 scfm of NG and the remaining fuel will be provided by DG.

$$\begin{aligned}
 \text{DG heating value} &= 1,700,000 \text{ Btu/hr (flare)} - [2.5\text{scfm} \times 60\text{min/hr} \times 1050\text{Btu/scf (NG)}] \\
 &= 1,542,500 \text{ Btu/hr} \\
 \text{DG flow rate} &= 1,542,500 \text{ Btu/hr} / 300\text{Btu/scf} / 60\text{min/hr} = 85.7 \text{ scfm} \\
 \text{DG exhaust flow rate} &= 85.7 \text{ scfm DG} \times 5.32 \text{ scfm exhaust / scfm DG expansion} = 456 \text{ scfm} \\
 \text{NG exhaust flow rate} &= 2.5 \text{ scfm NG} \times 13.5 \text{ scfm exhaust/scfm NG expansion} = 34 \text{ scfm} \\
 \text{Total exhaust flow rate} &= 456 \text{ scfm(DG)} + 34 \text{ scfm (NG)} = 490 \text{ scfm}
 \end{aligned}$$

CO emissions

Based on previous evaluation:

$$0.06 \text{ lbs/mmBtu} \times 1.7 \text{ mmBtu/hr} = 0.10 \text{ lbs/hr} = 2.43 \text{ lbs/day (NSR)}$$

Based on guaranteed emissions: 10 ppm OR 0.008 lbs/mmBtu

$$10 \text{ ppm} \times 2,314 \text{ dscfm} \times 60\text{mins/hr} \times \text{lbmole}/379\text{E6} \text{ cf} \times 28 \text{ lbs/lbmole} = 0.10 \text{ lbs/hr} = 2.43 \text{ lbs/day(NSR)}$$

OR

$$0.008 \text{ lbs/mmBtu} \times 1.7 \text{ mmBtu/hr} = 0.01 \text{ lbs/hr} = 0.24 \text{ lbs/day (NSR)}$$

Rule 407 requirement: 2000 ppmvd

$$2000 \text{ ppmvd} \times 490 \text{ dscfm} \times 60\text{mins/hr} \times \text{lbmole}/379\text{E6} \text{ cf} \times 28 \text{ lbs/lbmole} = 4.34 \text{ lbs/hr} > 0.10 \text{ lbs/hr}$$

Rule 409 requirement: 0.1 grain/cf

$$0.1 \text{ grain/cf} \times \text{lb}/7000\text{grains} \times 490 \text{ dscfm} \times 60\text{mins/hr} = 0.42 \text{ lbs/hr} > 0.10 \text{ lbs/hr}$$

Rule 1303 LAER/BACT requirement (see A/N 02-540ML): 0.06 lbs/mmBtu

$$0.06 \text{ lbs/mmBtu} \times 1.7 \text{ mmBtu/hr} = 0.10 \text{ lbs/hr} = 2.43 \text{ lb /day (NSR)}$$

Rule 1303 modeling requirement: 11.0 lbs/hr for <2 mmBtu, 11.0 lbs/hr > 0.10 lbs/hr

NOx emissions

Based on previous evaluation:

$$0.025 \text{ lbsNOx/mmBtu} \times 1.7 \text{ mmBtu/hr} = 0.04 \text{ lbs/hr} = 0.97 \text{ lbs/day (NSR)}$$

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Based on guaranteed emissions: 15 ppm OR 0.018 lbs/mmBtu
 $15 \text{ ppm} \times 490 \text{ dscfm} \times 60 \text{ mins/hr} \times \text{lbmole}/379\text{E}6 \text{ cf} \times 46 \text{ lbs/lbmole}$
 $= 0.05 \text{ lbs/hr} \qquad = 1.22 \text{ lbs/day (NSR)}$

OR
 $0.018 \text{ lbs/mmBtu} \times 1.7 \text{ mmBtu/hr}$
 $= 0.03 \text{ lbs/hr} \qquad = 0.73 \text{ lbs/day (NSR)}$

Rule 409 requirement: 0.1 grain/cf
 $0.1 \text{ grain/cf} \times \text{lb}/7000 \text{ grains} \times 490 \text{ dscfm} \times 60 \text{ mins/hr} = 0.42 \text{ lbs/hr} > 0.04 \text{ lbs/hr}$

Rule 1303 BACT requirement: 0.06 lbs/mmBtu
 $0.06 \text{ lbs/mmBtu} \times 1.7 \text{ mmBtu/hr}$
 $= 0.10 \text{ lbs/hr} \qquad = 2.43 \text{ lb /day (NSR)}$

Rule 1303 LAER/BACT requirement (see A/N 02s-540ML): 0.025 lbs/mmBtu
 $0.025 \text{ lbs/mmBtu} \times 1.7 \text{ mmBtu/hr}$
 $= 0.04 \text{ lbs/hr} \qquad = 0.97 \text{ lb /day (NSR)}$

Rule 1303 modeling requirement: 0.20 lbs/hr for <2 mmBtu, 0.20 lbs/hr > 0.04 lbs/hr

PM10 emissions

Based on previous evaluation:

$26 \text{ lbsPM10}/\text{mmscf} \times 1.7 \text{ mmBtu/hr} \times 1/550 \text{ Btu/cf} \qquad = 0.08 \text{ lbs/hr} \qquad = 1.95 \text{ lbs/day (NSR)}$

Rule 1303 modeling requirement: 1.20 lbs/hr for <2 mmBtu; 1.20 lbs/hr > 0.08 lbs/hr

Rule 404 requirement: Exhaust flow rate: 490 dscfm, 0.196 grains/dscf
 $0.196 \text{ grains/dscf} \times 490 \text{ dscfm} \times 60 \text{ min/hr} \times 1 \text{ lb}/7000 \text{ grains} = 0.82 \text{ lbs/hr} > 0.08 \text{ lbs/hr}$

Rule 409 requirement: 0.1 grain/cf
 $0.1 \text{ grain/cf} \times \text{lb}/7000 \text{ grains} \times 490 \text{ dscfm} \times 60 \text{ mins/hr} = 0.42 \text{ lbs/hr} > 0.08 \text{ lbs/hr}$

ROG emissions

Based on previous evaluation:

$R1 = 0.005 \text{ lbsROG}/\text{lb gas} \times 95.0 \text{ cfm} \times 60 \text{ min/hr} \times 86 \text{ lb}/\text{lbmole} \times \text{lbmole}/379 \text{ cf}$
 $= 6.47 \text{ lbs/hr} \qquad = 155.28 \text{ lbs/day}$
 $R2 = 6.47 \text{ lbs/hr} \times (1-0.99)$
 $= 0.06 \text{ lbs/hr} \qquad = 1.46 \text{ lbs/day(NSR)}$

Applicant requested emission:

20 ppmv @ 3%O2
 $20 \text{ ppmv} @ 3\% \text{O}_2 \times (20.9 - 8.79^*) / (20.9 - 3) = 13.5 \text{ ppmv}$
 $13.5 \text{ ppmv} \times 490 \text{ dscfm} \times 60 \text{ mins/hr} \times \text{lbmole}/379\text{E}6 \text{ cf} \times 16 \text{ lbs/lbmole}$
 $= 0.02 \text{ lbs/hr} \qquad = 0.49 \text{ lbs/day (NSR)}$

*A/N 457924, ID10983 March 8, 2007 Source test

Based on guaranteed emissions: 10 ppm OR 0.004 lbs/mmBtu
 $10 \text{ ppm} \times 490 \text{ dscfm} \times 60 \text{ mins/hr} \times \text{lbmole}/379\text{E}6 \text{ cf} \times 16 \text{ lbs/lbmole}$
 $= 0.01 \text{ lbs/hr} \qquad = 0.24 \text{ lbs/day(NSR)}$

OR
 $0.004 \text{ lbs/mmBtu} \times 1.7 \text{ mmBtu/hr}$
 $= 0.0068 \text{ lbs/hr} \qquad = 0.24 \text{ lbs/day (NSR)}$

Rule 1303 LAER/BACT requirement (see A/N 9788): 0.038 lbs/mmBtu OR 15 ppmvd 3% O2 as hexane

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$$0.038 \text{ lbs/mmBtu} \times 1.7 \text{ mmBtu/hr} = 0.06 \text{ lbs/hr} = 1.46 \text{ lb /day (NSR)}$$

OR

$$15 \text{ ppmv @ } 3\%O_2$$

$$15 \text{ ppmv @ } 3\%O_2 \times (20.9 - 8.79) / (20.9 - 3) = 10 \text{ ppmv}$$

$$10 \text{ ppm} \times 490 \text{ dscfm} \times 60 \text{ mins/hr} \times \text{lbmole}/379E6 \text{ cf} \times 16 \text{ lbs/lbmole} = 0.01 \text{ lbs/hr} = 0.24 \text{ lbs/day(NSR)}$$

*A/N 457924, ID10983 March 8, 2007 Source test

Rule 409 requirement: 0.1 grain/cf

$$0.1 \text{ grain/cf} \times \text{lb}/7000 \text{ grains} \times 490 \text{ dscfm} \times 60 \text{ mins/hr} = 0.42 \text{ lbs/hr} > 0.06 \text{ lbs/hr}$$

SOx emissions

Based on previous evaluation:

$$40 \text{ ppm} \times 95.0 \text{ cfm} \times 60 \text{ min/hr} \times 64 \text{ lb/lbmole} \times \text{lbmole}/379E6 \text{ cf} = 0.04 \text{ lbs/hr} = 0.97 \text{ lbs/day (NSR)}$$

Rule 407 requirement: 500 ppmvd

$$500 \text{ ppmvd} \times 490 \text{ dscfm} \times 60 \text{ mins/hr} \times \text{lbmole}/379E6 \text{ cf} \times 64 \text{ lbs/lbmole} = 2.48 \text{ lbs/hr} = 60.35 \text{ lbs/day(NSR)}$$

Rule 409 requirement: 0.1 grain/cf

$$0.1 \text{ grain/cf} \times \text{lb}/7000 \text{ grains} \times 490 \text{ dscfm} \times 60 \text{ mins/hr} = 0.42 \text{ lbs/hr} > 0.12 \text{ lbs/hr}$$

There was 200 ppmv TRS as H2S measured in the digester gas or a mole percent of < 0.10%.

Please note SOx is calculated as SO2.

$$200 \text{ ppm} \times 61 \text{ scfm} \times 60 \text{ min/hr} \times 64 \text{ lb/lbmole} \times \text{lbmole}/379E6 \text{ cf} = 0.12 \text{ lbs/hr} = 2.92 \text{ lbs/day (NSR)}$$

OR

$$0.10 \text{ molH}_2\text{S}^{**}/100 \text{ molDG} \times 1 \text{ molSO}_x/1 \text{ mol H}_2\text{S} \times 64 \text{ lbsSO}_x/\text{molSO}_x \times \text{molDG}/379 \text{ scf} \times 5,667 \text{ scfh}_{\text{DG}} = 0.96 \text{ lbs/hr} = 23.36 \text{ lbs/day (NSR)}$$

** Based on sulfur content of digester gas tested at MVRWRF on 12/3/2010.

BACT requirement: Rule 431.1 compliance: 1) Natural gas \leq 16 ppmv (flare is to operate with DG and only NG to assist, not applicable), 2) Facility wide emission < 5 lbs/day

$$2) \ 5 \text{ lbs/day H}_2\text{S} \times \text{lb-mole}/34.08 \text{ lbsH}_2\text{S} \times 64.07 \text{ lbsSO}_x/\text{lb-mole} \times \text{day}/24 \text{ hours} = 0.39 \text{ lbs/hr as SO}_2 = 9.49 \text{ lbs/day (NSR)}$$

Annual Emissions (AER 2009) SOx emission: 0.089 tons/yr

$$0.089 \text{ tons/yr} \times 2000 \text{ lbs/ton} \times 1 \text{ yr}/365 \text{ days} = 0.49 \text{ lbs/day SO}_x = 0.02 \text{ lbs/hr SO}_x$$

Toxic Risk Analysis

Nearest Residential Receptor Distance: 227 m

Nearest Commercial Receptor Distance: 396 m

Stack height: 13 ft.

Exhaust flow rate: 490 dscfm

Compound	MW (lb/mole)	Outlet Concentration (ppmv)
Benzene	78.11	0.0097
Chlorobenzene	112.56	0.01

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1,4-Dichlorobenzene	147.01	0.0163
1,1-Dichloroethane	98.96	0.0001
1,1-Dichloroethylene	96.95	0.0324
Ethyl benzene	106.16	0.0115
Methylene Chloride	84.94	0.0009
Tetrachloroethylene	165.83	0.0949
Toluene	92.13	0.698
Trichloroethylene	130.4	0.0791
m/p-Xylenes	106.17	0.0133
o-Xylenes	106.18	0.0113

Outlet concentration is based on laboratory analysis of digester, raw inlet to a fuel cell at EMWD-Moreno Valley from March 4, 2009.

Tier II analysis was used since the nearest receptor is greater than 25m from the exhaust stack. Tier II risk analysis was based on the outlet emission listed in the above table. MICR was calculated to be 8.95E-8 for residential and 6.85E-9 for commercial receptors. HIC and HIA are less than 1 and Cancer Burden is less than 0.5. Please note: the cumulative HIC and HIA from both emission sources are less than 1.

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)- There are no emission increases of toxic air contaminants.
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 limits are listed under Rule 404 Table 404(a).

Rule 407: Liquid and Gaseous Air Contaminants
Rule 407 (a)(1)- CO < 2000 ppmvd.
Rule 407(a)(2)- SOx < 500 ppmvd.
Compliance is expected.

Rule 409: Combustion Contaminants
< 0.1 grains/cf of gas
0.1 grains/cf x lb/7000grains x 490 dscfm x 60mins/hr = 0.42 lbs/hr

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- Rule 431.1: Sulfur Content of Gaseous Fuels
Rule 431.1(c)(1)- Natural gas contains ≤ 16 ppmv sulfur compounds as H₂S. The flare is to operate with DG and only NG to assist not only NG, therefore this is not applicable.
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, as SO₂ 50,000 ppmv.
Rule 53(b)- Fluorine compounds shall be controlled to the maximum degree technically feasible. No fluorine potential emission from this equipment.
Compliance is expected.
- Rule 1147 NOx Reductions From Miscellaneous Sources
Rule 1147(a)- Applicability: Not applicable, equipment is exempt per Rule 1147(g)(3)(E).
Rule 1147(g)(3)(E)- A flare, afterburner, degassing unit, remediation unit, thermal oxidizer, catalytic oxidizer or vapor incinerator process in which a fuel, including but not limited to natural gas, propane, butane or liquefied petroleum gas, is mixed with air toxics, VOCs, landfill gas, digester gas or other combustible vapors prior to incineration in the unit, in order to maintain vapor concentration above the upper explosion limit or above a manufacturer specified limit in order to maintain combustion or temperature in the unit. This exemption does not apply to a burner with a separate fuel line used to heat up or maintain temperature of a unit or incinerate air toxics, VOCs or other combustible vapors in a gas stream moving past the burner flame.
- Reg XIII: Rule 1303(a)- BACT is not required, since there is no emission increase greater than 1.0 lbs/day.
LAER/BACT from the previous application was already equipped, if it were not equipped, BACT would apply.
Applied LAER/BACT: CO: 0.60 lbs/mmBtu, NOx: 0.025 lbs/mmBtu, VOC: 0.038 lbs/mmBtu (see BACT determinations A/N 02-540ML & 9788).
Applied BACT: CO: Ground level, ≥ 1400 °F, and auto combustion air control. VOC: Ground level, ≥ 1400 °F, auto combustion air control and automatic shutoff gas valve, PM10: Knockout vessel.
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 (1301 Appendix A).
Rule 1303(b)(2)- There is no increase of emissions. Since the facility is an essential public service, required offsets shall be provided through priority reserve.
Compliance with Regulation XIII is expected.
- Rule 1401: Toxic Air Contaminants
Rule 1401(d)(1)(A)- MICR less than 1.0×10^{-6} limit.
Rule 1401(d)(1)(C)- Cancer burden is less than 0.5.

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Rule 1401(d)(2) and Rule 1401(d)(3)- HIC and HIA values are estimated to be less than 1 respectively.

Rule 1401.1: Requirements for New and Relocated Facilities Near Schools
 Rule 1401.1(b)- Not applicable, since the facility is an existing facility.

Reg. XXX: The modification of the digester gas flare, conversion of a stationary IC engine from non-emergency use to emergency use, an administrative change to a sewage treatment plant to remove a Rule 219 exempt boiler in the equipment description and permitting a LPG tank that was operating without a permit is considered a Title V Minor permit revision under Rule 3000(b)(15), since there is no emission increase and the modification of the equipment 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 510438. For Permit Conditions please see Sample Permits. A revised Title V permit is recommended after EPA review.