

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT STATIONARY SOURCE COMPLIANCE DIVISION PERMIT APPLICATION PROCESSING AND CALCULATIONS	PAGES 8	PAGE 1
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Permit to Operate (Alteration/Modification Without Prior Approval)

Applicant Inland Empire Utilities Agency (IEUA)–Regional Plant 1 (RP-1)

Mailing Address P.O. Box 9020
Chino Hills, CA 91709

Equipment Location 2450 East Philadelphia Avenue
Ontario, CA 91761

Equipment Description
APPLICATION 533317, FACILITY ID 9163

BOILER NO. 1, HURST, FIRETUBE TYPE, MODEL S45-X-250-60W, 10,500,000 BTU PER HOUR, DIGESTER OR NATURAL GAS FIRED, WITH A LOW NOX BURNER, POWER FLAME, MODEL NVCR7-GG-30.

APPLICATION 533318, FACILITY ID 9163

BOILER NO. 2, HURST, FIRETUBE TYPE, MODEL S45-X-250-60W, 10,500,000 BTU PER HOUR, DIGESTER OR NATURAL GAS FIRED, WITH A LOW NOX BURNER, POWER FLAME, MODEL NVCR7-GG-30.

Background/Process Description

The above applications were submitted on April 16, 2012 as an alteration/modification without prior approval (Permit to Operate) application type for two identical natural gas or digester gas fired 10.5 mmBtu/hr low-NOx boilers (firtube). These applications are to replace Permits to Construct A/N 526318 & 526319, respectively, which are for a natural gas or digester gas fired 8.7mmBtu/hr boilers. The heat input rating for A/Ns 526318 & 526319 was incorrectly specified in the application materials. The application materials mistakenly used the net heat rating of 8.7mmBtu/hr as the heat input rating, instead of the correct heat input rating of 10.5mmBtu/hr. Therefore this application was submitted to correct the heat input rating in the equipment description and conditions of permit and update the associated emission calculations. A/Ns 526318 & 526319 were submitted to replace two boilers that IEUA uses to create steam for the digestion process. IEUA has had two identical 4.713mmBtu/hr boilers under Permit F19309, A/N 328181 & Permit F19311, A/N 328182. These boilers typically operate as a supplemental heat source to the on-site cogeneration equipment (ICEs). Although, IEUA is in the process of replacing the engines with a fuel cell system operated on digester gas. Due to this change in overall facility process, the boilers will need to produce more heat. Therefore, these applications were submitted to install larger boilers which will comply with current and future (2015) Rule 1146 emission limits. The operating schedule the equipment is 24 hours/day, 7 days/week, 52 weeks/ year.

IEUA RP-1 is a 44 MGD sewage treatment facility accepting and treating sewage and producing recycled water for the area. The facility has been in operation since 1948. The facility uses primary, secondary, tertiary, and biosolids treatment processes. The facility provides recycled water that is compliant with the State of California Title 22 regulations. There is no school within 1000 feet of emission source. Notice to Comply #E01766 was issued on March 18, 2011 for the compliance requirement to 1) Retest Engine #1 (PTO R-F53212) at 3 engine loads required per Rule 1110.2(f)(1)(C)(ii), or 2) Submit an application to revise this requirement through a permit condition. There have been no odor complaints for the facility in the last two years.

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Emission Calculations

Maximum heat input rate: 10.5 mmBtu/hr

Natural gas HHV: 1,050 Btu/scf

Natural gas F-Factor: 8,710 dscf/mmBtu

Assumed digester gas HHV: 600 Btu/scf

Assumed digester gas F-Factor: 9,184 dscf/mmBtu (per 3/21/2011 Total Air Analysis, Inc. DG analysis)

Assume O2 concentration at outlet = 5.28% (based on A/N 503050, ID 19159 evaluation)

$$\begin{aligned}
 \text{Fuel consumption (NG)} &= 10,500,000 \text{ Btu/hr} \times \text{scf}/1,050 \text{ Btu} \\
 &= 10,000 \text{ scfh} = 167 \text{ scfm} \\
 &= 167 \text{ scfm natural gas} \times 13.5 \text{ scfm combustion products/scfm gas} \\
 &= 2,250 \text{ scfm}
 \end{aligned}$$

$$\begin{aligned}
 \text{Fuel consumption (DG)} &= 10,500,000 \text{ Btu/hr} \times \text{scf}/600 \text{ Btu} \\
 &= 17,500 \text{ scfh} = 292 \text{ scfm} \\
 &= 292 \text{ scfm natural gas} \times 13.5 \text{ scfm combustion products/scfm gas (assumed)} \\
 &= 3,938 \text{ scfm}
 \end{aligned}$$

CO emissions

AER Emission Factors (NG): 84.00 lb/mmscfNG

$$\begin{aligned}
 \text{NG: } 84.00 \text{ lb/mmscfNG} \times \text{mmscfNG}/1\text{E}6\text{scfNG} \times 10,000 \text{ scfhNG} \\
 &= 0.84 \text{ lbs/hr} \qquad \qquad \qquad = 20.44 \text{ lbs/day (NSR)}
 \end{aligned}$$

Rule 1146 requirement: 400 ppmvd @ 3% O2 (NG) or 0.30 lbs/mmBtu (NG)

$$\begin{aligned}
 \text{NG: } 400 \text{ ppmvd @ } 3\% \text{ O}_2 \times 7.27\text{E-}8 \text{ lb/ppm-scf} \times 8710 \text{ dscf/mmBtu} \times 20.9/(20.9-3) \times 10.5 \text{ mmBtu/hr} \\
 &= 3.11 \text{ lbs/hr} \qquad \qquad \qquad = 75.68 \text{ lbs/day (NSR)}
 \end{aligned}$$

or

$$\begin{aligned}
 \text{NG: } 0.30 \text{ lbs/mmBtu} \times 10.5 \text{ mmBtu/hr} \\
 &= 3.15 \text{ lbs/hr} \qquad \qquad \qquad = 76.65 \text{ lbs/day (NSR)}
 \end{aligned}$$

Rule 1146 requirement: 400 ppmvd @ 3% O2 (DG)

$$\begin{aligned}
 \text{DG: } 400 \text{ ppmvd @ } 3\% \text{ O}_2 \times 7.27\text{E-}8 \text{ lb/ppm-scf} \times 9,184 \text{ dscf/mmBtu} \times 20.9/(20.9-3) \times 10.5 \text{ mmBtu/hr} \\
 &= 3.27 \text{ lbs/hr} \qquad \qquad \qquad = 79.57 \text{ lbs/day (NSR)}
 \end{aligned}$$

Rule 1303 BACT requirement (NG): 50 ppmvd @ 3% O2 (firtube)

$$\begin{aligned}
 \text{NG: } 50 \text{ ppmvd @ } 3\% \text{ O}_2 \times 7.27\text{E-}8 \text{ lb/ppm-scf} \times 8710 \text{ dscf/mmBtu} \times 20.9/(20.9-3) \times 10.5 \text{ mmBtu/hr} \\
 &= 0.39 \text{ lbs/hr} \qquad \qquad \qquad = 9.49 \text{ lbs/day (NSR)}
 \end{aligned}$$

Rule 1303 BACT requirement (DG): 100 ppmvd @ 3% O2

$$\begin{aligned}
 \text{DG: } 100 \text{ ppmvd @ } 3\% \text{ O}_2 \times 7.27\text{E-}8 \text{ lb/ppm-scf} \times 9184 \text{ dscf/mmBtu} \times 20.9/(20.9-3) \times 10.5 \\
 \text{mmBtu/hr} \\
 &= 0.82 \text{ lbs/hr} \qquad \qquad \qquad = 19.95 \text{ lbs/day (NSR)}
 \end{aligned}$$

Rule 1303 Modeling requirement (> 10, <20 mmBTU), CO: 47.3 lbs/hr > 0.82 lbs/hr

NOx emissions (as NO2)

AER Emission Factors (NG): 100.00 lb/mmscfNG

$$\begin{aligned}
 \text{NG: } 100.00 \text{ lb/mmscfNG} \times \text{mmscfNG}/1\text{E}6\text{scfNG} \times 10,000 \text{ scfhNG} \\
 &= 1.00 \text{ lbs/hr} \qquad \qquad \qquad = 24.33 \text{ lbs/day (NSR)}
 \end{aligned}$$

Rule 1146 requirement (NG&DG Current): 30 ppmvd @ 3% O2

$$\begin{aligned}
 \text{NG: } 30 \text{ ppmvd @ } 3\% \text{ O}_2 \times 1.194\text{E-}7 \text{ lb/ppm-scf} \times 8710 \text{ dscf/mmBtu} \times 20.9/(20.9-3) \times 10.5 \text{ mmBtu/hr}
 \end{aligned}$$

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$$= 0.06 \text{ lbs/hr} \quad = 1.46 \text{ lbs/day (NSR)}$$

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

$$\text{DG: } 5.50 \text{ lb/mm scfNG} \times \text{mm scfNG}/1\text{E6scfNG} \times 17,500 \text{ scfhDG} \\ = 0.10 \text{ lbs/hr} \quad = 2.43 \text{ lbs/day (NSR)}$$

SOx emissions

AER Emission Factors (NG): 0.60 lb/mm scfNG

$$\text{NG: } 0.60 \text{ lb/mm scfNG} \times \text{mm scfNG}/1\text{E6scfNG} \times 10,000 \text{ scfhNG} \\ = 0.006 \sim 0.01 \text{ lbs/hr} \quad = 0.24 \text{ lbs/day (NSR)}$$

AER Emission Factors (DG): 0.60 lb/mm scfDG (assume emission factor for NG is the same for DG)

$$\text{DG: } 0.60 \text{ lb/mm scfNG} \times \text{mm scfNG}/1\text{E6scfNG} \times 17,500 \text{ scfhDG} \\ = 0.01 \text{ lbs/hr} \quad = 0.24 \text{ lbs/day (NSR)}$$

$$\text{DG: } 11.7 \text{ ppmvH}_2\text{S(inDG)} \times 17,500 \text{ scfhDG} \times \text{lb-moleH}_2\text{S}/379 \times 10^6 \text{ ft}^3 \times \text{lbmoleSO}_2/\text{lbmoleH}_2\text{S} \times \\ 64.07 \text{ lbsSO}_2/\text{lbmole SO}_2 = 0.03 \text{ lbs/hr} \quad 0.73 \text{ lbs/day (NSR)}$$

$$0.10 \text{ molH}_2\text{S}^{**}/100 \text{ molDG} \times 1 \text{ molSO}_x/1 \text{ mol H}_2\text{S} \times 64 \text{ lbsSO}_x/\text{molSO}_x \times \text{molDG}/379 \text{ scf} \times 17,500 \\ \text{scfhDG} = 2.96 \text{ lbs/hr} \quad = 72.03 \text{ lbs/day (NSR)}$$

** Based on sulfur content of digester gas tested at RP-1 on 3/21/2011.

Rule 1303 BACT requirement (NG): Using natural gas

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

- 1) $16 \text{ ppmv} \times 2,250 \text{ scfm} \times 60 \text{ min/hr} \times \text{lb-moleH}_2\text{S}/379 \times 10^6 \text{ ft}^3 \times \text{lbmoleSO}_2/\text{lbmoleH}_2\text{S} \times 64.07 \\ \text{lbsSO}_2/\text{lbmole SO}_2 = 0.37 \text{ lbs/hr SO}_x \text{ (as SO}_2\text{)}$
- 2) $5 \text{ lbs/day H}_2\text{S} \times \text{lb-mole}/34.08 \text{ lbsH}_2\text{S} \times 64.07 \text{ lbsSO}_x/\text{lb-mole} = 9.40 \text{ lbs/day SO}_x \text{ (as SO}_2\text{)}$
 $= 0.39 \text{ lbs/hr SO}_x \text{ (as SO}_2\text{)}$

Annual Emissions (AER 2011) SOx emission: 1.482 tons/yr

$$1.482 \text{ tons/yr} \times 2,000 \text{ lbs/ton} \times 1 \text{ yr}/365 \text{ days} = 8.12 \text{ lbs/day SO}_x \\ = 0.34 \text{ lbs/hr SO}_x < 0.39 \text{ lbs/hr}$$

H2S emission

$$11.7 \text{ ppmv} \times 292 \text{ scfm} \times 60 \text{ min/hr} \times \text{lb-moleH}_2\text{S}/379 \times 10^6 \text{ ft}^3 \times 34.08 \text{ lbsH}_2\text{S}/\text{lbmole H}_2\text{S} = 0.0184 \text{ lbs/hr}$$

Toxic Risk Analysis

Nearest Residential Receptor Distance:	1426 ft. (435 m)
Nearest Commercial Receptor Distance:	525 ft. (160 m)
Stack height:	29 ft. (8.8 m)
Stack inner diameter:	20 in. (0.51 m)
Rain cap:	Yes
Exhaust temperature:	280 F (per Southern California Boiler)
Exhaust flow rate:	4,100 acfm (per Southern California Boiler)
Building height:	34 ft. (10.4 m)
Building dimensions	95 ft. (29 m) x 103 ft. (31 m)

Compound	MW (lbs/lbmole)	Outlet emission (Maximum of NG and DG) (lb/hr)
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Acetaldehyde	44.06	4.30E-05
Acrolein	56.06	2.70E-05
Ammonia	17.03	1.80E-01
Benzene	78.11	1.38E-04
Ethyl benzene	106.16	9.50E-05
Formaldehyde	30.03	2.93E-04
Hexane (n-)	86.18	6.30E-05
Hydrogen Sulfide	34.08	1.84E-02
Naphthalene	128.17	3.00E-06
PAHs	252.3	6.90E-06
Propylene	42.08	7.31E-03
Toluene	92.13	3.66E-04
Xylenes	106.2	2.72E-04

The emission rates for the toxic air contaminants (TACs) listed above are the maximum emissions of emissions calculated from 1) AER Emission Factors for Natural Gas Boilers, 2) AER Emission Factors for Digester Gas Boilers, 3) Natural Gas Boiler Rule 1401 spreadsheet calculations, and the Hydrogen Sulfide calculation above.

Tier III analysis was used since the exhaust stack has 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 dimensions listed above. The MICR values are determined to be 4.05×10^{-7} for residential and 9.85×10^{-8} for commercial receptors. HIA and HIC were less than 1. Cancer Burden was less than 0.5.

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.

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- 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
Rule 431.1(c)(1)- Natural gas contains \leq 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 53: San Bernardino County – Specific Contaminants (Contained in Addendum to Reg IV)
Rule 53(a)- Sulfur compound emission limit, as SO₂ 1,000 ppmv. Compliance can be expected based on other similar category permits issued in SCAQMD.
Rule 53(b)- Combustion contaminants emission limit 0.3 grain/scf @12%CO₂.
Rule 53(c)- Fluorine compounds to be controlled to the maximum degree technically feasible. No fluorine potential emissions 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 regulation is not applicable, since this facility is not categorized as a major source of HAPs.
- Reg IX: Part 63, Chapter I, Title 40 of Code of Federal Regulations, Subpart JJJJJ- National Emissions Standards for Hazardous Air Pollutants for Industrial, Commercial, and Institutional Boilers Area Sources
This regulation is not applicable, since the boiler are not fired on coal, biomass, or oil.
- Rule 1146: Emissions of Oxides of Nitrogen from Industrial, Institutional, and Commercial Boilers
Rule 1146(a)- Rule applicable to boiler \geq 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 ppm_d 3%O₂ or 0.036 lbs/mmBtu (NG).
Rule 1146(c)(1)(I)- Digester gas fired, NO_x emission limit (effective 1/1/2015): 15 ppm_d 3%O₂. Manufacture guaranteed 15 ppm NO_x emission for DG.
Rule 1146(c)(1)(I)- Group III Units 75% or more, NO_x emission limit (effective 1/1/2013): 9 ppm_d 3%O₂ or 0.011 lbs/mmBtu (NG). Manufacture guaranteed 9 ppm NO_x emission for NG.
Rule 1146(c)(4)- Heat input capacity \geq 5 mmBtu/hr, shall exceed CO 400 ppm_d 3%O₂ or 0.30 lbs/mmBtu (NG).
Rule 1146(c)(8)- Those that choose the lb/mmBtu limit shall install a non-resettable totalizing fuel meter to measure the total of each fuel used by each individual unit, as approved by the Executive Officer.
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 3 years (10.5 > 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

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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 NOx 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 NOx burner.
BACT Natural gas: CO: 50 ppmvd 3%O2(firetube), NOx: 12 ppmvd 3%O2, SOx & PM10: Natural gas.
BACT Digester gas: CO: 100 ppmvd @ 3%O2, NOx: 30 ppmvd @ 3%O2, PM10: 0.1 gram/scf @ 12%CO2.
Rule 1303(b)(1)- Modeling for VOC and SOx is not required (1303 Appendix A). NOx, 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 1309.1(a)(3)- This essential public service shall surrender the permits for the existing boilers, for which the boilers under these applications are replacing. The boilers under these applications are being installed in order to meet lower emission requirements. There are no sources that can be modified to BARCT levels, other than replacing the existing boilers and surrendering the existing boiler permits.
- 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 two identical digester gas and natural gas boilers is considered a Title V De Minimis Significant permit revision under Rule 3000(b)(7), since the cumulative emission increases of non-RECLAIM pollutants or HAPS due to these permit revisions do not exceed thresholds, listed under Draft Technical Guidance Document for Title V Program, Version 4.0, March 2005, Chapter 5, Table 5-4 (lbs/day VOC: 30, CO: 220, PM10: 30 and HAP: 30), does not require any significant change in monitoring or permit conditions, does not require relaxation or avoidance of a requirement, 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.

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Conclusions & Recommendations

The equipment is in compliance with the Rules and Regulations of the AQMD. A Permit to Operate is recommended for applications 533317 and 533318. For Permit Conditions please see Sample Permit. A revised Title V permit is recommended after EPA review.