| Emission Factors for S-1 through S-14 | | | |
|---|---|---|---|
| **Pollutant** | **Source** | **Value** | **Unit** |
| NOx | Applicant Proposed Permit Limit of 5 ppm | 0.01842 | lb/MMBtu |
| CO | Applicant Proposed Permit Limit of 13 ppm | 0.02915 | lb/MMBtu |
| POC | Applicant Proposed Permit Limit of 25 ppm (annual average) | 0.03203 | lb/MMBtu |
| PM10 | Vendor Guarantee | 2.2 | lb/hr |
| SOx | Total Sulfur in Natural Gas 0.0367 lb/hr, Lube Oil Combustion 0.2 lb/hr | 0.2367 | lb/hr |
| NPOC | None | | |

**Emission Factor Derivation**

NOx lb/MMBtu = ppm x 1/molar volume x MW x Fd x 20.9/(20.9 - %O2)

ppm = 5 ppm @15%O2 limit proposed by Applicant
molar volume = 386.8 dscf/lbmol @ 14.696 psia, 70 deg. F
MW = molecular weight, lb/lb-mol
Fd = 8743 dscf/MMBtu for 1050 Btu/scf Natural Gas @ 70 deg F

NOx lb/MMBtu = 5 E-06 ft3 of NOx/ft3 stack gas x 1/386.8 dscf/lb-mol x 46 lb/lb-mol x 8743 dscf/MMBtu x 20.9/(20.9 - 15)
NOx lb/MMBtu = 0.01842

CO lb/MMBtu = ppm x 1/molar volume x MW x Fd x 20.9/(20.9 - %O2)

ppm = 13 ppm @ 15% O2 limit proposed by Applicant
molar volume = 386.8 dscf/lbmol @ 14.7 psia, 70 deg. F
MW = molecular weight, lb/lb-mol
Fd = 8743 dscf/MMBtu for 1050 Btu/scf Natural Gas @ 70 deg F

CO lb/MMBtu = 13 E-06 ft3 of CO/ft3 stack gas x 1/386.8 dscf/lb-mol x 28 lb/lb-mol x 8743 dscf/MMBtu x 20.9/(20.9 - 15)
CO lb/MMBtu = 0.02915

POC lb/MMBtu = ppm x 1/molar volume x MW x Fd x 20.9/(20.9 - %O2)

ppm = 25 ppm @ 15% O2 (annual average) limit proposed by Applicant
molar volume = 386.8 dscf/lbmol @ 14.7 psia, 70 deg. F
MW = molecular weight, lb/lb-mol
Fd = 8743 dscf/MMBtu for Natural Gas

POC lb/MMBtu = 25 E-06 ft3 of POC/ft3 stack gas x 1/386.8 dscf/lb-mol x 16 lb/lb-mol x 8743 dscf/MMBtu x 20.9/(20.9 - 15)
POC lb/MMBtu = 0.03203

SOx lb/hr (as SO2)
Natural Gas 0.182 grains of S/100 scf
Natural Gas Combustion Portion
SO2 = (0.182 gr/100 scf)(lb/7000 gr)(1/1020 BTU/scf)(1 x 10E6 Btu/MMBtu)(64 lb SO2/32 lb S) = 0.0005098 lb/MMBtu
SO2 = (0.0005098 lb/MMBtu)(72.08 MMBtu/hr) = 0.0367 lb/hr
Lube Oil Portion
SO2 = 0.2 lb/hr

| | | | |
|---|---|---|---|
| **Engine Operating Parameters S-1 through S-14** | | | |
| **Engine Firing Rate:** | | | |
| Annual | 72.08 | MMBTU/hr | Design data (8439 kW and 8541 BTU/kW) |
| Short Term | 72.80 | MMBTU/hr | Design data + 1% margin |
| **Cold Catalyst Start** | | | |
| Pollutant | (kg/event) | (lb/event) | |
| NOx | 4 | 8.818 | Manufacturer Estimate - 30 minutes operation after 6 hr downtime |
| CO | 6 | 13.228 | Manufacturer Estimate - 30 minutes operation after 6 hr downtime |
| POC | 3 | 6.614 | Manufacturer Estimate - 30 minutes operation after 6 hr downtime |
| PM10 | 1.1 | 2.425 | Manufacturer Estimate - 30 minutes operation after 6 hr downtime |
| SOx | | 0.1184 | Based on 30 minutes at full load |
| **Warm Catalyst Start** | | | |
| Pollutant | (kg/event) | (lb/event) | |
| NOx | 1.1 | 2.425 | Manufacturer Estimate - 15 minutes operation |
| CO | 1 | 2.205 | Manufacturer Estimate - 15 minutes operation |
| POC | 0.8 | 1.764 | Manufacturer Estimate - 15 minutes operation |
| PM10 | 0.9 | 1.984 | Manufacturer Estimate - 15 minutes operation |
| SOx | | 0.0592 | Based on 15 minutes at full load |
| **Shutdown** | | | |
| Pollutant | | (lb/event) | |
| NOx | | 0.188 | Based on 8.5 minutes at full load |
| CO | | 0.298 | Based on 8.5 minutes at full load |
| POC | | 0.327 | Based on 8.5 minutes at full load |
| PM10 | | 0.312 | Based on 8.5 minutes at full load |
| SOx | | 0.0335 | Based on 8.5 minutes at full load |

## TOTAL CRITERIA POLLUTANT EMISSONS FROM THE FACILITY – AIR TOXICS EMISSIONS NOT INCLUDED

| Pollutant | One Engine Normal Operation Emissions (ton/yr) | One Engine Startup/Shutdown Emissions (ton/yr) | One Engine Total Emissions (ton/yr) |
|---|---|---|---|
| NOx | 2.528 | 1.351 | 3.879 |
| CO | 4.000 | 2.029 | 6.029 |
| POC | 4.395 | 1.041 | 5.436 |
| PM10 | 4.188 | 0.411 | 4.599 |
| SOx | 0.451 | 0.023 | 0.473 |

| Pollutant | 14 Engines Normal Operation Emissions (ton/yr) | 14 Engines Startup/Shutdown Emissions (ton/yr) | 14 Engines Total Emissions (ton/yr) | Emergency Standby Generator Emissions (ton/yr) | Total Project Emissions (ton/yr) | Offset Ratio | Offset (ton/yr) |
|---|---|---|---|---|---|---|---|
| NOx | 35.387 | 18.914 | 54.300 | 0.053 | 54.354 | 1.15 | 62.507 |
| CO | 56.000 | 28.403 | 84.403 | 0.047 | 84.450 | NA | |
| POC | 61.533 | 14.576 | 76.109 | 0.003 | 76.112 | 1.15 | 87.529 |
| PM10 | 58.636 | 5.747 | 64.383 | 0.002 | 64.385 | NA | |
| SOx | 6.309 | 0.319 | 6.628 | 0.000 | 6.628 | NA | |

## ANNUAL CRITERIA POLLUTANT EMISSIONS FROM NORMAL OPERATIONS – NO STARTUP/SHUTDOWN EMISSIONS

| Pollutant | Value | Unit | One Engine Maximum Firing Rate (MMBtu/hr) | One Engine Normal Operation Emissions (lb/hr) | One Engine Normal Operation Emissions (lb/day) | Maximum Operation (hr/yr) | One Engine Normal Operation Emissions (lb/yr) | One Engine Normal Operation Emissions (ton/yr) |
|---|---|---|---|---|---|---|---|---|
| NOx | 0.01842 | lb/MMBtu | 72.08 | 1.328 | 31.87 | 3807.5 | 5055.27 | 2.528 |
| CO | 0.02915 | lb/MMBtu | 72.08 | 2.101 | 50.43 | 3807.5 | 8000.06 | 4.000 |
| POC | 0.03203 | lb/MMBtu | 72.08 | 2.309 | 55.41 | 3807.5 | 8790.46 | 4.395 |
| PM10 | 2.2 | lb/hr | | 2.2 | 52.80 | 3807.5 | 8376.50 | 4.188 |
| SOx | 0.2367 | lb/hr | | 0.2367 | 5.68 | 3807.5 | 901.24 | 0.451 |

Commisioning Period Emissions and Startup/Shutdown Emissions Not Included
Operation Hours = 4000 hours - 192.5 hours for Startup/Shutdown = 3807.5 hours

| Pollutant | Value | Unit | One Engine Maximum Firing Rate (MMBtu/hr) | One Engine Normal Operation Emissions (lb/hr) | 14 Engines Normal Operation Emissions (lb/day) | Maximum Operation (hr/yr) | 14 Engines Normal Operation Emissions (lb/yr) | 14 Engines Normal Operation Emissions (ton/yr) |
|---|---|---|---|---|---|---|---|---|
| NOx | 0.01842 | lb/MMBtu | 72.08 | 1.328 | 446.11 | 3807.5 | 70773.77 | 35.387 |
| CO | 0.02915 | lb/MMBtu | 72.08 | 2.101 | 705.98 | 3807.5 | 112000.84 | 56.000 |
| POC | 0.03203 | lb/MMBtu | 72.08 | 2.309 | 775.73 | 3807.5 | 123066.45 | 61.533 |
| PM10 | 2.2 | lb/hr | | 2.2 | 739.20 | 3807.5 | 117271.00 | 58.636 |
| SOx | 0.2367 | lb/hr | | 0.2367 | 79.53 | 3807.5 | 12617.29 | 6.309 |

Commisioning Period Emissions and Startup/Shutdown Emissions Not Included
Operation Hours = 4000 hours - 192.5 hours for Startup/Shutdown = 3807.5 hours

## STARTUP/SHUTDOWN CRITERIA POLLUTANT EMISSIONS

| Pollutant | Cold Catalyst Start (lb/event) | Warm Catalyst Start (lb/event) | Shutdown (lb/event) | One Engine Maximum Cold Startups (event) | One Engine Maximum Cold Shutdowns (event) | One Engine Startup Emissions (lb/yr) | One Engine Shutdown Emissions (lb/yr) | One Engine Startup/Shutdown Emissions (lb/yr) | One Engine Startup/Shutdown Emissions (ton/yr) |
|---|---|---|---|---|---|---|---|---|---|
| NOx | 8.818 | 2.425 | 0.188 | 300 | 300 | 2645.50 | 56.43 | 2701.93 | 1.351 |
| CO | 13.228 | 2.205 | 0.298 | 300 | 300 | 3968.25 | 89.30 | 4057.55 | 2.029 |
| POC | 6.614 | 1.764 | 0.327 | 300 | 300 | 1984.13 | 98.12 | 2082.25 | 1.041 |
| PM10 | 2.425 | 1.984 | 0.312 | 300 | 300 | 727.51 | 93.50 | 821.01 | 0.411 |
| SOx | 0.1184 | 0.0592 | 0.0335 | 300 | 300 | 35.51 | 10.06 | 45.56 | 0.023 |

Notes:

SOx emissions estimates are based on a maximum hourly emission rate of 0.2367 lb/hr. SOx emissions will remain at a simular level during startup and shutdown.

Worst case assumption 300 coldstarts per year for each engine.

One Cold Start/Shutdown Cycle (30 min startup, 8.5 min shutdown) and One Warm Start/Shutdown Cycle (15 min for startup, 8.5 min for shutdown)

| Pollutant | Cold Catalyst Start (lb/event) | Warm Catalyst Start (lb/event) | Shutdown (lb/event) | 14 Engines Maximum Cold Startups (event) | 14 Engines Maximum Cold Shutdowns (event) | 14 Engines Startup Emissions (lb/yr) | 14 Engines Shutdown Emissions (lb/yr) | 14 Engines Startup/Shutdown Emissions (lb/yr) | 14 Engines Startup/Shutdown Emissions (ton/yr) |
|---|---|---|---|---|---|---|---|---|---|
| NOx | 8.818 | 2.425 | 0.188 | 4200 | 4200 | 37037.04 | 789.99 | 37827.03 | 18.914 |
| CO | 13.228 | 2.205 | 0.298 | 4200 | 4200 | 55555.56 | 1250.17 | 56805.73 | 28.403 |
| POC | 6.614 | 1.764 | 0.327 | 4200 | 4200 | 27777.78 | 1373.69 | 29151.47 | 14.576 |
| PM10 | 2.425 | 1.984 | 0.312 | 4200 | 4200 | 10185.19 | 1309.00 | 11494.19 | 5.747 |
| SOx | 0.1184 | 0.0592 | 0.0335 | 4200 | 4200 | 497.07 | 140.84 | 637.91 | 0.319 |

Notes:

SOx emissions estimates are based on a maximum hourly emission rate of 0.2367 lb/hr. SOx emissions will remain at a simular level during startup and shutdown.

Worst case assumption 300 coldstarts per year for each engine.

One Cold Start/Shutdown Cycle (30 min startup, 8.5 min shutdown) and One Warm Start/Shutdown Cycle (15 min for startup, 8.5 min for shutdown)

## MAXIMUM HOURLY EMISSIONS FOR NATURAL GAS FIRED ENGINE GENERATOR SETS

**Max Hourly Emissions - One Cold Start (30 minutes for startup)**

| Pollutant | Normal Operation (lb/hr) | Normal Operation (hour/day) | Cold Startup (lb/event) | Startup (event) | Shutdown (lb/event) | Number Shutdown (event) | One Engine Total (lb/hr) | 14 Engines Total (lb/hr) |
|---|---|---|---|---|---|---|---|---|
| NOx | 1.328 | 0.5 | 8.818 | 1 | 0.188 | 0 | 9.48 | 132.75 |
| CO | 2.101 | 0.5 | 13.228 | 1 | 0.298 | 0 | 14.28 | 199.89 |
| POC | 2.309 | 0.5 | 6.614 | 1 | 0.327 | 0 | 7.77 | 108.75 |
| PM10 | 2.200 | 0.5 | 2.425 | 1 | 0.312 | 0 | 3.53 | 49.35 |
| SO2 | 0.2367 | | 0.1184 | | 0.0335 | | 0.2367 | 3.31 |

## MAXIMUM DAILY EMISSIONS FOR NATURAL GAS FIRED ENGINE GENERATOR SETS

Max Daily Emissions For One Engine - One Cold Start (30 min startup)

| Pollutant | Normal Operation (lb/hr) | Normal Operation (hour/day) | Cold Startup (lb/event) | Cold Startup (event) | Warm Startup (lb/event) | Warm Startup (event) | Shutdown (lb/event) | Number Shutdown (event) | Total (lb/day) |
|---|---|---|---|---|---|---|---|---|---|
| NOx | 1.328 | 23.50 | 8.818 | 1 | 2.425 | 0 | 0.188 | 0 | 40.02 |
| CO | 2.101 | 23.50 | 13.228 | 1 | 2.205 | 0 | 0.298 | 0 | 62.60 |
| POC | 2.309 | 23.50 | 6.614 | 1 | 1.764 | 0 | 0.327 | 0 | 60.87 |
| PM10 | 2.200 | 23.50 | 2.425 | 1 | 1.984 | 0 | 0.312 | 0 | 54.13 |
| SO2 | 0.2367 | 24 | 0.118 | | 0.059 | | 0.034 | | 5.68 |

| Pollutant | One Engine Total (lb/day) | 14 Engines Total (lb/day) |
|---|---|---|
| NOx | 40.02 | 560.27 |
| CO | 62.60 | 876.46 |
| POC | 60.87 | 852.16 |
| PM10 | 54.13 | 757.75 |
| SO2 | 5.68 | 79.5312 |

# Diesel Engine Emissons (S-15)

BAAQMD Final, 3/23/07

**Rated Horsepower:** **369** Nameplate

| | g/kw-hr | (g/hp-hr) |
|---|---|---|
| NOx | 3.5150 | 2.6211 |
| CO | 3.1000 | 2.3117 |
| POC | 0.1850 | 0.1380 |
| $PM_{10}$ | 0.1500 | 0.1119 |
| $SO_2$ | 0.0074 | 0.0055 |

g/kw-hr

**NOx & POC**

3.7

95% NOx

5% POC

| Pollutants | | Factors | hp | Hours | lb/g | | lbs/yr | | TPY |
|---|---|---|---|---|---|---|---|---|---|
| NOx | = | (2.6211 g/hp-hr)* | (369 hp)* | (50 hrs/yr)* | (0.00220 lbs/g) | = | 106.61 lbs/yr | = | 0.053 TPY |
| CO | = | (2.3117 g/hp-hr)* | (369 hp)* | (50 hrs/yr)* | (0.00220 lbs/g) | = | 94.03 lbs/yr | = | 0.047 TPY |
| POC | = | (0.1380 g/hp-hr)* | (369 hp)* | (50 hrs/yr)* | (0.00220 lbs/g) | = | 5.61 lbs/yr | = | 0.003 TPY |
| $PM_{10}$ | = | (0.1119 g/hp-hr)* | (369 hp)* | (50 hrs/yr)* | (0.00220 lbs/g) | = | 4.55 lbs/yr | = | 0.002 TPY |
| $SO_2$ | = | (0.0055 g/hp-hr)* | (369 hp)* | (50 hrs/yr)* | (0.00220 lbs/g) | = | 0.22 lbs/yr | = | 0.000 TPY |

| Pollutants | | Factors | hp | hr/day | lb/g | | lbs/day |
|---|---|---|---|---|---|---|---|
| NOx | = | (2.6211 g/hp-hr)* | (369 hp)* | (24 hr/day)* | (0.00220 lbs/g) | = | 51.175 lbs/day |
| CO | = | (2.3117 g/hp-hr)* | (369 hp)* | (24 hr/day)* | (0.00220 lbs/g) | = | 45.133 lbs/day |
| POC | = | (0.1380 g/hp-hr)* | (369 hp)* | (24 hr/day)* | (0.00220 lbs/g) | = | 2.693 lbs/day |
| $PM_{10}$ | = | (0.1119 g/hp-hr)* | (369 hp)* | (24 hr/day)* | (0.00220 lbs/g) | = | 2.184 lbs/day |
| $SO_2$ | = | (0.0055 g/hp-hr)* | (369 hp)* | (24 hr/day)* | (0.00220 lbs/g) | = | 0.107 lbs/day |

**Grain Loading Calculation for a Single Natural Gas Fired Engine Generator Set**

PM-10 Emission Rate 2.2 lb/hr
Firing Rate 72.08 MMBtu/hr
F-factor 8743 dscf/MMBtu
lb = 7000 grains
Regulation 6 O2 Concentration 6%
Ambient Air O2 Concentration 20.9%

grains/dscf = (2.2 lb/hr x 7000 grains/lb)/(72.08 MMBtu/hr x (8743 dscf/MMBtu x 20.9/(20.9 - 6))

grains/dscf = 0.0174

**COMMISSIONING EMISSION FACTORS (PER ENGINE)**

**Fuel Consumption Assumptions:**

| kW load | kW (full load) | kW | kJ/kWh | kJ/Btu | Btu/kWh | MMBtu/hr | Btu load |
|---|---|---|---|---|---|---|---|
| 100% | 8439 | 8439 | 9010 | 1.055 | 8541 | 72.08 | 100% |
| 90% | 8439 | 7595 | 9101 | 1.055 | 8627 | 65.52 | 90.9% |
| 75% | 8439 | 6329 | 9330 | 1.055 | 8844 | 55.97 | 77.6% |
| 50% | 8439 | 4198 | 10114 | 1.055 | 9587 | 40.25 | 55.8% |

Note: kJ/kWh at various loads provided by vendor.

**Emission Factor Assumptions:**

| | | |
|---|---|---|
| molar volume = | 386.8 | dscf/lbmol @ 14.696 psia, 70 deg. F |
| Fd = | 8743 | dscf/MMBtu for 1050 Btu/scf Natural Gas @ 70 deg F |
| MW (molecular weight) = | 46 | lb NOx/lb-mol |
| MW (molecular weight) = | 28 | lb CO/lb-mol |
| MW (molecular weight) = | 16 | lb POC/lb-mol |
| Reference Oxygen | 15 | % |
| Ambient Oxygen | 20.9 | % |

Commissioning

| Pollutant | 100% Load Emission Rate | | 90% Load Emission Rate | | 75% Load Emission Rate | | 50% Load Emission Rate | |
|---|---|---|---|---|---|---|---|---|
| | (ppm) | (lb/hr) | (ppm) | (lb/hr) | (ppm) | (lb/hr) | (ppm) | (lb/hr) |
| NOx | 120 | 31.86 | 120 | 28.96 | 110 | 22.68 | 100 | 14.82 |
| CO | 260 | 42.02 | 260 | 38.19 | 300 | 37.64 | 400 | 36.10 |
| POC | 110 | 10.16 | 110 | 9.23 | 140 | 10.04 | 170 | 8.77 |
| *PM10 | | 2.2 | | 2.2 | | 2.2 | | 2.2 |
| *SOx | | 0.237 | | 0.237 | | 0.237 | | 0.237 |

Note: ppm at various loads provided by vendor.

No change assumed for PM10 and SOx emissions. PM10 based on vendor guarantee. SOx based on 0.182 g S/100 scf + 0.2 lb/hr from lube oil.

## Worst Case Maximum Daily Emissions for Commissioning Period for Natural Gas Fired Engine Generator Sets

| Commissioning | | | | | | |
|---|---|---|---|---|---|---|
| **Pollutant** | **# Engines** | **Per Engine (lb/hr)** | **All Engine (lb/hr)** | **Operation (hr/day)** | **Per Engine (lb/day)** | **Total (lb/day)** |
| NOx | 4 | 31.86 | 127.43 | 24 | 764.60 | 3,058.39 |
| CO | 4 | 42.02 | 168.06 | 24 | 1,008.38 | 4,033.53 |
| POC | 4 | 10.16 | 40.63 | 24 | 243.78 | 975.14 |
| *PM10 | 4 | 2.20 | 8.80 | 24 | 52.80 | 211.20 |
| *SOx | 4 | 0.237 | 0.95 | 24 | 5.69 | 22.75 |

For NOx, CO, and POC worst case commissioning emissions occur with 4 engines operating uncontrolled at 100% load.
For PM10 and SOx worst case commissioning are the same as post commissioning emissions with 14 engines operating at 100% load.

## TOXIC AIR CONTAMINANT EMISSION ESTIMATE FOR FACILITY

| Toxic Air Contaminant | Uncontrolled Emission Factor (lb/MMBtu) | Max Firing Rate 14 Engines (MMBtu/hr) | Max Firing Rate 14 Engines (MMBtu/yr) | Abatement Efficiency Oxidation Catalyst (%) | Total Project Emissions (lb/hr) | Acute Risk Screening Trigger Level (lb/hr) | Total Project Emissions (lb/yr) | Chronic Risk Screening Trigger Level (lb/yr) |
|---|---|---|---|---|---|---|---|---|
| 1,3-Butadiene | 3.60E-04 | 1019.2 | 4036480 | 40 | 2.20E-01 | None | 8.72E+02 | 1.10E+00 |
| Acetaldehyde | 5.19E-04 | 1019.2 | 4036480 | 40 | 3.17E-01 | None | 1.26E+03 | 6.40E+01 |
| Acrolein | 5.78E-05 | 1019.2 | 4036480 | 40 | 3.53E-02 | 4.20E-04 | 1.40E+02 | 2.30E+00 |
| Ammonia | 1.36E-02 | 1019.2 | 4036480 | 0 | 1.39E+01 | 7.10E+00 | 5.49E+04 | 7.70E+03 |
| Benzene | 2.14E-04 | 1019.2 | 4036480 | 40 | 1.31E-01 | 2.90E+00 | 5.18E+02 | 6.40E+00 |
| Benzo-a-anthracene | 5.76E-08 | 1019.2 | 4036480 | 40 | 3.52E-05 | None | 1.40E-01 | None |
| Benzo-a-pyrene | 2.65E-09 | 1019.2 | 4036480 | 40 | 1.62E-06 | None | 6.42E-03 | 1.10E-02 |
| Benzo-b-fluoranthene | 4.01E-08 | 1019.2 | 4036480 | 40 | 2.45E-05 | None | 9.71E-02 | None |
| Benzo-k-fluoranthene | 7.68E-09 | 1019.2 | 4036480 | 40 | 4.70E-06 | None | 1.86E-02 | None |
| Chrysene | 1.40E-08 | 1019.2 | 4036480 | 40 | 8.56E-06 | None | 3.39E-02 | None |
| Dibenz-ah-anthracene | 2.65E-09 | 1019.2 | 4036480 | 40 | 1.62E-06 | None | 6.42E-03 | None |
| Ethylbenzene | 6.97E-05 | 1019.2 | 4036480 | 40 | 4.26E-02 | None | 1.69E+02 | 7.70E+04 |
| Formaldehyde | 4.62E-03 | 1019.2 | 4036480 | 40 | 2.83E+00 | 2.10E-01 | 1.12E+04 | 3.00E+01 |
| Indeno-123cd-pyrene | 7.03E-09 | 1019.2 | 4036480 | 40 | 4.30E-06 | None | 1.70E-02 | None |
| Naphthalene | 2.46E-05 | 1019.2 | 4036480 | 40 | 1.50E-02 | None | 5.96E+01 | None |
| Propylene | 5.27E-03 | 1019.2 | 4036480 | 40 | 3.22E+00 | None | 1.28E+04 | 1.20E+05 |
| Toluene | 2.34E-04 | 1019.2 | 4036480 | 40 | 1.43E-01 | 8.20E+01 | 5.67E+02 | 1.20E+04 |
| Xylenes | 6.33E-04 | 1019.2 | 4036480 | 40 | 3.87E-01 | 4.90E+01 | 1.53E+03 | 2.70E+04 |
| Diesel Exhaust Particulate | | | | | 9.10E-02 | None | 4.55E+00 | 5.80E-01 |

## AMMONIA SLIP EMISSION ESTIMATE FOR NATURAL GAS FIRED ENGINE GENERATOR SETS

Ammonia lb/MMBtu = ppm x 1/molar volume x MW x Fd x 20.9/(20.9 - %O2)

ppm = 10 ppm @15%O2 limit
molar volume = 386.8 dscf/lbmol @ 14.696 psia, 70 deg. F
MW = molecular weight, lb/lb-mol
Fd = 8743 dscf/MMBtu for Natural Gas @ 70 deg. F

Ammonia lb/MMBtu = 10 E-06 ft3 of NH3/ft3 stack gas x 1/386.8 dscf/lb-mol x 17 lb/lb-mol x 8743 dscf/MMBtu x 20.9/(20.9 - 15)
Ammonia lb/MMBtu = 0.02722 0.01361

| Pollutant | Value | Unit | One Engine Maximum Firing Rate (MMBtu/hr) | One Engine Normal Operation Emissions (lb/hr) | One Engine Normal Operation Emissions (lb/day) | Maximum Operation (hr/yr) | One Engine Normal Operation Emissions (lb/yr) | One Engine Normal Operation Emissions (ton/yr) |
|---|---|---|---|---|---|---|---|---|
| Ammonia | 0.01361 | lb/MMBtu | 72.08 | 0.98 | 23.54 | 4000 | 3924.04 | 1.96 |

Commisioning Period Emissions and Startup/Shutdown Emissions Not Included

| Pollutant | Value | Unit | 14 Engines Maximum Firing Rate (MMBtu/hr) | 14 Engines Normal Operation Emissions (lb/hr) | 14 Engines Normal Operation Emissions (lb/day) | Per Engine Maximum Operation (hr/yr) | 14 Engines Normal Operation Emissions (lb/yr) | 14 Engines Normal Operation Emissions (ton/yr) |
|---|---|---|---|---|---|---|---|---|
| Ammonia | 0.01361 | lb/MMBtu | 1009.12 | 13.73 | 329.62 | 4000 | 54936.49 | 27.47 |

Commisioning Period Emissions and Startup/Shutdown Emissions Not Included