

Title V Permit Evaluation

Site Number: B1669

Site Name: Gas Recovery Systems, Inc.

Site Address: 15999 Guadalupe Mines Road, San Jose, CA 95120

Background:

The Gas Recovery Systems, Inc. (GRS) operates several facilities in the Bay Area. This facility, located on Guadalupe Mines Road in San Jose, includes three rich burn internal combustion engines (S-2, S-3, and S-4) and one lean burn internal combustion engine (S-5). These engines are fired on landfill gas exclusively and are used to control some of the landfill gas generated by Guadalupe Rubbish Disposal's landfill.

Guadalupe Rubbish Disposal (Facility # A3294) is also subject to Title V permitting requirements because it is a designated facility under the NSPS requirements for Municipal Solid Waste Landfills (40 CFR Part 60, Subpart WWW). Guadalupe Rubbish Disposal submitted Major Facility Review Application # 115 on August 16, 1999. The MFR Permit for Facility # A3294 has been submitted for public comment and EPA review and will be issued shortly.

Guadalupe Rubbish Disposal's landfill will be required to meet the NSPS control requirements by February 12, 2002. Since GRS's four engines (S-2, S-3, S-4, and S-5) are being used to control landfill gas from an NSPS landfill, these engines will also be required to comply all applicable NSPS requirements on the same schedule as the landfill.

Periodic Monitoring:

Summary Table(s)

Particulate Matter: S-2, S-3, S-4 and S-5

| S# & Description | Federally Enforceable Limit Citation | Federally Enforceable Limit | Potential to Emit: tpy | Monitoring |
|--------------------------------|--------------------------------------|-----------------------------|------------------------|-----------------|
| S-2 Internal Combustion Engine | BAAQMD 6-301 | Ringelmann 1 | 1.42 TPY | Not Recommended |
| S-3 Internal Combustion Engine | BAAQMD 6-301 | Ringelmann 1 | 1.42 TPY | Not Recommended |
| S-4 Internal Combustion Engine | BAAQMD 6-301 | Ringelmann 1 | 1.42 TPY | Not Recommended |

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Particulate Matter: S-2, S-3, S-4 and S-5

| S# & Description | Federally Enforceable Limit Citation | Federally Enforceable Limit | Potential to Emit: tpy | Monitoring |
|---|---|------------------------------------|-------------------------------|-------------------|
| S-5 Internal Combustion Engine | BAAQMD 6-301 | Ringelmann 1 | 2.84 TPY | Not Recommended |
| All Engines Combined (S-2, S-3, S-4, and S-5) | BAAQMD 6-301 | Ringelmann 1 | 7.10 TPY | Not Recommended |
| S-2 Internal Combustion Engine | BAAQMD 6-310 | 0.15 grains/dscf | 1.42 TPY | Not Recommended |
| S-3 Internal Combustion Engine | BAAQMD 6-310 | 0.15 grains/dscf | 1.42 TPY | Not Recommended |
| S-4 Internal Combustion Engine | BAAQMD 6-310 | 0.15 grains/dscf | 1.42 TPY | Not Recommended |
| S-5 Internal Combustion Engine | BAAQMD 6-310 | 0.15 grains/dscf | 2.84 TPY | Not Recommended |
| All Engines Combined (S-2, S-3, S-4, and S-5) | BAAQMD 6-310 | 0.15 grains/dscf | 7.10 TPY | Not Recommended |

Sulfur Dioxide: S-2, S-3, S-4 and S-5

| S# & Description | Federally Enforceable Limit Citation | Federally Enforceable Limit | Potential to Emit: tpy | Monitoring |
|--------------------------------|---|--|-------------------------------|-------------------|
| S-2 Internal Combustion Engine | BAAQMD 9-1-301 | Property line ground level limits ≤ 0.50 ppm for 3 minutes ≤ 0.25 ppm for 60 minutes ≤ 0.05 ppm for 24 hours | 4.35 TPY | Not Recommended |

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Sulfur Dioxide: S-2, S-3, S-4 and S-5

| S# & Description | Federally Enforceable Limit Citation | Federally Enforceable Limit | Potential to Emit: tpy | Monitoring |
|---|--------------------------------------|---|------------------------|-----------------|
| S-3 Internal Combustion Engine | BAAQMD 9-1-301 | Property line ground level limits ≤ 0.50 ppm for 3 minutes ≤ 0.25 ppm for 60 minutes ≤ 0.05 ppm for 24 hours | 4.35 TPY | Not Recommended |
| S-4 Internal Combustion Engine | BAAQMD 9-1-301 | Property line ground level limits ≤ 0.50 ppm for 3 minutes ≤ 0.25 ppm for 60 minutes ≤ 0.05 ppm for 24 hours | 4.35 TPY | Not Recommended |
| S-5 Internal Combustion Engine | BAAQMD 9-1-301 | Property line ground level limits ≤ 0.50 ppm for 3 minutes ≤ 0.25 ppm for 60 minutes ≤ 0.05 ppm for 24 hours | 8.70 TPY | Not Recommended |
| All Engines Combined (S-2, S-3, S-4, and S-5) | BAAQMD 9-1-301 | Property line ground level limits ≤ 0.50 ppm for 3 minutes ≤ 0.25 ppm for 60 minutes ≤ 0.05 ppm for 24 hours | 21.76 TPY | Not Recommended |

The tables above contain only the limits for which there is no monitoring.

Discussion

S-2, S-3, S-4 & S-5: Internal Combustion Engines

PM: Particulate emissions from internal combustion engines fired on landfill gas are expected to be similar to engines burning natural gas. As with natural gas combustion, visible emissions are not normally associated with the proper combustion of landfill gas. Therefore, periodic monitoring for Ringelmann limits would not be appropriate for these engines.

Using the AP-42 emission factor for landfill gas combustion (48 lbs/MM dscf methane), the worst case methane content (45%), and worst case landfill gas flue gas factor (4.395 sdcf flue gas/scf LFG), the particulate emission rate from the engines is expected to be 0.0344 gr/dscf at 0% oxygen. The BAAQMD

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Regulation 6-310 of 0.15 gr/dscf is far above any expected PM emissions. It would therefore not be appropriate to add periodic monitoring for this standard.

SO₂: This facility will be subject to a federally enforceable limit of 1300 ppmv of total reduced sulfur (TRS) compounds in the landfill gas. This limit will ensure compliance with the BAAQMD and SIP Regulation 9-1-302 emission limit of 300 ppmv of SO₂ in the engine exhaust. For these engines, the highest concentration measured to date is 14 ppmv of SO₂ in the engine exhaust. Staff has proposed permit conditions that require the landfill gas to be monitored for total reduced sulfur content (on a weekly basis, initially) to ensure compliance with this limit. Sources complying with the 9-1-302 limit are not expected to exceed the ground level concentration limits listed in BAAQMD Regulation 9-1-301. Furthermore, a District source test indicated that the actual concentration of total reduced sulfur compounds in this facility's landfill gas was only 42 ppmv. At 42 ppmv of TRS, maximum SO₂ emissions are 2.28 tons/year of SO₂ from all engines combined. Monitoring for ground level SO₂ concentrations in addition to the proposed landfill gas monitoring would not be appropriate for such low levels of SO₂ emissions.

Permit Shield:

The applicant requested a permit shield from the area monitoring requirements of Regulation 1 and Regulation 9, Rules 1 and 2. In accordance with Regulation 9-1-501, area monitoring for sulfur dioxide is only required "Upon request of the APCO ...". The APCO has determined that sulfur dioxide emissions from this facility are very low and are not expected to ever exceed the ground level standards stated in 9-1-301. As a result, the APCO has not requested any ground level sulfur dioxide monitoring for this facility; and Regulation 9-1-501 does not apply. Regulation 9-1-502 does not apply, because this facility is not subject to 9-1-304, 9-1-307, 9-1-309, or 9-1-310. Regulation 9, Rule 2 is not included in the State Implementation Plan and therefore has no federally enforceable monitoring requirements. The District revised Regulation 9, Rule 2 after the application was submitted and the monitoring that was previously required by Regulation 9-2-501 is no longer required. Since this facility is not subject to any area monitoring requirements, Regulations 1-510, 1-530, 1-540, 1-542, 1-543, and 1-544 do not apply. Therefore, the permit shield requested by the applicant is not necessary.

Alternate Operating Scenario:

No alternative operating scenarios were requested, and none have been included in the proposed permit.

Compliance Status:

On October 20, 1995, Gas Recovery Systems, Inc. certified that all equipment was operating in compliance. No non-compliance issues have been identified to date. The most current compliance status for this facility is described in detail in the attached Compliance Report.

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Alignment of Information in Application and Proposed Permit:

In the application, both Gas Recovery Systems, Inc. (GRS) and the District staff identified numerous rules that apply to this facility. Most of the requirements that GRS cited in their application materials were included in the MFR Permit and are listed under Administrative Requirements, Generally Applicable Requirements, or Source-Specific Requirements.

GRS also stated in their application that two storage vessels are subject to Regulation 8, Rule 5. The District has not listed this equipment in the MFR Permit, because the vessels are exempt from permit requirements pursuant to Regulation 2-1-123.2 for storing only materials with less than 1% VOC by weight. Due to the large percentage of water in the condensate, the vapor pressure of the liquid is expected to be less than 0.01 psia. Therefore, these tanks are exempt from Regulation 8, Rule 5 pursuant to 8-5-117, because they are storing liquids with a true vapor pressure of less than 0.5 psia. These tanks will comply with Regulation 8, Rule 2, Section 301 by emitting less than 15 pounds per day of total carbon.

GRS stated in their application that all of the engines were subject to Title 17, Subchapter 7.6, Sections 93300, 93304, 93320, 93330, and 93350 of the California Code of Regulations. These sections implemented the requirements of the California Air Toxic "Hot Spots" Information and Assessment Act of 1987. Several of these sections have been deleted since the application was submitted and replaced by the equivalent requirements in the California Health and Safety Code, Section 44300 et seq. The District cited these Health and Safety Code requirements in Table III Generally Applicable Requirements. These requirements are not federally enforceable.

After the application was submitted, the District determined that the engines at this facility are subject to the NSPS for Municipal Solid Waste Landfills (40 CFR Part 60, Subpart WWW). The District added all applicable NSPS requirements to the proposed MFR Permit. The proposed MFR Permit now identifies all applicable requirements for S-2, S-3, S-4, and S-5, including requirements with future effective dates.

Emission Calculations:

Worst case emissions will occur when landfill gas has a low methane content and low heat content. The following emission calculations assume that the landfill gas contains 45% methane and has a heat content of 450 BTU/scf of landfill gas. For landfill gas containing 45% methane, the amount of flue gas generated is estimated to be 4.3949 cubic feet of flue gas per cubic foot of landfill gas at 0% excess oxygen.

PM₁₀ from IC Engines (S-2, S-3, S-4, and S-5)

Emissions Allowed by the Standard in Regulation 6-310

Rich Burn Engines (S-2, S-3, S-4):

$(6.75 \text{ E6 BTU/hour/engine}) / (450 \text{ BTU/ft}^3 \text{ LFG}) * (4.3949 \text{ ft}^3 \text{ flue/ft}^3 \text{ LFG}) * (0.15 \text{ grains/ft}^3) / (7000 \text{ grain/lb}) * (24 \text{ hours/day})$

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= 33.90 lbs/day/engine = 6.19 tons/year PM per engine

(6.19 tons/year/engine)*(3 engines) = 18.56 tons/year PM from all rich burn engines combined

Lean Burn Engine (S-5):

(13.5 E6 BTU/hour)/(450 BTU/ft³ LFG)*(4.3949 ft³ flue/ft³ LFG)*(0.15 grains/ft³)/

(7000 grain/lb)*(24 hours/day) = 67.81 lbs/day = 12.37 tons/year PM

All PM emissions are assumed to be PM₁₀.

Total Emissions Allowed from All Engines (S-2, S-3, S-4, S-5) = 30.93 tons/year PM₁₀

Potential to Emit

From AP-42 Chapter 2.4, Table 2.4-5:

Engine: (48 lbs PM₁₀/10⁶ dscf methane) * (0.45 scf methane/scf LFG) / (450 BTU/scf LFG)

= 0.048 lbs PM₁₀/MM BTU

Rich Burn Engines (S-2, S-3, S-4):

(6.75 MM BTU/hour/engine)*(0.048 lbs PM₁₀/MM BTU)*(24 hours/day)

= 7.78 lbs PM₁₀/day/engine = 1.42 tons/year PM₁₀ per engine

(1.42 tons/yr/engine)*(3 engines) = 4.26 tons/year PM₁₀ from all engines combined

Lean Burn Engine (S-5):

(13.5 MM BTU/hour)*(0.048 lbs PM₁₀/MM BTU)*(24 hours/day)

= 15.55 lbs PM₁₀/day = 2.84 tons/year PM₁₀

Total Potential to Emit from All Engines (S-2, S-3, S-4, S-5) = 7.10 tons/year PM₁₀

The ratio of allowable emissions to potential emissions is 4.4 to 1. Therefore, the margin of compliance is high. While it is true that the quality of the AP-42 emission factor is "E", it is presumed that the emission factor contains condensable particulate, while the District standard does not. Therefore, the margin of compliance is higher by an unknown quantity.

SO₂ from IC Engines (S-2, S-3, S-4, and S-5)

Emissions Allowed by the Standard in Regulation 9-1-302

As shown below, the federally enforceable emission limit of 300 ppmv of SO₂ in the exhaust gas (BAAQMD Regulation 9-1-302) is equivalent to a total reduced sulfur concentration of 1318 ppmv in the landfill gas. This concentration was rounded down to 1300 ppmv of TRS to establish a federally enforceable concentration limit.

(300 E-6 ft³ SO₂/ft³ flue gas)*(4.3949 ft³ flue/ft³ LFG)*(1 ft³ S/1 ft³ SO₂)*(1 ft³ H₂S/1 ft³ S)*(10⁶)

= 1318.5 ppmv of total reduced sulfur (TRS) as H₂S in landfill gas

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A concentration limit of 1300 ppmv TRS in the landfill gas will be used as a surrogate for the 300 ppmv SO₂ limit in the combustion gases.

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Rich Burn Engines (S-2, S-3, S-4):

$$\begin{aligned} & (6.75 \text{ E6 BTU/hour/engine}) / (450 \text{ BTU/ft}^3 \text{ LFG}) * (1300 \text{ E-6 ft}^3 \text{ S/ft}^3 \text{ LFG}) * (1 \text{ ft}^3 \text{ SO}_2 / 1 \text{ ft}^3 \text{ S}) / \\ & (386.8 \text{ ft}^3 \text{ SO}_2 / \text{lbmol SO}_2) * (64.06 \text{ lbs SO}_2 / \text{lbmol SO}_2) * (24 \text{ hours/day}) \\ & = 77.51 \text{ pounds/day SO}_2 \text{ per engine} = 14.15 \text{ tons/year SO}_2 \text{ per engine} \\ & (14.15 \text{ tons/year/engine}) * (3 \text{ engines}) = 42.44 \text{ tons/year SO}_2 \text{ from all rich burn engines} \end{aligned}$$

Lean Burn Engine (S-5):

$$\begin{aligned} & (13.5 \text{ E6 BTU/hour}) / (450 \text{ BTU/ft}^3 \text{ LFG}) * (1300 \text{ E-6 ft}^3 \text{ S/ft}^3 \text{ LFG}) * (1 \text{ ft}^3 \text{ SO}_2 / 1 \text{ ft}^3 \text{ S}) / \\ & (386.8 \text{ ft}^3 \text{ SO}_2 / \text{lbmol SO}_2) * (64.06 \text{ lbs SO}_2 / \text{lbmol SO}_2) * (24 \text{ hours/day}) \\ & = 155.02 \text{ pounds/day SO}_2 = 28.29 \text{ tons/year SO}_2 \end{aligned}$$

Total Emissions Allowed from All Engines (S-2, S-3, S-4, S-5) = 70.73 tons/year SO₂

Potential to Emit

Although the federally enforceable concentration limit is 1300 ppmv of TRS, the maximum amount of TRS detected in any Bay Area landfill to date is 350 ppmv. Using a statistical analysis on the available data, Bay Area landfill gas is determined to contain no more than 400 ppmv of TRS. This worst case concentration (400 ppmv of TRS) will be used to calculate the maximum potential sulfur dioxide emissions, instead of the federally enforceable concentration limit (1300 ppmv of TRS).

Rich Burn Engines (S-2, S-3, S-4):

$$\begin{aligned} & (6.75 \text{ E6 BTU/hour/engine}) / (450 \text{ BTU/ft}^3 \text{ LFG}) * (400 \text{ E-6 ft}^3 \text{ S/ft}^3 \text{ LFG}) * (1 \text{ ft}^3 \text{ SO}_2 / 1 \text{ ft}^3 \text{ S}) / \\ & (386.8 \text{ ft}^3 \text{ SO}_2 / \text{lbmol SO}_2) * (64.06 \text{ lbs SO}_2 / \text{lbmol SO}_2) * (24 \text{ hours/day}) \\ & = 23.85 \text{ pounds/day SO}_2 \text{ per engine} = 4.35 \text{ tons/year SO}_2 \text{ per engine} \\ & (4.35 \text{ tons/year/engine}) * (3 \text{ engines}) = 13.06 \text{ tons/year SO}_2 \text{ from all rich burn engines} \end{aligned}$$

Lean Burn Engine (S-5):

$$\begin{aligned} & (13.5 \text{ E6 BTU/hour}) / (450 \text{ BTU/ft}^3 \text{ LFG}) * (400 \text{ E-6 ft}^3 \text{ S/ft}^3 \text{ LFG}) * (1 \text{ ft}^3 \text{ SO}_2 / 1 \text{ ft}^3 \text{ S}) / \\ & (386.8 \text{ ft}^3 \text{ SO}_2 / \text{lbmol SO}_2) * (64.06 \text{ lbs SO}_2 / \text{lbmol SO}_2) * (24 \text{ hours/day}) \\ & = 47.70 \text{ pounds/day SO}_2 = 8.70 \text{ tons/year SO}_2 \end{aligned}$$

Total Potential to Emit from All Engines (S-2, S-3, S-4, S-5) = 21.76 tons/year SO₂

The ratio of allowable emissions to potential emissions is 3.25 to 1. Therefore, the margin of compliance is high.

Expected Emissions

The highest measured sulfur content for this facility is of 42 ppmv of TRS.

$$\begin{aligned} & (33.75 \text{ E6 BTU/hour}) / (450 \text{ BTU/ft}^3 \text{ LFG}) * (42 \text{ E-6 ft}^3 \text{ S/ft}^3 \text{ LFG}) * (1 \text{ ft}^3 \text{ SO}_2 / 1 \text{ ft}^3 \text{ S}) / \\ & (386.8 \text{ ft}^3 \text{ SO}_2 / \text{lbmol SO}_2) * (64.06 \text{ lbs SO}_2 / \text{lbmol SO}_2) * (24 \text{ hrs/day}) \\ & = 12.52 \text{ pounds/day SO}_2 \text{ (all engines)} = 2.28 \text{ tons/year SO}_2 \text{ (all engines)} \end{aligned}$$

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The ratio of allowable emissions to expected emissions is 31 to 1. Therefore, the margin of compliance, based on expected emissions, is very high.