ACTIVE SMAQMD BACT CLEARINGHOUSE

CATEGORY: **FLARE**

BACT Size: Minor Source BACT **FLARE (PROJECT-SPECIFIC DETERMINATION)**

BACT Determination Number:	140	**BACT Determination Date:**	**7/25/2017**

Equipment Information

Permit Number: 24978
Equipment Description: FLARE (PROJECT-SPECIFIC DETERMINATION)
Unit Size/Rating/Capacity: 9.8 MMBtu/hr Digester Gas (low heating value)*
Equipment Location: SYNERGEX VENTURES
8550 FRUITRIDGE RD
SACRAMENTO, CA

BACT Determination Information

ROCs	**Standard:**	0.068 lb/MMBTU
	Technology Description:	
	Basis:	Achieved in Practice
NOx	**Standard:**	0.06 lb/MMBTU
	Technology Description:	Emission estimate from John Zink
	Basis:	Achieved in Practice
SOx	**Standard:**	None
	Technology Description:	50 PPM of H2S achieved with the use of an Iron Sponge
	Basis:	Achieved in Practice
PM10	**Standard:**	None
	Technology Description:	Smokeless Cumbustion and a LPG or Natural Gas Fired Pilot
	Basis:	Achieved in Practice
PM2.5	**Standard:**	None
	Technology Description:	Smokeless Cumbustion and a LPG or Natural Gas Fired Pilot
	Basis:	Achieved in Practice
CO	**Standard:**	None
	Technology Description:	Operation in accordace with the manufacturers specifications in order to minimize CO emissions
	Basis:	Achieved in Practice
LEAD	**Standard:**	None
	Technology Description:	
	Basis:	

Comments: * Although the flare is actually rated at 10.65 MMBtu/hr when burning natural gas, when burning digester gas, the heat release is between 737,000 btu/hr to 9,800,000 btu/hr. Therefore, the rating of the flare will be considered to be 9.8 MMBtu/hr.

District Contact: Venk Reddy Phone No.: (916) 874 - 4861 email: vreddy@airquality.org

Printed: 7/26/2017

777 12th Street, Third Floor

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Sacramento, CA 95814

BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION

DETERMINATION NO.: 140

DATE: 6/15/17

ENGINEER: Venk Reddy

Category/General Equip Description: Project Specific BACT: Treatment of Low BTU gas from a Digester Refining Process (non Petroleum refining) with a total facility limit of less than 10 tons per year of VOC and NOx respectively located at 8550 Fruitridge Rd., Sacramento, CA

Equipment Specific Description: 9.8 MMBtu/Hr enclosed flare

Equipment Size/Rating: Minor Source BACT

Previous BACT Det. No.: None

This BACT was determined under the project for A/Cs 24978 and applies to the treatment of gases from a digester refining process having a higher heating value (HHV) of no more than 450 Btu/scf.

SMAQMD reviewed flares and processes for several source categories and analyzed the BACT determinations in those categories to verify if they are applicable to this operation. Attachment A is a review of flare operations from several BACT clearinghouses and an assessment of applicability.

This is a project specific BACT determination for the installation at this location. If a similar project is received by SMAQMD, a new BACT determination will be required. This BACT determination will not be applied to another project.

BACT ANALYSIS

A: ACHIEVED IN PRACTICE (Rule 202, §205.1a)

The following control technologies are currently employed as BACT for the treatment of low BTU gas from a digester gas production refining process by the following air pollution control districts:

District/Agency	Best Available Control Technology (BACT)/Requirements
US EPA	**BACT** Source: EPA RACT/BACT/LAER Clearinghouse Refer to attachment A for a sample list of BACT determinations found in the clearinghouse that is not applicable.

<table>
<tr><td>District/Agency</td><td>Best Available Control Technology (BACT)/Requirements</td></tr>
<tr><td></td><td>
<table>
<tr><td>VOC</td><td>N/A – No applicable BACT determinations found</td></tr>
<tr><td>NOx</td><td>N/A – No applicable BACT determinations found</td></tr>
<tr><td>Sox</td><td>N/A – No applicable BACT determinations found</td></tr>
<tr><td>PM10</td><td>N/A – No applicable BACT determinations found</td></tr>
<tr><td>PM2.5</td><td>N/A – No applicable BACT determinations found</td></tr>
<tr><td>CO</td><td>N/A – No applicable BACT determinations found</td></tr>
</table>
<u>RULE REQUIREMENTS</u>:

There is no rule that governs this source category. The following is discussed because of the use of a flare as a control device in the NSPS.
40 CFR 60 Subpart WWW – Standards of Performance for Municipal Solid Waste Landfills
Per Section 60.754, (d) the flare shall operate at either a 98 weight percent destruction efficiency of NMOC or 20 ppmv outlet concentration measured as Hexane. The lower end of the HHV range of landfill gas is within the upper HHV range for this BACT determination, so it will be considered in the evaluation of technologically feasible controls.</td></tr>
<tr><td>ARB</td><td><u>BACT</u>
Source: ARB BACT Clearinghouse

Refer to attachment A for a sample list of BACT determinations found in the clearinghouse that is not applicable.

<table>
<tr><td>VOC</td><td>N/A – No applicable BACT determinations found</td></tr>
<tr><td>NOx</td><td>N/A – No applicable BACT determinations found</td></tr>
<tr><td>Sox</td><td>N/A – No applicable BACT determinations found</td></tr>
<tr><td>PM10</td><td>N/A – No applicable BACT determinations found</td></tr>
<tr><td>PM2.5</td><td>N/A – No applicable BACT determinations found</td></tr>
<tr><td>CO</td><td>N/A – No applicable BACT determinations found</td></tr>
</table>
<u>RULE REQUIREMENTS</u>:
None</td></tr>
<tr><td>SMAQMD</td><td><u>BACT</u>

<table>
<tr><td>VOC</td><td>N/A – No applicable BACT determinations found</td></tr>
<tr><td>NOx</td><td>N/A – No applicable BACT determinations found</td></tr>
<tr><td>Sox</td><td>N/A – No applicable BACT determinations found</td></tr>
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<tr><td>PM2.5</td><td>N/A – No applicable BACT determinations found</td></tr>
<tr><td>CO</td><td>N/A – No applicable BACT determinations found</td></tr>
</table>
<u>RULE REQUIREMENTS</u>:
None</td></tr>
<tr><td>South Coast AQMD</td><td><u>BACT</u>

Refer to attachment A for a sample list of BACT determinations found in the</td></tr>
</table>

<table>
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<tr><td>CO</td><td>N/A – No applicable BACT determinations found</td></tr>
</table>
clearinghouse that is not applicable.

<u>RULE REQUIREMENTS</u>:

The following are discussed, but are not applicable to this type of process flare.

Rule 1147 NOx Reductions from Miscellaneous Sources
Per section (g) (3) (B), this flare only uses a fuel (natural gas) to maintain a pilot for vapor ignition and is thus exempt.

Rule 1118 Control of Emissions from Refinery Flares
Since this is not a petroleum refinery, sulfur recovery plant or hydrogen production plant, this facility is not subject to this rule.</td></tr>
<tr><td>San Diego County APCD</td><td>
<u>BACT</u>
Source: NSR Requirements for BACT.

<table>
<tr><td>VOC</td><td>N/A – No applicable BACT determinations found</td></tr>
<tr><td>NOx</td><td>N/A – No applicable BACT determinations found</td></tr>
<tr><td>SOx</td><td>N/A – No applicable BACT determinations found</td></tr>
<tr><td>PM10</td><td>N/A – No applicable BACT determinations found</td></tr>
<tr><td>PM2.5</td><td>N/A – No applicable BACT determinations found</td></tr>
<tr><td>CO</td><td>N/A – No applicable BACT determinations found</td></tr>
</table>
<u>RULE REQUIREMENTS</u>:
The following are discussed, but are not applicable to this type of process flare.

Rule 68 Fuel Burning Equipment – Oxides of Nitrogen

This regulation applies to equipment rated greater than 50 MMBTU/hr. The equipment is not rated at greater than 50 MMBTU/hr.</td></tr>
<tr><td>Bay Area AQMD</td><td>
<u>BACT</u>
Source: BAAQMD BACT Guideline

Refer to attachment A for a sample list of BACT determinations found in the clearinghouse that is not applicable.

<table>
<tr><td>VOC</td><td>N/A – No applicable BACT determinations found</td></tr>
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<table>
<tr><td>CO</td><td>N/A – No applicable BACT determinations found</td></tr>
</table>
<u>RULE REQUIREMENTS</u>:

None</td></tr>
<tr><td>San Joaquin Valley APCD</td><td>
<u>BACT</u>
Best Available Control Technology (BACT) Guideline 1.4.4 – Digester Gas-Fired Flare (rescinded 11/7/16)

The BACT that was presented by SJVAPCD is identified as a similar operation because it is used to treat a gas from a waste water treatment plant, the fuel is derived from a microbial digestion source which is similar to the flare fuel in question, and the BTU content of the fuel (250 btu/scf) is more closely related to the proposed fuel characteristics and is not temperature dependent. Although it was previously published as achieved in practice, the standard was never verified because the flare was never built. Therefore, it will not be considered achieved in practice but rather technologically feasible. This was confirmed by e-mail and verbally by SJVAPCD staff.

<table>
<tr><td>VOC</td><td>Enclosed Flare and VOC emissions <= 0.068 lb/ MMBTU</td></tr>
<tr><td>NOx</td><td><=0.06 lb/MMBTU</td></tr>
<tr><td>SOx</td><td>LPG or Natural Gas Pilot</td></tr>
<tr><td>PM10</td><td>Smokeless Combustion and a LPG or Natural gas fired pilot</td></tr>
<tr><td>PM2.5</td><td>No standard</td></tr>
<tr><td>CO</td><td>Operating in accordance with the manufactures specifications in order to minimize CO emissions</td></tr>
</table>
<u>RULE REQUIREMENTS</u>:
The following are discussed, but are not applicable to this type of process flare.

<u>Rule 4311 Flares</u>
The facility will be restricted to less than 10 tons per year of VOC and less than 10 tons per year of NOx, With these restrictions this rule would not apply. A review of the staff report (link) for the rule and with conversations with SJVAPCD staff (Anna Meyers, 9/1/16), the regulated sources for the rule fall into a list of source categories. As found on page 37 of the staff report, the source category that this flare is being applied to is not one of the affected sources. The lack of review for this source category shows that it is not achieved in practice however, the standards in this rule will be evaluated to determine if they are technologically feasible. For the purposes of the rule the following limits apply:

<table>
<tr><td>Type of flare and heat Release, Without Steam Assist</td><td>VOC (lb/ MMBTU)</td><td>NOx (lb/ MMBTU)</td></tr>
<tr><td>< 10 MMBTU/hr</td><td>0.0051</td><td>0.0952</td></tr>
<tr><td>10 -100 MMBTU/hr</td><td>0.0027</td><td>01330</td></tr>
<tr><td>> 100 MMBTU/hr</td><td>0.0013</td><td>0.5240</td></tr>
</table>
Per the manufacturer of the flare, when burning digester gas, the heat release is between 737,000 btu/hr to 9,800,000 btu/hr. Therefore the < 10MMBTU/hr catagory will be used for comparison.
</td></tr>
</table>

The following control technologies have been identified and are ranked based on stringency:

SUMMARY OF ACHIEVED IN PRACTICE CONTROL TECHNOLOGIES	
VOC	No Achieved in Practice limit was identified.
NOx	No Achieved in Practice limit was identified.
SOx	No Achieved in Practice limit was identified.
PM10	No Achieved in Practice limit was identified.
PM2.5	No Achieved in Practice limit was identified.
CO	No Achieved in Practice limit was identified.

B. TECHNOLOGICALLY FEASIBLE AND COST EFFECTIVE (Rule 202, §205.1.b.):

Technologically Feasible Alternatives:
Any alternative basic equipment, fuel, process, emission control device or technique, singly or in combination, determined to be possibly technologically feasible by the Air Pollution Control Officer.

The table below shows the potential technologically feasible alternatives identified as capable of reducing emissions beyond the levels determined to be "Achieved in Practice" as per Rule 202, §205.1.a.

VOC	1) 0.0051 lb/ MMBTU of VOC [SJVAPCD] 2) 98% Destruction efficiency or 20 PPM VOC emissions as Hexane [Landfill Gas NSPS] 3) Enclosed Flare and VOC emissions <= 0.068 lb/ MMBTU, Total Facility limited to 10 tons of VOC per year [SJVAPCD]
NOx	1) 0 025 lb/MMBTU [John Zink Ultra Low NOx Flare] 2) <= 0.06 lb/MMBTU [John Zink Standard Flare, SJVAPCD] 3) <=0.0952 lb/MMBTU, Total facility limited to 10 tons of NOx per year [SJVAPCD]
SOx	H2S Treatment of fuel prior to flare
PM10	Smokeless Combustion and a LPG or Natural gas fired pilot
PM2.5	No other technologically feasible option identified
CO	Operating in accordance with the manufactures specifications in order to minimize CO emissions

VOC Discussion, numbers cross reference to the table above

1) 0.0051 lb/ MMBTU of VOC [SJVAPCD]

SJVAPCD Rule 4311 has an emissions standard of 0.0051 lb VOC per MMBTU for flares with a heat release of under 10 MMBtu/hr operating at facilities (except for landfills) that have a PTE of 10.0 tons/year or more of NOx or VOCs. This facility is well under 10 tons/year for NOx and VOCs, and about 95% of the emissions are from the flare. Facilities like this will never be subject to the standards of this rule based on VOC emissions. At 9.8 MMBTU/hr the flare by itself would only equate to 0.2 tons/yr at the rule limit or 3.2 tons per year at an emission rate of 0.068 lb/MMBTU.

Additionally, SJVAPCD in the rule writing process identified in the staff report source categories that would be covered by this rule. A biogas refining process was not considered in the rule writing process and never identified as technologically feasible. The applicant has stated that

they cannot achieve a high enough BTU value in the fuel, required to meet this standard. John Zink has stated that there is no additional control options to increase VOC destruction without changing the BTU value of the fuel. Due to the low BTU value of the fuel, it has been shown that the VOC emission limit from this rule is not technologically feasible at this facility. The applicant has source tested and shown that they cannot meet the emission standards. The applicant has source tested the flare with results that show the VOC emissions of 0.056 lb/MMBTU at a set point temperature of 800F. The applicant has difficulty in reaching higher temperatures due to the volume of gas available and the BTU content of the fuel.

John Zink was contacted to see if there was technology that could lower the VOC emission rate of the flare without adding BTU's to the fuel. The manufacture of the flare stated that there is no additional technology readily available that could lower the VOC emission rate while keeping the BTU content static.

The applicant has shown that at the proposed temperatures and conditions, it cannot meet the requirements of this rule. Per the flare manufacturer, there is no additional technology that could be added to the flare to increase VOC destruction efficiency to meet the rule requirements. Therefore, since the flare by itself would never be subject to the rule, and since a flare, as part of a biogas refining process, was not considered in the rule development process, the requirements will not be considered to be technologically feasible for a source of this size and for this process.

2) 98% Destruction efficiency or PPM VOC 20 emissions as Hexane [Landfill Gas NSPS]

The NSPS standard for flares at landfills is predicated on the BTU value of the gas as low as 350 btu/scf. Since the applicant is requesting to go lower than 350 btu/scf, technologies for landfill gas control are eliminated because of the difference in the BTU content of the fuels.

The applicant source tested the flare and determined that at 800 F the emissions meet the NSPS requirement but at lower than 800 F it could not. The applicant states that they cannot maintain greater than 800F at all times due to the variable BTU in the gas stream. There is no additional equipment that can be added that will increase the VOC destruction rate. Therefore the requirement will not be considered to be technologically feasible for a source of this size and for this process.

3) Enclosed Flare and VOC emissions <= 0.068 lb/ MMBTU, Total Facility limited to 10 tons of VOC per year [SJVAPCD]

The SJVAPCD rescinded BACT determination for VOC emission is more suitable to this application since the proposed BTU value of the fuel is similar and the source of the fuel is from a digestion process. Although now rescinded, it was considered technically feasible at the time of permit issuance. The flare was tested at various temperatures and was shown to meet this destruction efficiency.

NOx Discussion

1) 0 025 lb/MMBTU [John Zink Ultra Low NOx Flare]

Per the manufacturer John Zink, the use of their Low NOx flare would achieve emissions of 0.025

lb/mmbtu of NOx and is technologically feasible for many applications. However, based on the lower operating temperature of the pilot operation it is not possible to assess the actual NOx emissions when comparing equipment types and it is unclear if this technology would be viable in this specific application. Since this option has not been achieved in practice and the specific application's unique characteristics (i.e. pilot project) do not make this a feasible technology at the time of this application. Therefore the use of an Ultra-Low NOx Flare is eliminated.

2) <=0.06 lb/MMBTU [John Zink Standard Flare, SJVAPCD]

In conversation with the Manufacturer (phone conversation with Aron Katz, John Zink 918-234-2791 on 9/1/16) and with the understanding of the application at Clean World, the flare will be able to meet 0.06 lb/MMBTU of NOX as documented in the technical paper, *Ultra-Low Emission Enclosed Landfill Gas Flare, 3/98*, published by John Zink (link) on page 13.

The NOx emission rate, found in the San Joaquin BACT 1.4.4 , has not been source tested per phone conversations and e-mails with SJVAPCD engineering staff. Other source test data could not be found for a flare that is used to burn low BTU digester gas fuel.

However the flare manufacturer, believes that the flare should be able to meet 0.06 lb/MMBTU with no additional equipment. Therefore it will be considered cost effective and technologically feasible.

3) <=0.952 lb/MMBTU, Total Facility limited to 10 tons of NOx per year [SJVAPCD RULE 4311]

Per the manufacturer, the flare should be able to meet an emission rate of 0.06 lb/MMBTU as stated in 2 above. There is no need to further discuss this standard since there are lower standards that are possible.

SOx Discussion

H2S treatment of the fuel prior to combustion is done through the use of an Iron Sponge. An Iron Sponge has been able to reduce the H2S concentration to less than 50 PPM of H2S in the fuel stream prior to combustion. The applicant has shown that the use of an Iron sponge has been achieved in practice.

PM10 Discussion

This existing flare has achieved smokeless combustion and uses a natural gas fired pilot and therefore will be considered cost effective and technologically feasible

PM2.5 Discussion

No other technologies or determinations have been identified. However, since PM2.5 is a subset of PM10 the same BACT technologically feasible standard of smokeless combustion and the use of a natural gas pilot will be considered cost effective and technologically feasible.

CO Discussion

The existing flare currently operates in accordance with the manufactures specifications in order to minimize CO emissions (i.e good combustion practices) and thus will be considered cost effective and technologically feasible.

Cost Effective Determination:
After identifying the technologically feasible control options, a cost analysis is performed to take into consideration economic impacts for all technologically feasible controls identified.

Maximum Cost per Ton of Air Pollutants Controlled

1. A control technology is considered to be cost-effective if the cost of controlling one ton of that air pollutant is less than the limits specified below (except coating operations):

Pollutant	Maximum Cost ($/ton)
ROG	17,500
NO_X	24,500
PM_{10}	11,400
SO_X	18,300
CO	TBD if BACT triggered

Since no other alternative control methodologies were identified and the applicant has proposed H2S pretreatment (removal) for the fuel, a cost effective determination for SOx is not required.

C. SELECTION OF BACT:

BACT For A Low BTU Gas From A Digester Refining Process (Non Petroleum Refining) With A Total Facility Limit Of Less Than 10 Tons Per Year Of VOC And NOx Respectively.		
Pollutant	**Standard**	**Source**
VOC	Enclosed Flare and VOC emissions =< 0.068 lb/ MMBTU, for facilities with a potential to emit of less than 10.0 tons/year of VOC and NOx.	SJVAPCD
NOx	0.06 lb/MMBTU	John Zink Emission Estimate
SOx	LPG or Natural Gas Pilot, pre treatment of fuel to remove H2S (50 PPM of H2S)	SJVAPCD
PM10	Smokeless Combustion and a LPG or Natural Gas Fired Pilot	SJVAPCD
PM2.5	Smokeless Combustion and a LPG or Natural Gas Fired Pilot	New Determination
CO	Operating in accordance with the manufactures specifications in order to minimize CO emissions	SJVAPCD

REVIEWED BY: _____ **DATE:** 7-25-17

APPROVED BY: _____ **DATE:** 7/26/17

Attachment A

Review of BACT Determination

Attachment A - Representative BACT Analysis

District	Project	Description	Discussion
SMAQMD	Determination #102	Landfill Gas Flare, 18 MMBTU/hr	Different Source category, Equipment is larger than proposed
SJVAPCD	BACT Guideline 1.4.1	Waste Gas Flare - 15.3 MMBTU/hr Serving a Tank Vapor Control System	The use of a steam assisted or air assisted flares produces an open flame that is not appropriate for the location of this flare
SJVAPCD	BACT Guideline 1.4.2	Waste Gas Flare- Incinerating Produced Gas	The use of a steam assisted or air assisted flares produces an open flame that is not appropriate for the location of this flare
SJVAPCD	BACT Guideline 1.4.3	Landfill Gas Vapor Collection System	Different Source category
SJVAPCD	BACT Guideline 1.4.4	Digester Gas Fired Flare	Applicable to this operation
SJVAPCD	BACT Guideline 1.4.6	Biogas fired Flare = or > 10.9 MMBTU/hr, Limited Use	Not achieved in practice
SJVAPCD	BACT Guideline 1.4.7	Waste Gas Flare - Oilfield well Drilling and testing Operation <50 MMscf/day	The use of open flare is not approved for this site location
BAAQMD	Document #80.1	Flare - Digester Gas or Landfill Gas from Non Hazardous Waste landfill	Operational parameters do not have an emission limit; Different Source Category
BAAQMD	Document #81.1	Flare - Digester Gas or Landfill Gas from Hazardous Waste landfill	Operational parameters do not have an emission limit; Different Source Category
SCAQMD, Minor	Flare (pg 53)	Digester Gas or Landfill Gas from Non Hazardous Waste Landfill	Operational parameters do not have an emission limit; Different Source Category
SCAQMD, Major	Application Number 538706	Enclosed Flare with clean enclosed burner, burning process gas from oil and gas operation	BTU value of process gas was 913 BTU/scf. This is not comparable to low BTU value digester gas which is between 250 to 450 BTU/SCF
SCAQMD, SBCAPCD	Application 9788	Landfill Gas Flare, 63.68 MMBTU/hr	Different Source category; Equipment size is larger proposed, Fuel flow is larger than proposed
ARB SDAQMD	9801063	Landfill gas flare, 1,800 scfm, 54 MMBTU/hr	Different Source Category, Different equipment size , CFM of gas is larger than proposed
ARB SANTA Barbara	ATC 12037	Landfill gas	Different Source Category
EPA	TX-0671	Resin Manufacturing	Different Source Category
EPA	TX-0703	LDPE Plant	Different Source Category, Additional Natural gas fuel is used to assisting in destruction.
EPA	TX-0706	Natural gas Fractionation emergency flare	Different Source Category