SMAQMD BACT CLEARINGHOUSE

CATEGORY: **BOILER/HEATER < 5 MMBTU**

BACT Size: Minor Source BACT **BOILER/HEATER**

BACT Determination Number:	130	**BACT Determination Date:**	**7/1/2016**

Equipment Information

Permit Number: 24855
Equipment Description: BOILER/HEATER
Unit Size/Rating/Capacity: Boiler/Heater >= 2 and < 5 mmbtu/hr, Propane Fired
Equipment Location: TELFER PAVEMENT TECHNOLOGIES, LLC
5330 SHELTER RD
MCCLELLAN, CA

BACT Determination Information

ROCs	**Standard:**	Good combustion practice; Use of LPG
	Technology Description:	
	Basis:	Achieved in Practice
NOx	**Standard:**	12 ppmvd
	Technology Description:	Ultra Low-NOx burner
	Basis:	Achieved in Practice
SOx	**Standard:**	Good combustion practice; Use of LPG
	Technology Description:	
	Basis:	Achieved in Practice
PM10	**Standard:**	Good combustion practice; Use of LPG
	Technology Description:	
	Basis:	Achieved in Practice
PM2.5	**Standard:**	Good combustion practice; Use of LPG
	Technology Description:	
	Basis:	Achieved in Practice
CO	**Standard:**	Firetube: 50 ppmvd; Watertube: 100 ppmvd
	Technology Description:	Ultra Low-NOx burner
	Basis:	Achieved in Practice
LEAD	**Standard:**	
	Technology Description:	
	Basis:	

Comments: PPMVD is corrected to 3% O2.

District Contact: Felix Trujillo Phone No.: (916) 874 - 7357 email: ftrujillo@airquality.org

777 12th Street, Third Floor

SACRAMENTO METROPOLITAN AIR QUALITY MANAGEMENT DISTRICT

Sacramento, CA 95814

BEST AVAILABLE CONTROL TECHNOLOGY DETERMINATION

DETERMINATION NO.:	130
DATE:	4/7/16
ENGINEER:	Felix Trujillo, Jr.
Category/General Equip Description:	Boiler/Heater – LPG/Propane
Equipment Specific Description:	Boiler/heater greater or equal to 2 and less than 5 MMBTU/hr, fired on LPG/propane
Equipment Size/Rating:	Minor Source BACT
Previous BACT Det. No.:	54, 61, and 62

This BACT determination will update the following determinations

#54 which was made on 4/25/2012 for non-atmospheric boilers/heaters ≥ 2 and < 5 MMBtu.
#61 which was made on 3/15/2013 for non-atmospheric boilers/heaters ≥ 2 and < 5 MMBtu.
#62 which was made on 3/15/2013 for atmospheric boilers/heaters ≥ 2 and < 5 MMBtu.

The District performed the BACT determinations listed above with the assumption that the limits would apply to both natural gas and LPG/propane. RF MacDonald informed the District that LPG/propane fired units would not be able to meet the 9 ppm @ 3% O_2 NOx limit for boilers in this size range. RF MacDonald provided a letter to the District stating the boiler companies that they represent (Cleaver Brooks, Fulton Boiler, Camus) do not manfufacture boilers that can meet this limit for LPG/propane fired units in this size range. Cleaver Brooks reiterated this statement in an email to the District dated 10/29/15. The District contacted other boiler (Unilux) and burner manufacturers (Maxon, Coen, Johnson burners) and none had a propane fired unit that can meet the 9 ppm @ 3% O_2 NOx limit (see Attachment E for correspondence). According to Cleaver Brooks, LPG/propane has a higher flame temperature and length than natural gas, which prevents them from gauaranteeing the 9 ppm @ 3% O_2 NOx limit for LPG/propane. Upon further review it was determined that LPG fired units are currently unable to meet the 9 ppm @ 3% O_2 NOx limit. Therefore, a new BACT determination addressing units in this size range and fired on LPG will be performed. A separate BACT determination for natural gas fired units in this size range will be performed under BACT #112.

BACT ANALYSIS

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

The following control technologies are currently employed as BACT for boilers/heaters greater or equal to 2 and less than 5 MMBTU/hr by the following air pollution control districts:

<table>
<tr><th>District/ Agency</th><th>Best Available Control Technology (BACT)/Requirements</th></tr>
<tr><td>US EPA</td><td>
<u>BACT</u>
Source: <u>EPA RACT/BACT/LAER Clearinghouse</u>
RBLC ID: CA-1190
<table>
<tr><td colspan="2">For LPG/propane fired units with a rating of ≥ 2 to <5 MMBtu/hr</td></tr>
<tr><td>VOC</td><td>No standard</td></tr>
<tr><td>NOx</td><td>12 ppmvd corrected to 3% O_2*</td></tr>
<tr><td>SOx</td><td>No standard</td></tr>
<tr><td>PM10</td><td>No standard</td></tr>
<tr><td>CO</td><td>No standard</td></tr>
</table>
* This BACT determination was found to be the most stringent <u>Achieved in Practice</u> BACT determination published in the EPA clearinghouse. See Attachment A for more information.

<u>RULE REQUIREMENTS:</u>
None.
</td></tr>
<tr><td>ARB</td><td>
<u>BACT</u>
Source: <u>ARB BACT Clearinghouse</u>
ATC 12949-01 (1-24-12) SBAPCD

<table>
<tr><td colspan="2">For LPG/propane fired units with a rating of ≥ 2 to <5 MMBtu/hr</td></tr>
<tr><td>VOC</td><td>No standard</td></tr>
<tr><td>NOx</td><td>20 ppmvd corrected to 3% O_2 [SBCAPCD]</td></tr>
<tr><td>SOx</td><td>No standard</td></tr>
<tr><td>PM10</td><td>No standard</td></tr>
<tr><td>PM2.5</td><td>No standard</td></tr>
<tr><td>CO</td><td>No standard</td></tr>
</table>
<u>RULE REQUIREMENTS</u>:
None
</td></tr>
</table>

<table>
<tr><th>District/ Agency</th><th>Best Available Control Technology (BACT)/Requirements</th></tr>
<tr><td>SMAQMD</td><td>
<u>BACT</u>
Source: <u>SMAQMD BACT Clearinghouse</u> (last updated 3/8/16)

<table>
<tr><td colspan="2">For LPG/propane fired units with a rating of ≥ 2 to < 5 MMBtu/hr</td></tr>
<tr><td>VOC</td><td>No standard</td></tr>
<tr><td>NOx</td><td>No standard</td></tr>
<tr><td>SOx</td><td>No standard</td></tr>
<tr><td>PM10</td><td>No standard</td></tr>
<tr><td>PM2.5</td><td>No standard</td></tr>
<tr><td>CO</td><td>No standard</td></tr>
</table>

<u>RULE REQUIREMENTS</u>:

<u>Rule 411 – NOx from Boilers, Process Heaters and Steam Generators (8/23/07)</u>

For gaseous fired units with a rating of ≥ 2 and < 5 MMBtu/hr, emissions shall not exceed the following levels:
1. 30 ppmvd of NOx corrected to 3% O2
2. 400 ppmvd of CO corrected to 3% O2
</td></tr>
<tr><td>South Coast AQMD</td><td>
<u>BACT</u>
Source: <u>SCAQMD BACT Guidelines for Non-Major Polluting Facilities, page 13</u> (10/3/08)

<table>
<tr><td colspan="2">For units fueled by natural gas or LPG/propane, with a rating of ≥ 2 and < 5 MMBtu/hr:</td></tr>
<tr><td>VOC</td><td>No standard</td></tr>
<tr><td>NOx</td><td>12 ppmvd corrected to 3% O_2 (A)</td></tr>
<tr><td>SOx</td><td>Use of natural gas (B)</td></tr>
<tr><td>PM10</td><td>Use of natural gas (B)</td></tr>
<tr><td>PM2.5</td><td>No standard</td></tr>
<tr><td>CO</td><td>Firetube Boiler: 50 ppmvd corrected to 3% O_2
Watertube Boiler: 100 ppmvd corrected to 3% O_2</td></tr>
</table>

(A) This limit was verified by source test on 1/21/16 (see Attachment B). Based on the research that was performed for this determination, Power Flame has provided the lowest NOx limit for units in this size range and fired on LPG/propane. The tested boiler is equipped with a Power Flame ultra low NOx burner. Power Flame provided an emissions sheet showing the limits that are achievable by their burners when fired on natural gas and LPG (see Attachment C). Power Flame was contacted on 4/14/16 for an updated emissions sheet and the response was that limits provided in the 2009 version were still current. 12 ppmvd @ 3% O_2 is the lowest limit that is listed for LPG fired units.
(B) Pursuant to SCAQMD's BACT Clean Fuel Policy, LPG/propane is considered a clean fuel and equivalent to natural gas.
</td></tr>
</table>

<table>
<tr><th>District/ Agency</th><th>Best Available Control Technology (BACT)/Requirements</th></tr>
<tr><td></td><td><u>RULE REQUIREMENTS</u>:

<u>Reg XI, Rule 1146.1 – Emisions of Oxides of Nitrogen from Small Industrial, Institutional, and Commercial Boilers, Steam Generators, and Process Heaters 1146.1</u> (11/1/13)

Requirements Table 1146-1

<table>
<tr><th>Category</th><th>NOx Limit</th><th>CO Limit</th></tr>
<tr><td>LPG/propane Fired Units</td><td>30 ppmvd @ 3% O_2</td><td>400 ppmvd @ 3% O_2</td></tr>
</table>
</td></tr>
<tr><td>San Diego County APCD</td><td><u>BACT</u>
Source: <u>NSR Requirements for BACT, page 3-5</u> (6/11)
Note: SDCAPCD BACT Guidelines do not contain a specific determination for boilers/heaters in the size range of 2 to less than 5 MMBtu/hr, since these units are not required to obtain a written permit, pursuant to SDAPCD Regulation II Rule 11 – Exemptions from Rule 10 Permit Requirements (11/19/11).

<u>SDAPCD Rule 11(d)</u>
Any equipment, operation, or process that is listed below in Subsections (d)(1) through (d)(20), and that meets the stated exemption provision, parameter, requirement, or limitation, is exempt from the requirements of Rule 10. (d)(2)(v) Any boiler, process heater, or steam generator with a manufacturer's maximum gross heat input rating of less than 5 million BTU per hour fired exclusively with natural gas and/or liquefied petroleum gas.

The SDCAPCD has a BACT determination that applies to natural gas or propane fired boilers/heaters with a rating of less than 50 MMBtu/hr. The SDCAPCD has a BACT trigger level of 10.0 lb/day for NOx, VOC, SOx and PM10. No limits have been established for PM2.5 or CO. Since, boilers in the size range of 2 to less than 5 MMBtu/hr are exempt from permit requirements, this BACT guideline does not apply.

<u>RULE REQUIREMENTS</u>:

<u>Regulation 4, Rule 69.2.1 – Industrial and Commercial Boilers, Process Heaters and Steam Generators (3/25/09)</u>
For any unit with a heat input rating from 600,000 Btu/hr to 2 MMBtu/hr. (Note that for this BACT determination only units rated exactly at 2 MMBtu/hr would apply)
1. 30 ppmvd of NOx when operated on a gaseous fuel, corrected to 3% O_2
2. 40 ppmvd of NOx when operated on a liquid fuel, corrected to 3% O_2
3. 400 ppmvd of CO corrected to 3% O_2

The SDCAPCD does not have a prohibitory rule that applies to boilers rated at greater than equal to 2 MMBtu/hr and less than 5 MMBtu/hr.</td></tr>
</table>

District/ Agency	Best Available Control Technology (BACT)/Requirements
Bay Area AQMD	**BACT** Source: BAAQMD BACT Guideline Note: BAAQMD BACT Guidelines do not contain a determination for boilers/heaters 10 MMBtu/hr or less fired exclusively on natural gas or LPG, since these units are not required to obtain a written permit, pursuant to BAAQMD Regulation 2, Rule 1 – General Requirements. BAAQMD Rule 2-1-114 – General Requirements (4/18/12) The following equipment is exempt from the, requirements of Sections 2-1-301 and 302 (requirement to obtain an ATC or PTO): (114.1) Boilers, Heaters, Steam Generators, Duct Burners, and Similar Combustion Equipment: 1.2 Any of the above equipment with less than 10 million BTU per hour rated heat input If fired exclusively with natural gas (including compressed natural gas), liquefied petroleum gas (e.g. propane, butane, isobutane, propylene, butylenes, and their mixtures), or any combination thereof. **RULE REQUIREMENTS**: None
San Joaquin Valley APCD	**BACT** Source: SJVUAPCD BACT Guideline 1.1.1, Last Update: 10-26-09 (Rescinded) The boiler BACT determinations listed in the SJVAPCD Clearinghouse have been rescinded. Note: SJVUAPCD BACT Guidelines do not contain a determination for boilers 5 MMBtu/hr or less, since these units are not required to obtain a written permit, pursuant to SJUVAPCD Rule 2020 - Exemptions. SJVUAPCD Rule 2020 §6.0 (12/18/14) No Authority to Construct or Permit to Operate shall be required for (§6.1) steam generators, steam superheaters, water boilers, water heaters, steam cleaners, and closed indirect heat transfer systems that have a maximum input heat rating of 5,000,000 Btu per hour (gross) or less and is equipped to be fired exclusively with (§6.1.1.1) natural gas, (§6.1.1.2) liquefied petroleum gas, or (§6.1.1.3) any combination of the two. **RULE REQUIREMENTS**: **Rule 4307 – Boilers, Steam Generators, and Process Heaters (5/19/11)** For units ≥ 2 MMBtu/hr and ≤ 5 MMBtu/hr

District/ Agency	Best Available Control Technology (BACT)/Requirements

Type	NOx Limit ppmvd @ 3% O_2	CO Limit ppmvd @ 3% O_2	Effective Date
New or replacement atmospheric units not listed below	12	400	1/1/2010
New or replacement atmospheric unit that is one of the following: - A unit used at a school, or - A unit in an oil field or refinery, or - a glycol reboiler, or - A unit with a heat input of greater than 1.8 billion Btu but less than 5.0 billion Btu per calendar year.	12	400	1/1/2016
New or replacement non-atmospheric units not listed below	9	400	1/1/2010
New or replacement non-atmospheric unit that is one of the following: - A unit used at a school, or - A unit in an oil field or refinery, or - a glycol reboiler, or - A unit with a heat input greater than 1.8 billion Btu but less than 5.0 billion Btu per calendar year.	9	400	1/1/2016

The SJVAPCD has a permit registration program that is regulated under Rule 2250 *Permit Exempt Equipment Registration* (10/19/06) for units that would normally be exempt from permitting requirements. There are currently no certified LPG/propane fired units at the SJVAPCD. The District received confirmation from the SJVAPCD on 4/18/16 stating no LPG/propane fired boilers in this size range have been tested in their district (see Attachment F for correspondence). Therefore, these limits have not been achieved in practice for LPG/propane.

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

SUMMARY OF ACHIEVED IN PRACTICE CONTROL TECHNOLOGIES	
VOC	1. No standard – [SMAQMD, SCAQMD, SJVAPCD, BAAQMD, SDCAPCD, EPA, ARB]
NOx	1. 12 ppmvd corrected to 3% O_2 – [SCAQMD (BACT), EPA BACT Clearinghouse, ARB BACT Clearinghouse] 2. 20 ppmvd corrected to – [EPA BACT Clearinghouse, ARB BACT Clearinghouse] 3. 30 ppmvd corrected to 3% O_2 – [SMAQMD, SCAQMD, SJVAPCD, SDCAPCD]
SOx	1. Use of LPG – [SCAQMD (BACT)] (A)
PM10	1. Use of LPG – [SCAQMD (BACT)] (A)
PM2.5	1. No standard – [SMAQMD, SCAQMD, SJVAPCD, BAAQMD, SDAPCD, EPA, ARB]
CO	1. Firetube Boilers: 50 ppmvd corrected to 3% O_2, and Watertube Boilers: 100 ppmvd corrected to 3% O_2 – [SCAQMD] 2. 400 ppm of CO corrected to 3% O2 – [SMAQMD, SCAQMD, SJVAPCD, SDCAPCD]

(A) Pursuant to the SCAQMD's BACT Clean Fuel Policy, the use of LPG is equivalent to natural gas.

The following control technologies have been identified as the most stringent, achieved in practice control technologies:

BEST CONTROL TECHNOLOGIES ACHIEVED		
Pollutant	**Standard**	**Source**
VOC	No standard	
NOx	12 ppmvd at 3% O_2	SCAQMD (BACT), EPA, ARB
SOx	Use of LPG (A)	SCAQMD (BACT)
PM10	Use of LPG (A)	SCAQMD (BACT)
PM2.5	No standard	
CO	Firetube Boilers: 50 ppmvd at 3% O_2 Watertube Boilers: 100 ppmvd at 3% O_2	SCAQMD (BACT)

(A) Pursuant to the SCAQMD's BACT Clean Fuel Policy, the use of LPG is equivalent to natural gas.

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 technologically feasible by the Air Pollution Control Officer.

The table below shows the 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.

Pollutant	Technologically Feasible Alternatives
VOC	Good combustion practice
NOx	Selective Catalytic Reduction (SCR)
SOx	Good combustion practice
PM10	Good combustion practice; Use of LPG
PM2.5	Good combustion practice; Use of LPG
CO	Good combustion practice

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)
VOC	17,500
NOx	24,500
PM_{10}	11,400
SOx	18,300
CO	TBD if BACT triggered

Cost Effectiveness Analysis Summary

Selective Catalytic Reduction:
Typically selective catalytic reduction (SCR) can be used to reduce emissions from larger boilers. SCR requires ammonia or urea for NOx reduction and units of this size range are typically used in residences and service/commercial applications where storage of these materials is impractical and could pose a health risk. Additionally, SCR is designed for industrial units that run full time and can maintain a temperature that the catalyst requires for NOx reduction, whereas smaller units are turned on and off throughout the day and cannot maintain the required temperatures. Finally, SCR systems require frequent maintenance for operation which may not be practical in a residential or small service/commercial setting.

District Staff has done an analysis[1] for using SCR on a boiler rated at 20 MMBTU/hr and the cost effectiveness was $53,084 per ton of NOx reduced. As the rating of the unit goes down the total emission reduction will decrease while cost will stay relatively equivalent and therefore the cost effectiveness will increase. Therefore, SCR is not only technologically infeasible for this size range of boilers/heaters but it is also not cost effective and is eliminated as a control option. Although this analysis was done for a natural gas boiler it would still apply to LPG boilers/heaters.

FGR with a Low-NOx Burner:
Adding FGR to a smaller unit would result in minimal additional reductions when paired with a low-NOx burner, and would cost more than a low-NOx burner alone. Like SCR, the system requires frequent maintenance for operation which may not be practical in a residential or small service/commercial setting. The BAAQMD did an analysis of adding FGR to a boiler in the 400,000 to 2,000,000 Btu/hr range in their 2007 Staff Report for Regulation 9, Rule 6 and found that the incremental cost effectiveness of adding FGR over a low-NOx burner is estimated at $60,000 per ton of NOx reduced. Therefore, FGR added to a boiler/heater with a low-NOx burner is not cost effective and is eliminated as a control option.

Good Combustion Practice:
Owners/operators of boilers/heaters should be maintaining good combustion practices as part of proper operation of a boiler/heater and requiring good combustion practices to continue would not add any additional costs. Therefore, because these requirements would not add any additional cost it is a valid control option.

Using the PM10 BACT standard for PM2.5:
LPG is already required as BACT for PM10. Since both, PM10 and PM2.5 trigger BACT at >0 lb/day and PM2.5 is a subset of PM10, BACT for PM2.5 will be triggered whenever BACT is triggered for PM10. Therefore, there is no additional cost associated with requiring LPG as BACT for PM2.5 for new emission units.

C: SELECTION OF BACT

Based on the cost effectiveness determinations, BACT for NOx will remain at what is currently achieved in practice and BACT for PM2.5 will be set to be the same as for PM10 (good combustion practice and use of LPG).

BACT for Boilers/Heaters ≥ 2 MMBtu/hr and < 5 MMBtu/hr		
Pollutant	**Standard**	**Source**
VOC	Good combustion practice; Use of LPG	
NOx	12 ppmvd at 3% O_2	SCAQMD (current BACT)
SOx	Good combustion practice; Use of LPG	SCAQMD (current BACT)

[1] SMAQMD, "BACT Determination: Boilers/Heaters ≥5 and <20 MMBTU/hr fired on natural gas or LPG," June 3,2015

BACT for Boilers/Heaters ≥ 2 MMBtu/hr and < 5 MMBtu/hr		
Pollutant	**Standard**	**Source**
PM10	Good combustion practice; Use of LPG	SCAQMD (current BACT)
PM2.5	Good combustion practice; Use of LPG	
CO	Firetube Boilers: 50 ppmvd at 3% O_2 Watertube Boilers: 100 ppmvd at 3% O_2	SCAQMD (BACT)

D: SELECTION OF T-BACT:

Toxics are in the form of VOCs and particulate matter. Since toxic emissions from LPG fired boilers in the 2 to less than 5 MMBtu/hr size range are so small and the cancer risk is not expected to be anywhere close to 1 in a million cases, T-BACT was not evaluated for this determination. In addition, none of the Districts', EPA or ARB BACT Clearinghouses have a T-BACT determination for this source category.

REVIEWED BY: Brian Ikeda **DATE:** 4-25-16

APPROVED BY: Brian Ikeda **DATE:** 4-25-16

Attachment A

Review of BACT Determinations Published by EPA

List of BACT determinations published in EPA's RACT/BACT/LAER Clearinghouse for boilers ≥ 2 MMBtu/hr to < 5 MMBtu/hr:

Capacity MMBtu/hr	Source	Date	Type	NOx ppmv @ 3% O_2	CO ppmv @ 3% O_2	VOC lb/MMBtu	Filerable PM10 lb/MMBtu	SO_2 lb/MMBtu
3.00	SANTA BARBARA COUNTY APCD	1/24/2012	Not Specified	12	NA	NA	NA	NA
2.00	SANTA BARBARA COUNTY APCD	1/24/2012	Not Specified	20	NA	NA	NA	NA

= Selected as the most stringent BACT determination achieved in practice.

http://cfpub.epa.gov/rblc/index.cfm?action=PermitDetail.ProcessInfo&facility_id=27287&PROCESS_ID=108062
Last updated on 2/1/2016

Technology Transfer Network
Clean Air Technology Center | RACT/BACT/LAER Clearinghouse
RACT/BACT/LAER Clearinghouse | RBLC Basic Search | RBLC Search Results | Process Information - Details

Process Information - Details

For information about the pollutants related to this process, click on the specific pollutant in the list below.

RBLC Home | New Search | Search Results | Facility Information | Process List | Process Information

Help

FINAL

RBLC ID: CA-1189
Corporate/Company: PETROROCK- TUNNELL LEASE
Facility Name: PETROROCK- TUNNELL LEASE
Process: Boiler

Primary Fuel: Propane, field gas, PUC natural gas
Throughput: 2.00 MMBTU/H
Process Code: 13.310

Process Notes: Oilfield tank heater

Pollutant Information - List of Pollutants

Help

Pollutant	Primary Emission Limit	Basis	Verified
Nitrogen Oxides (NOx)	20.0000 PPMVD@3% O2	OTHER CASE-BY-CASE	UNKNOWN

http://cfpub.epa.gov/rblc/index.cfm?action=PermitDetail.FacilityInfo&facility_id=27288
Last updated on 2/1/2016

Technology Transfer Network

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Facility Information

To learn more about the processes associated with this facility, click the Process List button. You can then view pollutant information for each process.

RBLC Home | New Search | Search Results | Facility Information | Process List

Help

Date Entered:04/23/2012 **Date Last Modified:09/06/2012**

FINAL

RBLC ID: CA-1190
Corporate/Company: PETROROCK- TUNNELL LEASE
Facility Name: PETROROCK- TUNNELL LEASE
Facility Description:

State: CA
County: SANTA BARBARA
EPA Region: 9
Zip Code: 93454
Country: USA

Facility Contact Information:

Name:
Phone:
E-Mail:

Agency Contact Information:

Agency: CA033 - SANTA BARBARA COUNTY APCD, CA
EXIT Disclaimer | Agency Link
Contact: MR. BEN ELLENBERGER
Address: SANTA BARBARA COUNTY AIR
POLLUTION CONTROL DISTRICT
260 NORTH SAN ANTONIO RD.
SUITE A.
SANTA BARBARA, CA 93110-1315
Phone: (805) 961-8879
Other Agency Contact Info: 805-961-8800

Permit Number: ATC- 12949-01 (3)

Permit Type: E: Add new process to existing facility

PERMIT URL:

EST/ACT DATE	
Complete Application Date:	ACT 03/07/2011
Permit Issuance Date:	ACT 01/24/2012
FRS Number:	Not Available
SIC Code:	1311
NAICS Code:	211111

Affected Class I / U.S. Border Area:

No affected Class 1 areas identified.

Facility-Wide Emission Increase/Decrease:
(After prevention/control measures)

No facilitywide emissions data available for this facility.

Other Permitting Information:

http://cfpub.epa.gov/rblc/index.cfm?action=PermitDetail.ProcessInfo&facility_id=27288&PROCESS_ID=108063
Last updated on 2/1/2016

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RACT/BACT/LAER Clearinghouse | RBLC Basic Search | RBLC Search Results | Process Information - Details

Process Information - Details

For information about the pollutants related to this process, click on the specific pollutant in the list below.

RBLC Home | New Search | Search Results | Facility Information | Process List | Process Information

Help

FINAL

RBLC ID: CA-1190
Corporate/Company: PETROROCK- TUNNELL LEASE
Facility Name: PETROROCK- TUNNELL LEASE
Process: Heater

Primary Fuel: Propane, field gas, PUC natural gas
Throughput: 3.00 MMBTU/H
Process Code: 13.310

Pollutant Information - List of Pollutants

Help

Pollutant	Primary Emission Limit	Basis	Verified
Nitrogen Oxides (NOx)	12.0000 PPMVD@3% O2	OTHER CASE-BY-CASE	UNKNOWN

Process Notes:

http://cfpub.epa.gov/rblc/index.cfm?action=PermitDetail.FacilityInfo&facility_id=27287
Last updated on 2/1/2016

Technology Transfer Network
Clean Air Technology Center | RACT/BACT/LAER Clearinghouse

Facility Information

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RBLC Home | New Search | Search Results | Facility Information | Process List

Help

Date Entered:04/23/2012 **Date Last Modified:09/06/2012**

FINAL

RBLC ID: CA-1189
Corporate/Company: PETROROCK- TUNNELL LEASE
Facility Name: PETROROCK- TUNNELL LEASE
Facility Description:

State: CA
County: SANTA BARBARA
EPA Region: 9
Zip Code: 93454
Country: USA

Facility Contact Information:

Name:
Phone:
E-Mail:

Agency Contact Information:

Agency: CA033 - SANTA BARBARA COUNTY APCD, CA
Contact: MR. BEN ELLENBERGER
Address: SANTA BARBARA COUNTY AIR
POLLUTION CONTROL DISTRICT
260 NORTH SAN ANTONIO RD.
SUITE A.
SANTA BARBARA, CA 93110-1315
Phone: (805) 961-8879
Other Agency Contact Info:

EXIT Disclaimer | Agency Link

Permit Number: ATC- 12949-01 (2)

EST/ACT DATE
Complete Application Date: ACT 03/07/2011
Permit Issuance Date: ACT 01/24/2012

Permit Type: B: Add new process to existing facility

FRS Number: Not Available
SIC Code: 1311
NAICS Code: 211111

PERMIT URL:

Affected Class I / U.S. Border Area:

No affected Class 1 areas identified.

Facility-Wide Emission Increase/Decrease:
(After prevention/control measures)

No facilitywide emissions data available for this facility.

Other Permitting Information:

California Environmental Protection Agency
Air Resources Board

BACT Determination Detail

Category

Source Category:	Boiler: < 5 MMBtu/hr
SIC Code	1311
NAICS Code	211111

Emission Unit Information

Manufacturer:	Rite Engineering & Manufacturing
Type:	
Model:	W200WG
Equipment Description:	Hot Water Heater
Capacity / Dimentions	2.00 MMBtu/hr
Fuel Type	Field Gas
Multiple Fuel Types	Propane, Field Gas, PUC natural gas
	Continuous (24/7/52)

Operating Schedule (hours/day)/(days/week)/ (weeks/year)e	
Function of Equipment	Oilfield tank heater

Bact Information

NOx Limit	20
NOx Limit Units	ppmvd @ 3% O2
NOx Average Time	40 minutes
NOx Control Method	Pollution Prevention
NOx Control Method Desc	Low-Nox burner
NOx Percent Control Efficiency	
NOx Cost Effectiveness (%/ton)	
NOx Incremental Cost Effectiveness (%/ton)	
NOx Cost Verified (Y/N)	
NOx Dollar Year	

Project / Permit Information

Application/Permit No.:	ATC 12949-01 (2)
Application Completeness Date:	

New Construction/Modification:	New Construction
ATC Date:	01-24-2012
PTO Date:	
Startup Date:	01-31-2012
Technology Status:	BACT Determination
Source Test Available:	No
Source Test Results:	

Facility / District Information

Facility Name:	PetroRock - Tunnell Lease
Facility Zip Code:	93454
Facility County:	Santa Barbara
District Name:	Santa Barbara County APCD
District Contact:	Ben Ellenberger
Contact Phone No.:	(805) 961-8800
Contact E-Mail:	cbe@sbcapcd.org

Notes

Notes:

Report Error In Determination

SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT
Best Available Control Technology (BACT) Guidelines for Non-Major Polluting Facilities*

10-20-2000 Rev. 0
10-03-2008 Rev. 1

Equipment or Process: Boiler

	Criteria Pollutants					
Subcategory/Rating/ Size	**VOC**	**NOx[1)]**	**SOx**	**CO**	**PM_{10}**	**Inorganic**
Natural Gas or Propane Fired, < 20 MM Btu/HR		≤ 12 ppmv dry corrected to 3% O_2[2)] (10-20-2000)	Natural Gas (10-20-2000)	≤50 ppmv for firetube type, ≤ 100 ppmv for watertube type, dry corrected to 3% O_2 (04-10-98)	Natural Gas (04-10-98)	
Natural Gas or Propane Fired, ≥ 20 MM Btu/HR		With Low-NOx Burner: ≤ 9 ppmv dry corrected to 3% O_2 With Add-On Controls: ≤ 7 ppmv dry corrected to 3% O_2 (10-20-2000)	Natural Gas (10-20-2000)	Same as above. (04-10-98)	Natural Gas (04-10-98)	With Add-On Controls: ≤ 5 ppmvd NH3, corrected to 3% O2 ≤ 1 ppmvd ozone, corrected to 3% O2 (10-20-2000)
Oil Fired[3)]		Compliance with AQMD Rule 1146 or 1146.1 (10-20-2000)	Sulfur Content ≤ 0.05% by Weight (10-20-2000) or .0015% by weight if purchased after May 31, 2004 (10-03-2008)	Same as above (10-20-2000)		
Landfill or Digester Gas Fired, < 75 MMBTU/Hr		≤ 30 ppmvd at 3% O_2 dry. (04-10-98)		≤ 100 ppmvd at 3% O_2 dry. (04-10-98)	≤ 0.1 gr/scf at 12% CO_2 (Rule 409) (04-10-98)	

* Means those facilities that are not major polluting facilities as defined by Rule 1302 - Definitions

Attachment B

SCAQMD Source Test Results

COMPLIANCE SOURCE TEST REPORT PERFORMED ON 1/21/2016 AT THE SANCON ENGINEERING, INC., HURST BOILER
FACILITY ID 108214, APPLICATIONS NUMBER 512499

Prepared for, Facility:

Sancon Engineering, Inc.
5841 Engineer Dr.
Huntington Beach, CA 92649

Facility Contact:	**Gary Drew**
Equipment Description:	**Hurst Boiler**
Applications Numbers:	**512499**
Test Date(s):	**1/21/2016**
Issue Date:	**1/25/2016**

Prepared by:

Wally Moe
Source Testing Manager

Reviewed by:

Hassan Amin
Project Manager

Source Testing Firm:

Accurate Environmental Services, Inc.
8200 Katella Ave, Suite D
Stanton, CA 90680
(714) 379-9200

Report Identification Number: R 04006 SEI

2.0 Summary of Results

The source testing was conducted on the Hurst Boiler in order to determine the emissions of nitrogen oxides (NO_x), carbon monoxide (CO), carbon dioxide (CO_2), and oxygen (O_2) at the exhaust. The source test also determined flow rate, temperature, and moisture at the exhaust of the unit. SCAQMD method 100.1 was used to measure NO_x, CO, CO_2, and O_2. The NO_x and CO concentrations were corrected to 3% oxygen. Moisture at the exhausts of the unit was calculated using Oxygen concentration calculations. The stack gas flow rate was measured using SCAQMD methods 1.1-3.1. The results show the boiler is in compliance with the permitted NO_x and CO concentration limits. The Compliance Test results are summarized in Tables 2-1. Tables 2-2 & 2-3 presents a Summary of the Reference Method Quality Assurance Checks.

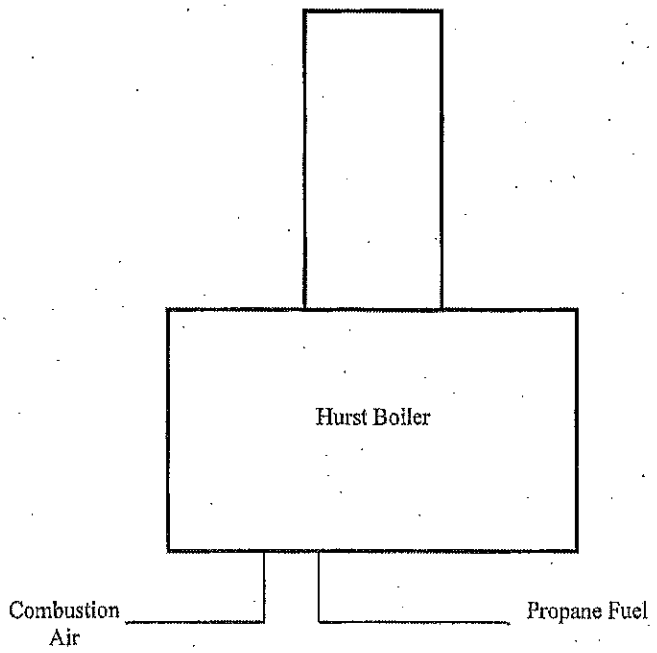
Table 2-1
Summary of Results

Parameter	Units	High Load	Low Load	Average Load	Normal Load	Allowable Limit
NOx, Concentration	ppm	6.07	5.87	6.01	6.93	N/A
NO_x, @ 3% O_2	ppm	8.42	8.26	8.41	9.57	12
NO_x, Emission Rate	lb/hr	0.039	0.011	0.026	0.030	N/A
CO, Concentration	ppm	16.08	15.48	15.48	15.96	N/A
CO, @ 3% O_2	ppm	22.29	21.79	21.64	22.05	50
CO Emission Rate	lb/hr	0.06	0.02	0.04	0.04	N/A
Total Stack Flow Rate, measured	dscfm	873	251	588	602	N/A
Total Stack Flow Rate, calculated	dscfm	914	273	554	564	N/A
% Difference	%	4.63	8.53	5.72	6.31	15
Stack Gas Flow Rate, Actual	acfm	1,579	432	1,029	1,057	N/A
Fuel Flow Rate	scfm	25.66	7.54	15.44	15.91	N/A
Stack Temperature	°F	365.58	327.58	340.25	340.87	N/A
Air/Fuel Ratio	N/A	35.98	35.18	40.26	40.06	N/A
O_2	%	7.99	8.18	8.10	7.95	N/A
Firing Rate	MMBtu/hr	3.89	1.14	2.34	2.41	N/A
% of Full Load	%	92.52	27.2	55.7	57.4	N/A

3.0 Processes and Equipment Description

The Hurst Boiler, Fire-Tube Type Model S5-X-100-150, with one Low-Nox Burner, Model NP2-520-G-30, Rated at 4.20 MMBTU/hr, Liquid Propane Gas Fired.A blocks flow diagrams are presented as Figures 3-1.

Figure 3-1
Simplified Boiler Diagram



Attachment C

Power Flame, Inc. Emissions Sheet

Power Flame Incorporated

9/28/2006
Rev. 03/06/2009

Typical Flue Product Emissions Data for Power Flame Burners

	Natural Gas	L.P. Gas	# 2 Fuel Oil [1]
Carbon Monoxide - CO	.037 lb CO 10^6 BTU Input (50 PPM)	.037 lb CO 10^6 BTU Input (50 PPM)	.037 lb per 10^6 BTU INPUT (50 PPM)
Sulfur Dioxide - SO_2	(1.05) x (% Sulfur by weight in fuel) = lb SO_2 per 10^6 BTU Input		
Particulate Matter	.0048 lb PM per 10^6 BTU Input	.0048 lb PM per 10^6 BTU Input	.0143 lb PM per 10^6 BTU Input
Hydrocarbons	.025 lb HC's per 10^6 BTU Input	.025 lb HC's per 10^6 BTU Input	.038 lb HC's per 10^6 BTU Input
CO_2	9 % to 10%	10% to 12%	10% to 13%
Nitrogen Oxides - NO_x			
Standard J, FDM & X4 Gas Burners	.088 lb NO_x per 10^6 BTU Input (75 PPM)	.092 lb NO_x per 10^6 BTU Input (75 PPM)	N/A N/A
Standard C(R) Burners	.088 lb NO_x per 10^6 BTU Input (75 PPM)	.092 lb NO_x per 10^6 BTU Input (75 PPM)	.159 lb NO_x per 10^6 BTU Input (90) PPM[2]
LNIC(R) Burners Fire box/Cast Iron boilers	.029 lb NO_x per 10^6 BTU Input (25 PPM)	.031 lb NO_x per 10^6 BTU Input (25 PPM)	.159 lb NO_x per 10^6 BTU Input (90) PPM[2]
LNIC(R) Burners Water tube boilers	.024 lb NO_x per 10^6 BTU Input (20 PPM)	.031 lb NO_x per 10^6 BTU Input (25 PPM)	.159 lb NO_x per 10^6 BTU Input (90) PPM[2]
LNIAC Burners	.029 lb NO_x per 10^6 BTU Input (25 PPM)	.031 lb NO_x per 10^6 BTU Input (25 PPM)	.12 lb NO_x per 10^6 BTU Input (90) PPM
CM Burners	.070 lb NO_x per 10^6 BTU Input (60 PPM)	.074 lb NO_x per 10^6 BTU Input (60 PPM)	.146 lb NO_x per 10^6 BTU Input (110) PPM
IFGR LNIC NO_x Burners	.029 lb NO_x per 10^6 BTU Input (25 PPM)	.031 lb NO_x per 10^6 BTU Input (25 PPM)	.126 lb NO_x per 10^6 BTU Input (110) PPM
LNICM Burners	.029 lb NO_x per 10^6 BTU Input (25) PPM	.031 lb NO_x per 10^6 BTU Input (25) PPM	.12 lb NO_x per 10^6 BTU Input (90) PPM
NPM Premix Burners	.029 lb NO_x per 10^6 BTU Input (25) PPM	.031 lb NO_x per 10^6 BTU Input (25) PPM	N/A N/A
Nova Plus Burners NVC AND NP2	.010 lb NO_x per 10^6 BTU Input (9) PPM	.015 lb NO_x per 10^6 BTU Input (12) PPM	N/A N/A

NOx emissions at 3 % 02 will vary based on the percent of fuel bound nitrogen (these are based on .02%) and boiler or heat exchanger configurations

90 PPM NOx on cast iron sectional, fire box and water tube boiler, 120 PPM on fire tube boilers.

Burning natural gas the VOC are estimated at 0.003 # per million BTU and SO_X are 0.0005 # per million BTU.

These emission rates are general estimates and do not constitute guarantees by Power Flame Inc.

In instances where guarantees are required, please consult the factory with the specific application information.

All NOx numbers stated are corrected to 3% O_2

Attachment D

Cost Effectiveness Determination for SCR

4.999 MMBtu/hr BOILER SCR COST EFFECTIVENESS CALCULATION

EPA AIR POLLUTION CONTROL COST MANUAL, Sixth Edition, EPA/452/B-02-001, January 2002
Section 4.2 - NOx Post-Combustion, Chapter 2 - Selective Catalytic Reduction

Cost Effectiveness = $ 33,533.73 $/ton

Equipment

Boiler rating		4.999	mmBTU/hr
Boiler Operating hours		8760	hours
Boiler capacity factor		1	
SCR Operating Days		365	days
Total Capacity Factor		1	
Baseline NOx (30 ppm)		0.0364	lb/mmBTU
SCR NOx (5 ppm)		0.006067	lb/mmBTU
Ammonia Slip		10	ppm
Ammonia Stochiometric Ratio		1.05	
Stored Ammonia Conc		29	%
Amonnia Storage days		90	days
Sulfur Content		0.005	%
Pressure drop for SCR Ductwork		3	inches W.G.
Pressure drop for each Catalyst Layer		1	inche W.G.
Temperature at SCR Inlet		650	degrees F
Cost year		1998	
Equipment Life		20	years
Annual interest Rate		7	%
Catalyst cost, Initial		240	$/ft2
Catalyst cost, replacement		290	$/ft2
Electrical Power cost		0.05	$/KWh
Ammonia Cost		0.101	$/lb
Catalyst Life		24000	hr
Catalyst Layers	2 full, 1 empty		

Boiler Calculations

Q_B	4.999	mmBTU/hr
$q_{flue\ gas}$	1781.28066	acfm
N_{NOx}	0.833324176	

SCR Reactor Calculations

$Vol_{Catalyst}$	11.22514556	ft3
$A_{Catalyst}$	1.855500688	ft2
A_{SCR}	2.133825791	ft2
l=w=	1.460762058	ft
n_{layer}	2	
h_{layer}	4.024829263	
n_{total}	3	
h_{SCR}	42.07448779	ft

Reagent Calculations

$m_{reagent}$	0.07071902	lb/hr
m_{sol}	0.24385869	lb/hr
q_{sol}	0.032576908	gph
Tank Volume	70.36612171	gal

Cost Estimation

Direct Costs

DC	$	135,387.79

Indirect Costs

General Facilites	$	6,769.39
Engineering and home office fees	$	13,538.78
Process Contingency	$	6,769.39
Total Indirect Installation Costs	$	27,077.56
Project Contingency	$	24,369.80
Total Plant Cost	$	186,835.15
Preproduction Cost	$	3,736.70
Inventory Capital	$	53.20
Total Capital Investment	$	190,625.06

Direct Annual Costs

Maintenance Costs	$	2,859.38	per yr
Power		1.59060664	KW
Annual Electricity	$	696.69	per yr
Reagent Solution Cost	$	215.76	per yr

Catalyst Replacement

FWF		0.311051666	
Annual Catalyst Replacement	$	506.28	per yr

Total Variable Direct Cost	$	1,418.72	per yr
Total Direct Annual Cost	$	4,278.10	per yr
CRF		0.094392926	
Indirect Annual Cost	$	17,993.66	per yr
Total annual Cost	$	22,271.76	per yr
NOx Removed		0.66	tons
Cost of NOx removal	**$**	**33,533.73**	**per ton**

2 MMBtu/hr BOILER SCR COST EFFECTIVENESS CALCULATION

EPA AIR POLLUTION CONTROL COST MANUAL, Sixth Edition, EPA/452/B-02-001, January 2002
Section 4.2 - NOx Post-Combustion, Chapter 2 - Selective Catalytic Reduction

Cost Effectiveness = $ 45,163.99 $/ton

Equipment

Boiler rating	2	mmBTU/hr
Boiler Operating hours	8760	hours
Boiler capacity factor	1	
SCR Operating Days	365	days
Total Capacity Factor	1	
Baseline NOx (30 ppm)	0.0364	lb/mmBTU
SCR NOx (5 ppm)	0.006068	lb/mmBTU
Ammonia Slip	10	ppm
Ammonia Stochiometric Ratio	1.05	
Stored Ammonia Conc	29	%
Amonnia Storage days	90	days
Sulfur Content	0.005	%
Pressure drop for SCR Ductwork	3	inches W.G.
Pressure drop for each Catalyst Layer	1	inche W.G.
Temperature at SCR Inlet	650	degrees F
Cost year	1998	
Equipment Life	20	years
Annual interest Rate	7	%
Catalyst cost, Initial	240	$/ft2
Catalyst cost, replacement	290	$/ft2
Electrical Power cost	0.05	$/KWh
Ammonia Cost	0.101	$/lb
Catalyst Life	24000	hr
Catalyst Layers	2 full, 1 empty	

Boiler Calculations

Q_B	2	mmBTU/hr
$q_{flue\ gas}$	712.6547952	acfm
N_{NOx}	0.833296703	

SCR Reactor Calculations

$Vol_{Catalyst}$	4.490844708	ft3
$A_{Catalyst}$	0.742348745	ft2
A_{SCR}	0.853701057	ft2
l=w=	0.923959445	ft
n_{layer}	2	
h_{layer}	4.024754025	
n_{total}	3	
h_{SCR}	42.07426207	ft

Reagent Calculations

$m_{reagent}$	0.028293267	lb/hr
m_{sol}	0.097562989	lb/hr
q_{sol}	0.01303337	gph
Tank Volume	28.1520791	gal

Cost Estimation

Direct Costs

DC	$74,233.09

Indirect Costs

General Facilites	$3,711.65
Engineering and home office fees	$7,423.31
Process Contingency	$3,711.65
Total Indirect Installation Costs	$14,846.62
Project Contingency	$13,361.96
Total Plant Cost	$102,441.67
Preproduction Cost	$2,048.83
Inventory Capital	$21.28
Total Capital Investment	$104,511.78

Direct Annual Costs

Maintenance Costs	$1,567.68	per yr
Power	0.63636972	KW
Annual Electricity	$278.73	per yr
Reagent Solution Cost	$86.32	per yr

Catalyst Replacement

FWF	0.311051666	
Annual Catalyst Replacement	$202.55	per yr

Total Variable Direct Cost	$567.60	per yr
Total Direct Annual Cost	$2,135.27	per yr
CRF	0.094392926	
Indirect Annual Cost	$9,865.17	per yr
Total annual Cost	$12,000.45	per yr
NOx Removed	0.27	tons
Cost of NOx removal	**$45,163.99**	**per ton**

Attachment E

Correspondence from Boiler and Burner Manufacturers

FELIX TRUJILLO JR.

From: Tony Fix <tfix@powerflame.com>
Sent: Wednesday, April 13, 2016 2:02 PM
To: FELIX TRUJILLO JR.
Subject: RE: Information Request for 2 - <5MMBtu/hr Propane Fired Boiler
Attachments: Emission Standards 7 LP.pdf

Felix,
Nice to hear from you again. The emissions data on the attached document is still current. I have checked for a more resent revision and this is the most current one.

Thanks,

Tony Fix
Product Support Team Service Technician
Power Flame Inc.
tfix@powerflame.com
Product Support Direct Service Line (620) 820-8301
620-421-0480 Main
620-820-8361 Direct
620-421-0948 Fax

From: FELIX TRUJILLO JR. [mailto:FTrujillo@airquality.org]
Sent: Wednesday, April 13, 2016 3:57 PM
To: Tony Fix
Subject: RE: Information Request for 2 - <5MMBtu/hr Propane Fired Boiler

Hi Tony,

You had previously sent me an emissions document showing the emissions limits for different types of fuels. The revision date on the sheet showed that it was revised in 2009. I wanted to know if there has been another sheet with a more recent revision. If not, if you could confirm that the emissions listed on the sheet still hold true. Thank you.

Felix Trujillo, Jr.
Associate Air Quality Engineer
Stationary Source Division
Sacramento Metropolitan AQMD
777 12th Street, 3rd Floor
Sacramento, CA 95814
Phone: (916) 874-7357
Fax: (916) 874-4899
E-mail: ftrujillo@airquality.org

FELIX TRUJILLO JR.

From: Doug Vickery <Doug.Vickery@RFMacDonald.com>
Sent: Tuesday, February 17, 2015 4:50 PM
To: FELIX TRUJILLO JR.; BRIAN KREBS
Cc: Ashraf Qader; john.cadrett@valleyair.org; Jim.Swaney@valleyair.org; Jeff Wagner
Subject: Propane fire boiler emissions
Attachments: BACT Letter (2-17-15).pdf

Felix, in follow up to our conversation, here is the letter from our engineering director stating that there is no know boiler in this size range that can meet 9ppm NOx on propane.
I am still waiting for confirmation from the San Joaquin Valley APCD on their findings.
Sincerely,

Doug Vickery

Boiler Sales Engineer

Ph: 209-576-0726

R.F. MacDonald Co.
your boiler & pump solutions team
since 1956

1549 Cummings Drive
Modesto, CA 95358
Phone: 209.576.0726
Fax: 209.576.1312
www.rfmacdonald.com

February 17, 2015

To: Sacramento Metropolitan AQMD

Attn: Felix Trujillo, Jr.

Re: BACT for Propane Fired Boilers

Based on our field experience and as a representative for three major boiler manufacturers (Cleaver-Brooks, Fulton Boiler, Camus-Hydronics) which have the lowest NOx and CO emissions in the industry. Based on that experience we can confirm that the Best Available Control Technology for a 2.5MMbtu/hr hot water boiler is 9PPM NOx while firing natural gas only. 9PPM NOx can not be achieved with burner technology alone while firing Propane.

Feel free to give me a call if you have any further questions.

Regards,

AJ Feliz
Central Sales and Engineering Manager

RF MacDonald Co.
10261 Matern Place
Santa Fe Springs, CA 90670
Phone: (714) 257 - 0900 x246
Fax: (714) 257 - 1176
Anthony.feliz@rfmacdonald.com

FELIX TRUJILLO JR.

From: Brian Huibregtse <BHuibregtse@cleaverbrooks.com>
Sent: Thursday, October 29, 2015 4:12 PM
To: FELIX TRUJILLO JR.
Cc: Sean Lobdell; Doug Vickery
Subject: RE: Propane Fired Boiler Question

Felix,

Thank you for your inquiry. We have reviewed this topic with our engineering team. With propane combustion, it is more challenging to obtain low NOx levels when compared to natural gas. In the case of high efficiency condensing HHW boilers, the practical limit Cleaver-Brooks can meet when firing propane is 30 ppm NOx. When firing natural gas, our standard NOx limit is 20ppm NOx.

Cleaver-Brooks does have an option for 9ppm NOx on natural gas for high efficiency boilers greater than 2.0 mmBtu/h. However, the combustion characteristics of propane prevent us from offering a similar NOx level offering. These characteristics include higher flame temperatures and increased flame length. The higher flame temperatures increase NOx formation. Longer flames lead to furnace wall impingement resulting in combustion instability. Cleaver-Brooks has conducted extensive low NOx testing with both fuels on our high efficiency condensing boilers in our Milwaukee Research & Development Lab and has determined these are the NOx limits that we can support with present technology.

Also of note, Cleaver-Brooks, along with many other manufacturers, has pre-certified our high efficiency (model ClearFire-C) boilers with SCAQMD to Rule 1146.2 (scope covers boilers <2.0 mmBtu/h) which stipulates <30 ppm NOx limit for natural gas. I do not believe it addresses propane in this rule, nor was propane evaluated as part of this certification.

If you have any other questions or would like to discuss further, please feel free to contact us. Thanks again for allowing Cleaver-Brooks to provide input in this area.

Sincerely,

Brian Huibregtse
Product Engineering - Commercial Boilers
Packaged Boiler Systems

Cleaver Brooks CERTIFIED HYDRONIC SOLUTIONS SPECIALIST™

Office: 414.577.2743 | Mobile: 414.336.8483
bhuibregtse@cleaverbrooks.com
cleaverbrooks.com

From: FELIX TRUJILLO JR. [mailto:FTrujillo@airquality.org]
Sent: Tuesday, October 27, 2015 4:31 PM
To: Brian Huibregtse
Subject: Propane Fired Boiler Question

Hi Brian,

I have been in contact with Doug Vickery at the RF MacDonald location in Modesto, CA. The Sacramento Metropolitan AQMD issued an Authority to Construct permit for a 2.5 MMBtu/hr propane fired boiler with a NOx limit of 9 ppm @ 3% O2. This was based on what was determined to be Best Available Control Technology. We looked at other districts BACT guidelines and rules, in their were indications that the 9 ppm was achievable for boilers 2 MMBtu/h to less than 5 MMBtu/hr. But RF MacDonald informed us this was not the case. That propane fired units in this size range are unable to meet a 9 ppm limit with just the use of an ultra low NOx burner. So I just need to confirm if this is the case with Cleave Brooks boilers. If 9 ppm is not achievable for propane, what emissions limit would you guarantee for this size of boilers? South Coast AQMD has a BACT guideline for boilers less than 20 MMBtu/hr for natural gas and propane that lists a NOx limit of 12 ppm. Any information that you can provide is greatly appreciated. Thank you.

http://www.aqmd.gov/docs/default-source/bact/bact-guidelines/part-d---bact-guidelines-for-non-major-polluting-facilities.pdf?sfvrsn=4

Felix Trujillo, Jr.
Associate Air Quality Engineer
Stationary Source Division
Sacramento Metropolitan AQMD
777 12th Street, 3rd Floor
Sacramento, CA 95814
Phone: (916) 874-7357
Fax: (916) 874-4899
E-mail: ftrujillo@airquality.org

FELIX TRUJILLO JR.

From: Dean Wadland <dwadland@uniluxam.com>
Sent: Monday, October 26, 2015 3:18 PM
To: FELIX TRUJILLO JR.
Subject: FW: 2 MMBtu/hr to 5 MMBtu/hr Propane Fired Boiler Information Request

Dear Mr. Trujillo,

I have looked into this with our burner suppliers based upon your inquiry. The best that they have indicated being able to guarantee when firing propane is less than 12 ppm NOx in this size range. I have asked Power Flame to find some installations that they have done firing propane and achieving less than 12 ppm NOx. I'll get back to you with this as soon as I hear from them. Thank you,

Sincerely,

Dean T. Wadland, P.E.
Vice President
Unilux Advanced Manufacturing

From: Larry Farrelly
Sent: Friday, October 23, 2015 7:56 PM
To: Dean Wadland; Kyle Mau
Subject: Fwd: 2 MMBtu/hr to 5 MMBtu/hr Propane Fired Boiler Information Request

Sent from my iPhone

Begin forwarded message:

> **From:** FELIX TRUJILLO JR. <FTrujillo@airquality.org>
> **Date:** October 23, 2015 at 4:11:23 PM EDT
> **To:** "info@uniluxam.com" <info@uniluxam.com>
> **Subject: 2 MMBtu/hr to 5 MMBtu/hr Propane Fired Boiler Information Request**
>
> Hi,
>
> I am doing some research on propane fired boilers and I am trying to see if you have an propane fired boilers in the above range that can meet a NOx limit of 9 ppm @ 3% O2 with just the use of an ultra low NOx burner. If not what is achievable for this size range of boilers? If so have any units been tested to confirm the limit? Your help in this matter is greatly appreciated. Thank you.
>
> Felix Trujillo, Jr.
> Associate Air Quality Engineer
> Stationary Source Division
> Sacramento Metropolitan AQMD
> 777 12th Street, 3rd Floor
> Sacramento, CA 95814
> Phone: (916) 874-7357

FELIX TRUJILLO JR.

From: Lou Brizzolara <lbrizzolara@ahmassoc.com>
Sent: Thursday, October 29, 2015 4:25 PM
To: FELIX TRUJILLO JR.
Cc: Kyle Richards
Subject: FW: Information Request for 2 - < 5 MMBtu/hr Propane Fired Boiler

Felix,

Though Coen could technically do this, they don't make burners for this small capacity. However, ST Johnson do make burners for this capacity range and can meet the 9 ppm NOx(3% O2 ref.). ST Johnson are located in Fairfield, Ca. and have well over 400 gas fired burners operating at 9 ppm NOx(3% ref.). I will be in Sacramento next week and would be happy to discuss this further as well as provide additional information. Feel free to visit our website at www.ahmassoc.com where can access the ST Johnson website.

Regards,
Lou Brizzolara
AHM Associates, Inc.
lbrizzolara@ahmassoc.com
Phone: 510-785-6670

Hi,

I am doing some research on propane fired boilers in the size range of 2 MMBtu/hr to less than 5 MMBtu/hr. I am trying to determine if a boiler in this size range with an ultra low NOx burner and fired on propane can meet a NOx limit of 9 ppm @ 3% O2. Do you know if COEN has such a unit and would they guarantee such a limit for propane and for units in this size range? Is this achievable for propane fired units with just the use of an ultra low NOx burner? Your help is greatly appreciated. Thank you.

Felix Trujillo, Jr.

Associate Air Quality Engineer

Stationary Source Division

Sacramento Metropolitan AQMD

FELIX TRUJILLO JR.

From: Robert Nickeson <rnickeson@johnsonburners.com>
Sent: Wednesday, December 02, 2015 11:46 AM
To: FELIX TRUJILLO JR.
Subject: RE: Propane Boiler (2 to less than 5 MMBtu/hr) Emissions Information Request

Felix – sorry for the delayed response, but operating on propane we have a 15 ppm NOx, corrected to 3% O2, emissions guarantee on those burners. Hope this is helpful.
Bob

From: FELIX TRUJILLO JR. [mailto:FTrujillo@airquality.org]
Sent: Tuesday, December 01, 2015 1:43 PM
To: rnickeson@johnsonburners.com
Subject: Propane Boiler (2 to less than 5 MMBtu/hr) Emissions Information Request

Hi Bob,

I was looking at your website and saw that you have a NOxMatic Mini ultra low NOx burner in the 2 to less than 5 MMBtu/hr size range that can meet a NOx limit of 9 ppm @ 3% O2 when fired on natural gas. I wanted to know if the same boiler when fired on propane can also meet the same limit. If not what is the limit that is achievable for propane? I am working on a BACT determination for this size of boilers here in Sacramento Metro AQMD. So far the lowest limits that I have seen from other agencies are 12 ppm @ 3% O2 (South Coast AQMD BACT Guideline for natural gas or propane fired boilers with a rating of less than 20 MMBtu/hr) and 20 ppm @ 3% O2 from the Ventura County APCD for propane fired boilers (Per their Boiler Rule 74.15.1). Thank you.

Felix Trujillo, Jr.
Associate Air Quality Engineer
Stationary Source Division
Sacramento Metropolitan AQMD
777 12th Street, 3rd Floor
Sacramento, CA 95814
Phone: (916) 874-7357
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FELIX TRUJILLO JR.

From: Helverson, Vernon (KS07) <vhelverson@maxoncorp.com>
Sent: Friday, November 20, 2015 1:05 PM
To: FELIX TRUJILLO JR.
Subject: Maxon Contact information

Felix,

Thank you for your inquiry. Per our conversation, Maxon doesn't really have burners that are specific to boilers. We have seen some Maxon burners used on Fulton boilers, but it's not very common.

That being said, we do have multiple burners used in process applications. We have burners that are used to satisfy the requirement for 30 ppm NOx cor 3% O2 as well as under 10 ppm NOx cor 3% O2. We do not offer a blanket guarantee of emissions for any of our burners. Maxon prefers to evaluate case by case. We do this because many factors (burner included) affect process NOx emissions. The following is how Maxon typically assists a customer in order to help them achieve emissions.

Maxon will collect application information from the customer. This includes a confirmation from the local agency having jurisdiction as to the actual emission requirements. Masxon will evaluate the information and make a burner recommendation. Depending on the requirements, Maxon may require additional equipment to be purchased in conjunction with the burner in order to meet the emissions requirements. Maxon will make the emissions guarantee and offer a guarantee letter upon receipt of a confirming purchase order.

Please let me know if you have additional questions. Thanks again for your time.

Best Regards,

Vernon Helverson
Engineer App/Sys Sales

Honeywell
Commercial & Industrial Combustion
MAXON **& Honeywell** Brand Products

Cell (913) 522-3350
vhelverson@maxoncorp.com

http://customer.honeywell.com
http://www.maxoncorp.com

Attachment F

Correspondence from SJVAPCD

FELIX TRUJILLO JR.

From: Mike Oldershaw <Mike.Oldershaw@valleyair.org>
Sent: Monday, April 18, 2016 10:01 AM
To: FELIX TRUJILLO JR.
Subject: RE: District Rule 4307 Question

Good morning Mr. Trujillo,

We have no record of any testing done for one of these smaller units fired on propane/LPG. A quick search in the database did not disclose other than one of these that uses propane as a backup – but this is an existing unit that is required to meet 30 ppm (they will have to meet the lower limits when the unit is replaced, or if the burner is changed).

Sorry this is not much help for you, but please let me know if I can provide anything else.

Mike Oldershaw
Manager
Southern Region Compliance Department
34946 Flyover Court
Bakersfield, CA 93308
661-392-5521