State of Utah
DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY

Michael O. Leavitt, Governor
Dianne R. Nielson, Ph.D., Executive Director
Russell A. Roberts, Director

150 North 1950 West
P.O. Box 144820
Salt Lake City, Utah 84114-4820
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(801) 538-4414 T.D.D.

FILE COPY

DAQE-824-94

September 29, 1994

James R. Van Orman
Hill Air Force Base
Headquarters Ogden Air Logistics Center
Dept. of the Air Force
Hill Air Force Base, Utah 84056

Re: Approval Order For Used Oil Burner/Boiler Permit Modification
Davis County CDS B NA

Dear Mr. Van Orman:

The attached document is an Approval Order for the above referenced project.

Future correspondence on this Approval Order should include the engineer's name as well as the DAQE number as shown on the upper right-hand corner of this letter. Please direct any technical questions you may have on this project to Mr. Arjun Ram. He may be reached at (801) 536-4066.

Sincerely,

Russell A. Roberts, Executive Secretary
Utah Air Quality Board

RAR:AR:dn

cc: Davis County Health Department
Mike Owens, EPA Region VIII
Cheryl Prawl, Solid & Hazardous Waste

4.2.4-434

STATE OF UTAH

Department of Environmental Quality

Division of Air Quality

APPROVAL ORDER FOR USED OIL BURNER/BOILER PERMIT MODIFICATION

Prepared By: Arjun Ram, Engineering Technician

Reviewed By: Dale Chapman, Engineer

APPROVAL ORDER NUMBER

DAQE-824-94

Date: September 29, 1994

Source

HILL AIR FORCE BASE

Russell A. Roberts
Executive Secretary
Utah Air Quality Board

Abstract

Your request dated July 18, 1994, to change Approval Order (AO) DAQE-501-92, has been reviewed. The increase for NO_x emissions from the approved used oil boiler while burning used oil is approved. The emissions were changed from 110 ppmv as stated in the original NOI to 240 ppmv. The AO has been modified to reflect the requested change (Reference conditions #5 for the changes).

This project has been evaluated and found to be consistent with the requirements of the Utah Air Conservation Rules (UACR) and the Utah Air Conservation Act. A 30-day public comment period was held and all comments received were evaluated. The conditions of this AO reflect any changes to the proposed conditions which resulted from the evaluation of the comments received. This air quality AO authorizes the project with the following conditions, and failure to comply with any of the conditions may constitute a violation of this order.

1. Hill Air Force Base shall install and operate the used oil fired boiler rated at 20.9 million BTU/hr in Building 1703 according to the information submitted in the Notice of Intent dated March 27, 1990, with additional information submitted dated October 31, 1990, and requests for modifications dated May 13, 1992, and July 18, 1994. This AO shall replace the AO DAQE-501-92, dated May 26, 1992. The boiler shall be a dual-fuel boiler with the capability of burning used oil.

   A copy of this AO shall be posted on site and shall be available to the employees who operate the air emission producing equipment. All employees who operate the air emission producing equipment shall receive instruction as to their responsibilities in operating the equipment in compliance with the appropriate and relevant conditions.

2. The approved installation shall consist of the following equipment:

   A. 500 hp Scotch Marine 3 Pass Boiler or equivalent, complete with dual (natural gas and used oil) burner - Equivalency shall be determined by the Executive Secretary.

   B. Oil filtration system

   C. Associated piping, control, and alarms, chemical feed pump, chemical mixing tank, and appropriate tie-ins to existing feed water and natural gas line systems

3. Visible emissions from the boiler shall not exceed 20% opacity. Opacity observation of emissions from stationary sources shall be conducted in accordance with 40 CFR 60, Appendix A, Method 9.

4. The following fuel consumption limits for the boiler shall not be exceeded without prior approval in accordance with R307-1-3.1, UAC:

   A. Used oil consumption - 100,000 gallons per 12-month period
   B. Natural gas consumption - 166.89 x 10^6 scf per 12-month period

Compliance with the annual limitations shall be determined on a rolling 12-month total. Based on the first day of each month, a new 12-month total shall be calculated using the previous 12 months. Records of consumption shall be kept for all periods when the plant is in operation. Records of consumption shall be made available to the Executive Secretary or his representative upon request, and shall include a period of two years ending with the date of the request. Natural gas fuel consumption shall be determined by examination of records from a fuel meter. Used oil consumption for the boiler shall be determined by examination of records from the used oil transfer log. The records shall be kept on a daily basis.

5. Emissions to the atmosphere from the used oil boiler operating with used oil shall not exceed the following rates and concentrations:

A. SO_2

1) 10.3 lbs/hr
2) 270 ppmdv (7% oxygen, dry)

B. NO_x

1) 6.62 lbs/hr
2) 240 ppmdv (7% oxygen, dry)

6. Stack testing to show compliance with the emission limitations in condition #5 operating with used oil shall be performed for the following emission points and air contaminants, as determined by the following test methods in accordance with 40 CFR 60, Appendix A, and as directed by the Executive Secretary:

Pollutant	Method	First test	Retest
SO_2	6	No later than 180 days after start-up	Every 5 years
NO_x	7	No later than 180 days after start-up	Every 5 years

Notification

The applicant shall provide a notification of the test date at least 45 days prior to the test. A pretest conference shall be held if directed by the Executive Secretary. It shall be held at least 30 days prior to the test between the owner/operator, the tester, and the Executive Secretary. The emission point shall be designed to conform to the requirements of 40 CFR 60, Appendix A, Method 1, and Occupational Safety and Health Administration (OSHA) or Mine Safety and Health Administration (MSHA) approved access shall be provided to the test location.

Sample Location

40 CFR 60, Appendix A, Method 1, if required by test method used

Volumetric Flow Rate

40 CFR 60, Appendix A, Method 2, if required by test method used

Calculations

To determine mass emission rates (lbs/hr, etc.), the pollutant concentration as determined by the appropriate methods above shall be multiplied by the volumetric flow rate and any necessary conversion factors determined by the Executive Secretary to give the results in the specified units of the emission limitation.

Source Operation

For a new source/emission point, the production rate during all compliance testing shall be no less than 90% of the production rate at which the facility will be operated.

7. The ash content of any used oil burned shall not exceed 0.65 percent by weight without prior approval in accordance with R307-1-3.1, UAC. The ash content shall be tested using the appropriate ASTM method if directed by the Executive Secretary.

8. Used oil may be used for fuel, except that oil which contains more than 1000 ppm by weight of total halogen shall be considered hazardous and shall be treated as a hazardous waste and shall not be burned in the boiler. The halogen content shall be tested by ASTM Method D-808-81 before used oil is transferred to the boiler tank and burned.

9. Used oil which does not exceed the following listed contaminants content is considered to be specification used oil per Used Oil Regulation 40 CFR 266 Subpart E § 266.40:

A.	Total halogens	1000 ppm by weight
B.	Cadmium	2 ppm by weight
C.	Chromium	10 ppm by weight
D.	Lead	100 ppm by weight
E.	Arsenic	5 ppm by weight

In addition, the nitrogen content of the used oil shall not exceed 0.3% (by weight) and the sulfur content of the used oil shall not exceed 0.5% (by weight). The flash point of the used oil shall not be less than 100 degrees Fahrenheit.

The owner/operator shall provide test certification for each load of used fuel oil from 55 gallon drums or bulk carrier. Certification shall be either by his own testing or test

reports from a testing contractor. Records of used fuel oil consumption and the test reports shall be kept for all periods when the plant is in operation. The records shall be made available to the Executive Secretary or his representative upon request, and shall include a period of two years ending with the date of the request.

Used oil which does exceed the above listed contaminants content is considered to be off-specification used oil per Used Oil Regulation 40 CFR 266 Subpart E § 266.40 and may be used except for halogens, but they are subject to the record keeping provisions of § 266.43.

10. In addition to the requirements of this AO, all provisions of 40 CFR 60, new source performance standards (NSPS) Subparts A and Dc apply to this installation. Consult 40 CFR 60 for additional details on this regulation.

    For sources which are subject to NSPS (provided there is an opacity standard in the applicable NSPS), visible emission observations which are performed during the initial compliance inspection shall consist of 30 observations of six minutes each in accordance with 40 CFR 60.11(b) and 40 CFR 60, Appendix A, Method 9. It is the responsibility of the owner/operator of the source to supply these observations to the Executive Secretary. A certified observer must be used for these observations. Emission points which are subject to the initial observations are the boiler stacks.

11. All installations and facilities authorized by this AO shall be adequately and properly maintained. The owner/operator shall comply with R307-1-3.5 and 4.7, UAC. R307-1-3.5, UAC addresses emission inventory reporting requirements. R307-1-4.7, UAC addresses unavoidable breakdown reporting requirements. The owner/operator shall calculate/estimate the excess emissions whenever a breakdown occurs. The sum total of excess emissions shall be reported to the Executive Secretary for each calendar year no later than January 31 of the following year.

12. The Executive Secretary shall be notified in writing upon start-up of the installation as an initial compliance inspection is required. Eighteen months from the date of this AO the Executive Secretary shall be notified in writing of the status of construction/installation if construction/installation is not completed. At that time, the Executive Secretary shall require documentation of the continuous construction/installation of the operation and may revoke the AO in accordance with R307-1-3.1.5, UAC.

Any future modifications to the equipment approved by this order must also be approved in accordance with R307-1-3.1.1, UAC.

This AO in no way releases the owner or operator from any liability for compliance with all other applicable federal, state, and local regulations including the UACR.

Annual emissions for this boiler are calculated at:

2.85 tons/yr for Particulates
2.85 tons/yr for PM_{10}
3.75 tons/yr for SO_2
10.86 tons/yr for NO_x
3.17 tons/yr for CO
0.33 tons/yr for VOC
0.0008 ton/yr for Barium
0.0013 for Cadmium
0.0011 ton/yr for Chromium
0.0358 ton/yr for Lead

These calculated emission rates are for the purposes of determining the applicability of prevention of significant deterioration (PSD) and nonattainment area major source requirements of the UACR. They are not to be used for purposes of determining compliance.

Approved By:

Russell A. Roberts, Executive Secretary
Utah Air Quality Board

DEPARTMENT OF ENVIRONMENTAL QUALITY
DIVISION OF AIR QUALITY

Michael O. Leavitt
Governor
Dianne R. Nielson, Ph.D.
Executive Director
Russell A. Roberts
Director

150 North 1950 West
Salt Lake City, Utah 84114
(801) 536-4000
(801) 536-4099 Fax
(801) 536-4414 T.D.D.

Reply to: State of Utah
Division of Air Quality
P.O. Box 144820
Salt Lake City, Utah 84114-4820

MEMORANDUM

To: File

Through: Lynn R. Menlove, Manager, New Source Review Section, Utah Division of Air Quality

Through: Dale Chapman, Engineer III, New Source Review Section Utah Division of Air Quality DC

From: Arjun Ram, Environmental Engineering Technician

Date: September 29, 1994

Subject: AO Modification for Used Oil Boiler at Hill Air Force Base

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Abstract

Hill Air Force Base (HAFB) has requested permission to modify the allowable emission rates listed on their current AO for their used oil boiler. The maximum allowable concentration of NO_x emissions will change from 110 to 240 ppmdv and the maximum allowable concentration of SO_2 emissions will change from 39 to 270 ppmdv. This will require a modification of the AO DAQE-501-92, dated May 26, 1992. The increase has been requested because the boiler could not meet the concentration limits specified for SO_2 and NO_x in the existing AO. Also, a discussion with the manufacturer (Internal Combustion, Monroe, Wisconsin) revealed that there is no low-NO_x technology available for used oil boilers, and that the boiler that HAFB presently has, is BACT for dual fuel (oil and natural gas) boilers. The amount of gas used and the total oil burned per year would be the same as before. The total allowable emissions will increase from 10.05 to 10.86 TPY for NO_x and decreases from 6.72 to 3.75 TPY for SO_2. The decrease in allowable SO_2 emissions results from the overestimation of allowable SO_2 emissions in the previous AO. The minimal increase in allowable NO_x emissions will be more than offset by the decrease in allowable SO_2 emissions, since both are considered to be PM_{10} precursors.

This issue was previously discussed in the Level III staff meeting of the NSR section, and the increase in concentrations was approved. This will not result in a violation of any State or Federal rules.

Recommendation

It is recommended that the proposed emission rates be accepted as BACT, as requested. The minimal increase in NO_x will be more than offset by the decrease in SO_2 emissions, and therefore, a waiver is requested from the public comment process.

Fee

A $400 fee needs to be charged to HAFB for the AO modification.

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Calculation NOX

Molecular weight for NO_2 :	46	lb/lb Mole
S-Factor for waste oil :	12200	SCF/MMBTU
S-Factor for Natural Gas :	11990	SCF/MMBTU
	2.64E-03	lb Mole/SCF NOX
HHV of oil :	133000	BTU/gal oil
HHV of Gas :	1000	BTU/SCF
Firing rate Natural Gas :	350	SCF/min
Firing rate Waste Oil :	140	gal/hr
Heat Input :	20.9	MMBTU/Hr
Max Oil Firing :	100000	gal/yr
Max Gas Firing :	7985	hr/yr
Emissionlimit Waste-Oil:	**160**	**ppmv**
Emission Gas:	**70**	**ppmv**

Combustion of Waste Oil

0.032 lb NOX/Gal		
4.884 lb NOX/hr		
0.237 lb NOX/MMBTU		
1.576 tons/yr		
3.100 lb NOX/hr	AP 42	
1.000 tons NOX/yr	AP 42	

Combustion of Natural Gas

2.129 lb NOX/hr		
0.102 lb NOX/MMBTU		
8.500 tons/yr		
2.100 lb NOX/hr	AP 42	
8.384 tons NOX/yr	AP 42	

Combustion of Waste Oil

Calculation of lb NOX / Gal Oil

$$\frac{160\ \text{SCF NOX}}{1.00\text{E+06}\ \text{SCF Flue Gas}} \times \frac{12200\ \text{SCF Flue Gas}}{1.00\text{E+06}\ \text{BTU}} \times 2.64\text{E-03}\ \frac{\text{lb Mole}}{\text{SCF NOX}} \times 46\ \frac{\text{lb}}{\text{lb Mole}} \times 133{,}000\ \frac{\text{BTU}}{\text{gal Oil}}$$

0.032 lb NOX/Gal

Calculation of lb NOX / hr

0.032 lb NOX/Gal X 155 gal/hr =

4.884 lb NOX/hr

Calculation of lb NOX / MMBTU

$$\frac{160\ \text{SCF NOX}}{1.00\text{E+06}\ \text{SCF Flue Gas}} \times 12200\ \frac{\text{SCF Flue Gas}}{\text{MMBTU}} \times 2.64\text{E-03}\ \frac{\text{lb Mole}}{\text{SCF NOX}} \times 46\ \frac{\text{lb}}{\text{lb Mole}}$$

0.237 lb NOX/MMBTU

Calculation of tons NOX / yr

$$0.032\ \text{lb NOX/Gal} \times 100000\ \text{gal/yr} \times \frac{1}{2000}\ \frac{\text{tons}}{\text{lb}} =$$

1.576 tons/yr

Combustion of Natural Gas

Calculation of lb NOX / MMBTU

$$\frac{70 \text{ SCF NOX}}{1.00\text{E+06 SCF Flue Gas}} \times \frac{11990 \text{ SCF Flue Gas}}{\text{MMBTU}} \times \frac{2.64\text{E-03 lb Mole}}{\text{SCF NOX}} \times \frac{46 \text{ lb}}{\text{lb Mole}}$$

0.102 lb NOX/MMBTU

Calculation of lb NOX / SCF

$$0.102 \frac{\text{lb NOX}}{\text{MMBTU}} \times 1000 \frac{\text{BTU}}{\text{SCF}} =$$

101.868 lb NOX/SCF

Calculation of lb NOX / hr

$$0.102 \frac{\text{lb NOX}}{\text{MMBTU}} \times 20.9 \frac{\text{MMBTU}}{\text{hr}} =$$

2.129 lb NOX/hr

Calculation of tons NOX / yr

$$2.1290 \frac{\text{lb}}{\text{hr}} \times 7985 \frac{\text{hr}}{\text{yr}} \times \frac{1}{2000} \frac{\text{tons}}{\text{lb}} =$$

8.500 tons/yr

Calculation of NOX using AP 42 Emissionfactors

Emissionfactor Nitrogen Oxides Waste Oil : 20 lb/1000 gal
Emissionfactor Nitrogen Oxides Natural Gas : 100 lb/mill SCF

Combustion of Waste Oil

2.31 lb/1000 gal ?
1.42 — 20 — 1000 — 11-9

20 / 1000 lb/gal X 155 gal/hr = **3.100 lb NOX/hr**

Calculation of tons NOX / yr

20 / 1000 lb/gal X 100000 gal/yr X 1 / 2000 tons/lb =

1.000 tons NOX/yr

Combustion of Natural Gas

Small Industrial boilers (AP42 1.4-1) 140 lb/10^6 ft^3

100 / 1000000 lb/SCF X 350 SCF/min X 60 min/hr =

2.100 lb NOX/hr

Calculation of tons NOX / yr

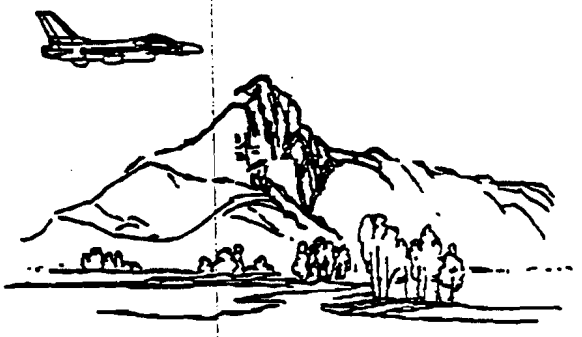
2.100 lb/hr X 7985 hr/yr X 1/2000 tons/lb =

8.384 tons NOX/yr

4.2.4-446

RECEIVED
JUL 0 8 1994
Air Quality

FAX COVER SHEET



From:

Andreas Zekorn
Environmental Management Directorate
OO-ALC/EME
7274 Wardleigh Road
Hill AFB,UT 84056-5137

Tel: Commercial: 801-777-0359
DSN 458-0359
Fax:Commercial:801-777-4306

Date: 7/8/94

To:
Name: **Arjun Ram**
Organization: **DAQ**
Fax No.: **536-4099**

Message:

Dear Mr. Arjun Ram

attached are some information from the burner manufacturer and the analaysis of the nitrogen content of the waste oil.

Sincerely

Andreas Zekorn

Total number of pages including cover sheet: 9

WESTERN ANALYTICAL, INC.
2417 CONSTITUTION BOULEVARD
SALT LAKE CITY, UTAH 84119-1225
PHONE (801) 973-9238 OR (800) 383-5924
FAX (801) 973-7635

CERTIFICATE OF ANALYSIS

June 15, 1994
PS4-317
ACCT: No. 1000
YOUR PURCHASE ORDER: F-47650-94-M0758

HILL AIR FORCE BASE
MR. JIM BATES
EMH BILLING 514
H.A.F.B UTAH 84056

Dear Mr. Bates:

Transmitted herewith are the analytical data for the three (3) oil samples delivered to our laboratory for nitrogen (N) analysis.

DATE RECEIVED: June 13, 1994
DATE OF ANALYSIS: June 14, 1994
RECEIVED BY: Julie Lopez

SAMPLE IDENTIFICATION	N (%)
Sample #1	0.20
Sample #2	0.23
Sample #3	0.19

E. H. PHILLIPS
Laboratory Director

EHP/jl

INDUSTRIAL COMBUSTION
DIVISION OF AQUA-CHEM, INC.
351-21st Street - Monroe, Wisconsin 53566-2798 - Phone: 608/325-3141 - Fax: 608/325-4379 - Telex II: 910/280-2870

INDUSTRIAL AND COMMERCIAL BURNERS AND BOILERS

June 14, 1994

Hill Air Force Base
OO-ALC/EME
Att: Mike Graziano
7276 Wardleigh Road
Hill Air Force Base, UT 84056

Re: Boiler Emissions

Dear Mr. Graziano:

Please find enclosed two (2) copies of our Boiler Emission Guide as well as a graph with fuel bound nitrogen versus expected NOx emissions. You notice that the range on the graph varies and so for your standard "D" burner you should use the upper line as the reference.

For the waste oil which you are firing, in my opinion the burner system presently installed on your boiler is the best available technology for NOx reduction.

If you have any questions, please let me know.

Sincerely,

INDUSTRIAL COMBUSTION

Kim Black sm.

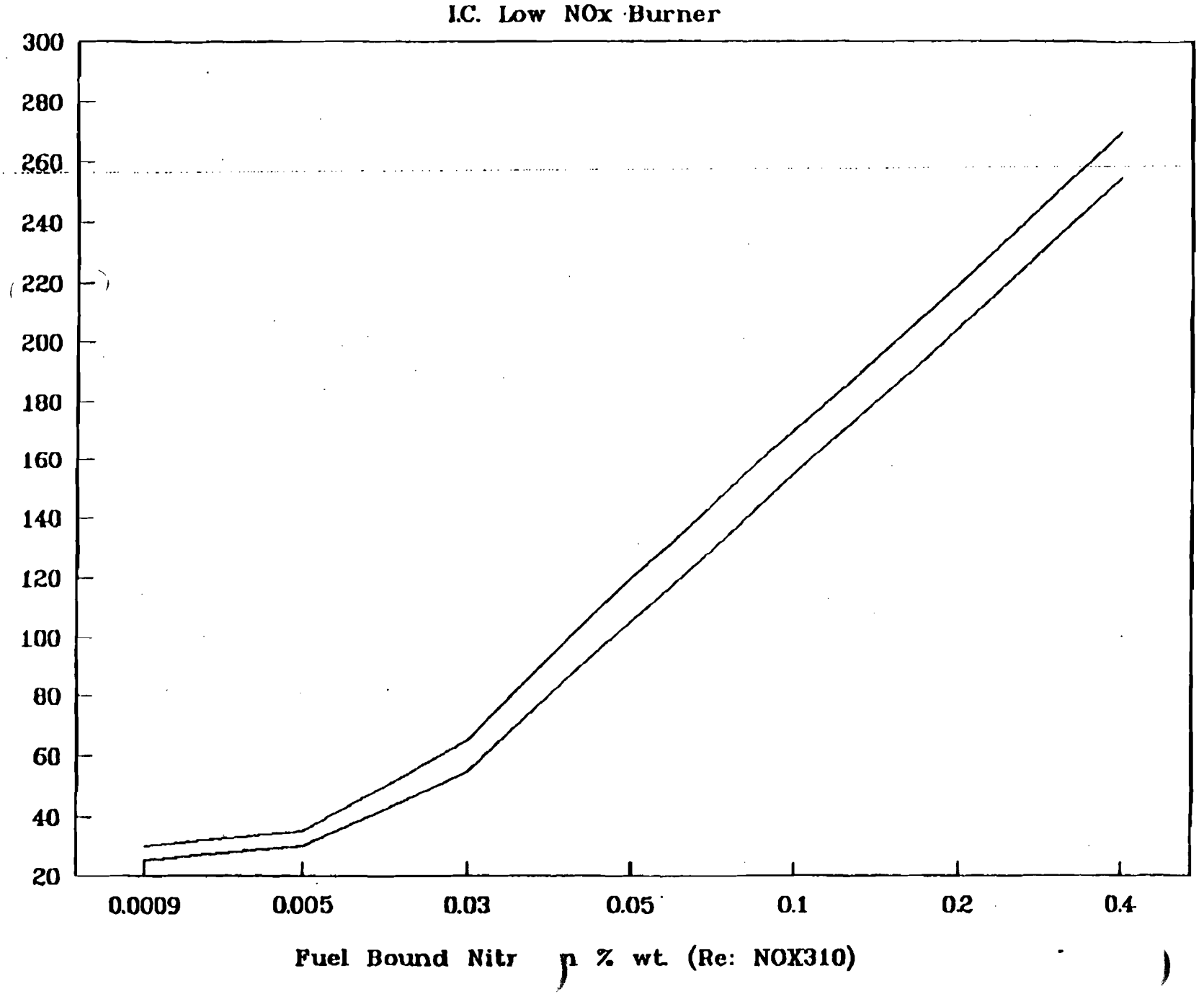
R. Kim Black

RKB/sm

Enclosures: IC-1155, Charts

cc: Ken Hanninen

NOx EMISSIONS FIRING LIQUID FUEL



NOx500
Job Name:

Distributor:

Attn:
SO#
Fax No.
Tel No.

ESTIMATED Burner Emissions

I.C. Burner Model - DEG-210-P **BTU's per Hour - 21,000,000**

Fuel - Natural Gas

	PPMv (Corr to 3% O2)	Pounds per 1,000,000 BTU's	TOTAL Pounds per Hour @ 100% Firing Rate
Particulate (PM-10)	N/A	0.0060	0.13
Carbon Monoxide (CO)	50	0.0367	0.77
SOx (<8 PPM wt. Sulfur in Fuel)	0.4	0.0007	0.01
VOC (Methane + Non-Methane)	15	0.0080	0.17
NOx	70	0.0844	1.77

Required Combustion Air (60 Degrees F.) SCFM	3,815
Flue Gas Volume (400 Degrees F. Gross) ACFM	6,888
Flue Gas Velocity (24" Stack Diameter) Feet per Minute	2,193

NOX500A
Job Name:

Distributor:

Attn:
SO#
Fax No.
Tel No.

ESTIMATED Burner Emissions

I.C. Burner Model - DEG-210-P **BTU's per Hour - 21,000,000**

Fuel - #2 Oil **Gallons per Hour - 150.0**

	PPMv (Corr to 3% O2)	Pounds per 1,000,000 BTU's	TOTAL Pounds per Hour @ 100% Firing Rate
Particulate (PM-10)	N/A	0.021	0.44
Carbon Monoxide (CO)	50	0.039	0.82
SOx (<0.5% wt. Sulfur in Fuel)	290	0.539	11.32
VOC (Methane + Non-Methane)	10	0.006	0.13
NOx (<.04% wt. Nitrogen in Fuel)	120	0.157	3.30

Required Combustion Air (60 Degrees F.) SCFM	3,867
Flue Gas Volume (400 Degrees F. Gross) ACFM	6,748
Flue Gas Velocity (24" Stack Diameter) Feet per Minute	2,148

NOXSOC
Job Name:

Distributor:

Attn:
SO#
Fax No.
Tel No.

ESTIMATED Burner Emissions

I.C. Burner Model - DEG-210-P

BTU's per Hour - 21,000,000

Fuel - # 6 Oil

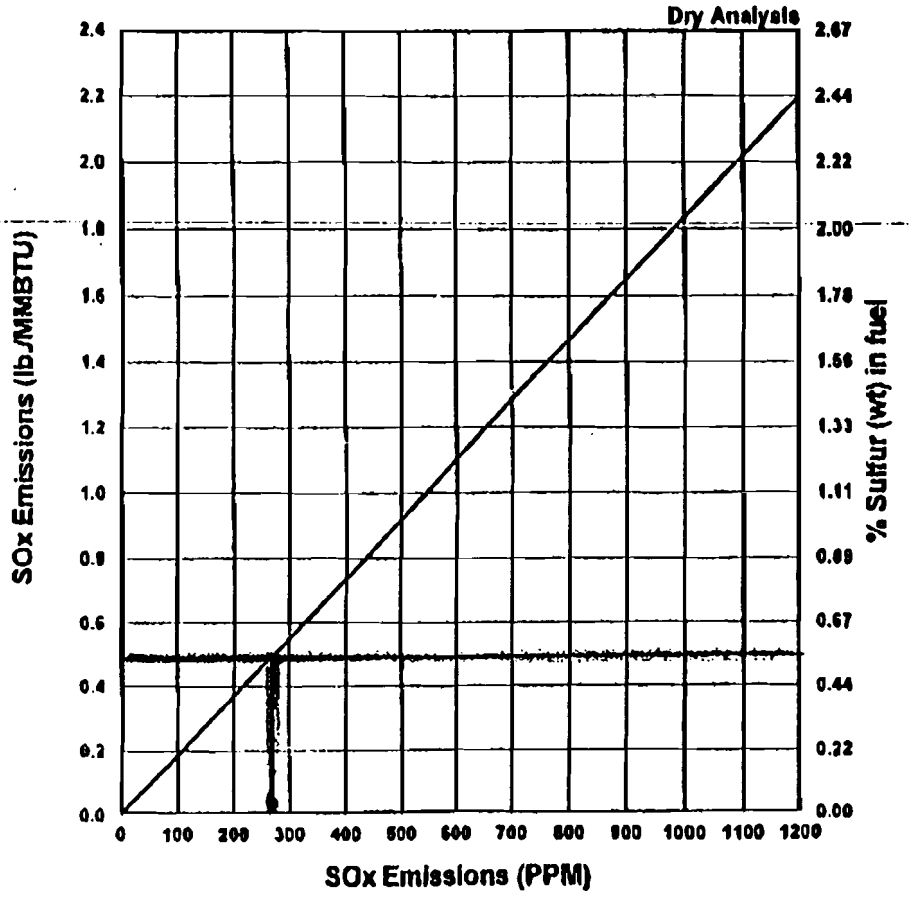
Gallons per Hour - 140.0

	PPMv (Corr to 3% O2)	Pounds per 1,000,000 BTU's	TOTAL Pounds per Hour @ 100% Firing Rate
Particulate (PM-10)	N/A	0.098	2.06
Carbon Monoxide (CO)	50	0.039	0.82
SOx (<1.0% wt. Sulfur in Fuel)	560	1.041	21.86
VOC (Methane + Non-Methane)	20	0.012	0.25
NOx (<0.5% wt. Nitrogen in Fuel)	300+	0.393	8.25

8.25 x 100 lbs / 1000 lbs = 2.34 TPY

Required Combustion Air (60 Degrees F.) SCFM	3,867
Flue Gas Volume (400 Degrees F. Gross) ACFM	6,748
Flue Gas Velocity (24" Stack Diameter) Feet per Minute	2,148

SOx Emissions Conversion Curves
(3% O_2)



—— #2 & #6 Oil

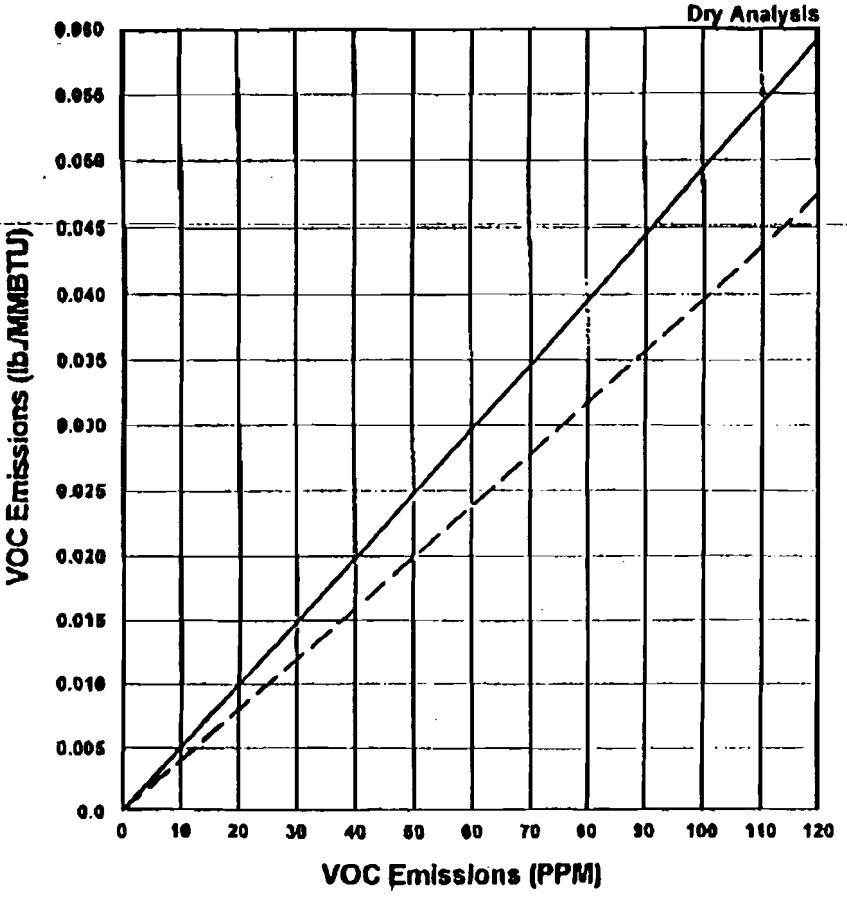
Conversion Equations

#2 & #6 Oil:

PPM = (lb./MMBTU) X 538

lb./MMBTU = (PPM) / 538

VOC Conversion Curves
(3% O_2)



—— #2 & #6 Oil
— — Natural Gas & Propane

Conversion Equations

#2 & #6 Oil:

PPM = (lb./MMBTU) X 2000

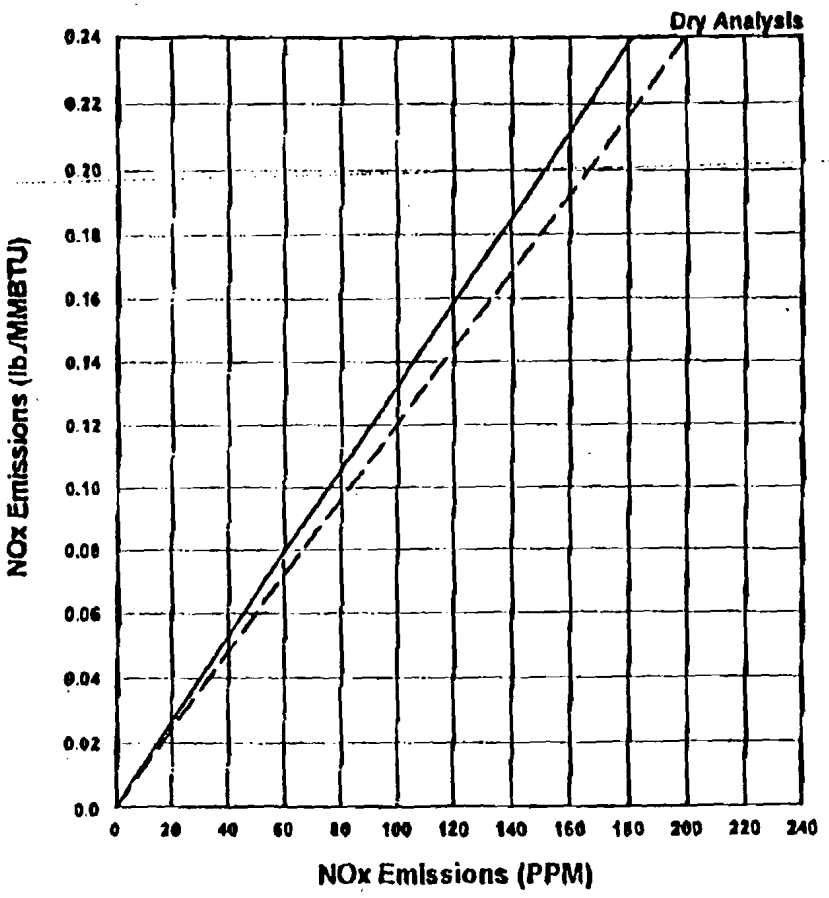
lb./MMBTU = (PPM) / 2000

Natural Gas & Propane:

PPM = (lb./MMBTU) X 2500

lb./MMBTU = (PPM) / 2500

NOx Emissions Conversion Curves (3% O_2)

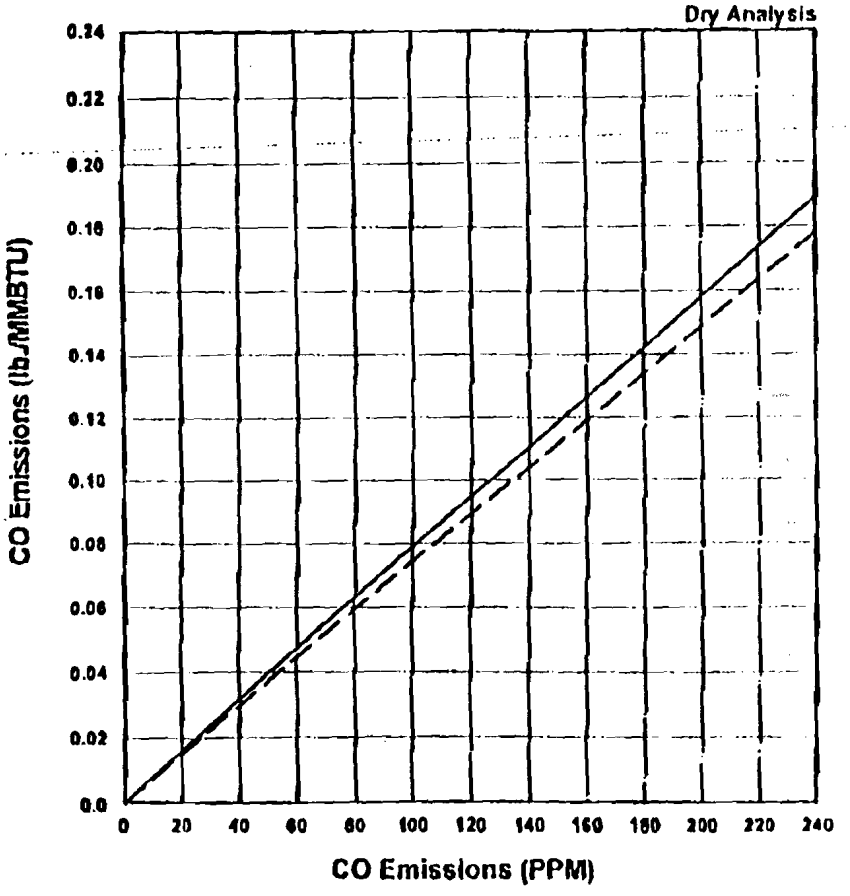


Conversion Equations

#2 & #6 Oil:
PPM = (lb./MMBTU) X 763
lb./MMBTU = (PPM) / 763

Natural Gas & Propane:
PPM = (lb./MMBTU) X 829
lb./MMBTU = (PPM) / 829

CO Conversion Curves (3% O_2)



Conversion Equations

#2 & #6 Oil:
PPM = (lb./MMBTU) X 1270
lb./MMBTU = (PPM) / 1270

Natural Gas & Propane:
PPM = (lb./MMBTU) X 1361
lb./MMBTU = (PPM) / 1361

TABLE 45. PARTICULATE EMISSIONS DURING USED OIL COMBUSTION IN LARGE BOILERS

Type of Virgin Oil	Percent Waste Oil	Ash Conc. %	O_2 Conc. %	Gas Volume Corrected to Zero Excess Air[a]	Average Emissions grains/SCF (dry)	Emissions Corrected to Zero Excess Air grains/SCF (dry)
No. 2	0	0.02	13.0	0.3812	0.0179	0.047
No. 2	15-25[b]	0.13	11.0	0.4764	0.0329	0.069
No. 2	8[c]	0.04	10.0	0.5240	0.0310	0.059
No. 6	0	0.01	9.8	0.5335	0.0062	0.012
No. 6	9.72[c]	0.09	6.6	0.6858	0.0139	0.020
No. 6	60.4[c]	0.48	7.5	0.6430	0.0476	0.074
No. 6	20.8[d]	0.20	5.3	0.7477	0.0283	0.038
--	100[d]	0.91	6.0	0.7144	0.0841	0.118
No. 6	20.6[b]	0.05	5.8	0.7239	0.0145	0.020

rection = [100 x (%O_2) x (4.76)]/100.
d industrial oils.
otive oils.
d oil.

es: Recon Systems, Inc. and ETA Engineering, Inc. (26)

with an average value of 0.73 lb/hour [0.34 lb/m
This is significantly higher than the literature
for commercial boilers firing residual oil; but
with the much higher ash content of used oil, wh
1.5%. Further, particulate sizing measurements
test sites indicated that 80 to 90% of the parti
submicron in nature and would be readily inhalab

Few data are available about the fate of in
sulfur, nitrogen, phosphorus, and halides during
general, the form of emissions resulting from th
the source and type of waste oil and the nature
Some examples of inorganic emissions expected fr
include:

- Sulfur -- the majority of the sulfur cont as sulfur dioxide (SO_2) with some sulfur acid (H_2SO_4). Small amounts of sulfur ar emissions and as boiler deposits in sulfa Approximately 0.152 to 0.465 lb SO_2/milli used oil containing 0.16 to 0.36% sulfur
- Nitrogen -- as gaseous emissions, nitroge nitrous oxide (NO) and nitric oxide (NO_2) boiler deposits (as nitrate and nitrite c ammonia compounds are other sources of ni instances. Some nitrogen emissions data
- Halides and phosphorus -- organic bromine compounds are emitted as hydrobromic, hyd acids. Phosphorus, in comparison, is emi form of phosphates.

ORGANIC EMISSIONS

With respect to organic emissions from comme
12.5 million Btu/hour), EPA's data indicate that
cies will range from 99% to greater than 99.9%, w
destruction and removal efficiencies of 99.4 to 9
strong correlations were observed by EPA between
boiler sizes or firing techniq However, one
the data was that the destructi fficiencies fo

TABLE 21. USED OIL PROPERTIES BY OIL TYPE

Property	Automotive Oils		Industrial Oils[a]	
	Low	High	Low	High
Physical Properties				
Viscosity, SUS (at 100°F)	87	837	143	330
API gravity (at 60°F)	19.1	31.3	25.7	26.2
Specific gravity	0.9396	0.8692	0.9002	0.8972
Water, vol %	0.2	33.8	0.1	4.6
Bottom sediment and water, vol %	0.1	42	--	--
Flashpoint, °F	174	430	315	--
Carbon residue, wt %	1.82	4.43	--	--
Ash, sulfated, wt %	0.03	6.43	3.2	5.9[b]
Benzene insolubles, wt %	0.56	3.33	--	--
Gasoline dilution, vol %	2.0	9.7	--	--
Heating value, Btu/lb	13,580	19,316	17,268	18,008
Chemical Properties				
Fatty oils, wt %	--	--	0	60
Chlorine, wt %	0.17	0.47	<0.1	0.83
Sulfur, wt %	0.17	1.09	0.54	1.03
Zinc, ppm	260	1,787	--	--
Calcium, ppm	211	2,291	--	--
Barium, ppm	9	3,906	--	--
Phosphorus, ppm	319	1,550	--	--
Lead, ppm	85	21,676	--	--
Aluminum, ppm	<0.5	758	--	--
Iron, ppm	97	2,401	--	--

[a]Limited data available for used industrial oils.
[b]Values for industrial oils are for regular not sulfated ash.

Source: Kirk-Othmer (12)

reduce the fouling and corrosion of boiler heat exchange surfaces or emission of metallic contaminants that would result from waste oil combustion. In order to obtain a significant metallic contaminant removal, higher level advanced reprocessing techniques must be utilized (14).

Finally, a comparison of the properties of used automotive oils with virgin distillate and residual fuels is shown in Table 23. This table, in conjunction with Table 8, provides an overall picture of used oil composition

TABLE 22. POTENTIAL IMPACTS AND IMPACT RE
OF USING UNTREATED USED OIL AS

Property	Potential Impacts	
Specific gravity	Formation of concentration gradients when combined in storage tanks with distillate oils.	• Storag via co • Separa prior
Water	Fuel line freezing	• Use wi • Remova pretre
	Burner flameout	• Use wi flame.
	Inconsistent heating value	• Use fo tion. • Removal pretrea
Coarse solids	Sludge buildup in storage tank	• Storage moval d • Use wit sludge • Removal pretrea
	Line strainer fouling	• Removal level p
	Abrasion of positive displacement pump seals	• Separat port pr impelle • Removal pretrea
	Abrasion of burner nozzles	• Use wit • Removal pretrea
Ash forming materials	Health hazard to boiler-cleaning personnel	• Use of • Removal to use
	Scaling and corrosion of heat transfer surfaces	• Use in • Removal to use
	Hazardous emissions	• Use wit control • Removal to use
	Ash disposal problems	• Removal to use

Source: GCA Corporation (14)

BOILER PLANT 1703

WASTE OIL BOILER

90% LOAD	CO		O2		NOX	S/TEMP	A/TEMP	SO2	
1/19/94		8		5.8	141	490	84	78	
1/21/94		26		6.1	150	530	74	81	
1/31/94		6		6.9	144	408	59	66	
2/1/94		7		6.7	155	529	78	63	
LOW FIRE									
1/21/94		29		5.6	114	341	74	75	
1/31/94		3		8.1	108	206	59	52	
2/1/94		2		9.1	110	359	78	42	

12% CO_2 15% excess air

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS OGDEN AIR LOGISTICS CENTER (AFMC)
HILL AIR FORCE BASE, UTAH

18 July 1994

OO-ALC/EM
7274 WARDLEIGH ROAD
HILL AFB, UT 84056-5137

Mr. Russell A. Roberts
State of Utah
Division of Air Quality
P.O. Box 144820
Salt Lake City, Ut 84114-4820

Re: Waste Oil Boiler Approval Order DAQE-501-92

Dear Mr. Roberts

Stack testing of the waste oil boiler prior to startup from 19 January to 1 February 1994 showed that the emissions of NO_X and SO_X were above the limits of the Approval Order.

An analysis of the waste oil indicates an average content of 0.21% fuelbound nitrogen and a sulfur content of 0.2%. As the fuelbound nitrogen content varies depending on the composition of the waste oil, we expect a nitrogen content up to 0.3%. The NO_X emissions for this nitrogen content are calculated to 240 ppm by the manufacturer (Atch.1). As low NO_X burners are not available for firing waste-oil and natural gas in a dual burner, this boiler has the Best Available Control Technology concerning the NO_X-Emissions.

Calculations of the annual emissions are included as Atch. 2. According to our new calculations, the increase of the emissions is less than 1 ton per year over the current Approval Order.

We request a change of the Approval Order to the following limits while burning waste oil.

-240 ppm NO_X or nitrogen content not greater than 0.3 percent.
-sulfur content not greater than 0.5 percent

Compliance with the content requirements above can be done by testing the waste oil in the tank before transfering it to the boiler feed tank.

Burning of the waste oil could be limited to 100,000 gal per year. With a firing rate of 140 gal/hr the waste oil boiler will run only 27 days a year for burning waste oil. The rest of the year the boiler will run with natural gas.

If you have any questions, please contact Mr. Andreas Zekorn at 777-0359

Sincerely

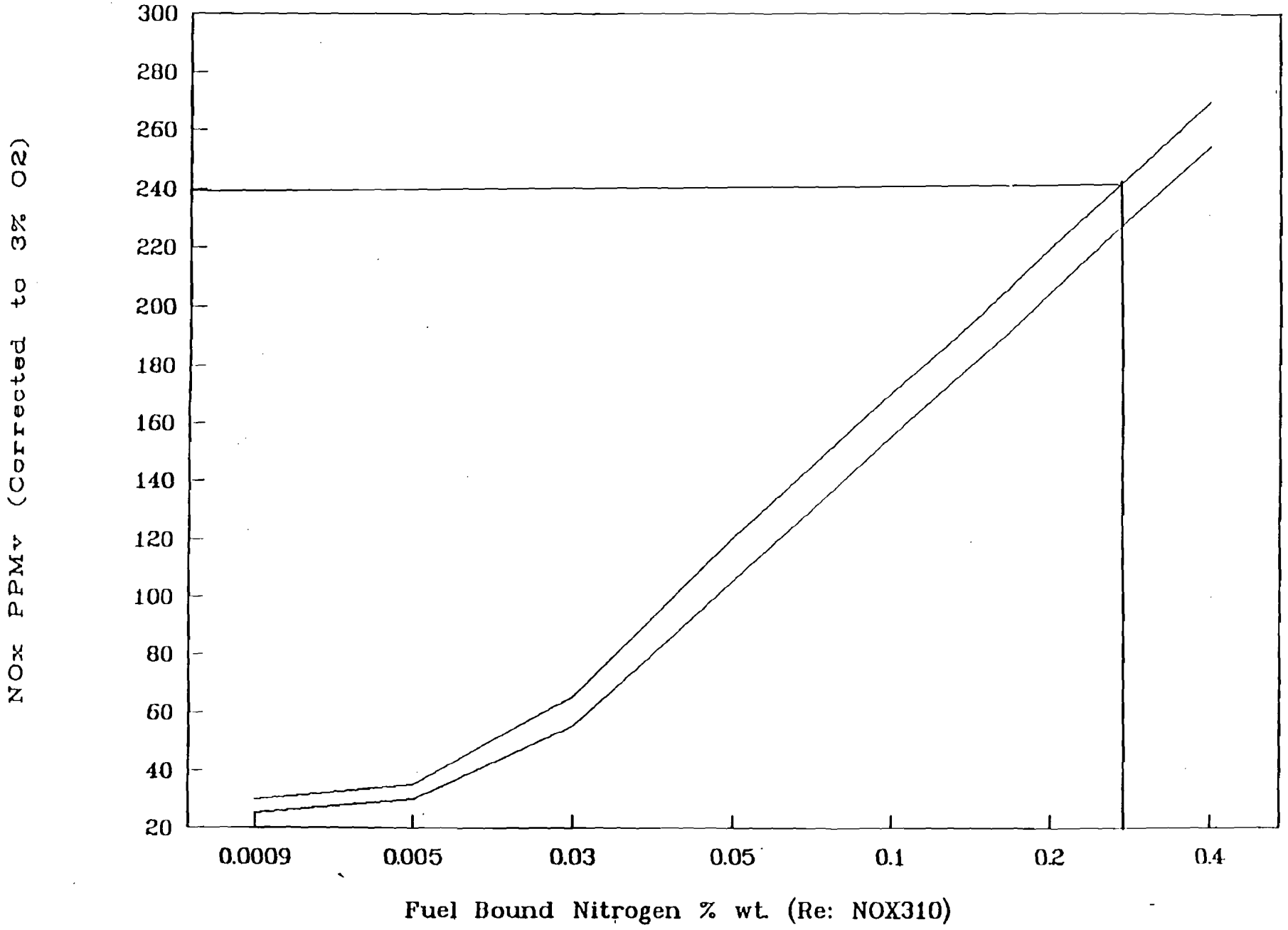
James R. VanOrman

JAMES R. VAN ORMAN
Director of Environmental Management

Attachments
NO_X Emissions Chart
Calculation NO_X
Calculation SO_X

NOx EMISSIONS FIRING LIQUID FUEL

I.C. Low NOx Burner



4.2.4-461

Calculation NOX

Molecular weight for NOX :	46	lb/lb Mole
S-Factor for waste oil :	12200	SCF/MMBTU
S-Factor for Natural Gas :	11990	SCF/MMBTU
	2.64E-03	lb Mole/SCF NOX
HHV of oil :	133000	BTU/gal oil
HHV of Gas :	1000	BTU/SCF
Firing rate Natural Gas :	350	SCF/min
Firing rate Waste Oil :	140	gal/hr
Heat Input :	20.9	MMBTU/Hr
Max Oil Firing :	100000	gal/yr
Max Gas Firing :	7985	hr/yr
Emissionlimit Waste-Oil:	**240**	**ppmv**
Emissions Natural Gas:	**70**	**ppmv**

Combustion of Waste Oil

0.047 lb NOX/Gal
6.617 lb NOX/hr
0.355 lb NOX/MMBTU
2.363 tons/yr

2.800 lb NOX/hr AP 42
1.000 tons NOX/yr AP 42

Combustion of Natural Gas

2.129 lb NOX/hr
0.102 lb NOX/MMBTU
8.500 tons/yr

2.100 lb NOX/hr AP 42
8.384 tons NOX/yr AP 42

Combustion of Waste Oil

Calculation of lb NOX / Gal Oil

$$\frac{240\ \text{SCF NOX}}{1.00\text{E+06}\ \text{SCF Flue Gas}} \times \frac{12200\ \text{SCF Flue Gas}}{1.00\text{E+06}\ \text{BTU}} \times 2.64\text{E-03}\ \frac{\text{lb Mole}}{\text{SCF NOX}} \times 46\ \frac{\text{lb}}{\text{lb Mole}} \times 133{,}000\ \frac{\text{BTU}}{\text{gal Oil}}$$

0.047 lb NOX/Gal

Calculation of lb NOX / hr

0.047 lb NOX/Gal X 140 gal/hr =

6.617 lb NOX/hr

Calculation of lb NOX / MMBTU

$$\frac{240\ \text{SCF NOX}}{1.00\text{E+06}\ \text{SCF Flue Gas}} \times 12200\ \frac{\text{SCF Flue Gas}}{\text{MMBTU}} \times 2.64\text{E-03}\ \frac{\text{lb Mole}}{\text{SCF NOX}} \times 46\ \frac{\text{lb}}{\text{lb Mole}}$$

0.355 lb NOX/MMBTU

Calculation of tons NOX / yr

0.047 lb NOX/Gal X 100000 gal/yr X $\frac{1\ \text{tons}}{2000\ \text{lb}}$ =

2.363 tons/yr

Combustion of Natural Gas

Calculation of lb NOX / MMBTU

$$\frac{70 \text{ SCF NOX}}{1.00\text{E+}06 \text{ SCF Flue Gas}} \times \frac{11990 \text{ SCF Flue Gas}}{\text{MMBTU}} \times \frac{2.64\text{E-}03 \text{ lb Mole}}{\text{SCF NOX}} \times \frac{46 \text{ lb}}{\text{lb Mole}}$$

0.102 lb NOX/MMBTU

Calculation of lb NOX / SCF

$$0.102 \frac{\text{lb NOX}}{\text{MMBTU}} \times \frac{1000 \text{ BTU}}{\text{SCF}} =$$

101.868 lb NOX/SCF

Calculation of lb NOX / hr

$$0.102 \frac{\text{lb NOX}}{\text{MMBTU}} \times \frac{20.9 \text{ MMBTU}}{\text{hr}} =$$

2.129 lb NOX/hr

Calculation of tons NOX / yr

$$2.1290 \frac{\text{lb}}{\text{hr}} \times \frac{7985 \text{ hr}}{\text{yr}} \times \frac{1 \text{ tons}}{2000 \text{ lb}} =$$

8.500 tons/yr

Calculation of NOX using AP 42 Emissionfactors

Emissionfactor Nitrogen Oxides Waste Oil : 20 lb/1000 gal
Emissionfactor Nitrogen Oxides Natural Gas : 100 lb/mill SCF

Combustion of Waste Oil

$\frac{20}{1000}$ lb/gal X 140 gal/hr = **2.800 lb NOX/hr**

Calculation of tons NOX / yr

$\frac{20}{1000}$ lb/gal X 100000 gal/yr X $\frac{1}{2000}$ tons/lb =

1.000 tons NOX/yr

Combustion of Natural Gas

$\frac{100}{1000000}$ lb/SCF X 350 SCF/min X 60 min/hr =

2.100 lb NOX/hr

Calculation of tons NOX / yr

2.100 $\frac{lb}{hr}$ X 7985 $\frac{hr}{yr}$ X $\frac{1}{2000}$ tons/lb =

8.384 tons NOX/yr

Calculation SOX

Molecular weight for SOX :	64	lb/lb Mole
S-Factor for waste oil :	12200	SCF/MMBTU
S-Factor for Natural Gas :	11990	SCF/MMBTU
	2.63E-03	lb Mole/SCF SOX
HHV of oil :	133000	BTU/gal oil
HHV of Gas :	1000	BTU/SCF
Firing rate Natural Gas :	350	SCF/min
Firing rate Waste Oil :	140	gal/hr
Heat Input :	20.9	MMBTU/Hr
Max Oil Firing :	100000	gal/yr
Max Gas Firing :	7985	hr/yr
Emissionlimit in ppm :	**270**	**ppmv**
Emission Gas in ppm :	**0.34**	**ppmv**

Combustion of Waste Oil		**Combustion of Natural Gas**	
0.074 lb SOX/Gal			
10.330 lb SOX/hr		**0.014 lb SOX/hr**	
0.555 lb SOX/MMBTU		**0.001 lb SOX/MMBTU**	
3.689 tons/yr		**0.057 tons/yr**	
10.290 lb SOX/hr	AP 42	**0.013 lb SOX/hr**	AP 42
3.675 tons SOX/yr	AP 42	**0.050 tons SOX/yr**	AP 42

3.725 tons SOX/yr

Combustion of Waste Oil

Calculation of lb SOX / Gal Oil

$$\frac{270\ \text{SCF SOX}}{1.00\text{E+06}\ \text{SCF Flue Gas}} \times \frac{12200\ \text{SCF Flue Gas}}{1.00\text{E+06}\ \text{BTU}} \times \frac{2.63\text{E-03}\ \text{lb Mole}}{\text{SCF SOX}} \times \frac{64\ \text{lb}}{\text{lb Mole}} \times \frac{133{,}000\ \text{BTU}}{\text{gal Oil}}$$

0.074 lb SOX/Gal

Calculation of lb SOX / hr

0.074 lb SOX/Gal X 140 gal/hr =

10.330 lb SOX/hr

Calculation of lb SOX / MMBTU

$$\frac{270\ \text{SCF SOX}}{1.00\text{E+06}\ \text{SCF Flue Gas}} \times \frac{12200\ \text{SCF Flue Gas}}{\text{MMBTU}} \times \frac{2.63\text{E-03}\ \text{lb Mole}}{\text{SCF SOX}} \times \frac{64\ \text{lb}}{\text{lb Mole}}$$

0.555 lb SOX/MMBTU

Calculation of tons SOX / yr

$$0.074\ \text{lb SOX/Gal} \times 100000\ \text{gal/yr} \times \frac{1\ \text{tons}}{2000\ \text{lb}} =$$

3.689 tons/yr

Combustion of Natural Gas

Calculation of lb SOX / MMBTU

$$\frac{0.34\ \text{SCF SOX}}{1.00\text{E+06}\ \text{SCF Flue Gas}} \times \frac{11990\ \text{SCF Flue Gas}}{\text{MMBTU}} \times \frac{2.63\text{E-03}\ \text{lb Mole}}{\text{SCF SOX}} \times \frac{64\ \text{lb}}{\text{lb Mole}}$$

0.001 lb SOX/MMBTU

Calculation of lb SOX / SCF

$$0.001\ \frac{\text{lb SOX}}{\text{MMBTU}} \times \frac{1000\ \text{BTU}}{\text{SCF}} =$$

0.687 lb SOX/SCF

Calculation of lb SOX / hr

$$0.001\ \frac{\text{lb SOX}}{\text{MMBTU}} \times \frac{20.9\ \text{MMBTU}}{\text{hr}} =$$

0.014 lb SOX/hr

Calculation of tons SOX / yr

$$0.0143\ \frac{\text{lb}}{\text{hr}} \times \frac{7985\ \text{hr}}{\text{yr}} \times \frac{1}{2000}\ \frac{\text{tons}}{\text{lb}} =$$

0.057 tons/yr

Calculation of SOX using AP 42 Emissionfactors

Emissionfactor Sulfur Dioxide Waste Oil : 147 lb/1000 gal
Emisslonfactor Sulfur Dioxide Natural Gas : 0.6 lb/mill SCF
Sulfurcontent in Waste Oil : 0.5 %

Combustion of Waste Oil

$\frac{147}{1000}$ lb/gal X 140 gal/hr X 0.5 = **10.290 lb SOX/hr**

Calculation of tons SOX / yr

$\frac{147}{1000}$ lb/gal X 100000 gal/yr X $\frac{1}{2000}$ tons/lb X 0.5 = **3.675 tons SOX/yr**

Combustion of Natural Gas

$\frac{0.6}{1000000}$ lb/SCF X 350 SCF/min X 60 min/hr =

0.013 lb SOX/hr

Calculation of tons SOX / yr

0.013 $\frac{lb}{hr}$ X 7985 $\frac{hr}{yr}$ X $\frac{1}{2000}$ tons/lb =

0.050 tons SOX/yr

HILL AIR FORCE BASE, UTAH 84056-5

Montie R. Keller, Manager Technical Evaluation
Bureau of Air Quality
1950 West North Temple
Salt Lake City, Utah 84116-0690

RE: Intent to Approve Waste Oil Boiler, Building 1703
(BAQE-201-91) Request for an Extension of Comment Period

Dear Mr Keller

We request an extension of comment period to 11 May, 1991 to allow us to fully evaluate and comment on condition 9 of the referenced Intent to Approve. We will request a meeting to discuss this matter with you.

Sincerely

James R. Van Orman
James R. Van Orman
Director of Environmental Management

DON - They have a problem with our 2-3 ppm limit on cadmium (they want ~10 ppm). They want more time to evaluate (no problem). They want to know the basis of our ppm limits.

Approved
Orig

[redacted]

AFLC COMBAT STRENGTH THROUGH LOGISTICS

4.2.4-470

04/25/91 13:11 801 777 4308 OO-ALC/EM → Air Quality 001

UTAH BUREAU OF AIR QUALITY
NEW/MODIFIED SOURCE PLAN REVIEW

James R. Van Orman
Director of Environmental Management
Department of the Air Force
Headquarters Ogden Air Logistic Center
Hill Air Force Base, Utah 84056-5990

RE:	Waste Oil Boiler and Two Tanks, Bldg 1703 Davis County CDS A1
ENGINEER:	J. Tim Blanchard
DATE:	February 25, 1991
NOTICE OF INTENT DATED:	March 27, 1990
PLANT CONTACT:	Jay Gupta
PHONE NUMBER:	(801) 777-7651
PLANT LOCATION:	Hill Air Force Base, Bldg 1703

FEES:

Filing Fee	$100.00
Review Engineer - 15 hours at $50.00/hour	$750.00
Modeler - 00 hours at $23.22/hour	$000.00
Computer Usage Fee	$000.00
Notice to Paper	$24.00
Travel - 00 miles at $0.23/mile	$000.00
Total	$874.00

APPROVALS:

Engineering Unit Manager DR 2-25-91

Applicant Contact Made JJB 3-18-91

Technical Evaluation Section Manager M. Keller 3/17/91

I. DESCRIPTION OF PROPOSAL

Hill Air Force Base has filed a notice of intent dated March 27, 1990. They are proposing to install and operate a boiler in Building 1703. The proposed boiler will be equipped with a dual burner capable of firing waste oil and natural gas. The proposed boiler will use natural gas as the primary fuel. Waste oil will be burned as it is available. As a part of the base waste minimization plan, HAFB is proposing to burn waste oil in the proposed boiler and recover generated heat for process steam.

The boiler will have the following equipment/parameters:

A. 500 hp Scotch Marine 3 Pass

B. Low NO_x rated dual burner

C. Two (2) existing 20,000 gallon waste oil storage tanks

D. Oil filtration system

E. Associated piping

F. Chemical feed pump, chemical mixing tank, appropriate tie-ins to existing feed water, natural gas line systems, and controls and alarms

Waste oil will be collected in two existing 20,000 gallon tanks located approximately 2 miles from the boiler. One tank will be used at a time to accept waste oil from throughout the base. The following will contribute to the waste oil used:

A. PD 680 Solvent (15%)

B. Turbine engine oil (11%)

C. JP-4 Turbine engine oil (13%)

D. Waste crank case oil (19%)

E. Hydraulic fluid (25%)

F. Purge Fluid (17%)

Waste oil is collected from the sources in 55 gallon drums and will be tested in bulk for halogen content using the Blastine Test. Waste oil passing this test will be pumped into the waste oil collection tank. Once the waste oil collection tank is full, a sample will be taken from the tank for a metal and halogen test. If no halogenated solvents are found and metals are within permit limits, the waste oil will be transferred to the boiler fuel tank and burned.

Building 1703 has two existing 250 hp gas-fired boilers which will continue to operate on natural gas. The following numbers only describe the proposed waste oil boiler operation:

A. Annual operating hours

1) 645 hours per year for the waste oil operation
2) 7,985 hours per year for the natural gas operation

B. Proposed boiler capacity - 20.9 x 10^6 BTU/hr

C. Fuel - natural gas/waste oil

D. Heating values

1) 133,000 BTU/gallon of waste oil
2) 1000 Btu/scf of natural gas

E. Fuel input

1) 155 gallons of waste oil per hour
2) 20,900 scf of natural gas per hour

F. Stack diameter - 28 inches

G. Stack height - 30 feet above ground

II. EMISSION SUMMARY

The emissions from this new emission point will be as follows:

Particulate	2.85	tons/year
PM_{10}	2.85	tons/year
SO_2	6.72	tons/year
NO_x	9.85	tons/year
CO	3.17	tons/year
VOC	0.33	ton/year
Barium	0.0008	ton/year
Cadmium	0.0013	ton/year
Chromium	0.0011	ton/year
Lead	0.0358	ton/year

III. BEST AVAILABLE CONTROL TECHNOLOGY (BACT) ANALYSIS

BACT will be required for all emission points. This includes both the boiler and the waste oil tank.

Boiler

The proposed boiler is equipped with a low NO_x designed burner that is guaranteed by the manufacturer for 75 ppmv or less for NO_x emissions. This low NO_x designed burner is recommended as BACT for the proposed boiler. The boiler must be properly maintained and operated in good working condition.

The use of waste oil fuel which meets the sulfur standards established in 40 CFR Part 60 Subpart Dc is required. For fuel oils, the NSPS standard is 0.50 lb of sulfur dioxide per million BTU heat input. Regarding metal contents, the oil must meet the specifications which are outlined in 40 CFR 266, Subpart E, "Used Oil Burned for Heat Recovery".

Section 1.132, UACR defines the term "significant". No. 2b in the definition states the following:

> "For purposes of Section 3.6, it shall also mean:
>
> b. In reference to a net emission increase or the potential of a source to emit a pollutant subject to regulation under the Clean Air Act not listed above, any emission rate."

Therefore, if HAFB already had a PSD permit, this would be a significant emission increase under PSD. The engineering section recommends that BACT for the metals emissions be compliance with 40 CFR 266, Subpart E and a consumption limitation as proposed.

The quantities of CO, VOC, SO_2 and PM_{10} annual emissions listed in Section II are such that it is not cost effective to install control systems for these pollutants. It is recommended that BACT for these listed pollutants be the proper operation and maintenance of the boiler in accordance with the manufacturer's instructions.

Waste Oil Tank

The only pollutant in question here is VOC emissions. Emissions associated with the waste oil tanks are from tank breathing losses and working losses. Due to the low true vapor pressure of waste oil (less than 1.50 psia), and the small tank sizes, the engineering section recommends that BACT for these two tanks be a fixed roof tank. A vapor recovery system is not cost effective for tanks with these amounts of proposed emissions.

IV. APPLICABILITY OF FEDERAL AND UTAH AIR CONSERVATION REGULATIONS (UACR)

This notice of intent is for a modification to an existing major source. It is not a new major source or a major modification. The following federal and state regulations have been examined to determine their applicability to this notice of intent:

1. Section 3.1.1, UACR - Notice of intent required for a modification. This regulation applies.

2. Section 3.1.8, UACR - Application of best available control technology (BACT) required at all emission points. This regulation applies.

3. Section 3.1.9, UACR - Rules for relocation of temporary sources. This source is a permanent source. Therefore, this regulation does not apply.

4. Section 3.1.10, UACR - Additional information requirements for a new major source or major modification which emits precursors of ozone and impacts an area of nonattainment for ozone. This notice of intent does not represent a new major source or a major modification. Therefore, this regulation does not apply.

5. Section 3.2, UACR - Particulate emission limitations for existing sources which are located in a nonattainment area. HAFB is listed in this regulation. As of the date of the regulation, the boilers are limited to 20% opacity. This new boiler is not listed in this regulation. Therefore, this regulation does not apply.

6. Section 3.3.1, UACR - Emission limitations for new major sources or major modifications which are located in a nonattainment area or which impact a nonattainment area. This notice of intent does not represent a new major source. Therefore, this regulation will not apply.

7. Section 3.3.2, UACR - Review requirements for new major sources or major modifications which are located in a nonattainment area or which impact a nonattainment area. This notice of intent does not represent a new major source or a major modification. Therefore, this regulation will not apply.

8. Section 3.5, UACR - Emission inventory reporting requirements. This regulation requires any source which emits 25 tons or more per year of any pollutant to submit an emission inventory to the Bureau of Air Quality every year. HAFB must comply with this regulation. Therefore, HAFB shall include emissions from sources listed in this approval order in its annual emission inventory.

9. Section 3.6.5(b), UACR - Prevention of significant deterioration (PSD) review requirements for new major sources or major modifications. This notice of intent does not represent a major source or a major modification under PSD rules. Therefore, this regulation does not apply.

10. Section 3.8, UACR - Stack height rule. This regulation limits the creditable height of stacks to that height determined to be good engineering practice. The formulas used to determine good engineering practice are found in 40 CFR 51.1. A de minimums height of 65 meters (213.2 feet) is allowed. This proposed boiler does not have stacks which exceed 65 meters in height. It is in compliance with this regulation.

11. Section 3.11, UACR - Visibility screening analysis requirements. This regulation requires all new major sources or major modifications to undergo a visibility screening analysis to determine visibility impact on any mandatory Class I area. This notice of intent does not represent a new major source or a major modification under UACR rules. Therefore, this regulation does not apply.

12. Section 4.1.2, UACR - 20% opacity limitation at all emission points unless a more stringent limitation is required by New Source Performance Standards (NSPS) or BACT or National Emission Standards for Hazardous Air Pollutants (NESHAPS). This regulation applies.

13. Section 4.1.9, UACR - EPA Method 9 to be used for visible emission observations. This regulation applies.

14. Section 4.2.1, UACR - Sulfur content limitations in oil and coal used for combustion. This notice of intent does contain oil combustion. However, the limitation actually imposed (0.5% sulfur by weight) is more stringent and takes precedence.

15. Section 4.7, UACR - Unavoidable breakdown reporting requirements. This regulation applies.

16. Section 4.9, UACR - Review requirements for volatile organic compound (VOC) sources located in a nonattainment area for ozone. The waste oil combustion is not covered in this regulation. The capacity of the waste oil storage tank is less than the regulated capacity of 40,000 gallons, and the true vapor pressure is less than 1.52 psia. This regulation will not apply.

17. Section 5, UACR - Emergency episode requirements. This regulation applies.

18. National Emission Standards for Hazardous Air Pollutants (NESHAPS) - There are no NESHAPS for this notice of intent.

19. National Ambient Air Quality Standards (NAAQS) - This source is located in Davis County, which is a nonattainment for ozone. The Bureau of Air Quality guidelines does not call for this source modification to be modeled for any pollutant. The Bureau has found through experience that, because of the small increase in quantity of emissions involved and the conservative predictions made by modeling, a source or emission point of this small increase is very unlikely to cause a new violation of the NAAQS.

20. 40 CFR 60.40c to 60.48c, NSPS, Subpart Dc, Standards of Performance for Small Industrial-Commercial-Institutional Steam Generating Units - This regulation applies. The effective date is June 9, 1989. An affected facility is each steam generating unit for which construction, modification, or reconstruction commenced after June 9, 1989 and that has a maximum design heat input capacity of 100 million BTU/hr or less, but greater than 10 million BTU/hr. The heat input is 20.9 million BTU/hr. The standards are as follows:

Sulfur Dioxide

If oil is the only fuel, no owner/operator shall cause to be discharged into the atmosphere any gases which contain SO_2 in excess of 0.50 lb per million BTU heat input.

Particulate

If oil is the only fuel and the heat input is 30 million BTU/hr or less but greater than 10 million BTU/hr, there is no standard. There are also recordkeeping requirements.

21. 40 CFR 60.110b to 60.117b, NSPS, Subpart Kb, Standards of Performance for Volatile Organic Liquid Storage Vessels (Including Petroleum Liquid Storage Vessels) for Which Construction, Reconstruction, or Modification Commenced after July 23, 1984. This regulation applies to the following tanks:

A. Storage capacity greater than or equal to 151 cubic meters (40,000 gallons) with a volatile organic liquid whose true vapor pressure is from 5.2 kPa to 76.6 kPa

B. Storage capacity greater than or equal to 75 cubic meters but less than 151 cubic meters (40,000 gallons) with a volatile organic liquid whose true vapor pressure is from 27.6 kPa to 76.6 kPa

This regulation will not apply to these two tanks.

22. 40 CFR 60.14, Definition of Modification - Any physical or operational change to an existing facility which results in an increase in the emission rate to the atmosphere of any pollutant to which an NSPS standard applies. The following are not by themselves considered modifications:

1) Maintenance, repair, and replacement

2) An increase in production rate of an existing facility, if that increase can be accomplished without a capital expenditure on that facility

3) An increase in the hours of operation

4) Use of an alternative fuel or raw material if, prior to the date any standard under this part becomes applicable to that source type, as provided by 60.1, the existing facility was designed to accommodate that alternative use

5) The addition or use of any system or device whose primary function is the reduction of air pollutants

6) Relocation or change in ownership

This notice of intent is a modification under this rule.

V. RECOMMENDED APPROVAL ORDER CONDITIONS

1. Hill Air Force Base shall install and operate the waste oil fired boiler rated at 20.9 million BTU/hr in Building 1704 according to the information submitted in the notice of intent dated March 27, 1990 and additional information submitted to the Executive Secretary dated October 31, 1990. The boiler shall be a dual fuel boiler with the capability of burning waste oil. A copy of this approval order shall be posted on site and shall be available to the employees who operate the air emission producing equipment. All employees who operate the air emission producing equipment shall receive instruction as to their responsibilities in operating the equipment in compliance with the appropriate and relevant conditions.

2. The approved installation shall consist of the following equipment:

A. 500 hp Scotch Marine 3 Pass boiler or equivalent complete with dual (natural gas and waste oil) burner - Equivalency shall be determined by the Executive Secretary.

B. Oil filtration system; and

C. Associated piping, control, and alarms, chemical feed pump, chemical mixing tank, and appropriate tie-ins to existing feed water and natural gas line systems.

3. Visible emissions from the boiler shall not exceed 20% opacity. Opacity observation of emissions from stationary sources shall be conducted in accordance with 40 CFR 60, Appendix A, Method 9.

4. The following fuel consumption limits for the boiler shall not be exceeded without prior approval in accordance with Section 3.1, UACR:

   A. Waste oil consumption - 100,000 gallons per 12 month period

   B. Natural gas consumption - 166.89 x 10^6 scf per 12 month period

   Compliance with the annual limitations shall be determined on a rolling 12 month total. Based on the first day of each month a new 12-month total shall be calculated using the previous 12 months. Records of consumption shall be kept for all periods when the plant is in operation. Records of consumption shall be made available to the Executive Secretary or his representative upon request and shall include a period of two years ending with the date of the request. Natural gas fuel consumption shall be determined by the use of records from a fuel meter. Waste oil consumption for the boiler shall be determined by the use of records from the waste oil transfer log. The records shall be kept on a daily basis. Hours of operation shall be determined by supervisor monitoring and maintaining of an operations log.

5. The emissions of sulfur dioxide from the boiler while burning waste oil shall not exceed 0.50 lb per million BTU heat input.

6. Stack testing to show compliance with the emission limitation of condition #5 shall be performed as specified below:

   Testing Status

   Initial compliance testing is required. The initial test date shall be within 180 days after the start up of a new emission source.

   Notification

   The applicant shall provide a notification of the test date at least 45 days prior to the test. A pretest conference shall be held if directed by the Executive Secretary. It shall be held at least 30 days prior to the test between the owner/operator, the tester, and the Executive Secretary. The emission point shall be designed to conform to the requirements of 40 CFR 60, Appendix A, Method 1, and Occupational Safety and Health Administration (OSHA) or Mine Safety and Health Administration (MSHA) approvable access shall be provided to the test location.

Sample Location

40 CFR 60. Appendix A, Method 1

Volumetric flow rate

40 CFR 60, Appendix A, Method 2

SO_2

40 CFR 60, Appendix A, Method 6 or 19

Calculations

To determine mass emission rates (lbs/hr, etc.), the pollutant concentration as determined by the appropriate methods above shall be multiplied by the volumetric flow rate and any necessary conversion factors determined by the Executive Secretary to give the results in the specified units of the emission limitation.

Source Operation

For a new source/emission point, the production rate during all compliance testing shall be no less than 90% of the production rate at which the facility will be operated.

7. The ash content of any waste oil burned shall not exceed 0.65 percent by weight. The ash content shall be tested using the appropriate ASTM method if directed by the Executive Secretary.

8. The waste oil used for fuel shall contain no more than 1000 ppm by weight of total halogen. The halogen content shall be tested by ASTM Method D-808-81 before waste oil is transferred to the boiler tank and burned.

9. The following element limitations ~~of metal content~~ in waste oil shall not be exceeded:

A. Total halogens - 1000 ppm by weight
B. Cadmium - 2 ppm by weight
C. Chromium - 10 ppm by weight
D. Lead - 100 ppm by weight
E. Arsenic - 5 ppm by weight

The owner/operator shall provide test certification for each load of waste fuel oil from 55 gallon drums or bulk carrier. Certification shall be either by his own testing or test reports from a testing contractor. Records of waste fuel oil consumption and the test reports shall be kept for all periods when the plant is in operation. The records shall be made available to the Executive Secretary or his representative upon request, and shall include a period of two years ending with the date of the request.

10. In addition to the requirements of this approval order, all provisions of 40 CFR 60, NSPS Subparts A and Dc apply to this installation.

11. Eighteen months from the date of this approval order the Executive Secretary shall be notified in writing of the status of construction of this project unless the construction is complete and operation has commenced.

12. All installations and facilities authorized by this approval order shall be adequately and properly maintained.

13. The Executive Secretary shall be notified in writing upon start-up of the installation, as an initial compliance inspection is required.

Any future modifications to the equipment approved by this order must also be approved in accordance with Section 3.1.1, UACR.

This approval order in no way releases the owner or operator from any liability for compliance with all other applicable federal, state, and local regulations including the Utah Air Conservation Regulations.

Annual emissions for this boiler are calculated at 2.85 tons/yr for particulates, 2.85 tons/yr for PM_{10}, 6.72 tons/yr for SO_2, 9.85 tons/yr for NO_x, 3.17 tons/yr for CO, 0.33 tons/yr for VOCs, 0.0008 ton/yr for barium, 0.0013 for cadmium, 0.0011 ton/yr for chromium, and 0.0358 ton/yr for lead. These calculations are for the purposes of determining the applicability of PSD and nonattainment area major source requirements of the UACR. They are not to be used for purposes of determining compliance.

TIM.B
HAFB1703

CONTROLLED AND UNCONTROLLED EMISSION ESTIMATES FOR:

FILE: TOTALS
DATE: FEB-06-1991
TIME: 12:33:06 PM

SOURCE: TOTAL PROJECT EMISSION ESTIMATES
COMPANY NAME: DEPT. OF THE AIR FORCE
LOCATION: HILL AFB - BLDG 1703 - DUAL FUEL BOILER

	CONTROLLED					UNCONTROLLED	
	HOURLY			ANNUAL			
	LBS/HR	GRAMS/SEC	TONS/YR	GRAMS/SEC	% CNTRL	LBS/HR	TONS/YR
TSP	8.0	1.0031	3.0	0.0849		8.0	3.0
PM-10	8.0	1.0031	3.0	0.0849		8.0	3.0
SOX	20.4	2.5755	6.6	0.1910		20.4	6.6
NOX	3.9	0.4905	7.0	0.2016		3.9	7.0
CO	1.5	0.1912	3.2	0.0913		1.5	3.2
VOC non METHANE	0.1	0.0154	0.3	0.0096		0.1	0.3
VOC METHANE	0.2	0.0277	0.3	0.0087		0.2	0.3
ALDEHYDES	0.0	0.0000	0.0	0.0000		0.0	0.0
HCl							
ARSENIC							
BARIUM	0.00	0.0003	0.00	0.0000		0.00	0.00
CADMIUM	0.00	0.0005	0.00	0.0000		0.00	0.00
CHROMIUM	0.00	0.0004	0.00	0.0000		0.00	0.00
COPPER							
LEAD	0.11	0.0140	0.04	0.0010		0.00	0.0
MANGANESE							
MERCURY							
NICKEL							
FORMALDEHYDE							
POLYCYCLIC ORGANIC MATTER (POM'S)							
	pCi/HR		pCi/YR			pCi/HR	pCi/YR
THORIUM-232							
URANIUM-235							

pCi = PICOCURIE = 10^-6 CURIES (A MEASURE OF RADIATION)

THIS TOTAL IS THE TOTAL OF THE FOLLOWING SUBTOTALS:

CONTROLLED AND UNCONTROLLED EMISSION ESTIMATES FOR:

FILE: AP1-3IR
DATE: FEB-08-1991
TIME: 12:33:06 PM

SOURCE: BOILER - WASTE OIL COMBUSTION
COMPANY NAME: DEPT. OF THE AIR FORCE
LOCATION: HILL AFB - BLDG 1703 - DUAL FUEL BOILER

	CONTROLLED					UNCONTROLLED	
	HOURLY		ANNUAL				
	LBS/HR	GRAMS/SEC	TONS/YR	GRAMS/SEC	% CNTRL	LBS/HR	TONS/YR
TSP	7.86	0.9900	2.5	0.0729	0.00	7.9	2.5
PM10	7.86	0.9900	2.5	0.0729	0.00	7.9	2.5
SOx	20.43	2.5739	6.6	0.1895	0.00	20.4	6.6
NOx	2.33	0.2930	0.8	0.0216	0.00	2.3	0.8
CO	0.79	0.0990	0.3	0.0073	0.00	0.8	0.3
VOC, non-METH	0.04	0.0055	0.0	0.0004	0.00	0.0	0.0
METHANE	0.16	0.0198	0.1	0.0015	0.00	0.2	0.1

AP-42 FOURTH EDITION SEPT. 1985 VOLUME 1
SECTION 1 EXTERNAL COMBUSTION SOURCES
1.3 FUEL OIL COMBUSTION
TABLE 1.3-1 FUEL OIL COMBUSTION
INDUSTRIAL BOILER (10 MMBTU/HR TO 100 MMBTU/HR) USING WASTE OIL

EMISSION FACTORS: (IN POUNDS PER 1000 GALLONS OF FUEL OIL COMBUSTED)			COMMENTS
P	50.00	LB/10^3GAL	BASED ON 0.65% ASH CONTENT
PM10	50.0	LB/10^3GAL	PM10 = (% <= 10um)*(TSP)
% <= 10um	100.0	% PASS	FROM TABLE 1.3-3
SOx	130.00	LB/10^3GAL	BASED ON 0.5% SULFUR CONTENT
% SULFER BY WEIGHT ALLOWED (s)	0.50	%	NSPS SUBPART Dc
SULFUR ALLOWED BY UACR 4.2 (S)	0.50	LB/MMBTU	FROM UACR SECTION 4.2
OIL HEAT VALUE (Hc)	133000.0	BTU/GAL	FROM AP42 PAGE A-3
FUEL OIL DENSITY (Dc)	6.66	LB/GAL	
NOX	14.8	LB/10^3GAL	FROM NOI
CO	5.0	LB/10^3GAL	FROM TABLE 1.3-1
NON METHANE VOC	0.28	LB/10^3GAL	FROM TABLE 1.3-1
METHANE	1.000	LB/10^3GAL	FROM TABLE 1.3-1
FUEL OIL CONSUMPTION	0.157	K GAL/HR	(MMBTU/HR)/(BTU/GAL)*(1E6)/(1000)
(MMBTU/HR)(HR/YR)/(BTU/GAL)	100.0	K GAL/YR	FROM NOI
MMBTU/HR	20.9	MMBTU/HR	FROM NOI
HP	500	HP	FROM NOI
BOILER % EFFICIENCY	80	%	FROM NOI

HOURS OF OPERATION AO CONDITIONS

HOURS PER DAY	24.0	HRS/DAY	FROM NOI
DAYS PER WEEK	7.0	DAYS/WEEK	FROM NOI
WEEKS PER YEAR	52.0	WEEKS/YR	FROM NOI
HRS PER YEAR	845.0	HRS/YR	FROM NOI

CONTROLLED AND UNCONTROLLED EMISSION ESTIMATES FOR:

FILE: AP1-3IR
DATE: FEB-08-1991
TIME: 12:33:08 PM

SOURCE: BOILER - WASTE OIL COMBUSTION
COMPANY NAME: DEPT. OF THE AIR FORCE
LOCATION: HILL AFB - BLDG 1703 - DUAL FUEL BOILER

	CONTROLLED					UNCONTROLLED	
TRACE METALS	HOURLY LBS/HR	HOURLY GRAMS/SEC	ANNUAL TONS/YR	ANNUAL GRAMS/SEC	% CNTRL	LBS/HR	TONS/YR
ARSENIC	0.0000	0.0000	0.0000	0.0000	0.00	0.0000	0.0000
BARIUM	0.0026	0.0003	0.0008	0.0000	0.00	0.0000	0.0000
CADMIUM	0.0039	0.0005	0.0013	0.0000	0.00	0.0000	0.0000
CHROMIUM	0.0034	0.0004	0.0011	0.0000	0.00	0.0000	0.0000
COPPER	0.0000	0.0000	0.0000	0.0000	0.00	0.0000	0.0000
LEAD	0.1110	0.0140	0.0358	0.0010	0.00	0.0000	0.0000
MANGANESE	0.0000	0.0000	0.0000	0.0000	0.00	0.0000	0.0000
MERCURY	0.0000	0.0000	0.0000	0.0000	0.00	0.0000	0.0000
NICKEL	0.0000	0.0000	0.0000	0.0000	0.00	0.0000	0.0000
FORMALDEHYDE	0.0000	0.0000	0.0000	0.0000	0.00	0.0000	0.0000
POLYCYCLIC ORGANIC MATTER (POM'S)	0.0000	0.0000	0.0000	0.0000	0.00	0.0000	0.0000

SUMMARY OF TRACE EMISSIONS FROM AND RECOMMENDATIONS OF RISK AS
METHODOLOGIES FOR COAL AND OIL COMBUSTION SOURCES FINAL REPORT

FOLLOWING EMISSION FACTORS ARE UNCONTROLLED			COMMENTS
ARSENIC	0.0	LB/HR	FROM NOI
BARIUM	0.0	LB/HR	FROM NOI
CADMIUM	0.0	LB/HR	FROM NOI
CHROMIUM	0.0	LB/HR	FROM NOI
COPPER	0.0	LB/HR	FROM NOI
LEAD	0.1	LB/HR	FROM NOI
MANGANESE	0.0	LB/HR	FROM NOI
MERCURY	0.0	LB/HR	FROM NOI
NICKEL	0.0	LB/HR	FROM NOI
FORMALDEHYDE	0.0	LB/HR	FROM NOI
POLYCYCLIC ORGANIC MATTER (POM'S)	0.0	LB/HR	FROM NOI
FUEL OIL CONSUMPTION	0.2	K GAL/HR	(MMBTU/HR)/(BTU/GAL)*(1E6)/(1000)
OIL HEAT VALUE (HV)	133000.0	BTU/GAL	FROM AP42 TABLE A-3

CONTROLLED AND UNCONTROLLED EMISSION ESTIMATES FOR: FILE: AP1-4IND
DATE: FEB-08-1991
TIME: 12:33:06 PM

SOURCE: BOILER - NATURAL GAS FIRED
COMPANY NAME: DEPT. OF THE AIR FORCE
LOCATION: HILL AFB - BLDG 1703 - DUAL FUEL BOILER

	CONTROLLED					UNCONTROLLED	
	HOURLY		ANNUAL				
	LBS/HR	GRAMS/SEC	TONS/YR	GRAMS/SEC	% CNTRL	LBS/HR	TONS/YR
TOTAL PARTICULATE	0.105	0.0132	0.42	0.0120	0.0	0.10	0.42
PM-10	0.105	0.0132	0.42	0.0120	0.0	0.10	0.42
SOX	0.013	0.0016	0.05	0.0014	0.0	0.01	0.05
NOX	1.568	0.1975	6.26	0.1800	0.0	1.57	6.26
CO	0.732	0.0922	2.92	0.0840	0.0	0.73	2.92
VOC, non-METH	0.059	0.0074	0.23	0.0067	0.0	0.06	0.23
VOC, METH	0.063	0.0079	0.25	0.0072	0.0	0.06	0.25

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SECTION 1 EXTERNAL COMBUSTION SOURCES
1.4 NATURAL GAS COMBUSTION
TABLE 1.4-1 INDUSTRIAL BOILERS (10 - 100 MILLION BTU/HR)

EMISSION FACTORS: (IN LBS/MILLION CUBIC FEET OF GAS COMBUSTED)			COMMENTS
RTICULATE	5.0	LBS/MMCF	BAQ DEFAULT VALUE (FROM TABLE 1.4-1)
PM10	5.0	LBS/MMCF	NEDS SOURCE CLASSIFICATION CODES
SO2	0.6	LBS/MMCF	SULFUR CONTENT = 2000 GR/10^6 SCF
NOX	75.0	LBS/MMCF	FROM NOI
CO	35.0	LBS/MMCF	FROM TABLE 1.4-1
NON METHANE VOC	2.8	LBS/MMCF	FROM TABLE 1.4-1
METHANE	3.0	LBS/MMCF	FROM TABLE 1.4-1
GAS CONSUMPTION:	166.9	MMCF/YR	(MMCF/HR) * (HRS/YR)
MILLION CUBIC FEET PER HOUR	0.0	MMCF/HR	(MMBTU/HR)/(BTU/CUBIC FT)
BOILER CAPACITY RATING	20.9	MMBTU/HR	FROM NOI INFORMATION
FUEL HEAT CONTENT	1000.0	BTU/CU FT	FROM NOI INFORMATION

HOURS OF OPERATION AQ CONDITIONS

HOURS PER DAY	24	HRS/DAY
DAYS PER WEEK	7	DAYS/WEEK
WEEKS PER YEAR	52	WEEKS/YR
HOURS PER YEAR	7985	HRS/YR

CONTROLLED AND UNCONTROLLED EMISSION ESTIMATES FOR:

FILE: AP4-SEB12
DATE: FEB-08-1991
TIME: 12:33:06 PM

SOURCE: WASTE OIL TANK - TOTAL LOSS
COMPANY NAME: DEPT. OF THE AIR FORCE
LOCATION: HILL AFB - BLDG 1703 - DUAL FUEL BOILER

	CONTROLLED					UNCONTROLLED	
	HOURLY		ANNUAL				
	LBS/HR	GRAMS/SEC	TONS/YR	GRAMS/SEC	% CNTRL	LBS/HR	TONS/YR
VOC	0.020	0.00	0.087	0.00		0.020	0.087

TOTAL LOSSES FROM FIXED ROOF TANKS

Lt = Lb + Lw	173.734	LBS/YR
Lb = BREATHING LOSS	101.974	LBS/YR
Lw = WORKING LOSS	71.760	LBS/YR
TON/YR = (LB/YR)/(2000 LB/TON)	0.087	TON/YR

CONTROLLED AND UNCONTROLLED EMISSION ESTIMATES FOR:

FILE: AP4-3E01
DATE: FEB-08-1991
TIME: 12:33:08 PM

SOURCE: WASTE OIL TANK - BREATHING LOSS
COMPANY NAME: DEPT. OF THE AIR FORCE
LOCATION: HILL AFB - BLDG 1703 - DUAL FUEL BOILER

	CONTROLLED					UNCONTROLLED	
	HOURLY		ANNUAL				
	LBS/HR	GRAMS/SEC	TONS/YR	GRAMS/SEC	% CNTRL	LBS/HR	TONS/YR
VOC	0.012	0.0015	0.051	0.0015	0.0	0.012	0.051

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SECTION 4 EVAPORATION LOSS SOURCES
4.3 STORAGE OF ORGANIC LIQUID
4.3.2 EMISSIONS AND CONTROLS (FIXED ROOF TANKS)

BREATHING LOSS (Lb) IN POUNDS PER YEAR

$L_B = (2.26E\text{-}2)(M_V)((P/(P_a-P))^{0.68})(D^{1.73})(H^{0.51})(AVG\ T^{.50})(F_P)(C)(K_C)$ FROM EQUATION (1) PG. 4.3-5

(BREATHING LOSS) = ... 101.97 LBS/YR

M_V	130.0	LB/LB MOLE	MOLECULAR WT. OF STORAGE VAPOR, TABLE 4.3-2
P_a (ATMOSPHERIC PRESSURE AT TANK)	12.4	PSIA	$P_a = (29.9)/(10^{(e/62583.6263)})$
ELEVATION (e)	4,500.0	FEET	e = FEET ABOVE SEA LEVEL
P = TRUE VAPOR PRESSURE (FROM NOI)	0.230000	PSIA	AT AVE. ACTUAL LIQUID STORAGE TEMPERATURE
D	12.0	FT	D = TANK DIAMETER (FROM NOI)
H (FROM NOI)	11.8	FT	H = AVE. VAPOR SPACE HT. INCLUDING ROOF VOL
AVG T (FROM NOI)	10.0	DEG F	AVG T = AVE AMBIANT DIURNAL TEMP. CHANGE
F_P	1.0	-	F_P = PAINT FACTOR, FROM TABLE 4.3-1
C = ADJUSTMENT FACTOR FOR SMALL DIAMETER TANKS .	1.0	-	FROM FIGURE 4.3-4
Kc = PRODUCT FACTOR	0.6	-	SEE NOTE (4) PAGE 4.3-8

TON/YR = (LB/YR)/(2000 LB/TON)..... 0.051 TON/YR

CONTROLLED AND UNCONTROLLED EMISSION ESTIMATES FOR:

FILE: AP4-3E02
DATE: FEB-08-1991
TIME: 12:33:08 PM

SOURCE: WASTE OIL TANK - WORKING LOSS
COMPANY NAME: DEPT. OF THE AIR FORCE
LOCATION: HILL AFB - BLDG 1703 - DUAL FUEL BOILER

	CONTROLLED					UNCONTROLLED	
	HOURLY		ANNUAL				
	LBS/HR	GRAMS/SEC	TONS/YR	GRAMS/SEC	% CNTRL	LBS/HR	TONS/YR
VOC	0.008	0.0010	0.036	0.0010	0.0	0.008	0.036

AP-42 FOURTH EDITION SEPT. 1985 VOLUME I
SECTION 4 EVAPORATION LOSS SOURCES
4.3 STORAGE OF ORGANIC LIQUID
4.3.2 EMISSIONS AND CONTROLS (FIXED ROOF TANKS)
WORKING LOSS (LW) IN LBS/YR

= (2.40E-5)(Mv)(P)(V)(N)(Kn)(Kc)	71.7600	LBS/YR	EQUATION (2) PAGE 4.3-8
Mv	130.0	lb/lb-mole	MOLECULAR WT. OF STORAGE VAPOR, TABLE 4.3-2
P = TRUE VAPOR PRESSURE (FROM NOI)	0.230000	PSIA	AT AVE. ACTUAL LIQUID STORAGE TEMPERATURE
V	20000	GAL	V = TANK CAPACITY (IN GALLONS)
N = (NUMBER OF TURNOVERS PER YEAR)	5.000	PER YR	N = (Q)/(V)
Q	100,000	GAL/YR	Q = THROUGH-PUT IN GALLONS/YEAR
Kn = TURNOVER FACTOR	1.0	-	FROM FIGURE 4.3-7
Kc = PRODUCT FACTOR	1.0	-	SEE NOTE (1) ON PAGE 4.3-11
TON/YR = (LB/YR)/(2000 LB/TON)	0.036	TON/YR	