

MEDIUM TEMPERATURE FLARE CERTIFICATE

- 3rd party Factory Emission Testing has been performed on the **ABUTEC burner design** and results of 99.99% DRE was achieved on both PROPANE and Propylene (report is available upon request); testing was performed on the High Temperature Flare (model HTF).
- 3rd party Factory Emission Testing has been performed on the MTF 0.7 and MTF 2.7 units in the field by clients in the Eagleford and Bakken formations with greater than 98% DRE (tests performed by clients without ABUTEC receiving formal reports).
- ABUTEC's MTF design meets or exceeds 40 C.F.R. 60.18 in all sections and categories:
 - No Visible Emissions (reference Section c.1)
 - Thermocouples are used to prove flame present at all times during operation. If temp drops below 300 degrees F flare solenoid valve will close in less than a second to prevent venting of unburned gas. (reference section c.2)
 - Flare Controlled and monitored by Programmable Logic Controller. Several shutdown permissive programmed in for safe operation. (reference section c.2)
 - Flare solenoid valve is a fail closed design to prevent venting of gas in case of power interruption. (reference section c.2)
 - Deflagration flame arrestor (built into the system) with ATEX certification, Explosion Proof Category 3. To prevent the propagation of flame fronts back through lines and piping.
 - Flare designed to be used for gas with net heating values of 200 Btu/scf or greater.
 - Flare designed as natural draft (non-air assisted)
 - Flare designed for and operated with an exit velocity of less than 60ft/s (reference section 3.4).



CERTIFIED BY:

Richard A Smith
Vice President (Name)
(Title)

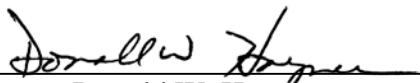
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(Date)

Emission Test Report
for one
ABUTEC 22.18 MMBtu/hr Combustor
Unit Number 22 MMBtu/hr (S/N 2011.166)
located at the
ABUTEC
Soddy-Daisy Plant
Soddy-Daisy, Hamilton County, Tennessee

Prepared for
ABUTEC
2959 Cherokee Street, Suite 101
Kennesaw, GA 30144

September 14, 2011
Nordon Project No. 11-0293

I certify, based on the information and belief formed after reasonable inquiry, the statements and information in this document are true, accurate, and complete.


Donald W. Haynes
Nordon Corporation

ABUTEC

 **NORDON** CORPORATION

LaDEQ LELAP Certification Number 02092

P. O. Box 1415 Round Rock, Texas 78680
Phone (512) 355-3786 Fax (512) 355-3785

Section 1: INTRODUCTION

1.1 Summary of Test Program

Exhaust emission testing was performed on one (1) ABUTEC 22.18 MMBtu/hr Combustor (Unit # 22 MMBtu/hr (S/N 2011.166)) located at the ABUTEC, Soddy-Daisy Plant. The Soddy-Daisy Plant is located near Soddy-Daisy, Hamilton County, Tennessee. Nordon Corporation of Round Rock, Texas, performed the exhaust emission testing on September 14, 2011.

This emission testing was performed to determine the mass emission rates of NO_x, CO, and non-methane VOC and to determine VOC destruction/reduction efficiency by measuring inlet flow rate and composition. The test methods used followed the principles and procedures set forth in the Code of Federal Regulations, Title 40, Part 60, Appendix A.

1.1.1 Owner/Operator: ABUTEC
2959 Cherokee Street, Suite 101
Kennesaw, GA 30144

1.1.2 Test Contractor: Nordon Corporation
P.O. Box 1415
Round Rock, Texas 78680
Attn: Don Haynes
Phone: (512) 355-3786
Fax: (512) 355-3785

1.1.3 Purpose of Test: To measure concentrations and mass emission rates of NO_x, CO, and VOC as well as VOC destruction efficiency.

1.1.4 Applicable Regulations:

1.1.5 Name of Plant: Soddy-Daisy Plant

1.1.6 Location: near Soddy-Daisy, Hamilton County, Tennessee.

1.1.7 Unit Tested: One ABUTEC 22.18 MMBtu/hr Combustor used to control VOC emissions. The unit is designated as the Unit # 22 MMBtu/hr (S/N 2011.166).

1.1.8 Test Dates: September 14, 2011

1.1.9 List of Analytes: NO_x (nitrogen oxides), CO (carbon monoxide), VOC (non-methane, volatile organic compounds), CO₂ (carbon dioxide) and O₂ (oxygen) and inlet gas composition. One inlet sample was taken during the test.

Table 3-2: Summary of Results - Maximum Capacity



P.O. Box 1415 Round Rock, Texas 78680
Phone (512) 355-3786 Fax (512) 355-3785

Plant: Soddy-Daisy Plant
Facility Owner: ABUTEC
Unit Owner: ABUTEC
Location: Soddy-Daisy, Hamilton County, Tennessee
Unit Make/Model: ABUTEC 22.18 MMBtu/hr Combustor
Unit Number: 22 MMBtu/hr, Ser. No. 2011.166
Test Personnel: DWH / HSJ / FTA
Date: September 14, 2011

Run Number	DH-91411.01	DH-91411.02	DH-91411.03	
Start Time	12:58	14:20	15:30	
Stop Time	13:58	15:20	16:30	
Combustor Operation				
Rated Capacity (MMBtu/hr)	22	22	22	
Percent of Rated Capacity (%)	99.1	99.1	100.3	
Inlet Gas Flow Rate, Mass Flow Meter (scfm)	146.3	146.2	148.0	
Inlet Gas Flow Rate (scfh)	8778	8772	8880	
Inlet Gas Flow Rate (Mscfd)	210.7	210.5	213.1	
Mid-Stack Temperature (°F)	2113	2151	2167	
Mid-Stack Temperature (°C)	1156	1177	1186	
Inlet VOC (propane) Mass Rate (lb/hr)	965.8	965.2	977.1	
Ambient Conditions				
Barometric Pressure (absolute In. Hg)	29.25	29.22	29.20	
Temperature Dry (°F)	89.0	89.0	91.0	
Temperature Wet (°F)	69.0	69.0	67.0	
Humidity (lb H ₂ O/lb Air)	0.0106	0.0106	0.0087	
Exhaust Flow Data				
Stoichiometric Exhaust Flow (dscfh)	6.97E+05	7.23E+05	7.05E+05	
M-2 Exhaust Flow Rate (dscfh)	3.53E+05	3.79E+05	3.80E+05	
O ₂ F factor (dscf/MMBtu)	8913	8913	8913	
Fuel Heating Value (Gross Btu/scf)	2484	2484	2484	
Heat Input (MMBtu/hr)	21.81	21.79	22.06	
Exhaust Gas Concentrations				AVERAGES
NO _x (ppmv, dry)	33.8	33.9	33.8	34
CO (ppmv, dry)	9.7	8.4	9.7	9.3
CO (ppmv, dry @ 3% CO ₂)	8.5	7.6	8.5	8.2
NMVOC (ppmv wet as C ₃)	0.5	0.5	0.5	0.5
NMVOC (ppmv wet as C ₃ @ 3% CO ₂)	0.5	0.5	0.5	0.5
NMVOC (ppmv dry as C ₃)	0.5	0.5	0.5	0.5
O ₂ (% , dry)	15.1	15.3	15.1	15.1
CO ₂ (% , dry)	3.4	3.3	3.4	3.4
Stack Moisture (% Volume)	6.3	6.1	5.4	6.0
Mass Emission Rates (M-2 Exhaust flow-based)				
NO _x (lb/hr)	1.42	1.53	1.53	1.50
CO (lb/hr)	0.25	0.23	0.27	0.25
NMVOC (lb/hr)	0.022	0.023	0.023	0.023
NO _x (lb/MMBtu)	0.065	0.070	0.069	0.068
CO (lb/MMBtu)	0.0114	0.0106	0.0122	0.0114
NMVOC (lb/MMBtu)	0.0010	0.0011	0.0010	0.0010
Mass Emission Rates (Stoichiometric Exhaust flow-based)				
NO _x (lb/hr)	2.81	2.92	2.84	2.86
CO (lb/hr)	0.49	0.44	0.50	0.48
NMVOC (lb/hr)	0.042	0.044	0.043	0.043
NO _x (lb/MMBtu)	0.13	0.13	0.13	0.13
CO (lb/MMBtu)	0.023	0.020	0.023	0.022
NMVOC (lb/MMBtu)	0.0019	0.0020	0.0019	0.0020
Combustor NMVOC DRE (%)	99.996	99.995	99.996	99.996
Combustor NMVOC DRE (%), M-2 flow-based	99.998	99.998	99.998	99.998

Table 3-3: Summary of Results - Multiple Capacities



P.O. Box 1415 Round Rock, Texas 78680
Phone (512) 355-3786 Fax (512) 355-3785

Plant: Soddy-Daisy Plant
Facility Owner: ABUTEC
Unit Owner: ABUTEC
Location: Soddy-Daisy, Hamilton County, Tennessee
Unit Make/Model: ABUTEC 22.18 MMBtu/hr Combustor
Unit Number: 22 MMBtu/hr, Ser. No. 2011.166
Test Personnel: DWH / HSJ / FTA
Date: September 14, 2011

Run Number	DH-91411.04	DH-91411.05	DH-91411.06	DH-91411.07	DH-91411.08	DH-91411.09	DH-91411.10
Start Time	17:03	17:23	17:50	18:16	18:39	19:00	19:26
Stop Time	17:17	17:37	18:04	18:30	18:53	19:14	19:40
Combustor Operation							
Rated Capacity (MMBtu/hr)	22	22	22	22	22	22	22
Percent of Rated Capacity (%)	33.9	40.7	47.4	61.0	74.5	88.1	98.2
Inlet Gas Flow Rate, Mass Flow Meter (scfm)	50.0	60.0	70.0	90.0	110.0	130.0	145.0
Inlet Gas Flow Rate (scfh)	3000	3600	4200	5400	6600	7800	8700
Inlet Gas Flow Rate (Mscfd)	72.0	86.4	100.8	129.6	158.4	187.2	208.8
Mid-Stack Temperature (°F)	1460	1358	1536	1703	1904	2057	2106
Mid-Stack Temperature (°C)	793	737	835	928	1040	1125	1152
Inlet VOC (propane) Mass Rate (lb/hr)	330.1	396.1	462.1	594.2	726.2	858.2	957.3
Ambient Conditions							
Barometric Pressure (absolute In. Hg)	29.17	29.16	29.16	29.15	29.14	29.14	29.13
Temperature Dry (°F)	88.7	88.8	85.4	83.4	82.2	77.5	77.5
Temperature Wet (°F)	66.7	66.5	68.1	68.7	67.4	66.2	66.2
Humidity (lb H2O/lb Air)	0.0090	0.0088	0.0108	0.0117	0.0110	0.0113	0.0113
Exhaust Flow Data							
Stoichiometric Exhaust Flow (dscfh)	7.21E+05	7.27E+05	7.11E+05	7.71E+05	8.11E+05	8.22E+05	9.25E+05
O2 F factor (dscf/MMBtu)	8913	8913	8913	8913	8913	8913	8913
Fuel Heating Value (Gross Btu/scf)	2484	2484	2484	2484	2484	2484	2484
Heat Input (MMBtu/hr)	7.45	8.94	10.43	13.42	16.40	19.38	21.61
Exhaust Gas Concentrations							
NO _x (ppmv, dry)	6.9	9.3	13.7	14.2	18.6	22.6	22.6
CO (ppmv, dry)	32.0	28.2	22.2	21.3	21.2	20.5	21.4
CO (ppmv, dry @ 3% CO ₂)	110.7	76.8	47.2	38.4	31.0	25.2	26.8
NM VOC (ppmv wet as C ₃)	33.6	18.4	9.1	6.6	4.6	2.7	4.0
NM VOC (ppmv wet as C ₃ @ 3% CO ₂)	119.7	51.7	20.2	12.5	7.1	3.5	5.3
NM VOC (ppmv dry as C ₃)	34.6	19.0	9.5	6.9	4.9	2.9	4.2
O ₂ (% , dry)	19.0	18.6	18.2	17.7	17.1	16.5	16.5
CO ₂ (% , dry)	0.9	1.1	1.4	1.7	2.0	2.4	2.4
Stack Moisture (% Volume)	3.0	3.2	3.8	4.4	4.8	5.3	5.3
Mass Emission Rates (M-2 Exhaust flow-based)							
NO _x (lb/hr)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CO (lb/hr)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
NM VOC (lb/hr)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
NO _x (lb/MMBtu)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
CO (lb/MMBtu)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
NM VOC (lb/MMBtu)	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Mass Emission Rates (Stoichiometric Exhaust flow-based)							
NO _x (lb/hr)	0.60	0.80	1.16	1.31	1.80	2.21	2.50
CO (lb/hr)	1.68	1.49	1.15	1.19	1.25	1.22	1.44
NM VOC (lb/hr)	2.85	1.58	0.77	0.61	0.45	0.27	0.45
NO _x (lb/MMBtu)	0.08	0.09	0.11	0.10	0.11	0.11	0.12
CO (lb/MMBtu)	0.225	0.167	0.110	0.089	0.076	0.063	0.067
NM VOC (lb/MMBtu)	0.3827	0.1765	0.0739	0.0453	0.0274	0.0139	0.0207
Combustor NM VOC DRE (%)	99.14	99.60	99.83	99.90	99.94	99.97	99.95