ADEQ

A R K A N S A S
Department of Environmental Quality

February 16, 2012

John Duggar
Owner
Duggar Services
548 Arbor Acres Avenue
Springdale, AR 72762

RE: Application for Registration
AFIN: 04-00460 Registration No.: 2278-AR-REG315

Dear Mr. Duggar:

The Department has reviewed your facility's application for registration for the facility located at 5723 Stoney Brook, Rogers in Benton County, Arkansas.

The Department has determined that the information certified in the application fulfills the required criteria for registration as specified in Arkansas Air Pollution Control Code (Regulation 18), Section 18.315 and other applicable regulations. Your registration number has been assigned as 2278-AR-REG315.

This registration is your authority to construct, operate, and maintain the equipment and/or control apparatus as set forth in your registration request received on February 6, 2012. Less than 60 days after initial startup, the equipment shall cease to operate. Registration No. 2278-AR-REG315 will expire on February 17, 2013.

Duggar Services is required to update this registration should the facility operations or emissions change so that the current registration no longer reflects actual operations.

Please maintain a copy of this letter and the application at the facility.

Sincerely,

Thomas Rheaume
Permit Branch Manager, Air Division

c: Compliance Monitoring

REGISTRATION FORM

AFIN		DATE	12-22-2012

FACILITY PHYSICAL LOCATION					
Facility Name	~~Ace~~ DUGGAR SERVICES				
Physical Address or Location	5723 Stoney Brook				
Physical City	Rogers				
Physical Zip	72758				
UTM Zone	AQCR 17	UTM Westing (nearest meter)		UTM Northing (nearest meter)	
NAICS Code		NAICS Description			
FACILITY AIR CONTACT					
Contact First Name	John				
Contact Last Name	Duggar				
Contact Position	Owner – Duggar Services				
Contact Mailing Address	548 Arbor Acres Ave				
Contact Mailing City	Springdale				
Contact Mailing State	AR	Contact Mailing Zip	72762		
Contact Phone #	479-799-8999	Contact FAX			
Contact Email Address	duggardad@gmail.com				
INVOICE MAILING ADDRESS					
Organization Name	Duggar Services				
Invoice Contact First Name	John				
Invoice Contact Last Name	Duggar				
Mailing Address	548 Arbor Acres Ave				
Invoice Mailing State	AR	Invoice Mailing Zip	72762		
Invoice Contact Phone	479-799-8999	Invoice Contact FAX			

1. **Organization Status of Applicant**

Please check the box which appropriately describes the legal organization of the applicant.

Solely Owned Proprietorship	X	Corporation	☐	Limited Partnership	☐
General Partnership	☐	OTHER:	☐	Please Specify:	

2. If the applicant is a corporation, indicate if it is a domestic (Arkansas) corporation or a foreign (chartered outside of Arkansas) corporation. Domestic ☐ Foreign ☐ N/A

3. If the applicant is a corporation, is it currently registered to do business with the Arkansas Secretary of State? Yes ☐ No ☐ N/A

4. Registration Information

New Facility X	Existing Facility ☐
Existing Facility with an Air Permit ☐	List Current Permit No. *The permit will be voided with this registration.*
Modification of Current Registration ☐	List Current Registration No.

5. Attach a brief description of the facility, processes and sources of air pollution emissions. USING AIR BURNER TO BURN WOOD DEBRIS,

6. What are the estimated total actual emissions from this facility?

Pollutant	**Tons/year**
PM	1.833
PM_{10}	3.675
SO_2	4.6 PPM
VOC	1.775
CO	43.43
NO_X	4.0 PPM
Single HAP*	0
Combination HAP*	0
Air Contaminants**	0

HAP* – Hazardous Air Pollutant
**Cannot exceed 25 tons per year

7. Attach an explanation of how the emissions estimate was determined e.g. AP-42, test information, etc. ESTIMATED EMMISIONS CALCULATION SHEET ATTACHED

8. Has a Disclosure Statement been submitted to the Department previously? Yes X No ☐
(If no, please attach a disclosure statement)

9. Do you wish to be added the Air Permits Newsletter email list? Yes X No ☐
If yes, list the email address(es) you wish to use: john@championnwa.com , duggardad@gmail.com
(or you can email us at AirPermits@adeq.state.ar.us with "subscribe" (no quotation marks) in the subject box.

5. Attach a brief description of the facility, processes and sources of air pollution emissions.

The 21 acre property at 5723 Stoney Brook Road, Rogers, AR has approximately 37,500 cubic yards of wood debris. Our goal is to clean up the debris with an EPA approved T400 portable Air Curtain Burner which will incinerate the debris with minimal smoke and emissions.

7. Attach an explanation of how the emissions estimate was determined e.g. AP-42, test information, etc.

Attached is the emissions data from Air Burner LLC.

10. The registration requires an annual fee of $200. The Department will send an invoice when the annual fee is due. Submit this Registration to:

Arkansas Department of Environmental Quality
Air Permitting Section
5301 Northshore Drive
North Little Rock, AR 72118

CERTIFICATION OF APPLICATION

"Responsible Official" means one of the following:

1) For a corporation: a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation, or a duly authorized representative of such person if the representative is responsible for the overall operation of one or more manufacturing, production, or operating facilities applying for or subject to a permit and either:

   A) the facilities employ more than 250 persons or have gross annual sales or expenditures exceeding $25 million (in second quarter 1990 dollars); or

   B) the delegation of authority to such representative is approved in advance by the permitting authority.

2) For a partnership or sole proprietorship: a general partner or the proprietor, respectively;

3) For a municipality, State, Federal, or other public agency: either a principal executive officer or ranking elected official. For the purposes of this part, a principal executive officer of a Federal agency includes the chief executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., a Regional Administrator of EPA).

I certify under penalty of law that this application and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

John Duggar	OWNER
Typed/printed name of responsible official	Title
[signature]	2/06/2012
Signature of responsible official	Date

Estimated Emissions Calculation Sheet

Particulate Matter ($PM_{2.5}$):

1.100 lbs/ton
X 10 tons per. Hr
11.0 lbs ($PM_{2.5}$) Per Hour.

11.000 lbs ($PM_{2.5}$) per. Hour
X 8 burn hours per day
88.0 lbs ($PM_{2.5}$) Per Day

88.000 lbs ($PM_{2.5}$) Per Day
X 41.67 Burn days OR 333.32 hours.
3,666.96 lbs. OR **1.833 Tons** ($PM_{2.5}$)

Note: These $PM_{2.5}$ releases are included in the Particulate Matter (PM_{10}) below (section 2):

Particulate Matter (PM_{10}):

Note: PM smaller than 10µ includes PM smaller than 2.5µ shown above.

2.200 lbs/ton
X 10 tons per. Hr
22.0 lbs (PM_{10}) Per Hour.

22.0lbs (PM_{10}) per. Hour
X 8 burn hours per day
176.0 lbs (PM_{10}) Per Day

176.0 lbs (PM_{10}) Per Day
X 41.76 Burn days OR 333.32 hours.
7,349.76 lbs. OR **3.675 Tons** (PM_{10})

Opacity Average

Average Opacity 5.4%

Sulfur dioxide (SO2):

4.6 ppm.

Please see the referenced Federal Reports at the bottom of the Air Burners, LLC Emissions Data and References for Permit Applications.

Nitrogen Oxides (NOX):

4.0 ppm.

Please see the referenced Federal Reports at the bottom of the Air Burners, LLC Emissions Data and References for Permit Applications.

Carbon Monoxide (CO):

26	lbs/ton
X 10	tons per. Hr
260.0 lbs	(PM 10) Per Hour.
260.0	lbs (CO) per. Hour
X 8	burn hours per day
2080.0	lbs (CO) Per Day
2080.0	lbs (CO) Per Day
X 41.76	burn days OR 333.32 hours.

86,860.8 lbs. OR **43.43 Tons** (CO)

Volatile Organic Compounds (VOC):

1.063	lbs/ton
X 10	tons per. Hr
10.63 lbs	(VOC/NMHC) Per Hour.
10.63	lbs (VOC/NMHC) per. Hour
X 8	burn hours per day
85.04 lbs	(VOC/NMHC) Per Day
85.04	lbs (VOC/NMHC) Per Day
X 41.76	burn days OR 333.32 hours.

3,551.27 lbs. OR **1.775 Tons** (VOC/NMHC)

4390 Cargo Way
Palm City, FL 34990
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E-Mail: info@airburners.com
www.airburners.com

GSA Contract Holder

Emissions Data Comparison of Forest Wood Debris Burning Open Burn vs. Air Curtain Firebox Burning

The data shown here is based on tests carried out by the USDA-FS (San Dimas) in Baker City, Oregon for which an Air Burners, LLC firebox Model S-217 was used. The test was conducted in November, 2002. A copy of this report was received by Air Burners, LLC in February, 2003. The full report can be accessed at www.airburners.com.

Table 1
Air Curtain Burner Emission Factors (Air Burners, LLC Firebox)

Sample Number	$EFCO_2$ (lbs/ton)	EFCO (lbs/ton)	$EFCH_4$ (lbs/ton)	EFNMHC (lbs/ton)	EFPM2.5 (lbs/ton)	CE %
1	3634	15.9	1.14	0.916	0.7	99%
2	3636	16.9	0.92	0.580		99%
3	3589	39.6	2.64	1.749	1.1	98%
4	3613	27.9	1.46	1.158	1.1	98%
5	3646	11.4	0.60	0.519		99%
6	3587	41.4	2.71	1.744	0.9	98%
7	3624	23.4	0.59	0.685	0.9	99%
8	3603	33.7	1.16	1.154	1.7	98%
Average	3616	26.3	1.40	1.063	1.1	99%

Table 2
Ponderosa Pine Understory Burn Emission Factors

	$EFCO_2$	EFCO	$EFCH_4$	EFNMHC	EFPM2.5	CE
	(lbs/ton)	(lbs/ton)	(lbs/ton)	(lbs/ton)	(lbs/ton)	%
Average	3286	179.8	6.6	5.4	36.0	90%

Table 3
Ponderosa Pine Pile Burn Emission Factors

Fire Code	$EFCO_2$ (lbs/ton)	EFCO (lbs/ton)	$EFCH_4$ (lbs/ton)	EFNMHC (lbs/ton)	EFPM2.5 (lbs/ton)	CE %
Average F	3444	99.2	6.22	6.84	14	94%
Average S	3092	257.8	21.5	12.96	36.9	84%
Average all	3268	178.5	13.86	9.9	25.5	89%

Notes on the data presented:

Table 1 shows that 8 samples taken during the demonstration where analyzed.

Terminology used:

EF is defined as the "Emissions Factor"
EFCO_2 would be the Emission factor for Carbon Dioxide
EFCO is for Carbon Monoxide
EFCH_4 is Methane based gases such as propane, butane etc.
EFNMHC is for the non-methane gases, hydrocarbons such as benzene
CE is Combustion Efficiency
EFPM2.5 The PM is the Particulate Matter expressed pounds per ton. Environmental Protection Agency regulates Particulate Matter starting from 2.5PM on down to the smaller PM

Dr. Ron Sussott, Rocky Mountain Research Center, Missoula Fire Sciences Laboratory in Missoula, Montana, stated that the particulate matter from the air curtain was 20 to 30 times (on average) less in particulate matter per ton than that of a ponderosa pile burn.

Notes on combustion efficiency:

Byram's chemical model for wood is $C_6H_9O_4$, and for ideal combustion, the only products from the combustion process are CO_2 and water:

$$4(C_6H_9O_4) + heat + 25(O_2) = 24(CO_2) + 18(H_2O)\,.$$

In reality, as the availability of O_2 deceases, many other products of incomplete combustion such as CO, CH_4, and NMHC are produced. CO_2 is normally produced in the breakdown and decay of woody material and is not usually considered to be a pollutant, while many of the products of incomplete combustion are.

Combustion Efficiency (CE) is defined to be the ratio of the carbon in CO_2 to the carbon contained in all of the emissions:

$$CO_2 \Big/ CO_2 + CO + CH_4 + C_2H_2 + C_2H_4 + C_2H_6 + \ldots.$$

If the combustion were ideal, the only gas produced would be CO_2, and the combustion efficiency would be 100%. As the quantity of the products of incomplete combustion increases, the CE decreases. For Ponderosa Pine emissions studied Arizona in 1993 and 1994, the CE was typically about 90% (tables below) for understory burns and 89% for pile burns. This means that 10 to 11% of the carbon emissions were in the form of products of incomplete combustion for these types of fires. The air curtain burner averaged a much higher combustion efficiency at 99%.

An Emission Factor (EF) is defined to be the quantity of a specific emission produced per some quantity of fuel consumed. EF's are usually given in units of grams/kilogram or lbs/ton. For example, for the pile burns, the EFCO was measured to be 178 lbs /ton; that is 178 pounds of *CO* is produced for every ton of fuel consumed.

Of particular interest are the reduced PM2.5 emission factors for the air curtain burner. Only about 1 lb. of PM2.5 per ton of (wood) fuel burned was produced by the air curtain incinerator verses a range of 14 to 37 lbs. of PM2.5 per ton (EF values for flaming and smoldering) with and average of 26 lbs. per ton for open pile burning. Thus the pile burn emissions were about 13 times higher in the flaming phase and 34 times higher in the smoldering phase, with the average being 23 times higher than the air curtain. At an average of 36 lbs. per ton, the understory burns produced about 33 times the amount of PM2.5, as did the air curtain incinerator.

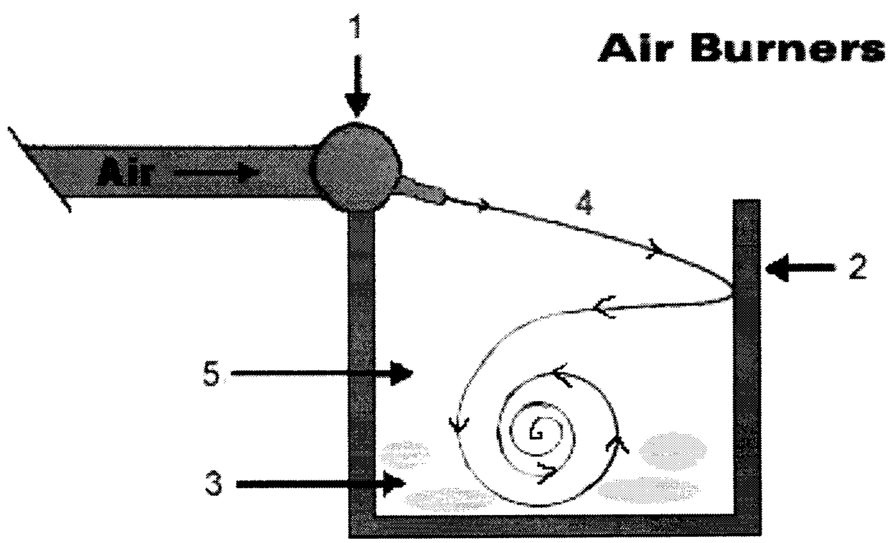
Other EPA criteria pollutants, such as NO_x and ozone are produced, but these have not been measured in any significant quantities during normal biomass burning.

* * * * *

Rev. 12/2003c

PRINCIPLE OF AIR CURTAIN INCINERATION

Air curtain incinerators are designed primarily as a pollution control device. Using a Diesel engine driven fan these machines generate a curtain of air with a very particular mass flow and velocity. This curtain of air acts as a trap over the top of an earthen trench or thermo ceramic lined pit. The wood debris is dumped into the trench or pit and then ignited (usually with a propane torch or with a small amount of diesel) just as you would light any other pile of wood you intended to burn. Once the fire has gained strength the air curtain is turned on. The air curtain traps most of the smoke particles and causes them to re-burn under the air curtain where the temperatures exceed 1,800° F. These machines do not inject any fuels into the fire, the fire is sustained only by adding more wood debris. The air from the air curtain is not heated. The only fuel used in the continuous operation is that of the Diesel engine driven fan.



1. Manifold and nozzles that create the air curtain over the refractory lined pit.
2. Refractory lined wall as on the "S" Series machines.
3. Material to be burned.
4. High velocity "air curtain" over fire.
5. Continued air flow over-oxygenates fire keeping temperatures high.

GENERAL DESCRIPTION T-400 SERIES

A mobile (trailer mounted) air curtain burner, which is used in combination with an earthen pit or trench made to function as the combustion chamber. The T-400 Series unit is fully self-contained trailer mounted system that includes a power plant, mechanical drive system, blower fan, manifolds, carrier pipes and fuel tank.

This unit does not require assembly on site as the carrier pipe and manifolds deploy and unfold. The diesel engine drives a fan which produces high velocity air. This high velocity air is directed down the carrier pipe to the manifold. The carrier pipe is an important safety element as it gives the machine the required "set-back" from the fire. This set-back will help protect the machine if the fire gets too high or if the wind changes direction.

Once in the manifold the air is evenly distributed across the burning trench through the manifold nozzles. Air is directed across the top and down into the combustion zone. The curtain of air acts as a top over the pit, trapping particulates (small air-born particles) and adding oxygen to the combustion zone, thereby generating a hotter more complete fire.

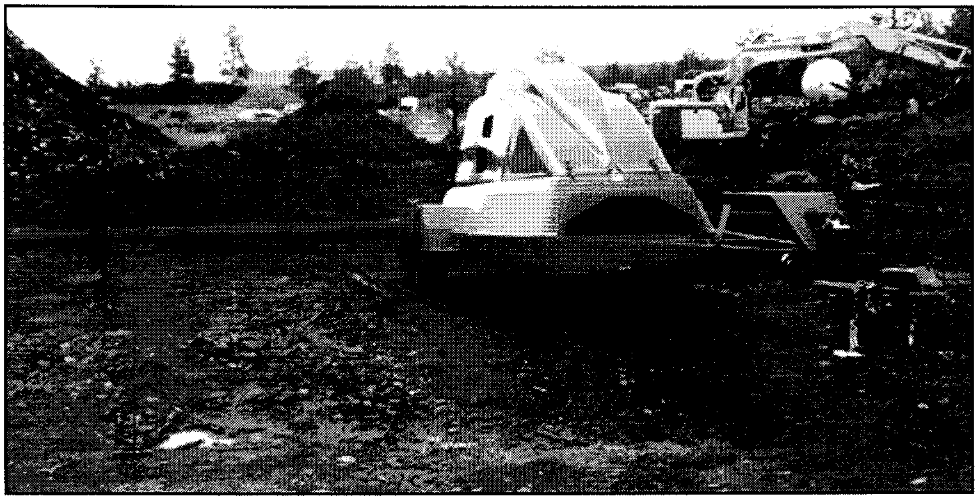
Temperature achieved by this unit while burning clean wood and vegetative waste can range between 1,600 and 2,400 degrees Fahrenheit.

The air flow coupled with the recommended dimensions of the pit, creates an afterburner effect. By re-circulating the air under the curtain, residence time of the particulates is increased long enough for their effective combustion with very little smoke escaping.

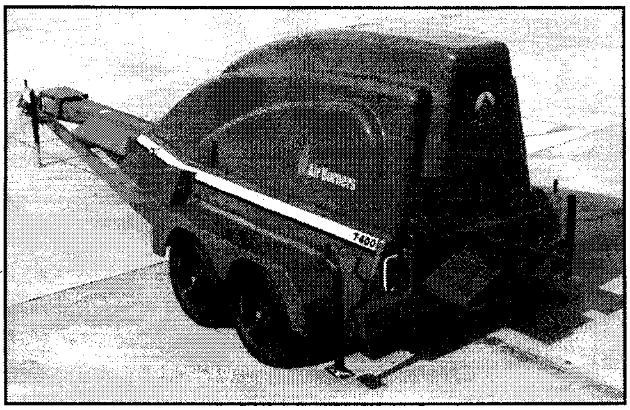
Carrier pipe fully extended
Manifolds partially extended

Carrier pipe fully extended
Manifolds fully extended

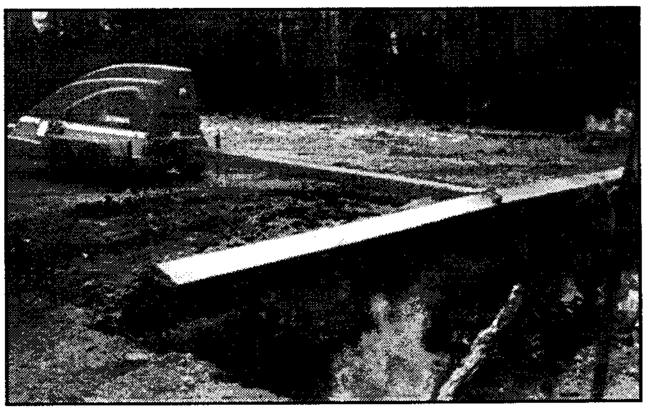
T-400 COMPONENTS



T-Series with manifold extended

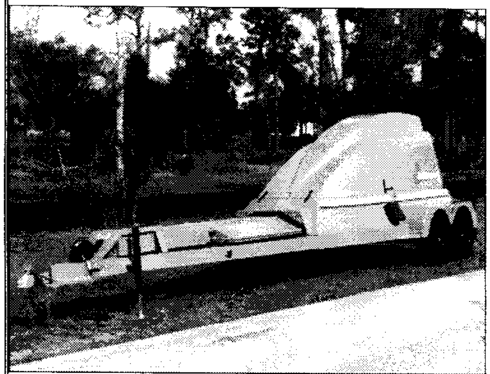


T-400 Trench Burner



T-400 positioned at 40 foot trench

TRENCH BURNER SPECIFICATIONS T-400



A trailer mounted air curtain burner system that has been designed and engineered to provide over-the-road transportability, offering the operator the flexibility of reducing land clearing or clean construction waste on-site as opposed to hauling the waste to a fixed processing or dumping location or chipping it at high cost and possibly hauling it as well.

1	Power	Four cylinder Diesel Engine 85 HP (Kubota V3600 -TE) or equivalent engine), full enclosure; security locks around power source; Emission certified US EPA Tier3. Engine mounted PTO (Power take-off) with multi-belt drive
2	Instrument Panel	Start/Stop key switch, tachometer, hour meter, oil pressure and water temperature indicators with safety shutdown feature and adjustable locking throttle; lockable instrument panel
3	Safety Systems	Engine over temperature shut down; Loss of cooling fluid shutdown; Loss of oil pressure shutdown
4	Air Supply	Custom heavy duty air fan
5	Carrier Pipe	The Carrier Pipe protects the trailer from fire damage by providing a "set-back" between the trailer and the burn trench; 20' (≈6 m) long carrier pipe, fully assembled, easily extends and retracts from trailer
6	Manifold Dimensions	Manifold Length: 40' (12 m)
7	Average Through-put	10-12 Tons per Hour (Average – See Note)
8	Fuel Consumption	Approx. 3.5 Gal/Hr (13 L/Hr)
9	Weight	6,900 lbs. (3,220 kg); Tongue Weight Approx. 1,200 lbs (544 kg)
10	Miscellaneous	45 gallon (170L) minimum fuel tank capacity Manual winch to assist with retraction of manifold assembly
11	Transportation	Fully welded steel trailer, dual axles with electric brakes on both axles; Full trailer lighting; Hitch: Both Pintle and 2 $^{5}/_{16}$ inch ball (convertible)
12	Dimensions	Length 28' 10" 8.80 m Width 8' 2" 2.50 m Height 6' 10" 2.10 m

Note: Achievable through-put depends on several variables, especially the nature of the waste material, the burn chamber temperature and the loading rate. All weights and dimensions are approximate and metric conversions are rounded. Subject to change without notice.

AIR BURNERS, INC.
4390 Cargo Way, Palm City, FL 34990
Phone 772-220-7303 - FAX 772-220-7302
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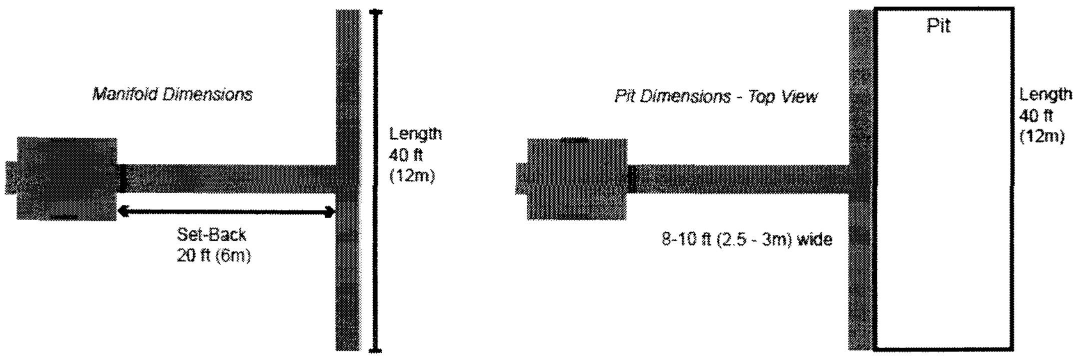
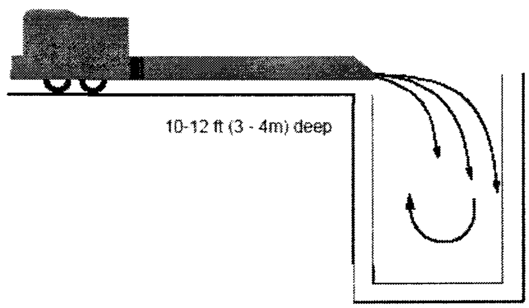
T-400 TRENCH CONFIGURATION





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FOUNTAINHEAD
ENGINEERING
LIMITED

Final Report Describing Particulate and Carbon Monoxide Emissions From the Whitton S-127 Air Curtain Destructor

December 26, 2000

Prepared for:
WHITTON TECHNOLOGY, INC.
Air Burners Products Division
4390 Cargo Way
Palm City, Florida 34990

Prepared by:
FOUNTAINHEAD ENGINEERING
134 N. LaSalle Street, Suite 720
Chicago, Illinois 60602
And
DERUITER ENVIRONMENTAL, INC.
P.O. Box 1702
Tallahassee, FL 32302

In association with:
GENESIS AIR, INC.
8412 Kreuter NE
Rockford, Michigan 49341

Project #00-21

FOUNTAINHEAD
ENGINEERING
LIMITED

December 26, 2000

Mr. Brian O'Connor
Managing Director
Whitton Technology Ltd.
4390 Cargo Way
Palm City, Florida 34990

RE: Transmittal of Final Emissions Report for the Whitton S-127 Air Curtain Destructor

Dear Mr. O'Connor:

Fountainhead Engineering, Ltd. (FOUNTAINHEAD) is pleased to submit the enclosed final report for the emissions testing performed on the Whitton S-127 refractory lined air curtain destructor conducted on October 10 and October 11, 2000 in Clarkston, Michigan. FOUNTAINHEAD performed three emission test runs with the S-Series technology and averaged the results. Methodologies and approaches are contained in the attached report.

The design of the Whitton S-Series air curtain destruction (ACD) incineration technology presents several challenges to representative emissions sampling. The largest obstacle to representative sampling is the lack of a single, measurable emission point due to its open combustion chamber or "box" design. The turbulence created by the operation of the air curtain, the make up air provided by the air curtain, the temperature of combustion and the resulting rising air creates an extremely turbulent flow over the operating ACD.

Traditional stack testing methods are not designed for sampling from a turbulent gas stream. However, with modifications the quantification or measurement of emissions from the ACD was documented for submittal to State regulators. To our knowledge this is the first time that the S-Series refractory lined incineration units have been subjected to this type of testing. The testing approach utilized can be reproduced following our initial testing methods described in the documentation report. The ability of others to reproduce the results by utilizing the testing protocol was an important factor considered when determining the test method(s). The project team did consider other approaches as well.

We assessed the performance of an ambient air quality testing approach, which would employ ambient air sampling techniques at a point downwind of the operating ACD to quantify particulate

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530 S. Whittaker, No. 378 • New Buffalo, Michigan, 49117 • Phone: 616-469-5014 • Fax: 616 469-5937
P.O. Box 2502 • Ann Arbor, Michigan 48106 • Phone: 734-663-0883 • Fax: 734-663-1882
P.O. Box 67 • Zenda, Wisconsin 53195 • Phone 262-249-0936 • Fax: 262-249-0937

emissions. This approach would give an indication of the "impact" of potential contaminants (particulates), but could not be correlated back to a point source emission rate. In addition with the active loading of the unit by either a front-end loader or track backhoe (possibly configured with a grapple attachment) there could be additional particulate readings associated with the rolling stock which could not necessarily be differentiated from particulate emissions from the combusted wood waste incinerated by the ACD. Furthermore measurements may be influenced by the rolling stock feeding fuel into the ACD since the "downwind side" of the ACD would be opposite of the manifold and this happens to be the "loading side" of the ACD. This approach would not illustrate what's happening "above the box". This brings us to our next consideration, a "Canopy Hood Approach".

The initial sampling strategy consisted of assessing the temporary placement of a canopy hood to fully capture any emissions and direct them towards a single exhaust port. The directed emissions would then be sampled using USEPA Methods 1-5 and USEPA Method 10 for Carbon Monoxide. Although this would be a more traditional approach as it relates to "methods" testing the logistical difficulties appeared to be substantial.

The primary "logistical" difficulty is fueling the ACD unit. Fuel is added from the top of the ACD via a front loader or similar "rolling stock" as described previously which is opposite of the manifold. The canopy hood would block efficient fueling of the ACD. Although initially attractive from a simplistic point of view the data collected would be flawed when truly assessing normal operating conditions of the ACD.

The effects of the air curtain and its flow dynamic would be disrupted by the flow interference caused by the collection hood. The likely scenario would be a loss of flow balance, resulting in emissions escaping from the bottom of the canopy hood and would cause a decrease of combustion efficiency resulting from insufficient oxygen supply. The effect on measured emissions rates associated with decreased combustion efficiency from combustion units are well documented and for the ACD the results would probably include increased carbon monoxide readings and increased particulate capture due to the hood. This is not representative of actual operation or "in-field" conditions.

There are many problems associated with the "hood" approach. The initial attractiveness of trying to "force" the flow to one isolated sample point should be weighed against the quality of the data obtained. The data collected in this testing approach would not be able to be reliably reproduced under normal operating conditions associated with this technology in the field and would overestimate emission rates. This approach may be appropriate for "methods applications" but biased for data collection and interpretation. In addition the hood would not allow for normal feeding or loading of the wood waste and would therefore once again not be representative of an actual operating installation under normal operating conditions. The hood approach could not be judged adequate since it changes the operations of the entire system and has many logistical interruptions to the normal operating ACD system.

The next option assessed was "total enclosure". This approach would pace the ACD inside of a temporary enclosure, similar to that of a metal building with a single emission point (or stack) located at the top of the building. Special sliding doors would need to be fabricated and installed in this approach which would allow a front loader to fuel the unit from opposite the manifold. The obvious drawbacks to this approach are safety and health risks for personnel performing the test and operating the unit. As with the canopy approach the entire system dynamics would be altered in order to make the "methods" application more traditional. This would sacrifice an understanding of how the system would actually perform in the field and it would be difficult to replicate under normal operating conditions. In addition it be difficult to evaluate the quality of the data since the building or enclosure would impact the thermal dynamics of the ACD.

From a practical standpoint the heat generated by the accelerated combustion process would be significant and very dangerous to sampling personnel on the roof of the structure. There is a possibility of an oxygen deficient atmosphere inside the building from lack of sufficient makeup air, which could jeopardize the health of the operators and fueling team. In addition to the human factors, a building that would be large and high enough to effectively house the ACD unit operating at maximum efficiency without taking structural damage would not be effective in collecting and concentrating emissions to a single point as intended. Therefore, this approach may be appropriates from a "methods application" but biased from a data quality standpoint.

The goal of any testing should be to accurately confirm how the air curtain technology will perform once installed in the field and operating normally. None of these approaches accomplish this nor do any of these proposed compliance-testing approaches allow for any reliable Method 9 assessment. Method 9 in most regulatory schemes is the primary "method" associated with air curtain incineration devices. Other testing consistent with traditional incineration methods, as we have illustrated would result in significant data collection errors or comprise the quality of the data as it relates to normal operating conditions in the field.

All of the" enclosure" strategies suggested by various regulatory personnel have severe limitations and will not provide consistency with "approved methods". The Whitton S-Series technology for untreated waste wood streams should be subjected to Method 9 testing. If Method 9 illustrates or reveals inconsistency with permit conditions then other testing may be appropriate. USEPA Method 9 is recognized as reliable by the USEPA and is used widely for compliance and used by state and federal agencies throughout the United States not only for compliance but for enforcement as well. Method 9 seems a simple and likely Method to assess this technology and it has been codified as well so consistency with federal regulation is not a problem if one chooses to use this Method for compliance purposes.

Regulatory agencies fail to address the fact that the enclosure testing approaches will:

- Cause an applicant to actually alter the technology for compliance testing only;
- Construct enclosures that if not impossible to build are extremely dangerous and would only be used for some sort of compliance testing that really isn't recognized;
- Place the applicants (or applicants staff) in dangerous conditions to collect unreliable data;
- Cause the fuel loading system to be altered from normal operating conditions and would make it impossible to fuel the S-Series efficiently or consistent with the manufactures specifications; and,
- Enclosure testing approaches will disrupt the flow and combustion characteristics of the ACD, resulting in conditions that are not reflective of actual operating conditions, which would place the results in the un-useable category.

The general goal was to provide a reproducible testing protocol that would not adversely interfere with the normal operating conditions of the ACD and allow the owner-operator to follow the manufactures guidance for safe and effective operation of the ACD. Since enclosures would not allow the ACD to operate as designed, a sampling method had to be devised that would allow the ACD to operate normally and still give a representative emission rate.

The solution devised was to use USEPA Method 5 for particulates (which encompasses Methods 1-4), USEPA Method 10 for Carbon Monoxide, and USEPA Method 9 for Opacity. These Methods were used as written in 40 CFR Part 60, Appendix A, with noted exceptions. These are explained in the documentation report and are summarized below.

The most significant deviation results with the use of USEPA Method 1. This method is used to determine the acceptable location for the sample point locations. This method was designed specifically for sampling *confined* sources of emissions, specifically stacks. The average stack has significant lengths of straight runs and gas flows at a consistent velocity when a blower or fan is incorporated into the system. Air flow in a confined stack follows predictable patterns, and the Reynolds number generally significantly decreases the further you get from any disturbances (fans, bends, changes in diameter). This results in an even, non-turbulent, easily sampled flow stream. Method 1 spells out sampling port locations in respect to upstream and downstream disturbances, and provides recommendations as to the number of sample points required in order to obtain a representative sample. This method is the root, the cornerstone, of all stack sampling.

An ideal sampling point, according to Method 1, is a point 7 to 8 stack diameters downstream from a disturbance, and 2 stack diameters from any upstream disturbance. The absolute minimum allowed is 2-stack diameters downstream, and 1 stack diameter upstream. This is the exact dimensions of the stack structure constructed (in accordance to USEPA Method 5D for lengthening short stacks) used to sample the ACD.

Unfortunately, the ACD does not produce a predictable gas stream source. The combustion chamber of the ACD is chaotic in its operation, with cross drafts, up drafts, and down drafts. To apply traditional stack testing methods to accurately quantify emissions of this source will leave considerable room for interpretation. But since it is classified as an incinerator, it has to be assigned some sort of emission specific to its actual point of emission. This implies to most regulators that do not have a separate category for air curtain incinerators that an applicant is somehow required to apply "traditional" stack testing methods. For the purposes of this discussion, the actual point will have to be classified as *"emissions past all emission control devices"*. The air curtain, along with its air supply properties that simultaneously aid with efficient combustion is also functioning as an emission control device. Therefore, point source emissions are classified as *emissions above the air curtain*.

The air curtain is invisible to the naked eye while in operation. It cannot be seen other than as a disturbance of the flame tips or a particularly intense area of combustion. The digital images included with the documentation report illustrate the clarity or minimal opacity of the operating ACD. However, the air curtain is quite noticeable from a velocity pressure standpoint.

When the stack structure is lowered into the air curtain, the air curtain actually creates a zone of negative pressure within the stack, drawing air from above the stack backwards down to the air curtain for re-circulation into the ACD. When the stack structure is raised above the air curtain, velocity pressure (which is used to calculate the volumetric flow rate) drops to zero. As the stack structure is raised slightly higher, velocity pressure becomes positive, very slightly positive (.010 to .050 inches of water displaced). If the stack is raised higher yet, velocity pressure drops off and becomes almost completely undetectable.

This indicated to the emission testing team that the most representative area to sample the Whitton S-Series unit is at the point of highest velocity pressure. This is what the field team did during the test. The point of negative pressure was identified and the sampling apparatus was raised to the point where velocity pressure was maximized. Our check was that we had a point in between the positive and negative pressures where the flow was zero. This demonstrates that the airflow from the exit manifold was not being funneled into the sampling apparatus (which would dilute the sample and give artificially low results). We were consistently able to reproduce this result during repeated trails before actual testing with the same results and therefore provided evidence that we were sampling the actual emissions of the ACD directly above the emission control device. By sampling at the point of highest velocity pressure, we were attempting to capture the most particulates and sample gas that we could for the ACD. We felt that this approach when compared to all other potential approaches described previously was reasonable, the most cost effective and did not interfere with the manufacturers operating instructions of the ACD and were exactly representative of in field normal operating conditions. The testing has yielded reasonable results, especially for run number 3, which yielded the lowest carbon monoxide numbers (this was the third run of the day, when the ACD was sufficiently heated and loading of the unit during this testing was near continuous).

Given similar conditions with another Whitton S-Series ACD in another location using slightly different waste wood feedstock with equal or greater fueling parameters and with at least 4 hours of peak operating efficiency prior to sampling we could reproduce the results within a reasonable degree of error. Therefore the general goal of reproducible data that reflects normal operating conditions can be achieved. In addition the Method 9 testing performed during testing should provide additional evidence of good combustion and good particulate capture and control.

FOUNTAINHEAD believes that the emission testing methods performed on the ACD provide accurate data that can be reproduced. The test methods also provide emissions data that reflects actual field conditions under normal operating conditions without altering the manufactures specification of the combustion or control technology.

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Sincerely,

Fountainhead Engineering, Ltd.

Milan Kluko

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