



West Virginia Purchasing Division

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Header @ 3

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Procurement Folder: 266603

Procurement Type: Central Purchase Order

Vendor ID: VS0000011203

Legal Name: Air Burners, Inc.

Alias/DBA:

Total Bid: \$40,601.05

Response Date: 11/15/2016

Response Time: 10:54

SO Doc Code: CRFQ

SO Dept: 1400

SO Doc ID: AGR1700000006

Published Date: 10/24/16

Close Date: 11/17/16

Close Time: 13:30

Status: Closed

Solicitation Description: Trench/Air Curtain Burner

Total of Header Attachments: 3

Total of All Attachments: 3



Purchasing Division
 2019 Washington Street East
 Post Office Box 50130
 Charleston, WV 25305-0130

**State of West Virginia
 Solicitation Response**

Proc Folder : 266603
Solicitation Description : Trench/Air Curtain Burner
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Date issued	Solicitation Closes	Solicitation Response	Version
	2016-11-17 13:30:00	SR 1400 ESR11151600000002161	1

VENDOR
VS0000011203 Air Burners, Inc.

Solicitation Number: CRFQ 1400 AGR1700000006

Total Bid : \$40,601.05 **Response Date:** 2016-11-15 **Response Time:** 10:54:01

Comments: Included, Air Burners will be happy to provide on-site operator training at no additional cost to ensure your experience is successful. if you have any questions or concerns, please contact us at any time. We thank you very much for the opportunity. Best regards, Matthew O'Connor

FOR INFORMATION CONTACT THE BUYER
 Linda Harper
 (304) 558-0468
 linda.b.harper@wv.gov

Signature on File	FEIN #	DATE
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All offers subject to all terms and conditions contained in this solicitation

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
1	Trench/Air Curtain Burner	1.00000	EA	\$38,551.750000	\$38,551.75

Comm Code	Manufacturer	Specification	Model #
41102401			

Extended Description : Trench/Air Curtain Burner per Section 3.1.1

Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
2	Freight	1.00000	EA	\$2,049.300000	\$2,049.30

Comm Code	Manufacturer	Specification	Model #
78121603			

Extended Description : Freight per section 6.1



Trench Burner

www.AirBurners.com

An Environmentally Friendly Alternative to Grinding



Additional Benefits Include:

- Low capital investment
- High mass reduction 95 to 98% waste reduction (100 tons of wood = 2 - 5 tons ash) increases landfill life
- High through-put up to 10 tons per hour
- Dramatically reduced operating costs when compared to grinding & trucking
- Environmentally friendly. Exceeds EPA regulations for Air Curtain Incinerators
- Ash can be used as a soil additive
- One operator can monitor and load one or two trench burners





Trench Burner vs Chipper Cost Comparison

(100 Tons)

	T-Series Air Curtain Burning	Chipping & Landfill Disposal	Direct Landfill Hauling & Disposal
OPERATING COSTS			
Fuel Cost (T-300: 10 hrs; Chipper: 6 hrs)	\$88	\$630	-
Maintenance and Repairs (T-300: \$0.60/hr; Chipper: \$16.00/hr)	\$6	\$96	-
Hauling of Residual to Landfill (50 Miles @ \$4.00/mile with 20-ton Dump Truck)	\$200 (1 load)	\$2,400 (12 loads)	\$5,000 (25 loads)
Tipping Fees at Landfill (\$30 per Ton)	\$90	\$2,940	\$3,000
Total Disposal Cost for 100 Tons	\$384	\$6,066	\$8,000

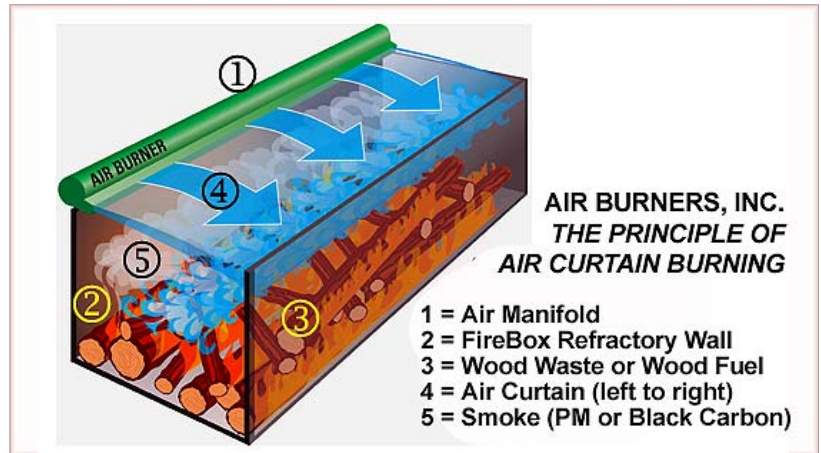
NOTES:

1. Chipper, approx. 400 HP, Diesel fuel consumption: approx. 30 gal/hr. Diesel fuel at \$3.50/gal.
2. Chipping process and chip handling produces large amounts of particulate matter (PM) in the form of wood dust that can cause serious illness in exposed workers. Wood dust is a proven carcinogenic (cancer-causing). Chipping losses, mostly in form of wood dust, are approximately 2% or 2 tons in this example. Only 98 tons of wood chips are deposited into the landfill.
3. Air Curtain Burner residual is 3 tons of ash, hauled by 1 truck, but is usually land-applied on site; Chipper residual yields no weight reduction, but does provide significant volume reduction. In this example, waste is hauled by at least 12 trucks, each carrying approximately 22 cubic yards or 5 – 6 tons.
4. The T-300 is a portable in-ground trench burner that can easily be moved with a standard 3/4 ton pick up truck. See www.AirBurners.com

AIR BURNERS, INC.
4390 SW Cargo Way
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www.AirBurners.com





Air Curtain Burner vs. Wood Grinder

Disposal of Wood Waste

A Comparison of Critical Emissions and Basic Economic Parameters from Two Disposal Methods

A. Overview:

The purpose of this paper is to provide details concerning a better environmental and economic method for the disposal of wood and vegetative waste. Technical details will be provided for comparing two machines typically used for the disposal of wood and vegetative waste: the Air Curtain FireBox and the Diesel powered Wood Grinder. For the disposal of accumulated wood and vegetative waste, an Air Curtain Burner (ACB) "FireBox" is a better choice for protecting the environment and it is also the most economical choice.

- 1) The ACB FireBox is an "end solution" and actually eliminates the wood waste, while a grinder is just a "handling process" where 100 tons of wood is ground-up into 100 tons of mulch.
- 2) The FireBox uses the waste as its fuel, where the grinder uses hundreds of gallons of Diesel fuel to grind wood in to mulch.
- 3) The FireBox creates a small amount of natural clean ash that is good for the soil, the grinder creates a huge amount of mulch that is bad for the soil and must be transported off-site.
- 4) The FireBox has less impact on the environment; the grinder and associated transportation have a significantly negative impact on the environment.
- 5) The FireBox is significantly less costly to purchase and to operate than the grinder.
- 6) The FireBox can create energy from the waste, the grinder only consumes energy.

The Air Curtain FireBox follows the same natural process as has been happening on Earth for millions of years, but without the unwanted particulate matter or black carbon release. As we concern ourselves with the reduction of climate changing impacts on our environment, the FireBox is the best choice for immediate reduction in black carbon and non-biogenic CO₂ emissions. This paper will provide more details in comparing the two machines and outlining the path to achieving significantly lower emissions today.

ENVIRONMENTAL

B. Comparison of Critical Pollutants

The following critical emission components will be compared: PM and CO₂. These are emissions, either aerosol and gaseous, which are classified as harmful Greenhouse Gas Emissions within the framework of Global Warming and Climate Change discussions.

PM



FireBox—No visible PM discharge

PM or Particulate Matter from a combustion process is Black Carbon (BC) consisting of clusters of carbon molecules measured in microns i.e. 10 μ (PM10) which are strictly regulated. Black Carbon emissions constitute an aerosol and not a gas, because BC consists of pure carbon

suspended in the atmosphere as tiny solids. BC tends to gravitate back to earth over time and is considered one of the most significant contributors to "Global Warming." While suspended in the atmosphere, the carbon particles absorb sunrays and release infrared rays as heat that raise the temperature of the layers in the atmosphere where they reside thus contributing to the warming of the planet. As they fall back onto earth, the Black Carbon causes reduction of "albedo", the ability of an object or particle, such as snow or ice crystals, to reflect sunlight (heat). When Black Carbon is deposited on snow and ice, it accelerates the melting of the snow, ice, or glaciers in areas where typically no appreciable reduction of frozen



Grinder—Significant PM discharge

mass occurs naturally. It adversely affects "Global Warming" which is most noticeable on earth in the permafrost regions but more significantly, its residence time in the atmosphere is very short measured in weeks and months.

Reducing Black Carbon would have a near immediate positive effect on Global Warming in contrast to CO₂ which remains in the atmosphere for 100 years or more, and any CO₂ mitigation efforts would yield results only for future generations. While we should work diligently towards the reduction of CO₂, immediate efforts should be made to mitigate or eliminate BC releases from combustion processes, whether from open burning or combustion of hydrocarbons in engines, due to the immediate positive impact on the effects of climate change. The Air Burners FireBox was designed specifically for the reduction of Black Carbon and it is a proven and effective tool for achieving the goal of Black Carbon reduction now.

In addition to PM from Diesel engine combustion, the grinding of wood waste and the subsequent handling, transporting and storage result in additional fugitive dust (PM) and these particles are predominantly raw wood aerosols. Raw wood particles are a known carcinogen with obvious health implications, especially to a population close to the source, such as the site operators. It is obvious that raw wood PM emissions from grinders must be minimized.

Strong regulations are being put in place to mitigate the raw wood PM release from grinders ie: California requires grinders to meet strict PM regulations in their Title V permits. In some areas like Martin County, Florida, buildings were constructed at great taxpayer expense to house the grinding operations in an effort to control the airborne particles. In many cases the Air Curtain FireBox is a better solution as it meets a much tighter PM standard than Grinders and does not emit raw wood particles.

With today's grinder technology it is very difficult to control PM emissions. The state of grinder technology today will only allow US authorities to regulate grinders to a maximum opacity of 20% whereas the limit for PM emissions from the air curtain burner is a maximum of 10% opacity. Opacity is a measurement of the density or thickness of a PM emission plume rising up from a stationary source. This means that it is recognized by the authorities that a FireBox will release much fewer particulate emissions when operated properly than is practical and achievable for the grinder.

The grindings also pose an extreme environmental hazard. There is a very limited market to recycle the wood grindings, first, for the grindings to be useful for gardening and landscaping they must be sorted to eliminate the spread and contamination of invasive species, second, the grinding will not eliminate any molds, fungi or diseases from destructive insect larvae, like longhorn beetle and third, with almost no recycling market the grindings are being piled at landfills and transfer stations across the country significantly increasing the occurrence of spontaneous combustion and the devastating environmental impact that follows.



PM—Mulch Fire in Florida caused by spontaneous combustion of wood grinding piles

CO₂

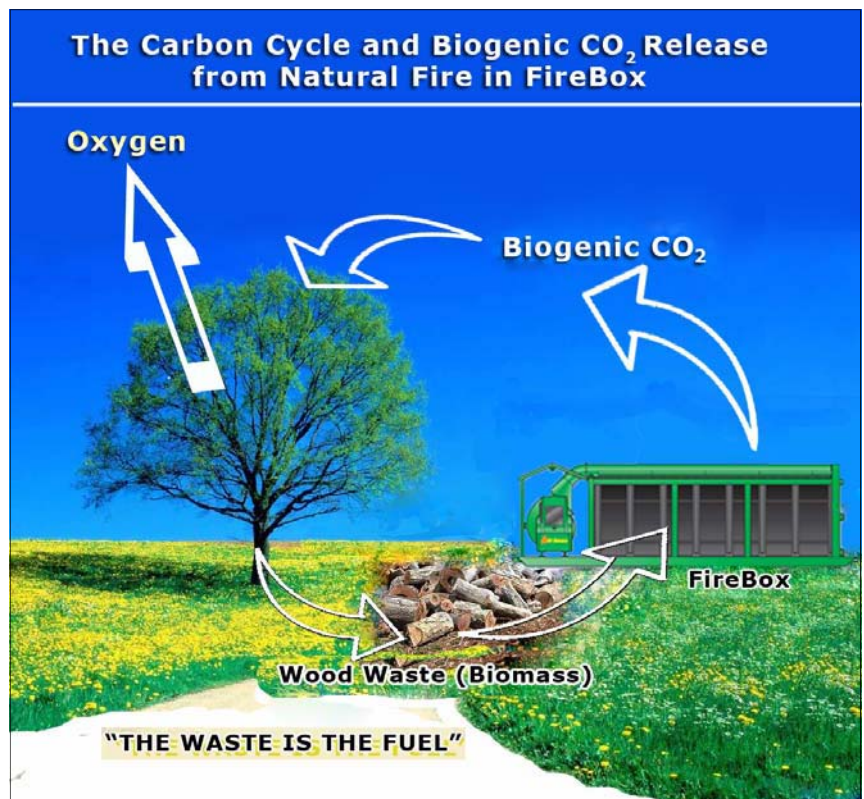
The gaseous emission of concern emitted from both air curtain burners and grinders is the dangerous *non-biogenic* CO₂. We are using this as the standard for comparison as it is classified as the major undesirable Greenhouse Gas and it tends to be the common denominator when comparing emissions. Other releases from a process of incomplete combustion, such as organic gases (CH₄, etc.) are not addressed in this review, as their releases follow the same proportions as CO₂ with regard to this FireBox-to-Grinder comparison study. *Biogenic CO₂* also does not enter the comparison, because Biogenic CO₂ from wood is considered *carbon neutral* by the IPCC and USEPA and the biogenic carbon release ultimately is the same for the air curtain burner and the grinder. The following sections compare and explain the CO₂ emissions.

C. Carbon Cycle

First we should understand "Biogenic CO₂ and the Carbon Cycle, based on which the IPCC and other agencies have determined that the burning of woody biomass is CARBON NEUTRAL, that is the release of biogenic CO₂ is not considered a bad Greenhouse Gas in contrast to the carbon dioxide that is released into the atmosphere from the combustion of hydrocarbons such as petroleum or Diesel fuel. That CO₂ is formerly sequestered "bad" Non-biogenic CO₂. The carbon that is released in this case was sequestered deep inside the Earth and it would have remained there forever, were it not harvested by man and combusted in Diesel engines of trucks, grinders, ocean ships, airplanes, etc.

The Biogenic CO₂ from Biomass burning represents carbon that was absorbed by trees and taken from the surrounding CO₂ in the air as the result of nature's process of photo syntheses by which life is sustained on Earth. The carbon portion of the CO₂ remains sequestered in the woody tree or other vegetation and the oxygen is released into the surrounding atmosphere.

When the wood waste burns in the air curtain burner, as it would naturally in a wildfire, but at very high combustion efficiency in the ACB, the carbon from the woody biomass again combines with oxygen and forms CO₂. The cycle is complete. No additional CO₂ was added to the atmosphere. The carbon cycle is depicted in the image to the right. The sequestered CO₂ in the wood will eventually be released whether it is submitted to the ACB or the grinder or left to fall in the forest.



D. Overview of Emissions from Air Curtain Burner and Grinder

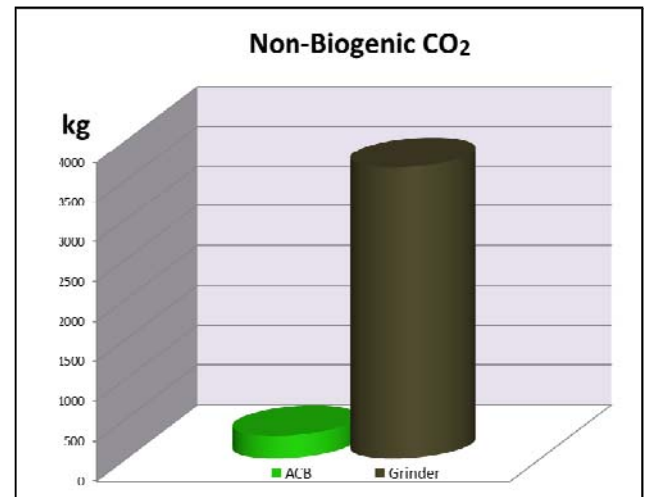
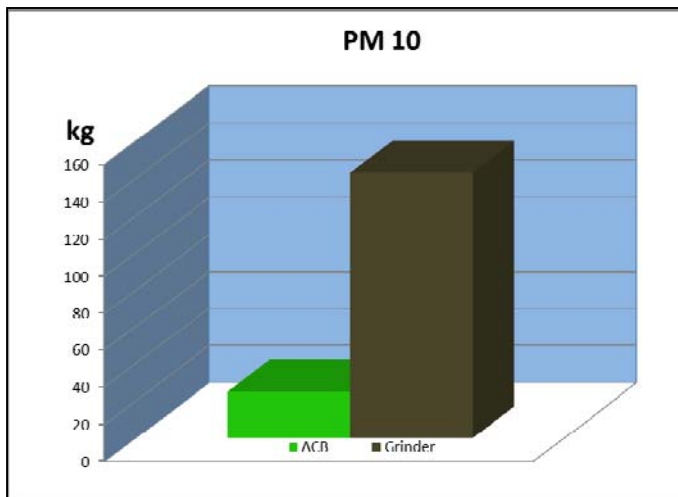
1. Air Curtain FireBox

The air curtain burner selected for this comparison is a mid-size Model S-220. It is equipped with a small Diesel engine (59 hp) that powers the air fan. Emissions from the engine's exhaust will be considered.

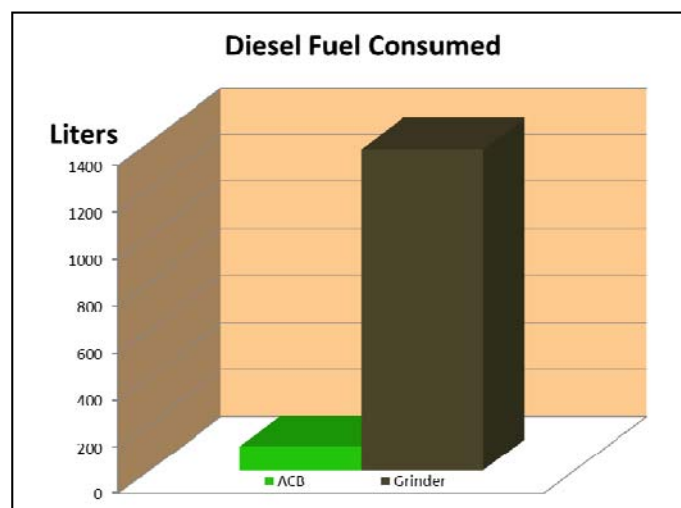
The wood is burned inside the burn chamber where the wood waste is the only actual "fuel" that is combusted. PM emissions from the combustion process will be considered.

2. Wood Grinder

Grinders are powered by large Diesel engines, as large as 12 cylinders, 1000HP engines with high fuel consumption. Emissions from the engine exhaust will be considered. The wood waste grinding operations release PM in the form of wood dust (a) from the grinding process itself and (b) from the release of the chips or mulch from the machine via a conveyor belt or similar system. (c) Fugitive PM is released from the storage pile, the on-site staging by a machine (i.e., front-end loader) that pushes the material away from the conveyor belt outlet area, and also each time the material is loaded, transported and finally dumped at its ultimate disposal site, usually a landfill.



These charts graphically show the stark differences between two similar sized machines that can process 100 tons of wood and vegetative waste in one day. The quantitative details are defined on the following pages.



E. Quantitative Comparison of Selected Two Pollutants from FireBox and Grinder for 100 Ton of Wood Waste Disposal/Processing

1. Air Curtain Burner (ACB) - 59HP S-220 by Air Burners, Inc.

- a. PM from ACB Diesel engine
- b. CO₂ from ACB Diesel engine
- c. PM from wood combustion (processing)

2. Grinder - 400HP Generic Grinder

- a. PM from Grinder Diesel engine
- b. CO₂ from Grinder Diesel engine
- c. PM from wood chipping/grinding (processing)
- d. PM, fugitive releases from on-site handling
- e. PM from Truck Diesel engines
- f. CO₂ from Truck Diesel engines
- g. PM, fugitive releases from transporting and discharge
- h. PM, fugitive releases from remote/landfill site handling

3. Basic Specifications of Air Curtain Burner (FireBox)

Model: Air Burners, Inc. S-220

Engine: Kubota Model V2403-TE, 59 HP max.

Diesel fuel consumption: 8.5 L/hr average

FireBox through-put: 8 tons/hr (8000 kg/hr)

4. Basic Specifications of Wood Grinder

Model: Generic Model

Engine: Generic Diesel, 6 Cylinder, 400 HP max.

Diesel fuel consumption: 113.5 L/hr average

Grinder through-put: 16 tons/hr (16000 kg/hr)

5. Notes

a. The loading equipment, such as an excavator, is not included in the comparison, because both the FireBox and the Grinder are assumed to use the same or a similar loading machine, albeit the FireBox for 10 hours and the Grinder for 6¼ hours. This is balanced by the use of the equipment for removing the beneficial ash from the FireBox and for pushing the chips away from the grinder's conveyor belt discharge area, where the mulch has to be cleared out over a period of 6 hours, however, the ash can be removed from the FireBox in less than 15 minutes.

b. Calculation of number of dump trucks required to transport 100 tons of wood waste ground into mulch:

1) Weight: 100t fairly dry woody debris

2) Typical grinding and mulch handling/spillage losses (wood dust and moisture) by weight 2% or $\approx 2,000\text{kg}$ (2t)

3) As 1m^3 of mulch has a weight of 290kg, $100\text{t} - 2\text{t} = 98\text{t}$ (198000kg) of wood material ground has a volume of $198000/290 = 337\text{m}^3$

4) 1 dump truck can hold (legally) heaped 17m^3 (no weight consideration needed, load weighs only $\approx 5\text{t}$)

5) $337/17$ trucks ≈ 20 dump trucks are required

c. Assumption of travel distance to mulch disposal site is 40km one way, total travel distance for 20 loads would be $20 \times 80\text{km}$ (roundtrip) or 1600km; at an average speed of 48km/hr, truck engines would release emissions for $1600/48 = 33$ hrs for every 100 tons (100000kg) of ground wood waste hauled.

d. The fugitive PM emissions from road dust caused by the trucks are ignored, but could be significant in rural areas with unpaved roadways.

e. Emissions from the frequently needed Diesel fuel tanker to refuel the grinder and fleet of trucks are also ignored for this comparison.

Table on following page

PM & CO₂ Data for 100 Tons of Wood Waste Processed

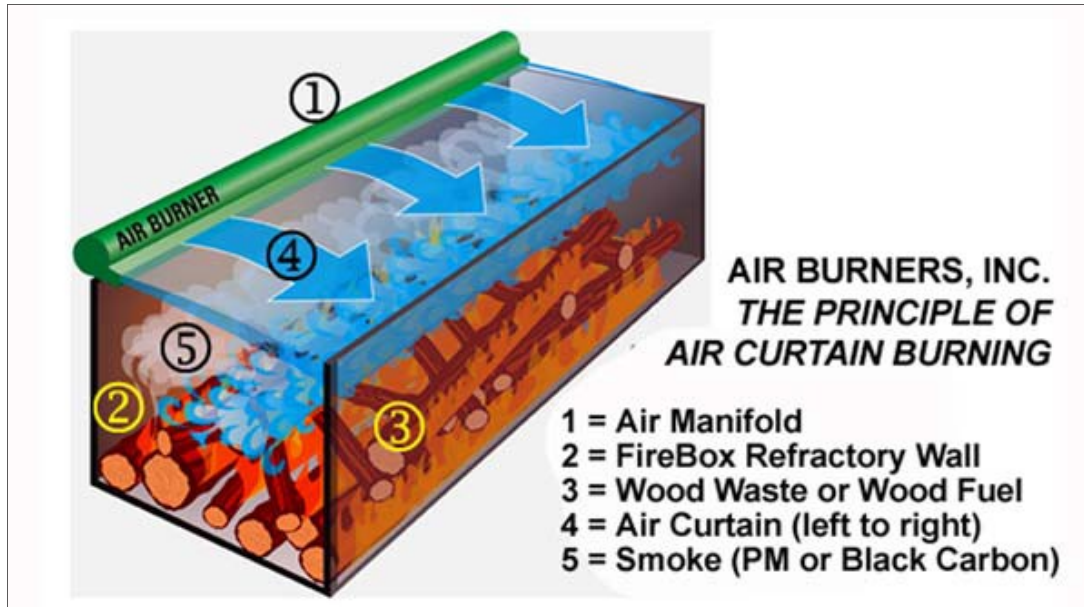
Source	Pollutant	Units	Typical Emissions or Data		Air Burners S-220 59HP	Wood Grinder 400HP
			ACB	Grinder	100t Wood Waste	
Diesel Engine - Processing	PM10	kg/HP-hr	0.059	0.4	0.74kg	2.5kg
Wood Processing	PM10	kg/t	0.24kg/t	0.8kg/t Fed Limit 0.9kg/t	24kg	80kg
Handling of Chips on-site*	PM10	kg/t	0	0.1	0	10kg
Diesel Engine - Trucking 300 HP	PM10	kg/HP-hr	0	0.3kg	0	30kg
Handling of Chips Trucking*	PM10	kg/t	0	0.1kg/t	0	10kg
Handling of Chips Remote Discharge*	PM10	kg/t	0	0.08kg/t	0	8kg
Total PM10					24	140.5
Diesel Engine - Processing	CO ₂ Non-biogenic	kg/L	2.67kg/L	2.67kg/L	283kg	1894kg
Diesel Engine - Trucking 300 HP	CO ₂ Non-biogenic	kg/L	0	2.67kg/L	0	1762kg
Total Non-biogenic CO₂					283kg	3656kg
Diesel Engine - Processing Fuel Consumption	-	L	8.5/hr	113.5/hr	106L	709L
Truck -300HP Fuel Consumption		L	0	41L/hr 100km		660L
Total Diesel Fuel					106L	1369L
Wood Processing - Particulate EPA Limit	PM Opacity	%	10	20	-	-
Summary of Totals (rounded)						
TOTAL PM10					25 kg	141 kg
TOTAL CO₂					283 kg	3656 kg
TOTAL Diesel Fuel Consumed					106 L	1369 L

See Charts on page 5

F. Brief Discussion of the Equipment and Operation

Air Curtain Burners are above ground refractory walled burn chambers that provide a high velocity curtain of air ("air curtain") over the top of the burn chamber. The air curtain acts like a lid trapping the PM rising from the fire with the intense hot gases and re-burning the PM until the particles are so small that they escape as a gas through the air curtain.

(www.aircurtaintechnology.com).



The high velocity air curtain is created by an air fan powered by a small Diesel engine. Air curtain burners reach very high temperatures of 800°C -1200°C thereby achieving virtually a complete combustion of the wood waste. The residue consists of 2%-3% or less of residual ash that has beneficial use and is usually applied to the surrounding land. (97% to 98% of the wood waste is being totally eliminated. A larger FireBox, such as model S-327, has been designed to eliminate 10-12 tons per hour.

Wood Grinders, such as horizontal or tub grinders were designed to facilitate the transportation of wood debris, not to eliminate it. It was the objective to grind or chip the wood debris into smaller pieces so more weight would fit onto a truck for hauling it to a location for final disposal or storage. The function of the grinders therefore is to provide an interim process, not a final disposal solution. Grinders are powered by large high horse power Diesel engines that drive massive mechanisms which cut or hammer the wood debris into small pieces commonly referred to as chips or mulch. The mechanism is quite susceptible to breakdowns, because objects, such as chunks of stones or metal which often are inadvertently loaded with the wood waste cannot be tolerated well. Rocks, stones and metal are of no concern for the ACB. This is actually the main reason why it is so preferred for getting rid of root balls.

For a comparison of the commercial or cost related aspects of the two methods (next section), the most important single distinction is the fact that the air curtain burner offers an end solution for wood waste disposal whereas the grinder offers only an interim process facilitating the transport of the woody debris. This process does not eliminate the waste, as the air curtain burner does.

ECONOMICS

G. Economics

One of the major benefits of the Air Curtain FireBox: it is a preferred environmental solution that provides an economic benefit to the operator. It is not often that you can have a machine that will benefit the environment and also provides an economic incentive for its use. The Air Burners FireBox is just that machine as demonstrated in the chart below.

Cost Comparison Example for the Disposal of 100 Tons of Wood Waste <i>Air Curtain Burning vs. Grinding vs. Landfill Dumping</i>			
	S-220 Air Curtain Burning	Grinding & Trucking Landfill Disposal	Direct Landfill Hauling & Disposal
Operating Costs			
Fuel Cost: ACB 10 hours or 39 gals (106L) Grinder: 6 hours or 138 gals (500 L)	\$146	\$517	-
Maintenance: S-220 \$0.75/hr Grinder \$16.00/hr	\$10	\$102	-
Hauling of Residual to Landfill 25 mile (40km) one way / 50 miles (80km) round trip @ \$4.00/mile with 20-ton Dump Truck	0	\$4,000 (20 Loads)	\$7,000 (35 Loads)
Tipping Fees at Landfill or other Mulch Disposal Cost (\$10 per Ton)	0	\$980 (Note 4)	\$1,000
Total Disposal Cost for 100 Tons (400 m³)	\$156	\$5,597	\$8,000
NOTES: 1) Individual results may vary. 2) HP to fuel consumption approx. $hp \times 0.05 = FC$ in UD Gals/hr. 3) Grinder: HP is 450, i.e. Vermeer HG4000. Diesel Fuel cost \$3.75/USgal. 4) It is assumed that chips cannot be reasonably sold for beneficial re-use. 5) Grinding process and mulch handling and transporting produces significant amounts of particulate matter (PM) in the form of wood dust (also PM) that can cause serious illness in exposed workers. Wood dust is a proven carcinogenic (cancer-causing). Mulch losses, in form of wood dust and spillage are approx. 2% or 2 tons in this example. Only 98 tons of wood chips are transported and dumped. 6) Air Curtain Burner residual is 2-3 tons of ash, is usually land-applied on site; Grinder output yields no weight reduction, but does provide significant volume reduction. In this example, waste is hauled by at least 20 trucks each carrying approximately 17m ³ or 5-6 tons. 7) Direct hauling of land clearing wood waste to landfill will require approximately 35 trucks. 8) Loading cost is not considered, as the same machine would be used for any of the options. 9) The S-220 is a medium size above ground refractory walled firebox. Larger and smaller models are also available. See www.AirBurners.com			

When evaluating different wood waste disposal alternatives, it is often overlooked that a

comparison of air curtain burners to grinders is really quite flawed: the FireBox offers an *end solution*; the waste is eliminated. The grinder in contrast thereto is only an *interim step*, a tool to facilitate the transport of the wood waste to the ultimate disposal location. Whenever the two methods are compared, whether from the standpoint of economics or environmental friendliness, the cost and the pollution from the transport vehicles must be factored into the equations. Only then a true and useful comparison can be drawn. The air curtain FireBox will be superior every time by margins so wide, that those voices wanting to argue the finer points of the above comparisons will be swiftly muted.

A quick discussion regarding the residual products of the two disposal methods is worthwhile. Forest fires burning vegetative waste represent a natural process that has been going on since the beginning of time. A lightning bolt strikes the ground, a wildfire starts and the forest floor is cleared of dead limbs, pathogens, insects and nutrient-robbing undergrowth. The ash becomes a beneficial soil amendment. The burning of wood waste in the FireBox replicates the burning of woody material by natural forest fires, but without the smoke, the FireBox ash becomes a beneficial soil amendment. Because the ashes have a high pH, they are also useful as an additive to the daily landfill cover at a commercial landfill site further augmenting the overall cost savings enjoyed by the use of the FireBox.

The mulch from the grinder, on the other side, more often than not poses a real commercial and environmental problem. The grinding and hauling is expensive, tipping fees can be high and the mulch hardly ever has a beneficial (commercial) use. Typical mulch grindings may include, seeds of invasive species plants, insect larvae, inorganics, mold spores and termites. The mulch is still a waste product, and it costs money to dispose of waste. For the environmentalist charged to safeguard our environment there are several concerns. First, a major problem across the US is the safety and pollution issue from the spontaneous combustion of larger mulch piles. They tend to smolder for many months with no good way to extinguish the fire. Second, the mulch will go septic from natural decomposition. That causes discharges of leachate that are undesirable, as they enter the ground drinking water table. Finally, mulch piles can attract rodents and other pests and when used as landscape material, the mulch can alter the ground ecosystem or even bring pests to homes, if scattered near them. The US Forest Service has long recognized the detrimental effect of mulch deposited on the forest floor and heavily restricts the amount of mulch that can remain from cutting operations.



H. Energy

Recovery

from the FireBox

The Air Burners FireBox has an optional heat recovery system that allows the operator to utilize waste heat for other purposes, such as kiln drying and heating facilities. In late 2012 the PowerGen FireBox will be available. Currently in testing this self-contained Biomass power generating system will produce electricity from the waste wood. In addition, the system is portable allowing users to "follow the waste", again reducing the environmentally damaging and costly transportation component. You can read more about this exciting new product on our website at www.powergenfirebox.com.



I. Conclusion

The Air Burners FireBox is a well proven and tested technology that delivers benefits to both the corporate budget and the environment. From an environmental standpoint we need to embrace technology that incentivizes the user to protect our environment. From a corporate budget standpoint you can purchase the FireBox for less than a competing grinder and you now have the "end solution".

A comparison of two common methods for the disposal of wood debris has been: (1) Air Curtain FireBox versus (2) grinder and associated trucking option where the ground mulch is hauled to a remote location for ultimate disposal.

The air curtain option is superior both from the economics of the operation and the protection of the environment. In every instance, grinding the waste and hauling it away will be considerably more costly and will release a higher level of undesirable pollutants. Protecting the environment and saving money is a winning combination.

J. References

1. Diesel Engine Emissions Calculations:
US EPA AP42, Section 3.3 "Gasoline and Diesel Engines", Los Alamos National Laboratory (LANL/US Energy Dept.): "Air Curtain Destructors, General Description of Source Category".
2. Air Curtain Burner PM Emissions Calculations:
 - A) USDA-Forest Service: Reducing PM2.5 Emissions Through Technology, Results from a Recent Study Evaluating the Effectiveness of an Air Curtain Incinerator.
Fountainhead Engineering: *Air Burners S-327 Emissions Test Report*
US EPA Chalmette, Louisiana Air Curtain Burner Test (S-327)
 - B) Grinder PM Emissions Calculations:
State of California BAAQMD Regulation 6-301 and BAAQMD Condition #6385 part 4.
Ringelmann 1/20% opacity; BAAQMD Regulation 6-311:
 $E=0.026(P^{0.67})$ where E=allowable emission rate (PM, lb/hr) and P=wood process rate (lb/hr)
 - C) Air curtain Burner Technical Data:
www.airburners.com
 - D) Grinder Technical Data:
Generic literature accessible at www.google.com

K. Appendix

1. Air Burners, Inc. FireBox Brochure
2. FireBox Specifications for S-327 and S-220
3. Air Burners, Inc. MSRP Price Sheet (US)

* * * * *



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www.AirBurners.com

Quotation

Date: November 15th. 2016

REF: T30009281618rev1

Attn: Linda B. Harper

Bill To: Agriculture Department of Administrative Services 1900 Kanawha Blvd., East Charleston, WV 25305 Work: (304) 558-0468 Email: linda.b.harper@wv.gov	Ship To: West Virginia Conservation Agency 255 Gus R Douglas Ln. Charleston, WV 25305-0913
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Item	Quantity	Description	Unit Cost	Amount (US\$)
1	1EA.	Air Burners 2016 Model T-300 Trench Burner with Four cylinder Diesel Engine 56 HP (Kubota V2403-TE or equivalent engine), full enclosure; security locks around power source; Painted yellow	\$39,950.00	\$39,950.00
2	1EA.	Government discount 3.50%		(1,398.25)
3	Lot	Freight by common carrier, to address above.		\$2,049.30
			TOTAL	\$40,601.05

Payment Terms: As specified in RFQ AGR1700000006.

Shipping Terms: EX WORKS (FOB) Factory, Palm City.

Delivery Time: The T-300 will ship no later than 45 business days from receipt of purchase order.

Notes: The published technical specifications for the T-300 air curtain trench burner apply.

THANK YOU FOR THE OPPORTUNITY TO BE OF SERVICE.

Air Burners, Inc.
Matthew O'Connor
Ph: 772-220-7303
Cell: 772-631-8140
Email: moconnor@airburners.com



TRENCH BURNER SPECIFICATIONS

T-300



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 56 HP (Kubota V2403 -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: 30' (9 m)
7	Average Through-put	8 Tons per Hour (Average – See Note)
8	Fuel Consumption	Approx. 2.5 Gal/Hr (9.5 L/Hr)
9	Weight	6,500 lbs. (2,950 kg); Tongue Weight: 750 lbs (340 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.