AIR CURTAIN BURNERS

Air Burners, Inc Model S-220 FireBox located at SRF Mad River Ranger District, Ruth Guard Station on loan from Cal Fire Humboldt-Del-Norte Unit.
The primary purpose of the air curtain is to create a "secondary burn chamber." The air curtain is like a lid covering the opening in a FireBox. The particles of smoke rising on the hot gasses of the fire are trapped under the air curtain. These smoke particles are then reburned and their size is significantly reduced. With this reduced size, they can now escape through the air curtain and appear more like waves of heat than smoke. The result is a very clean burn, with opacities well under 10% per EPA Method 9 Testing (as compared to open burning, which typically can run at 80% to 100% opacity).
AIR BURNERS, INC.
THE PRINCIPLE OF
AIR CURTAIN BURNING

1 = Air Manifold
2 = FireBox Refractory Wall
3 = Wood Waste or Wood Fuel
4 = Air Curtain (left to right)
5 = Smoke (PM or Black Carbon)
Semi-Stationary (FireBox on Skids) Model S-220

- Burn large material such as large logs and root balls
- Best air burner option for treating landing piles
- Dramatically reduced operating costs compared to grinding and trucking
- High mass reduction 95% to 98%, i.e. 100 tons wood = 2-4 tons of ash or BioChar
- Requires a lowbed trailer, a dozer or medium excavator for transporting and moving the firebox
- Requires an excavator or front-end loader for loading material into the firebox
- Price = $121,000

Mobile Trailer Mounted FireBox “The Burn Boss”

- Highly mobile (especially on logging roads) and can be towed with a standard heavy-duty pickup truck
- Best for roadside applications; forest slash, WUI areas, agricultural vegetative waste, invasive plants, land clearing, and community clean-up projects
- Can be loaded by hand if needed, but small excavator would minimize exposure to heat and smoke
- Price = $53,000
Biomass Power Generator

- Accepts whole logs, root balls, construction or vegetative waste without having to pre-treat by crushing or grinding
- Is a portable system and does not require a permanent facility
- Requires an excavator or front-end loader for loading material
- Air Burner, Inc has 3 systems; 100 KW, 500 KW, and 1MW
- Price starts at $840,000 for 100 KW

Trench Burner- Mobile Trailer Mounted

- Best used for short-term land clearing operations
- Mobile; can be towed with a standard heavy-duty pickup truck
- An excavator or front-end loader required
- Trench needs to be near perfect to achieve “curtain” effect
- Doesn’t work well in sandy or rocky soils or where numerous roots present
- May have application for landing pile burning without constructing a trench and utilized as a large air blower
- Trench requires a barrier for safety concerns
- Price = $42,000
Air Burner S-220 being loaded for trip to Ruth Guard Station
Loading the burn box utilizing a roll-on/off system requiring a dozer or excavator. This operation takes about 1 hour to complete.

Note: There are specialized burn boxes adapted to a standard cable hoist or hook lift truck transportation system. These come with a steel floor to support this type of roll-off system.
Landing piles from Mad Gap Timber Sale being loaded for transport to Ruth Guard Station

BEFORE REMOVAL
AFTER REMOVAL
Preparing the S-220 FireBox for ignition.

Note the refractory lined walls that aid in the combustion process by retaining and reflecting the high temperatures generated in the firebox.
CAN YOU SEE THE SMOKE ??

SRF Dozer Operator loading slash from nearby 1st 48 Project fuels treatment area
ADVANTAGES

AIR CURTAIN BURNING (ACB) vs OPEN PILE BURNING (OPB)

- Reduced Emissions by 80% - Greenhouse Gases (GHG) and Particulate Matter (PM)
- Better Consumption – 98%+
- More Opportunities to Burn:
  - Under Hotter/Drier Conditions (as allowed by Agency Burn Plan or Contingency Plan)
  - During Limited Operating Periods (LOPs) if approved in consultation and addressed in NEPA
  - Within or adjacent to communities, sensitive areas, or Class 1 airsheds (wildernesses) as approved by Air Quality
  - On “No Burn Days” by obtaining a “No Burn Day” permit from Air Quality
- Potential of Reduced Burn Time for Larger Piles (OPB may smolder for weeks)
- Reduced Staffing – Typically 1 to 2 persons for ACB, 3 person minimum for OPB
- ACB can burn larger material such as root balls more efficiently
- Reduced risk of fire spread and firebrand escape
- Soil damage restricted to landings, roads
- Minimizes scorch or mortality to surrounding residual trees/vegetation
FACTORS AFFECTING PRODUCTION

- Fuel Moisture (too wet or dry)
- Fuel Size
- Type/Species of Fuel
- Amount of Soil in Fuel
- Location of Fuel Relative to Location of the FireBox

Since May 2020, the FireBox has consumed 295 tons of slash, treating 67 acres of fuel reduction projects in the Ruth Lake area.
Trench burning was less smoke producing than open pile burning, but the “curtain” effect was compromised by loose, rocky soil collapsing the trench.

This trench burner will be utilized as a large blower for burning landing piles in lieu of constructing a trench. Effectiveness yet to be determined.
OTHER USES

- Biomass Energy: 100KW – 500KW – 1000KW
- Construction/Disaster (Hurricanes/Flooding) Clean-up
- Noxious Weeds/Illegal Marijuana
- Soil Remediation Utilizing Biochar
# AIR BURNER SPECIFICATIONS

*as provided by Air Burner, Inc*

<table>
<thead>
<tr>
<th></th>
<th>AIR CURTAIN S-220</th>
<th>BURN BOSS</th>
<th>TRENCH BURNER</th>
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<tbody>
<tr>
<td><strong>POWER</strong></td>
<td>3 Cylinder Turbo Diesel, Appx 49 HP (No DEF), EPA Tier 4 or 3 Phase 30 HP Electric</td>
<td>2 Cylinder Diesel, 12.5 HP EPA Tier 4</td>
<td>3 Cylinder Turbo Diesel, 49 HP, EPA Tier 4</td>
</tr>
<tr>
<td><strong>OVERALL SIZE</strong></td>
<td>30 ft 1 in x 8 ft 1 in x 8 ft 1 in</td>
<td>19 ft 8 in x 7 ft 8 in x 5ft 8 in</td>
<td>27 ft 5 in x 8 ft 2 in x 7 ft 4 in</td>
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<tr>
<td><strong>FIREBOX SIZE</strong></td>
<td>19 ft 8 in x 6 ft 2 in x 7 ft 1 in</td>
<td>12 ft x 4 ft x 4 ft</td>
<td></td>
</tr>
<tr>
<td><strong>WEIGHT</strong></td>
<td>36,650 lbs</td>
<td>9,900 lbs</td>
<td>6,500 lbs</td>
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<tr>
<td><strong>FUEL CONSUMPTION</strong></td>
<td>2 gallons/hour</td>
<td>.35 gallons/hour</td>
<td>2 gallons/hour</td>
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<tr>
<td><strong>PRODUCTION</strong></td>
<td>6-7 tons/hour</td>
<td>5-20 cubic yards/hour</td>
<td>8-10 tons/hour</td>
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JUNE 23 2020 – 2:30 PM
Temperature: 98 degrees F
Relative Humidity: 22%

BBQ at Ruth Guard Station

Air Curtain Burning at Ruth Guard Station
FINAL THOUGHTS - CONSIDERATIONS

BURNING UNDER HOT CONDITIONS:
- If Burn Plan required, follow Burn Plan prescription parameters
- Have a contingency plan:
  - Place water or apparatus on site as needed
    - Mad River RD is ordering a set of sprinkler systems to surround the air curtain
  - How close are firefighting resources
    - Consider moving to a centralized area closer to firefighting resources
  - What are the availability of firefighting resources
  - What is the current and predicted Fire Danger Rating

AIR CURTAIN VS TRADITIONAL BURNING: ??
- What are the Objectives
  - Landscape Ecosystem Management
  - WUI, Sensitive Areas
- Cost vs Benefit
Credits

- Air Burners, Inc
- Air Curtain Burners: A Tool for Disposal of Forest Residues (2017); Eunjai Lee and Han-Sup Han
- Personal Observations
  Mad River Ranger District
  Heavy Equipment and Fuels Personnel