

Burning Garbage and Land Disposal In Rural Alaska

A Publication for Small Alaskan Communities Considering Incineration and Energy Recovery



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May 2004

2) Burn Cages



Figure 6: Burn cage burning municipal garbage in rural Alaska.

A burn cage is a simple and inexpensive way to make an open burn more effective. It makes the following improvements over open burning on the ground:

1. As pictured above, the burn cage exposes the waste to natural draft on all surfaces including the bottom. This allows air to access the waste and promotes more efficient combustion throughout the burning period.
2. It limits the size of the waste pile thereby reducing the potential for smoldering of waste not exposed to air inside the pile.
3. It contains the burning within a specific location reducing the chance of the burn spreading to other waste disposal areas or surrounding vegetation.

The burn cage pictured above is a 12-foot long by 8-foot wide by 6-foot high rectangular frame (3 sections of which are 4-foot long) made of 3-inch by 2-inch double square tubing. Expanded metal grating covers the entire structure. The top is hinged in order to allow access and emptying of incomplete products of combustion. Metal plates welded to the bottom fit the forks of a forklift and allow the unit to be lifted so that ash can be removed from the ground and/or the unit can be easily re-positioned.

Proper operation involves loading the burn cage to about half of its capacity and then igniting the waste. Combustion air is drawn from all sides and the fuel is consumed much like that of an open burn, except more efficiently as more air is available. These units rely on natural draft, not a fan, to provide combustion air and do not require power or a motor to operate. The length of the burn cycle is dependent upon the amount and type of waste that is burned.

Although this form of burning is an improvement over uncontained open burning on the ground, there is still a good chance that insufficient turbulence and low burning temperatures will produce smoke and incomplete combustion products. The process may not consume large and frozen masses of waste and partly burned food wastes may still attract animals.

A common problem in using a burn cage is overfilling the unit. This decreases combustion efficiency and causes smoldering. Non-combustible items, hazardous wastes, and wastes that will smolder or produce smoke or odors should be separated out prior to burning. This method is an effective way to burn clean, dry wood, paper and other wastes that ignite and burn cleanly without smoke.

Burn cages can be built locally using existing resources. However, units can also be pre-cut and shipped for assembly on site. Plans for burn cages may be obtained by contacting Alaska Native Tribal Health Consortium, Environmental Health and Engineering Branch in Anchorage, Alaska at 907-729-3600.

2) Air Curtain Incineration

Air curtain incineration provides a more advanced form of combustion over open burning and burn boxes. Air curtain incineration operates by forcefully projecting a thin curtain of air at high velocity across an open chamber or pit in which burning occurs. This high-speed curtain of air helps these systems achieve the high temperatures and turbulence needed to burn waste completely. Incinerators of this type can be constructed above or below ground and with or without refractory walls and floor. All air curtain systems require externally supplied electrical power to drive the air curtain. This is provided through a generator or electrical power to the site.

Air curtain incinerators are not perfect systems. Even though ample turbulence is provided, the burn is not confined to a high-temperature region maintained by a fuel with a high BTU value. This means that cold areas exist within the burn and will form smoke. This is especially true during the start-up phase of the burn cycle when the turbulence will blow ash and smoke from the unit. This effect is minimized in the vertical column air curtain device that is described below.

The length of the burn cycle, including start-up and burn down, is dependent upon the amount, the moisture content, and the BTU value of the waste that is burned.

Three basic variations of the air curtain incinerator exist. One unit operates by blowing air into a pit (**Figure 11**). Another device has a refractory-lined, horizontal primary chamber into which the curtain of air is blown (**Figure 12**). These units have the advantage of being mobile and can be taken from site to site, but because they do not have retention chambers, smoke discharges directly from the unit into the air. These systems are used in other states to burn land clearing wastes and demolition debris. They have had limited use burning municipal waste in this country because of the difficulties in meeting air quality standards, especially during the start-up phase of the burn.



Figure 11: Pit air curtain incinerator.



Figure 12: Horizontal above ground air curtain incinerator during start-up (note 100% opacity).

A third type of air curtain incineration is called Vertical Column Air Curtain Incineration (**Figure 13**). Vertical Column Air Curtain Incineration has markedly improved burning qualities compared to the open burning and incineration methods previously discussed (including the other air curtain devices). It is one of the least costly of the better incineration methods.

A vertical column air curtain incinerator operates in a vertical column of air, in which smoke is returned from an upper retention chamber to the lower primary chamber using gravity and counter current draft.



Figure 13: Vertical Air Curtain Incinerator

Smoke is re-burned when it is convected back to the primary chamber. This process reduces smoke emissions and makes this system more acceptable for burning garbage and other municipal wastes. The air curtain provides active turbulent mixing of air into the waste, which increases the temperature. It takes approximately 10 minutes to reach operating temperatures during which time the unit will likely exceed air quality opacity standards. However, the waste will burn cleanly without smoke once operating temperatures are reached. Temperatures can

reach as high as 2,000 °F during combustion, which leaves cans that easily crumble and ash that is not attractive to animals. Bottom ash is easily removed through access doors in the primary chamber.

The vertical column air curtain incinerator uses externally supplied fuel oil or propane to ignite the waste in the lower (primary) chamber. Once the waste is ignited an overfire air system (the air curtain) is activated and the externally supplied fuel is turned off. This provides a cost saving compared to the more advanced incineration systems that require supplemental fuel during the entire burning process.

The unit is not mobile and has not been used in Alaska for municipal use. Questions remain regarding the combustion efficiency of these units in harsh cold and wet Alaskan climates and to the extent non-combustible wastes need to be separated out prior to burning. On the positive side, vertical column air curtain incinerators have been used to burn municipal garbage in Colorado and California and have had extensive use in other countries. The total cost for these units will vary depending upon size and transportation costs.