
Cardboard as a Fuel Source for Heat

Alaska processing & permitting summary



photo by Amanda Byrd, ACEP



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Cardboard as a Fuel Source for Heat

A summary of the processing and permitting steps necessary to burn cardboard in a burning appliance for the purpose of heating a building in Alaska



Haines Friends of Recycling photo

Abstract

Southeast Conference facilitates the Alaska Wood Energy Development Task Group in partnership with the Alaska Energy Authority, the U.S. Forest Service and state and private forestry groups in Alaska. It promotes clean burning, high-efficiency, low-emissions appliances.

The group receives requests for information and solicits applications from organizations interested in heating their facilities with wood. Applicants sometimes request to use cardboard as all or part of the fuel instead of wood. In rural communities, the greatest portion of the waste stream is cardboard. Currently, cardboard in rural landfills is burned in large open pits or burn piles, but the heat is lost to the air.

Purpose

The purpose of this paper is to explore the feasibility and practicality of burning cardboard in a boiler to heat a building. The rationale is that cardboard is made from wood fiber, is similar to wood and should create a similar amount of heat. Additionally, cardboard is readily available and can be easily segregated from the waste stream and processed.

The reason for considering cardboard for burning to create heat is two-fold. Abundant cardboard arrives at solid waste or recycling facilities, but there is no place in Alaska to process or recycle this cardboard, so it must be shipped to the Lower 48. Since this is not cost effective in many communities, the cardboard is open-burned in landfills. If the cardboard is being burned in this inefficient process, it could also be burned in controlled conditions and used to heat a public building.

Burning cardboard in an approved appliance would reduce the emissions from simply burning in the open air and would convert its energy to useful heat. Additionally, there would be a cost savings by not shipping the cardboard south and by not having to purchase another form of fuel.

According to the U.S. Energy Information Administration, most of the energy consumed in the United States is used for heating buildings. This includes all energy sources and uses and includes the military. In Alaska public schools, space heating accounts for approximately three-quarters of energy use (Wiltse, Madden, & Valentine, 2014).

Although Alaska is a major producer of petroleum, shipping the refined product to rural areas still comes at great expense. Finding local sources of fuel to displace imported fuel can help reduce greenhouse gases while retaining energy money in the local economy longer.

Resource assessment

In 2018, Americans generated approximately 1 ton of solid waste per person, and nearly a quarter of that was paper and cardboard. (U.S. Environmental Protection Agency, 2021) That amount is likely to be much greater in rural Alaska, where most products must be shipped in. This could mean hundreds of tons of paper and cardboard is available to be burned for heat each year in these small communities.

In 2008, a study in Cordova found that cardboard boxes made up approximately 10% of material in the local burn pile. The study estimated the pile collected about 500 pounds of all material daily and that 50 pounds of that was cardboard. This adds up to nearly 9 tons of potential fuel over an

entire year. It is likely a co-burning system alongside woody biomass would be needed for these amounts of cardboard.

Collecting and processing

Not all types of cardboard are created equal, including corrugated shipping cardboard, egg cartons, milk cartons and cereal boxes. To be used in a burning appliance, cardboard must be segregated from the waste stream and be free of staples and tape. Additionally, it cannot have a lot of printing ink and must only be unbleached cardboard. Other forms of cardboard have dyes and chemicals that can interfere with combustion.

While cardboard is made from wood pulp, it also contains chemicals that come from processing. These chemicals have combustion emissions that differ from those of wood. A particular concern with burning cardboard is the presence of chlorides from the pulping process. Cardboard is made in a wide variety of processes, so it is not possible to know how each piece of cardboard was manufactured. It must be assumed that chlorides are present in all cardboard. This is an issue because chlorides can corrode a burning appliance.

Additionally, the clay sometimes used in cardboard production can be abrasive and significantly increase the amount of residual ash.

Questions exist regarding the processing and handling of cardboard for burning. For example, the state of Alaska considers cardboard as municipal solid waste because it is taken to a landfill, but it is simpler to obtain a permit to burn fuel for heat than it is to obtain one to burn waste for heat. What if the cardboard was brought directly to a burning facility and processed there? Is it now a fuel that can be burned off the landfill premises, therefore easing the permitting process?

photo by Amanda Byrd, ACEP



Cardboard, regardless of where it comes from, must be processed before it can be burned in an appliance. It must be dry, clean and free of tape and staples, which requires human sorting. Processing involves shredding and forming the cardboard so it can be fed into the boiler in a uniform way.

Shredded cardboard must be stored in a location free of moisture and other debris. Care must be taken to reduce creation of dust.

Obtaining permits

Generally, operating an incinerator in Alaska requires state Title I and EPA Title V air permits from the state Department of Environmental Conservation. However, exemptions may apply and the rules affecting the project may differ.

For example, one exemption is that municipal waste can be burned in the open or in incinerators at a Class II or Class III landfill with different air quality and solid waste management requirements than those needed to burn offsite. This is typically done by open burning, but the same exemption applies when the heat is used on site. Additionally, diverting the cardboard before arriving at the landfill and processing it can possibly provide some exemptions because, depending on the process, the



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cardboard might be classified as a fuel instead of a waste product and the burning apparatus would no longer be an incinerator. However, which exemptions apply depend heavily on the specifics of each project: material burned, size and location of burning apparatus, etc.

Understanding the permitting process in advance is critical for the success of the project. Title V EPA permits require pre-purchase notifications, a siting analysis, a waste management plan and operator training. The permit application may require assistance from a consulting firm and must be submitted within 12 months of beginning operation. Air permits can be expensive. Additionally, emissions monitoring will be required once the project is operating. This is simply not feasible for many small communities, so knowing what exemptions may apply ahead of time is important.

Small scale cardboard burning appliances may need an applicability determination rather than a full permit. These criteria might reflect the size, Btu output, or the feed stream of the boiler, especially if it is co-burning with wood.

The DEC provides technical assistance through the permitting process with a fee per hour of staff time. A pre-application account (PAA) is needed for assistance beyond short discussions. To start, DEC advises that five to 15 hours are needed to determine the appropriate combination of permits or exemptions or both. See the instruction below to set up a pre-application account.

Conclusion

Cardboard waste from shipping is plentiful in rural Alaska and is already being burned. There is increasing interest in repurposing the cardboard out of the waste stream so the heat can be used to benefit the community. One impediment is the collection of regulations regarding incineration and solid waste. The state DEC will work with community leaders who want to use cardboard for heat and determine which permits or exemptions are applicable for the specific project.

PAA Instructions

Contact DEC Division of Air Quality with the following information:

Source information:

- Company (owner, not consultant): name and mailing address
- Stationary source (facility): name and address if known. If stationary source name is not provided, name will default to project name
- Latitude/longitude for stationary source (necessary if company mailing address is not located in Alaska)

PAA information:

- Project name (this name is not available to the public)

Billing information:

- Company name responsible for billing
- Billing address (if different than mailing address)
- Billing contact: name, phone number and email address

General information:

- Responsible official: name and contact information
- Project contact: name and contact information

Division of Air Quality contact information:

Environmental Program Technician

State of Alaska | Dept. of Environmental Conservation

Division of Air Quality | Air Permits Program

555 Cordova St.

Anchorage, AK 99501

907-269-3070



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