

Attachment E

Plasma Arc Technology for Waste Disposal

Overview

Plasma arc technology is being examined as a method of waste management. Plasma arc technology uses extreme high temperatures created by a plasma torch to break down waste into gas used for power generation and a rock-like waste with a potential use in construction projects (i.e., road gravel or aggregate for concrete or asphalt pavements). Plasma gas is the hottest heat source available, with temperatures ranging from 2,700 to 12,000 degrees Fahrenheit. A plasma arc system is designed specifically for the type, size, and quantity of waste material to be processed. The process is intended to be a net generator of electricity and to allow waste to be used completely (40% of the energy is used to operate the system; 60% sold to electric grid). The technology has been used primarily to treat industrial, military, and hazardous wastes.

Plasma arc facilities operating throughout the world are used primarily for incinerator ash and hazardous waste. Additionally, plasma arc technology is used in industries such as steelmaking and metallurgy.

Types of Plasma Arc Technology for Waste Industry

Plasma arc technology can be used to process waste as described in the previous section which is considered *ex situ* disposal. In this process, one or more plasma torches would operate to continuously pyrolyze household and industrial refuse material. By-products of this process include an inert rock-like slag and energy.

Another application for this technology is reclamation of landfills and remediation of contaminated soils and burial pits. This process called *in situ* remediation. Conceptually, a plasma arc torch can be lowered into a borehole and operated to melt contaminated materials into a type of magma, which cools into a zone of vitrified material. The plasma torch is slowly raised and operated at progressively higher levels to convert a mass of soil into a remediated material called slag. The slag can be left in place or removed to be used in construction processes such as roadways.

St. Lucie County Example

St. Lucie County in eastern Florida will be using plasma arc technology to process their municipal solid waste. This facility will be the first of its kind in the United States and the largest in the world, capable of processing 2,000 tons of municipal solid waste per day. Additionally, 1,000 tons per day will be mined from the existing landfill. The total cost of the facility will be approximately \$425 million.

Benefits

Although no large scale plasma arc facility is currently operating, there are several potential benefits to this technology.

Extend the life of landfills

Proponents claim that plasma arc produces two by-products: energy and slag. The slag can potentially be used in construction projects thereby reducing the need for landfill disposal.

Renewable energy

The plasma arc system is considered a renewable energy source since the waste stream is continuous.

Landfill Reclamation

As seen in the St. Lucie County example, plasma arc technology can potentially be used to reclaim landfills.

Managing Multiple Waste Streams

Plasma arc systems can process municipal solid waste, hazardous waste, asbestos, and medical waste.

Emissions

Emissions taken at five plasma plants revealed that either no contaminant emissions were present or that the amounts present were one thousand times below the US EPA's standards.

Barriers

There are many barriers and unanswered questions regarding plasma arc technology that should be investigated. The following is a list of questions that should be examined in more detail.

Emissions

Although some reports conclude that plasma arc systems have no emissions or that the amounts were a thousand times lower than USEPA standards, other reports conclude that emissions of mercury, cadmium, arsenic, and sulfur dioxide are higher than incineration.

Recycling of Slag Material

Proponents of plasma arc technology claim that the end products will not be landfilled. In Japan, the government has classified the slag as a safe product that can be used in construction processes. However, there is no market for the material at this time because of its content. Furthermore, in Hawaii, where plasma arc technology was examined, staff noted that landfilling of residues would still be necessary based on Japan's experience.

Capacity

Hamilton County currently disposes of approximately 3,000 tons of waste each day. To date, there is no full-scale facility of this size in operation.

Public acceptance

Critics view plasma arc technology as a high-tech incinerator.

Cost

High projected capital and operating costs.

References

University of California, Davis, Center for Environmental Research and Technology
EPA Science Forum
Georgia Institute of Technology, *Evaluation of Plasma Arc Technology for the Treatment of MSW in Georgia*. 1997.
Emerging Construction Technologies
Civil Engineering, November 2006.
City of Honolulu