

# Editorial on Waste Treatment using Plasma Arc Gasification (PAG)

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## Introduction

Plasma Arc Gasification (PAG) is a waste-treatment method that uses a mix of electricity and high temperatures to convert municipal waste (garbage or trash) into useable by-products without the use of combustion (burning). Although plasma gasification is sometimes associated with incinerating or burning trash, it does not combust the garbage like incinerators do. Instead, it turns organic waste into a gas that retains all of its chemical and thermal energy, while inorganic waste is converted into slag, an inert vitrified glass. The method can reduce the amount of waste delivered to landfills while also producing electricity.

## Process

An electrical arc gasifier in the PAG process creates an arc between two electrodes by passing a very high voltage electrical current across them. After that, inert gas under high pressure travels across the electrical arc and into a sealed container of waste materials (called a plasma converter). The arc column can reach temperatures of over 14,000 °C (25,000 °F), which is hotter than the Sun's surface. Most garbage is converted into gas consisting of simple elements when exposed to high temperatures, while complex molecules are ripped apart into individual atoms.

## Plasma arc gasification produces the following by-products:

- Syngas is a gas that is made up of hydrogen and carbon monoxide. Waste materials, such as plastics, have large levels of hydrogen and carbon monoxide, and their conversion to syngas can be as high as 99 percent. The syngas must be cleaned of dangerous elements such as hydrogen chloride before it can be used for power generation. The syngas may be used like natural gas once it has been cleaned, with a portion going to fuel the plasma arc gasification facility and the rest being sold to utility companies, which also utilise it to generate energy.
- Slag, a solid residue that resembles obsidian, may be cleaned of impurities such as mercury and cadmium and processed into bricks and synthetic gravel.
- Residual heat from the process, which can be used to generate steam for electricity generation.
- The composition of the waste stream can have an impact on the gasification process' efficiency. Garbage with a high percentage of inorganic components, such as metals and building trash, will produce less syngas and more slag, the most valuable by-product. As a result, pre-sorting the waste stream may be beneficial in some situations. If waste can be shredded before entering the gasifier, it would be ideal.

**How to cite this article:** Sushma P. "Editorial on Waste Treatment using Plasma Arc Gasification (PAG)." *Civil Environ Eng* 11 (2021): 390

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**Received** 10 May, 2021; **Accepted** 20 May, 2020; **Published** 25 May, 2021