

Plasma Arc Gasification of Solid Waste

Epaminondas Voutsas

*National Technical University of Athens
Laboratory of Thermodynamics and Transport Phenomena,
School of Chemical Engineering, 9 Heron Polytechniou Str.,
Zographou Campus, 15780 Athens, Greece
Email: evoutsas@chemeng.ntua.gr*

Abstract

The application of various technologies that convert solid waste to energy and other by-products for beneficial reuse has become an issue at the forefront of integrated solid waste management. Plasma arc gasification offers a solution that could effectively and safely dispose municipal as well as hazardous and toxic wastes that are generated by the residential, commercial, and industrial sectors. It is a thermal process that takes place at very high temperatures in an oxygen starved environment, aiming to the complete decomposition of the input waste into very simple molecules. The products of the process are: (a) a combustible gas, consisting mainly of hydrogen and carbon monoxide, known as synthesis gas, which is used to operate the plasma process, while the excess is used to produce electricity; and (b) a glassy, rock-like solid residue, coming from the inorganic components of the waste, which is highly resistant to leaching, so it has been shown that could be used as construction material.

This paper provides firstly a technical overview of the plasma arc technology, including its benefits and drawbacks. Next, energy analysis of the process is performed in order: (a) to demonstrate the most important process parameters that affect the energetic performance of the process, and (b) to assist the techno-economic analysis and optimization of the process.

Keywords: *Plasma arc, gasification, solid waste management, energy analysis.*