



Applications of Plasma Arc Technology for Waste Treatment

Dallavalle Vancini*

Department of Water Resources, Alma Mater Studiorum-University of Bologna, Bologna, Italy

DESCRIPTION

Science and Technology in Waste Treatment covers various aspects of waste management, such as generation, prevention, characterization, monitoring, treatment, handling, reuse and ultimate residual disposal of solid wastes. It also involves the development of suitable technologies that can reduce the environmental impact of waste and recover valuable materials or energy from it. Some examples of waste management technologies are e-waste recycling, rapid composting, bioreactor landfill, fuel cell technology, plasma arc technology, etc. Plasma arc technology is a waste treatment technology that uses a combination of electricity and high temperatures to turn waste into usable by-products without combustion (burning). It uses an electrical arc gasifies that passes a very high voltage electrical current through two electrodes, creating an arc between them. The temperature in the arc column can reach more than 28,000°C (50,000°F), which is hotter than the surface of the Sun. The by-products of plasma arc technology consist of syngas, slag and residual heat. Syngas is a mixture of hydrogen and carbon monoxide that can be burned like natural gas for producing electricity. Residual heat emanates from these process can be used to produce steam for electrical generation.

It is different from incineration, which involves in process of burns waste in the presence of oxygen, producing carbon dioxide, water vapor and ash. Incineration can also produce harmful emissions such as oxides of nitrogen and sulfur, dioxins and furans, and heavy metals. Plasma arc technology does not burn waste, but rather breaks it down into its basic elements in an oxygen-starved environment, producing syngas, slag and heat. Plasma arc technology does not produce ash or harmful emissions, and can treat a wider range of waste materials than incineration.

It is different from recycling that involves separating, collecting and reprocessing waste materials into new products. Recycling can reduce the amount of waste sent to landfills or incinerators,

conserve natural resources and energy, and prevent pollution. However, recycling also has some limitations, such as the need for sorting and cleaning the waste, the loss of quality or functionality of some materials after repeated recycling, and the difficulty of recycling some complex or mixed materials. Plasma arc technology is a process that involves heating waste to very high temperatures in an oxygen-starved environment to break it down into its basic elements. Plasma arc technology can treat a wide range of waste materials, including those that are difficult to recycle, such as electronic circuit boards. The high-pressure inert gas then crosses the electrical arc and enters a sealed container of waste products. Most trash is converted into gas composed of simple elements when exposed to high temperatures, whilst complex molecules are broken down into individual atoms. Slag is a solid byproduct that resembles obsidian and can be used to make artificial gravel and bricks. Plasma arc technology is a non-incineration thermal method that totally breaks down garbage into very small molecules by using extremely high temperatures in an oxygen-starved atmosphere. Metals processing has long made use of plasma arc technology.

CONCLUSION

It can also produce useful by-products, such as syngas, slag and heat, that can be used for energy generation or building materials. However, plasma arc technology also has some drawbacks, such as the high cost and complexity of the technology, the noise and radiation produced by the plasma torches, and the potential for gaseous emissions that need to be cleaned before being released to the atmosphere. Plasma arc technology can be used for waste treatment, as it can turn municipal waste into usable by-products without combustion. The by-products include syngas, slag and residual heat, which can be used for energy generation or building materials. Plasma arc technology can also be used for welding and cutting, as it produces a highly concentrated and stable arc that can melt and join metals with high precision and quality.

Correspondence to: Dallavalle Vancini, Department of Water Resources, Alma Mater Studiorum-University of Bologna, Bologna, Italy, E-mail: valle@ci.com

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