

Technical Meeting on Emerging Applications of Plasma Science and Technology

Contribution ID: 10

Type: **Invited Oral**

Safe Disposal of Different Solid Waste Streams and Energy recovery using Thermal Plasma Technology

Wednesday, 20 September 2023 16:05 (15 minutes)

Disposal of different waste streams including hazardous and biomedical waste in an environment friendly manner is a serious concern all over the world. Poorly designed incinerators and wrong operational practices produce extremely harmful carcinogenic compounds such as dioxins, furans, poly aromatic hydrocarbons (PAH) etc. which are released in the environment. Thermal plasma technology is becoming increasingly popular due to the disposal of various waste streams in a safe and environment friendly manner. Further, several companies in the world have successfully demonstrated energy recovery from organic waste such as papers, plastics, polymers, MSW and industrial waste using thermal plasma technology in a gasification mode. The sustainability of the thermal plasma technology is shown in a large scale waste disposal reactors.

Plasma torches or plasma arc systems are used to generate high temperature thermal plasma which efficiently converts electrical energy to heat energy. The high temperature created by plasma in the absence of fuel and air, disintegrate the infectious biomedical waste into CO, H₂ and lower hydrocarbons and residual ash. High temperature conditions (>5000oC in the plasma zone), oxygen starved environment and quenching of hot gases effectively restricts the recombination reactions and eliminate the formation of toxic molecules such as dioxins, furans, PAH etc. Institute for Plasma Research's constant efforts have resulted in recognition of plasma pyrolysis technology by Ministry of Environment and Forest and Climate Change (MoEF & CC, India) for safe disposal of biomedical waste in India in the year 2016. The institute has been granted 3 Indian Patents on plasma pyrolysis technology and this technology has been transferred to 6 Indian industries [3-5].

The presentation will briefly cover present status of plasma pyrolysis/gasification technology in waste disposal arena and energy recovery from waste in the world. The presentation will elaborate on current technological developments that are taking place in this field at Institute for Plasma Research such as development of Common Biomedical Waste Treatment Facility (CBWTF) along with 5 ton per day capacity plasma pyrolysis system to dispose waste that will be generated from 10,000 beds from various hospitals and health care facilities in and around Varanasi, India. Future opportunities in waste to wealth creation using thermal plasma technology and some of the challenges this technology is facing will also be discussed.

References:

- [1] "Plasma Pyrolysis of Medical Waste", S. K. Nema and K. S. Ganeshprasad in 'Current Science' 69, (2002).
- [2] A technical report on "Plasma pyrolysis technology and its evolution at FCIPT, Institute for Plasma Research, India; IPR/TR-364/2016 ; S.K. Nema, V.Jain, K.S.Ganeshprasad, A. Sanghariyat, S. Soni, C. Patil, V.Chauhan, P.I. John
- [3] An Indian Patent on "Plasma Pyrolysis System and process for the disposal of waste using graphite plasma torch" Indian Patent Number : 272122
- [4] An Indian Patent on "Plasma Pyrolysis System for Safe Disposal of Organic Waste using Plasma Torch with a Novel Endogenous Gas Source"; Indian Patent Number : 281257
- [5] A patent on "An apparatus to generate large plasma arc plume for waste disposal and thermal processing applications" Indian Patent No. 432380

Speaker's Affiliation

Institute for Plasma Research, India

Member State or IGO/NGO

India

Primary author: Dr NEMA, Sudhirkumar (Institute for Plasma Research)

Presenter: Dr NEMA, Sudhirkumar (Institute for Plasma Research)

Session Classification: Municipal Solid Waste Treatment

Track Classification: Municipal Solid Waste Treatment