



Air Plasma Incinerator

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In Pursuit of 'Clean India Mission'

S. Ghorui, S. Bhandari, N. Tiwari, V.C. Misra and Y. Chakravarthy

Thermal plasma torches have important applications in the management of municipal solid wastes (MSWs) and hazardous wastes, liquid, electronic and nuclear wastes. Energy intensiveness, which is considered to be a lagging aspect of the technology, has been addressed through development of a medium power (30 kW) hafnium electrode air plasma torch in BARC. With the help of the newly developed technology, a unique Air Plasma Gasifier/Incinerator technology has been developed by BARC (ready for technology transfer to industry), which adopts a combination of high temperature gasification and a controlled burning of syn-gas for carrying out incineration. The technology significantly minimizes the requirement of energy supply from external sources. Further, it can process waste in the order of 1-3 ton per day, which is dependent on the type of waste fed into the system.

At low operating temperatures, incineration may become a potential source for highly carcinogenic compounds, including dioxin, furan, other pollutants in this category and also ash. By virtue of extremely high operating temperature, the incinerator system of BARC leaves little or no scope for release of such harmful compounds as well as their residues into the environment.

The basic components of the unit comprises a waste feeder unit, primary chamber, torch system, secondary chamber, venturi scrubber, a packed bed column, ID fan unit and a stack.

The authors are from Thermal Plasma Technologies Section, Laser & Plasma Technology Division, BTDG, BARC

The waste identified for incineration is fed from the side portion located near the head of the primary chamber. The ID fan unit maintains a negative pressure throughout the process zone and does not permit any synthesized gas to escape from the process chamber.

The three air plasma torches of the incinerator system, which are azimuthally oriented 120° apart, discharge inside a coke bed located at the bottom of the primary chamber to create a uniform high temperature (>1500°C) process bed. The fed waste drops from the hopper on the top and eventually reaches the bottom hot bed of the primary chamber via mechanically interlocked compartments. During this process, the waste gets gasified, processed and is finally released into the environment as a benign gas. Nearly 1.5 ton waste was mitigated during the 'Swachhata Week 2022' organized in BARC. The system can be operated in both incineration as well as in gasification mode. Under incineration mode, emitted gases such as CO, SO_x, NO_x were found to be well within the permissible limit prescribed by the Central Pollution Control Board, Govt. of India. The syn-gas generation mode in the system gets activated soon after the entire external air inlet ports are closed. The obtained syn-gas (total of CH₄, CO and H₂) quality meets the energy content of more than 6.3 MJ/Nm³. Two such systems have been installed in BARC.

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