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Development of process for disposal of plastic waste using plasma pyrolysis technology and option for energy recovery

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Plasma pyrolysis is an innovative technology for transforming high calorific plastic waste into a valuable synthesis gas (syngas) by means of thermal plasma. The process developed is a drastic non-incineration thermal process, which uses extremely high temperature in an oxygen-starved environment to completely decompose input plastic waste into syngas, composed of very simple molecules viz : CO, H₂ and hydrocarbons. A 20 kg/hr capacity plasma arc pyrolyser for treatment of plastic waste as well as energy recovery options from waste plastic has been indigenously designed, developed, installed and studied its performance at the Central Mechanical Engineering Research Institute (CSIR), Durgapur.

After pyrolysis of plastic waste in the plasma arc reactor, generated hot gases (syngas) are quenched through water scrubbing to avoid recombination reactions of gaseous molecules that inhibit the formation of toxic gases. Syngas composition has been characterized by Gaschromatograph, residue/ash collects at the bottom of the pyrolyser has been characterized by Neutron Activation Analyzer (NAA). Research results indicated that the developed plasma pyrolyser may be a useful way of plastic waste treatment for energy recovery.