

Mobile Plasma Treatment System

The Mobile Plasma Treatment System is a plasma thermal treatment process capable of treating various types of solid/liquid hazardous wastes including military ordnance, industrial waste, high calorific-content industrial waste, and waste mixtures such as soil/metals, sludges, and soil contaminated with organic compounds.

The technology uses a plasma arc torch to combust organic materials and melt inorganic materials through high temperature oxidation. Electrical energy, supplied to the plasma torch, ionizes and heats a process gas (in this case air) to temperatures exceeding 10,000 °C. The high temperature gas melts and oxidizes the waste feed, producing a solid slag and combustion gases.

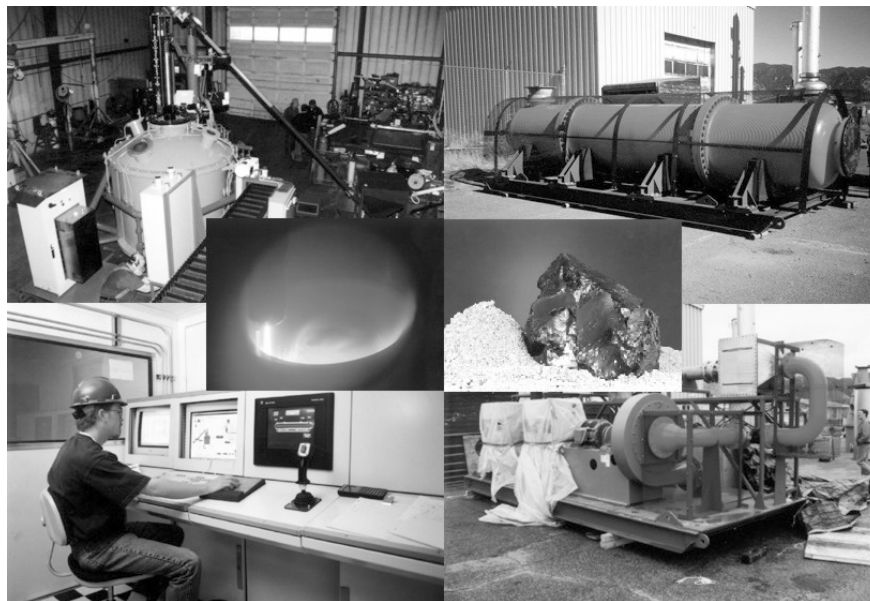
The slag produced in the process passes the leach requirements of the U.S. Environmental Protection Agency's Toxicity Characteristic Leaching Procedure and the Nuclear Waste Glass Product Consistency Test.

MAJOR SYSTEM COMPONENTS

- primary processing chamber
- feed systems
- 500-kilowatt (kW) dual mode, nontransferred/transferred, plasma arc torch
- secondary combustion chamber (SCC)
- dry scrubber system
- electric reheater and oxides of nitrogen (NO_x) removal reactor
- pressure blowers
- continuous emissions monitoring system

PRIMARY CHAMBER

The primary chamber is designed to remove the heat and energy from a high calorific-content industrial waste capable of producing up to 900,000 Btu per hour. In addition, the primary chamber and downstream offgas system are designed to handle up to 10 pounds per minute (lb/min) (4.54 kg/min) or 130 standard cubic feet per minute (scfm) (3.68 Nm³/min) of offgas generated from the combustion of waste.



Clockwise from top left: 1) primary chamber/feeder skid; 2) secondary combustion chamber; 3) NO_x skid; and 4) control room. Center left: plasma arc torch; center right: resultant slag.

Combustion gases generated in the process are routed to a pollution abatement system before being released to the environment.

PRIMARY CHAMBER SPECIFICATIONS

- Oxidizing process stoichiometry
- 900,000 Btu/hr (949 mJ/hr) waste energy removal rate (max)
- 10 lb/min (130 scfm) waste gas volume capacity (max)
- > 2 seconds (min) gas residence time
- Dual mode (675-kW, net 500-kW) torch configuration
- Water-cooled chamber configuration (100 ft³)
- Stationary hearth/water-cooled hearth configuration (10 ft³)
- Batch slag pouring mode
- Separate waste and soil handling system

OFFGAS SYSTEM DESIGN CRITERIA

- Secondary combustion of organic materials at temperatures over 2,000 °F (1,093 °C) and a residence time of > 2 seconds in the SCC
- 99% removal of hydrogen chloride in the dry scrubber system
- removal of particulate matter to below 0.015 grains per dry standard cubic foot in the baghouse
- 90% removal of NO_x in the stack gas concentration at design operating conditions

SYSTEM CONTROLS

- Centralized PC-based programmable logic controller control, touch screen man-machine interface, and a remote input/output communication network
- A single operator can control the system from a remote central control room
- Process data recording and storage system

CONTINUOUS EMISSIONS MONITORING SYSTEM

The Mobile Plasma Treatment System is designed and operated in accordance with applicable federal and state emissions regulations. The continuous emissions monitoring system analyzers include:

- Carbon monoxide
- Oxygen
- Carbon dioxide
- Total hydrocarbons
- NO_x

FLEXIBILITY

The flexibility of the design provides different levels of automation and control to meet specific applications and/or customer needs.

EQUIPMENT FACILITY REQUIREMENTS

The Mobile Plasma Treatment System is designed to be operated as skid-mounted modules consisting of a furnace module, controls module, offgas modules, and ancillary systems modules. These modules may be placed on a 100-foot by 100-foot level area for operation.

TRANSPORTABILITY LIMITS

Each module, when configured for transport, complies with U.S. Department of Transportation requirements. The modules are designed and fabricated to facilitate transporting on standard over-the-road tractor trailers.

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