Westinghouse Plasma Systems Mobile Unit

On-Site Chemical Waste Destruction

On-site destruction provides a superior solution.

Many industrial processes that provide necessary products and services create chemical waste byproducts. To assure the continued safe use of these processes and to protect our environment, government, business and environmental groups envision the use of advanced technologies which can help safely manage and dispose of waste byproducts.

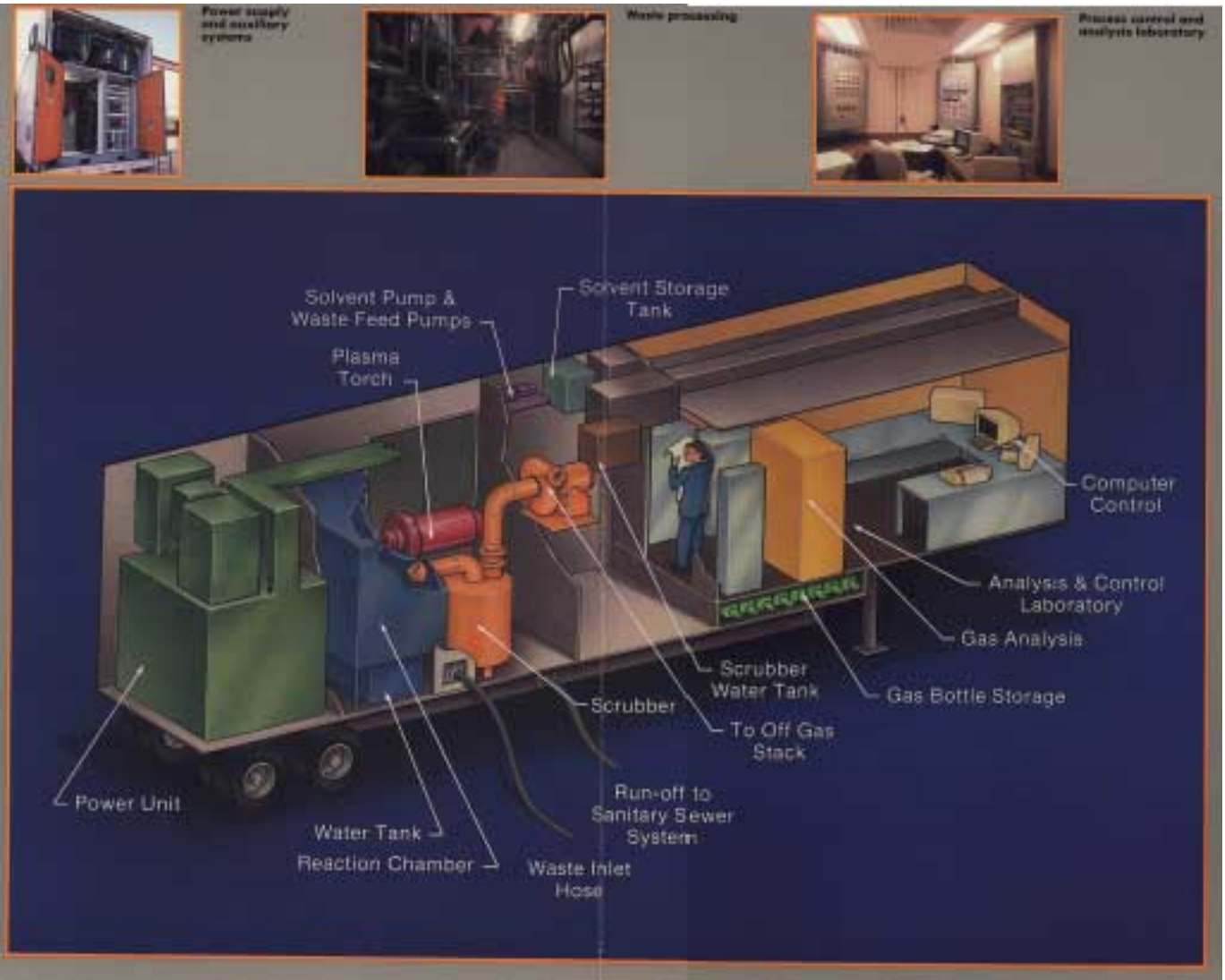
The Westinghouse Waste Technology Services Division has been aggressively developing these advanced waste management systems. In response to the need for chemical waste treatment, Westinghouse and Pyrolysis Systems Inc. have joined to form Westinghouse Plasma Systems.

The Westinghouse Plasma Systems mobile unit, Pyroplasma, houses an advanced plasma system which changes the molecular structure of chemical wastes; for example, changing hazardous wastes into nonhazardous substances.

The Pyroplasma system is unique in its ability to achieve the high temperatures required to destroy pumpable organic chemical wastes. The system has demonstrated the capability of meeting emission standards of regulatory agencies in the United States and Canada. Here is a superior alternative to landfill disposal and other treatment processes.


HIGH
VOLTAGE


Westinghouse


Power supply and auxiliary systems
Waste processing
Process control and analysis laboratory
Solvent Pump & Waste Feed Pumps
Solvent Storage Tank
Plasma Torch
Computer Control
Analysis & Control Laboratory
Gas Analysis
Scrubber Water Tank
Gas Bottle Storage
Scrubber
To Off Gas Stack
Power Unit
Run-off to Sanitary Sewer System
Water Tank
Reaction Chamber
Waste Inlet Hose

housed in a mobile unit

One of the major concerns about the treatment and subsequent disposal of chemical wastes is the cost and the liabilities associated with transportation and disposal. With the Westinghouse Plasma Systems mobile unit, chemical wastes are destroyed right at the site.

The entire plasma system unit is housed in a standard 48-foot trailer ready to go to work. Access to an AC power source, a water supply and a sanitary sewer system is all that is needed. All necessary hardware and process control equipment are contained inside the trailer. The plasma torch that destroys the waste, the reaction chamber for forming non-hazardous compounds and other process equipment is located in the center of the trailer. In the front of the mobile unit is a laboratory and a computerized monitoring system. This process control computer updates temperature, pressure, flow fluid reserve and other performance parameters, providing continuous on-line monitoring of the process. The computer is also programmed to safely shut down the process in the event of deviation from set parameters.

An on-board gas monitor analyzes for major gas constituants (ie: hydrogen, carbon monoxide, carbon dioxide, oxygen and total hydrocarbons). The power supply and associated electrical equipment is located in the rear of the trailer.

Scrubber system

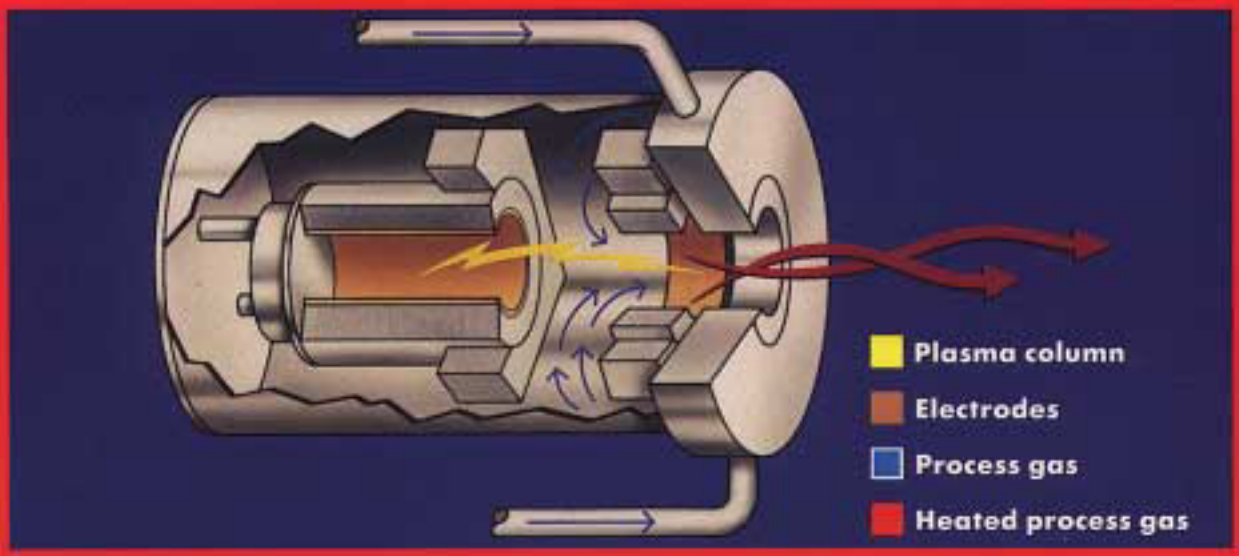
◄ Trailer schematic

chemical wastes

At the heart of the mobile unit is the Westinghouse plasma torch which efficiently generates ultra-high temperatures by passing a process gas through an electric arc. The Westinghouse plasma torch can use oxidizing, reducing or inert gas feedstocks with precise control. Computer modelling allows predictions of major product gas constituents. Product gas components can be altered by calculated feed stock modifications.

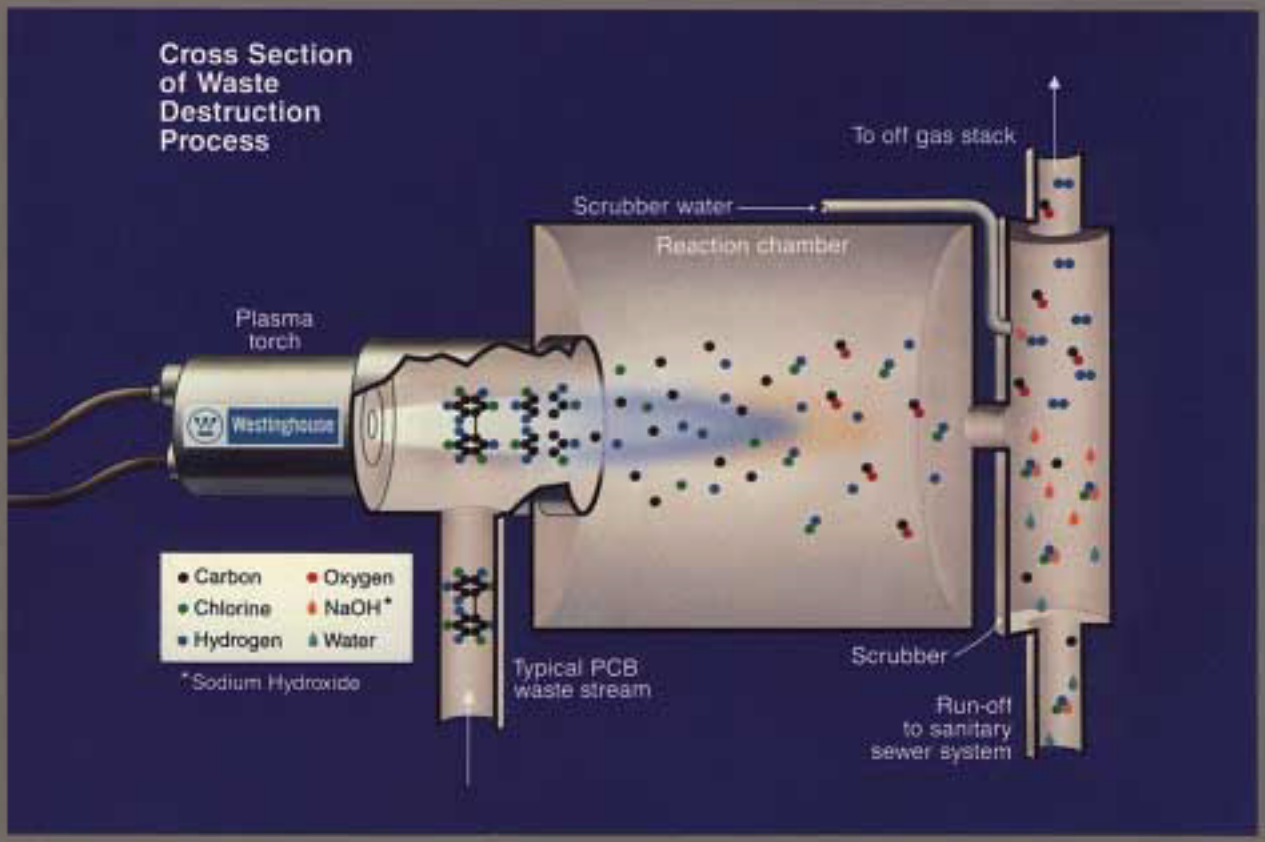
In operation, wastes are introduced into the discharge of the plasma arc. The wastes are atomized and are forced into the main reaction chamber where, upon cooling, they recombine to form non-hazardous compounds. The compounds move into a caustic soda scrubber. Rapid quenching of the gas limits the recombination of these compounds to safer molecules such as simple hydrogen, hydrogen chloride, carbon monoxide, and carbon. Sodium ions transform hydrogen chloride into a solution of water and simple table salt. During the process, powdered carbon is formed and is washed away by the lightly salted water. Hydrogen molecules and carbon monoxide leave the scrubber as a rich, clean fuel gas, a potential new source of combustion energy. The system produces almost three times as much fuel energy per unit of waste than the energy required to destroy the waste.

The Westinghouse plasma torch



The Westinghouse Plasma Systems mobile unit can also be used to reclaim chemical constituents from a waste stream which would normally be destroyed, stored, or buried. The Pyroplasma reaction chamber can serve as a chemical factory. Process parameters can be varied so that specific elements or compounds could be recovered from the waste stream (for example, chlorine, hydrogen chloride, carbon, carbon monoxide, hydrogen, methane, etc.). The use of Pyroplasma for reclamation can reduce overall destruction and raw material costs.

The Pyroplasma destruction process

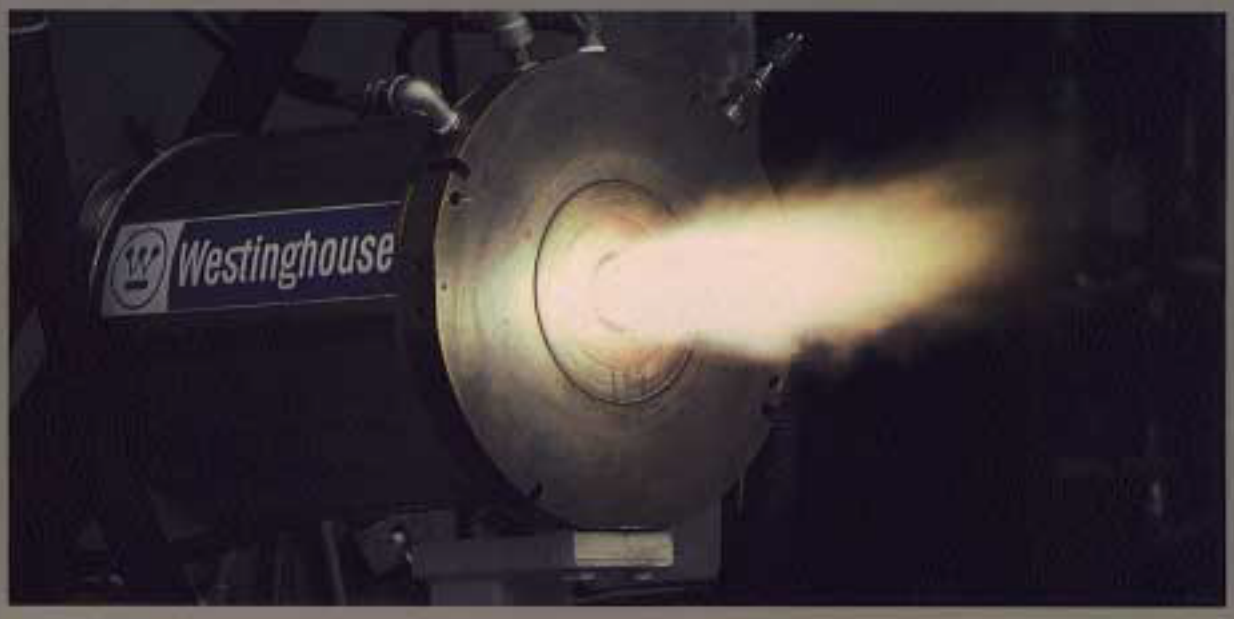


The Westinghouse Plasma Systems Mobile Unit is a superior alternative for safe destruction of chemical waste byproducts.

A unique solution to chemical waste management

Using Westinghouse plasma technology provides a unique alternative to organic chemical waste disposal. Everything necessary to destroy the wastes into non-hazardous substances is ready for use on-site in a compact mobile unit. This technology offers significant benefits:

- Destruction removal efficiencies in excess of 99.99999%.
- Selected by the Enviromental Protection Agency for demonstration.
- Capable of meeting the requirements of American and Canadian emission standards.
- Offers a superior alternative to landfill disposal and other treatment processes.
- Eliminates the costs and liabilities associated with transportation and disposal.
- Available on a service basis thereby reducing customer costs.
- Available where you need it most—on-site.
- Capable of chemical reclamation and recycling.
- Cost is competitive.
- Minimum site preparation and short start-up time.



Results of PCB Destruction Tests

TEST NO.	RUN TIME (MINUTES)	DRE (%)
1	60	99.999997
2	60	99.999994
3	60	99.99996
4	150	99.999998
5	300	99.9999998
6	300	99.9999998
7	300	99.999999

- Prior to these 7 PCB tests, 30,000 - 40,000 liters of solvents were destroyed and three successful one-hour carbon tetrachloride tests were performed. The Pyroplasma feed rate was approximately 1 gallon per minute.
- PCB is the Principal Organic Hazardous Constituent.
- The run time in minutes is the test time specified by authorities and was dependent upon the stack monitoring time required for valid results.
- DRE refers to the POHC destruction removal efficiency, defined by the equation below and based on stack emissions;

$$DRE = \frac{PCB\ (input) - PCB\ (output)}{PCB\ (input)} \times 100$$

Gas monitoring equipment

- All data obtained was from analyses performed by an independent laboratory under the direction of the Environmental Protection Agency.
- Destruction efficiencies calculated are based on valid analytical measurements, where PCBs were non-detectable, the minimum detection limit was assumed.
- PCB refers to a feed stock of Askarel transformer fluid in solvent. The PCB concentration is in the 13-18% by mass range with approximately the same mass percent of trichlorobenzene.
- Emissions of HCl, NO_x and particulate were within specified limits.
- These tests were performed under the auspices of the United States Environmental Protection Agency and the New York State Department of Environmental Conservation in cooperation with the Canadian Environmental Protection Services and the Ontario Ministry of the Environment.

Gas monitoring equipment