

HelioStorm™

Ultra-High Temperature Ionic Gasification

Heartland's HelioStorm™ is a novel ultra-high temperature ionic gasification technology that can be used as an environmentally friendly means to dispose of dried municipal biosolids as well other waste feedstocks.

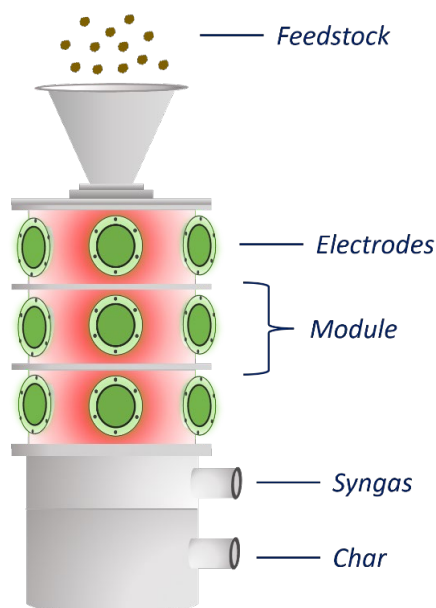
Key Features:

- Ultra-High temperature for Assured PFAS Destruction
- Greater than 90% Carbon Conversion
- *Tar-Free* renewable syngas. No thermal oxidizer required

Electrically driven and combustion-free, Heartland's ultra-high temperature process *destroys* chemical contaminants including perfluoroalkyl compounds (PFAS) ensuring regulatory compliance without the need for a thermal oxidation step. The resulting renewable syngas can be used to provide valuable process heat and power. The inert char generated is eligible for a host of beneficial reuse outlets, alleviating growing disposal uncertainty, controlling long term costs, and supporting sustainable environmental stewardship.

HelioStorm™, a deeper look...

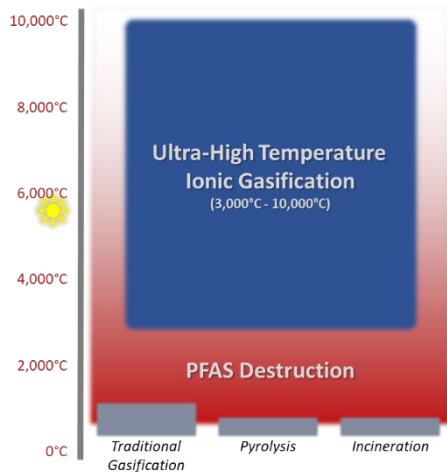
Ionic plasma fields are created by paired electrodes that produce an electric arc, filling the entire internal volume of the gasifier. Feedstock falls through HelioStorm™, fully immersed into an ultra-high-temperature plasma field, disassociating into individual atoms and ions.



How it Works

1. Carrier gas (N_2) enters the gasifier and electrode pairs are initiated creating a uniform high temperature plasma field.
2. Biosolids enter the top of the gasifier for preconditioning.
3. Ionic gasification proceeds at ultra-high temperature (avg. $5,000\text{ }^\circ\text{C}$) in a low-oxygen environment. Particles breakdown into atomic species H, C, O and then rapidly cool into their lowest energy state: H_2 and CO gas.
4. A clean "tar-free" syngas (H_2 & CO) is produced, free of long chain carbon-containing compounds requiring further polishing. Syngas is directed to a genset to produce renewable electricity and thermal energy to support the preceding biosolid drying process.
5. PFAS-free char is eligible for local beneficial reuse or a wide range of other disposal outlets.

Assured PFAS Destruction



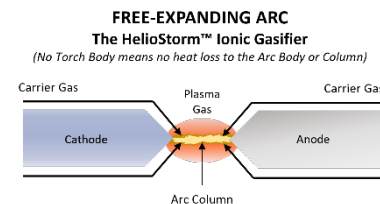
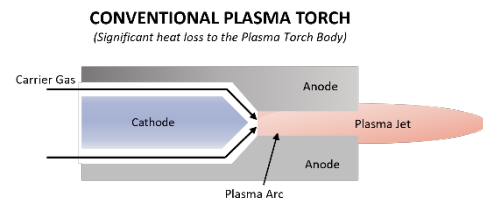
The HeliStorm gasifier achieves temperatures between 3,000 and 10,000°C, maintaining an average temperature of 5,000 °C throughout the reactor’s entire plasma field. Exceeding temperatures of the sun, ionic gasification far outperforms other thermal solids destruction technologies, attaining greater than 90% carbon conversion into a high purity syngas while rapidly destroying PFAS compounds at reaction rates well above other thermal technologies.

- One step solution – No thermal oxidization required
- PFAS-free char
- Meet or exceed with any state mandated PFAS air emission standard

Direct Contact Plasma Arc Technology:

The arc generated between electrodes is unconfined, extending through the entire diameter of the gasifier. Since the arc is continuously heating the gas surrounding it, the temperature of the plasma in a free-expanding arc is significantly higher than that of a plasma jet emanating from a conventional plasma torch.

- Efficient energy transfer to the plasma field without sacrificial losses to the metal body surrounding the electrode.
- Falling feedstock is brought into direct contact with the plasma field allowing for even mixing for solids destruction.



General Specification

M3 Gasifier

Feedstock	Dried Solids (tons per day)	4
	Typical Solids (%DS)	95%
	Feedstock (max particle size, mm)	1-2
Operations	Average operating temperature (°C)	5,000
	Volume Reduction	+95%
Products	Syngas Typical Heating value (BTU/lb)	6,800
	Syngas Outlet Temperature (deg F)	1,600
Biproducs	Char rate (ton/day)	1