

A GAME CHANGER

Renewable Natural Gas and biofuels from waste

New Hydrogen Reduction Technology brings wastes into the circular economy.



I. A Global Problem – Actually waste is poorly managed around the World

Our current technologies are *inefficient*, *costly* and *incomplete*:

Land filling	Incineration	Anaerobic Digestion (AD)
<ul style="list-style-type: none"> Large Footprint –Waste of Land Resources, siting concerns Legacy Issues: Leachate, Toxic Landfill Gas, GHG Emissions, Closure costs Long distances from source of waste, trucking concerns 	<ul style="list-style-type: none"> Ash Management, 30%-bottom and toxic fly ash Major Emitter of GHGs Expensive Capital and Operational Costs, siting concerns 	<ul style="list-style-type: none"> Only addresses Source Separated Organics Digestate is contaminated with PFAS. Management of Digestate, 40% of volume is problematic. Water, Odours and GHG Emissions are major concerns

II. A Local Solution –Hydrogen Reduction Technology

Complete and Cost-Effective Waste Management

- A chemical process –organic molecules reacting with a “reducing agent.”
- Hydrogen vaporizes or “reduces” waste into elemental compounds, primarily methane gas, carbon and silica.
- Converts ANY organic waste material, including **Forestry biomass**, Municipal Solid Waste (MSW), Auto Shredder Residue (ASR), Sewage Waste (SW) and hazardous wastes into RNG
- RNG can be purified to pipeline grade, offsetting demand for NG from fossil fuels.
- Significant diversion from land filling, incineration and anaerobic digestion
- Upwards of 95% solid reductions, leaving 5-10% residual (carbon and silica)
- Recovery of metals in waste (ferrous, aluminum, etc.) for recycling
- RNG is produced near to the source of waste to be used locally.
- RNG can be converted into high quality biofuels (Ethanol, Methanol, Diesel, Jet A fuel)

III. Environmental Benefits –Circular Economy in Action

Management of GHGs

- Eliminates all **GHGs** associated with the management of municipal/industrial wastes.
- **No fugitive emissions** (CO₂ or Methane) from the process
- No smokestacks, flaring or methane leakage from system
Reduced GHGs from not transporting wastes long-distances for processing
- **Non-incineration technology** – no formation of dioxins, furans or other toxic matter

Offsets/Reduction of GHGs

- RNG produced can be used to **off-set fossil fuels**
- Source of clean electrical generation
- Displaces fossil Natural Gas in the pipeline –greening the pipeline
- RNG can be used onsite in processes, such as blast furnaces, instead of NG or coal
- Can be converted to CNG and/or Hydrogen to be used as transportation fuel

Water Management

- Source of clean water
- Avoids and treats leachate and toxic water discharge (Landfills and AD)
- Eliminate PFAS, PFOS and other eternal contaminants.

IV. General Benefits of Hydrogen Reduction Technology

Better Management of ALL Wastes

- Municipalities, Commercial and Industrial Waste Producers
- **Diversion of waste from landfills, Incineration and AD**
- Better land management and reduced community opposition

Greenhouse Gas Reductions

- Local source of **green fuels and energy**
- **Makes 5 to 10 million m³ more gas than consumes.**
- Helps governments and industry meet GHG targets.
- Increased efficiency and energy production
- Reduced environmental impacts (CO₂, CH₄)
- Circular Economy Principles inaction

Economic Returns

- Reduced capital and waste management operating costs
- Job creation – construction (30 + workers) and operation (12 full time operators)

V. TARGETED WASTES

- Municipal Solid Waste
- Sewage Sludge, Septage and Digestate
- Households Source Separated Organic Wastes
- Agricultural Organic and Intensive Farming Wastes

ANY TYPE OF FORESTRY BIOMASS

- Restaurant and Food Processing Waste, Off Spec Foods
- All Mixed Plastics – Including Auto Shredder Residue
- Landfill leachate and gas purification
- Hazardous Household Wastes, such as paint and pesticides
- Electronic Wastes, circuit boards, cables, and casings
- And much, much more!

VI. PRODUCT OUTPUTS

Renewable Natural Gas and other renewable biofuels (ethanol, methanol, diesel, gas etc.)

- Pipeline grade quality to displace fossil fuels.
- Suitable for clean LOW CARBON electricity generation

LOW CARBON electricity generation

- Steam Reformed Renewable Hydrogen
- For zero carbon industrial, transportation and heating
- Captured Carbon Monoxide and Dioxide
- No toxic emissions, gases managed for industrial use.
- Recoverable Metals, as Present in Waste Streams
- Ferrous, non-ferrous, including copper, aluminum, silver and gold.
- Solid Chemical Elements, such as carbon, silica and more
- Wastewater Cleaned to Sanitary Discharge Standards



THE FUTURE

Proven Technology!

Australian plant in Kiwana, West Australia, processing DDT and PCB's on behalf of the Australian Government



Japan, Nippon Sharyo, purchased a full Technology License to build their own GPR facility in Japan.

Nippon Sharyo is a leading supplier and operator of the Bullet Trains in Japan.

The Bullet Trains are all electric, therefore the issues surrounding the disposal of PCBs are very extensive.



The GPR technology was used in the destruction of munitions propellants and chemical/biological weapons agents, a significant inventory of primarily artillery shells and air to ground rockets. The US Army project revenue projections were measured in the multiple hundreds of millions of dollars.

