

TAO Advisory Group Retreat

Stationary – Biowaste to Energy Conversion

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Presentation Overview

Type of Biowaste	Products
Digester Gas	Electricity, Hydrogen
Biosolids and Municipal Solid Waste	Synthetic Natural Gas, Hydrogen or Liquid Fuel
Green Waste	Electricity, Synthetic Natural Gas, Hydrogen

Conversion of Digester Gas to Electricity and Hydrogen Vehicle Fuel

- Location: Orange County Sanitation District, Fountain Valley Waste Water Treatment Plant
- Scale: pilot test
- Status: equipment installation in progress



Description

- 300-kW molten carbonate fuel cell (FuelCell Energy)
 - Digester gas cleanup (activated carbon)
 - Excess H₂ from anode reformer (100 kg/day)
 - Waste heat to sewage digester
- Hydrogen fueling station (Air Products & Chemicals)
 - H₂ purification - shift reactor, chiller, compressor, PSA
 - Compression to 350/700 bar
 - Fuel dispensing system

Emission Benefits – District-Wide

- Replace IC engines with lower-emission fuel cells for conversion of digester gas to electricity and heat
 - Approx. 40 tpy NO_x, 40 tpy VOC
- Adds option to produce renewable hydrogen
 - Approx. 10,000 kg/day

Conversion of Biosolids and MSW to Vehicle Fuels

- Location: UC Riverside, Center for Environmental Technology
- Scale: laboratory
- Status: tests in progress



Description

- Biomass (MSW) + sewage sludge
 - pumpable slurry
- Steam hydrogasification process (12 patents)
 - Smaller, lower cost, higher efficiency
 - Suitable for wet feedstock
 - Suitable for small, decentralized plants
- Downstream processing can be configured to produce CH₄, H₂ or Fischer-Tropsch fuels

Emission Benefits – District-Wide

- Eliminates landfill gas and digester gas IC engine emissions
 - Approx. 79 tpy NO_x, 79 tpy VOC
- Renewable H₂, SNG or liquid fuel
 - H₂: approx. 1.6 million kg/day
 - SNG: approx. 1.2 million gal/day diesel equivalent
 - Liquid Fuel: approx. 750,000 gal/day diesel equivalent

Conversion of Green Waste to Vehicle Fuel or Electricity

- Scale: 5 tpd pilot test
- Status: potential project



Description

- Green waste is chipped and dried to 20-30% moisture
- Process (pyrolysis, shift, methanation) produces SNG or H₂
- SNG or H₂ can be used for:
 - Electricity - fuel cell
 - Vehicle fuel - cleanup (PSA), compress

Emission Benefits

- Renewable SNG vehicle fuel
 - approximately 140,000 gal/day diesel equivalent (LA County)