Hydrothermal Processing (HTP)

Presentation to

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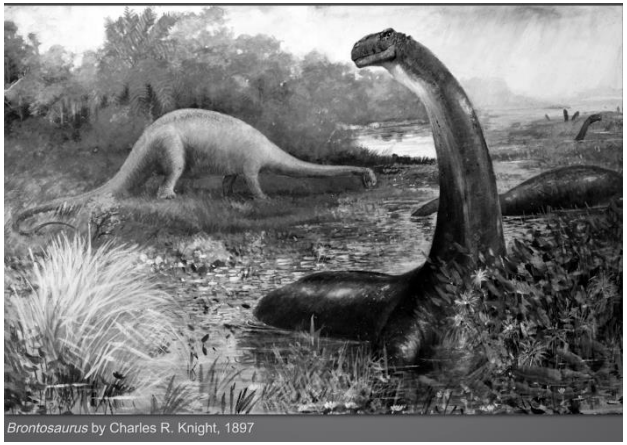
Hydrothermal Processing—
Nexus of Three Fundamental Industries

Temperature, Pressure and Water Convert Wet Wastes to Oil and Gas

Same as fossil fuels—but in 1 hour at 350°C, 21 MPa



Organic solids completely eliminated

Background

Process developed over 40 years by the US Dept. of Energy at Pacific Northwest National Laboratory; Genifuel formed 2006 and works closely with PNNL

Use With All Kinds of Wastes

Wastewater Solids

Drink and Food Processing

Animal Waste

Chemical

Organic MSW

And Many Others…..

Highly Efficient Process

90% of Carbon to Fuels--15% Runs the Process

Water is cleaned and conserved

Outputs Convert to Finished Fuels

Biocrude is refined for diesel, gasoline, jet

Renewable Natural Gas into pipeline for electricity or transportation

Project 1 Now In Progress

Wastewater Processing
Vancouver, Canada

Metro Vancouver
Refining Partner
Parkland Fuel

Project 2 Now in Progress

Central Contra Costa Sanitary District
Martinez, CA

Current Projects—Key Data

DATA	CENTRAL SAN	VANCOUVER
Size (WMTPD)*	15	10
Size (DMTPD)*	3	2
Equivalent Flow	3 Million Gallons/Day	2 Million Gallons/Day
Population Served	45,000	30,000
Outputs	Oil and Gas	Oil Now, Oil + Gas Later

*WMTPD = Wet Metric Tons Per Day @ 20% Solids
DMTPD = Dry Metric Tons Per Day

Path Forward

- **Consider pilot project for mixed wastewater solids and organic portion of MSW**
- **Same size as Metro Vancouver**
- **Cost savings by building two similar plants (<$10M each)**
- **Then expand to full size**

Thank You!

Additional Slides

Comparison to Anaerobic Digestion

MEASURE	VALUE
Footprint	**HTP is 44% of AD**
GHG Reduction	**HTP reduces GHG 3X as much as AD**
20-year NPV Cost	**HTP is 55% of AD Cost**

HTP Is Very Well Tested

Waste	**Dairy Manure, Poultry Manure, Pig Manure, Municipal Solid Waste, Pulp and Paper Mill Waste, Plastic Bottles**
Aquatic	**Water Hyacinths, Kelp (Marine), Red Algae (Marine), Green Algae (Brackish), Green Algae (Marine), Green Algae (Fresh), Diatoms, Cyanobacteria**
Ligno-Cellulosic	**Wood Slash, Sawdust, Corn Stover, Poplar Fermentation Residuals, Wood Gasification Residuals, Cellulosic Fermentation Residuals**
Herbaceous	**Napier Grass, Sorghum, Sunflowers, Corn Stover, Marigolds**
Food Processing	**Potato Waste, Corn Ethanol Bottoms (DWG), Grape Pomace (Wine Making), Cranberry Pomace, Digester Sludge, Kraft Paper Black Liquor, Cheese Whey, Coffee Grounds, Spent Distillers Grain, Vinegar, Olive Wash Water, Chicken Processing Waste, Fish Processing Waste, Gelatin Mfg. Waste, Rum Vinasse, Soda Pulp Wastewater, Soft Drink Factory Waste, Potato Processing Crumbs, Shrimp Waste, Potato Peels, Dairy Waste, Onions, Corn Canning DAF, Apple Pomace, Beer Waste**
Chemical Waste	**Nylon Wastewater, Acrylonitrile Wastewater, Fatty Acid Waste, Metal Chelate Solution, Sodium Cyanide Waste, Polyol Wastewater, Vitamin Fermentation Broth, Paint Booth Wash, Methyl Ethyl Ketone, Propylene Glycol, Carbon Tetrachloride, many other chemical compounds**