



# Hydrothermal Processing of Wastewater Solids

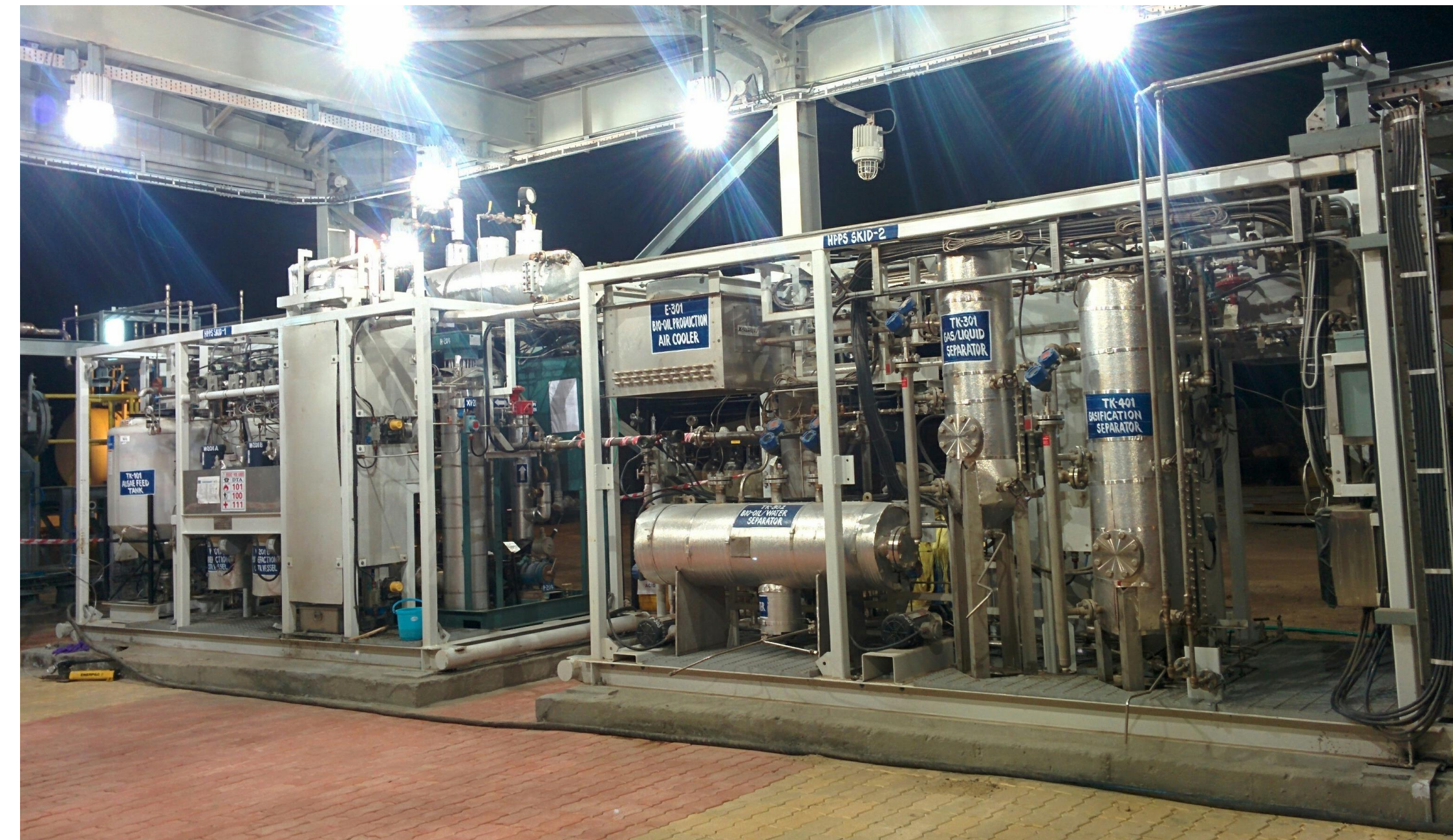
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*Converting Wastewater Solids to Bio-crude Oil*

## Details of the Pilot Plant

- Name of client—Metro Vancouver (MV)
- Location—Annacis Island Wastewater Treatment Plant
- Application—Primary and Secondary Sewage Sludge
- Flow rate—3 million gallons per day (11.4 million L/d)
- Influent and effluent spec—Influent is blended mix of sludge concentrated to 20% solids. Effluent is biocrude oil and sterile water.

This project is a pilot facility to demonstrate feasibility of Hydrothermal Processing using a side stream from the much larger Annacis Island facility. The data and experience gained from operation of the pilot system will be used to guide the larger strategic plan for upgrading the Metro Vancouver wastewater treatment system.



Hydrothermal Processing Pilot System.  
 The MV system will be app. 4X larger than the system shown.

## Process Description

Hydrothermal Processing (HTP) is a wet process using temperature (350°C) and pressure (200 bar) to convert wastewater sludge or other organic matter to biocrude oil. The oil can be blended with petroleum and refined for fuels.

## Compelling Value Proposition

Solids management is one of the most critical problems facing wastewater utilities. The alternative to HTP is Anaerobic Digestion (AD), but AD only converts 50% of the solids, leaving the remainder for expensive disposal.

MEASURE	VALUE
Footprint	HTP is <50% of AD size
GHG Reduction	HTP reduces GHG 3X as much as AD
Cost Reduction	HTP is <60% of AD cost

## The Experience

The Pacific Northwest National Laboratory of the US Department of Energy has extensively tested different types of sludge from different utilities with excellent results. These results have been independently validated and published by the Water Research Foundation, and are available on the WRF website. Selected results are shown below. HTP is the most efficient process known today to convert wastewater sludge to renewable fuels ..

MEASURE	VALUE
Oil as % feedstock solids	35% to 45%
COD of effluent water after gasification	<60 mg/L
Feedstock carbon recovered as fuel	85%
% of fuel energy needed to run system	14%
Time to recover CapEx (depends on size, options, tipping fees, etc.)	3 to 7 years

HTP Outputs, Efficiency, and Time to Recover Investment

## What Problems Does HTP Solve

The main problem which HTP solves is the cost and increasing regulatory burden of managing wastewater solids. In addition, HTP solves several other difficult problems common in the wastewater industry, specifically phosphorus removal and elimination of difficult pollutants such as pharmaceuticals, etc. Phosphorus is captured and can be sold for conversion to fertilizer. Large molecules are broken down in the process and are no longer active. The biocrude oil can be sold as a valuable product, and “clean energy” incentives are often available for the finished fuels.



Phosphorus “Ore”



Biocrude Oil

## What This Means for the Future

There are more than 16,000 wastewater utilities in North America, and much of the equipment is nearly 50 years old. A major cycle of upgrades is beginning, which can be met by Genifuel HTP systems. These systems may be owned and operated either by utilities or by investors with long-term contracts for sludge supply and sale of oil and gas products with associated credits. This model gives a 10-year CAGR of more than 35%.



MV Annacis Island Plant