

# Genifuel<sup>®</sup>

Advanced Hydrothermal Processing Technology  
Eliminates Wet Solids--Converts to High-Value Products



## *Many Water Resource Recovery Facilities (WRRFs) rank solids management as their #1 Challenge*

Hydrothermal Processing (HTP) solves the solids management challenge and reduces associated costs for the WRRF. It uses temperature, pressure, and water to convert organic materials to biocrude oil and methane gas. The temperature used in HTP is 350°C with a pressure of app. 200 bar. The system is continuous with a residence time of approximately 45 minutes. The feedstock is prepared by making the desired wastewater solids or other feed into a slurry of 20% solids in water.

### *HTP is a flexible and highly efficient solution for wastewater solids*

All types of wastewater solids can be processed—primary, secondary, post-digester, or any combination. More than 99% of the organic matter is converted, leaving a Chemical Oxygen Demand (COD) of less than 100 mg/L (parts per million) in the effluent water.

More than 85% of the energy contained in the wastewater solids is captured in the oil and gas products. The system is exceptionally efficient, using less than 15% of the captured energy to run the system.

More than 98% of the phosphorus in the feedstock is also captured and can be converted to fertilizer as an additional product, while eliminating a major problem in wastewater processing equipment.

### *Genifuel IP*

Genifuel has substantial intellectual property and is continuing to develop new advances. The original technology was developed by the Pacific Northwest National Laboratory, one of the premier laboratories of the US Department of Energy. Genifuel currently owns or licenses from PNNL more than 20 patents on hydrothermal processing, feedstock provision, and methods to increase efficiency, yield and quality. Current work targets byproducts and process improvements such as direct recapture of ammonia.

*An HTP system is much smaller than an anaerobic digester*



## *Hydrothermal Processing has been successfully verified by wastewater industry experts*

In 2014, the Water Environment & Reuse Foundation (WE&RF) began investigating HTP as a possible solution for solids management in the wastewater industry. It then sponsored a major study through its LIFT Program to investigate HTP with wastewater sludge. The study was sponsored by WE&RF, the US Environmental Protection Agency, and the US Department of Energy. A key outcome was that HTP was recommended for implementation at a participating utility, and two utilities are now proceeding for on-site installations.



*The LIFT Advisory Group for the testing of wastewater sludges with Hydrothermal Processing.*

## *Over 100 other feedstocks have been converted to fuels*

In addition to wastewater sludge, many other feedstocks have been successfully converted with HTP. Some of these wastes may be co-processed at a wastewater utility, an increasingly important capability in the industry.

- Food and food processing waste
- Animal wastes
- Brewing waste
- Municipal solid waste
- Fat, oil, and grease (FOG)

## *Convenient implementation options are available*

Genifuel systems can be owned, operated, and financed by the utility, but in addition an HTP project can be built, owned, operated, and financed by independent investors with a sludge supply agreement from the utility. This provides a low-risk path to HTP technology.

## *Genifuel systems are automated and safe*

Genifuel systems are constructed in accordance with all relevant standards for safe practice and operation. The systems are highly automated including shutdown in case of an abnormal situation or failure. Multiple redundant systems provide backup for both attended and unattended operation. A supervisory (SCADA) system provides data for historical review. The system can send alarms remotely via cell phone or internet.

## *Key benefits of Genifuel Hydrothermal Processing*

- Solves solids management issues and reduces cost for wastewater utilities
- Recovers valuable resources by converting waste into renewable oil and methane gas
- Effluent water from the process is clear and sterile, useful for secondary applications
- Completely eliminates pathogens and pharmaceuticals in the effluent water
- Can co-process other wastes together with wastewater sludge
- Recovers more than 85% of the feedstock energy into oil and gas products
- Captures more than 98% of the phosphorus in the feedstock as a byproduct
- System is highly efficient, using less than 15% of the product energy for operation
- GHG emissions are substantially lower than with other solids management approaches
- Can be integrated into existing operations at various locations, with or without digesters
- Methane gas is clean, with no sulfur or siloxanes
- Biocrude oil can be sold to refiners to convert to finished fuels
- Valuable renewable energy incentives are available for the oil and gas products
- Automated operation can run and shut down the system unattended
- Multiple levels of redundancy for safe operation
- System can be monitored remotely and can send alarms via cell phone or internet
- Compact size allows installation in constrained space
- Flexible installation options are available
- Systems are factory-built, skid-mounted, and shipped to site ready to install

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