



HEARTLAND
TECHNOLOGY PARTNERS, LLC

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CHP TECHNOLOGY APPLIED TO LEACHATE MANAGEMENT



Outline

- The Technology
- Advantages
- Operating Characteristics





The Technology

Driving Forces

- Leachate costs on the rise because of trucking
- POTW costs on rise as city's balance budgets
- Some states requiring on site treatment
- Renewable energy projects using site gas make a direct LFG leachate project unlikely
- Limited site foot print
- Changing discharge standards



The Technology

- Continuous Evaporative Process
- Operates on Waste Heat
- Direct Heat Exchange - No Heat Exchangers
- Operates at Mild Temperatures & Slight Vacuum
- Reduces Typical Leachate Volume by 95+%
- Simple to Install, Operate & Maintain



The Technology

Combined Heat and Power

LM-HT[®] Leachate Concentrators
seamlessly convert new or existing LFG
power plants into CHP power projects





The Technology

Distilling A Challenge to Simple Elements

Key Design Elements

- Highly Insensitive to Feed Characteristics
- High Levels of Volume Reduction
- Minimal Analytical Support Required
- Can Recover Clean Water for Reuse
- Compatible With Zero Liquid Discharge





Advantages

CFR Title 5 Subtitle D

Energy Independence and Security Act

Section 373

- Defines the requirements
- \$10.00 for each 3,412,000 Btu used
- \$10,000,000 each year in funding
- Requires 50% use of waste heat at source
- Must be used for different use



Advantages

Given the Energy Independence and Security Act is not funded – here are a couple methods to make CHP work to maximize energy conservation even if it is never funded:

Use jacket water heat with heat exchanger loop to heat onsite buildings like shop and office

- Use exhaust stack heat to treat leachate





Advantages

Enhancing The Value of LFG

A case study from a landfill I ran for 20 years:

At 1,133 scfm of LFG there was 49.63 MM scf/month

OR

The equivalent of 24,800 MM Btu/month

WHILE

A 4-engine power plant rejected the equivalent of
6,950 MM Btu/month in stack gas to atmosphere

WHICH

If put to use in an LM-HT[®] Concentrator could treat
more than 500,000 gallons per month of leachate



Advantages

Landfill Friendly Aspects

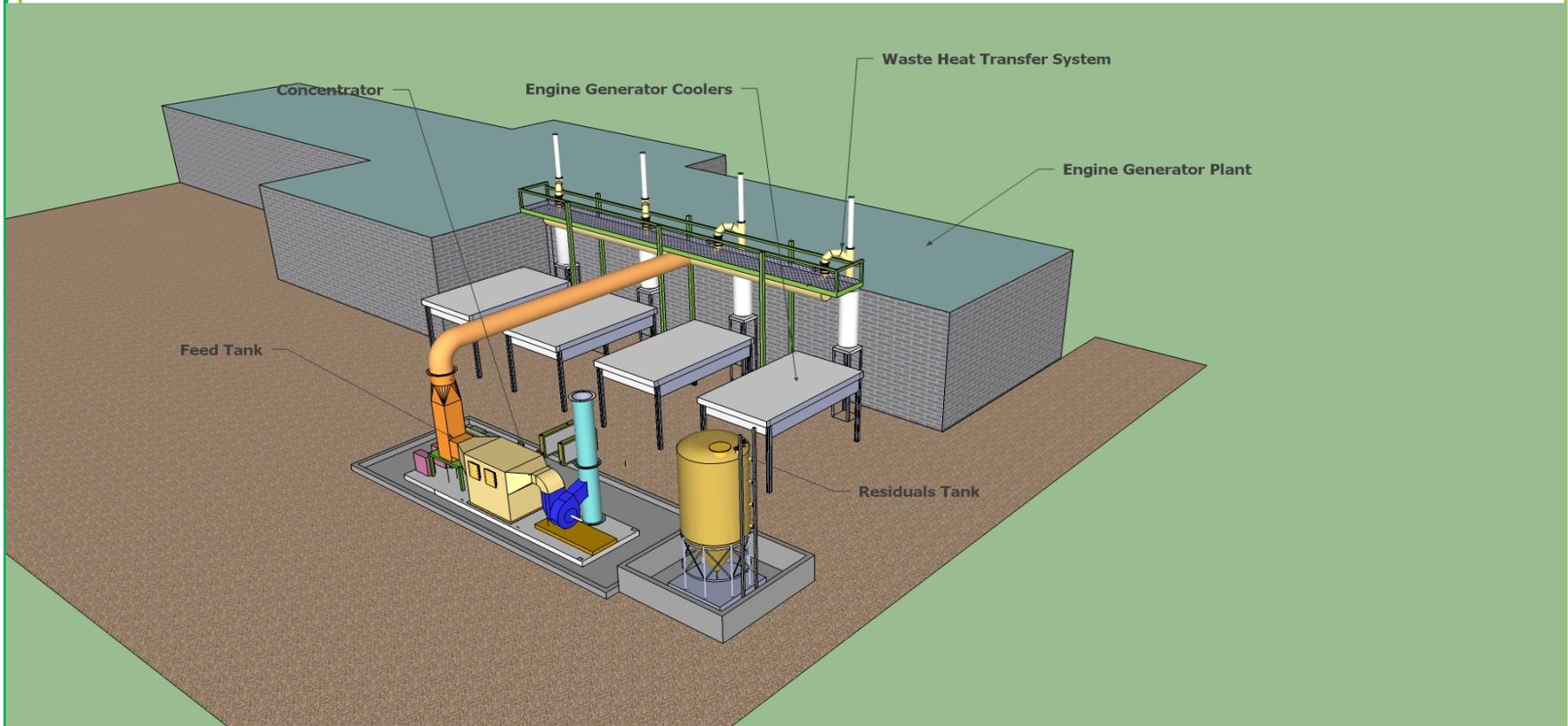
- Flexible use of waste heat as a fuel source
- Equipment paid for with capital not expense
- Small foot print
- Easy to install
- Eliminates trucking cost
- Zero liquid discharge





Operating Characteristics

Layout 3.2MW Landfill Gas Power Plant





Operating Characteristics

Energy Estimator

- Cat 3516 exhaust heat to process 4,200 gpd
- Cat 3520 exhaust heat to process 8,400 gpd
- Other 1 mega watt = 5,000 gpd
- Turbine = 10K gpd per mega watt
- 125 scfm natural gas = 10,000 gallon per day
- 250 scfm landfill gas = 10,000 gallon per day



Operating Characteristics

Cost Saving Features

- On site leachate treatment
- Waste heat from LFG to electric plants as fuel
- Eliminates hauling cost
- No off site costs
- One part-time Operator
- Solids put back in landfill
- Manages RO reject liquids



Thank You !

“Your Interest in Our Technology and
Services Is Greatly Appreciated”

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LM-HT[®] Concentrator¹ in Flex-Energy^{™ 2} Configuration

Shown Connected to Flare

Automated Flare Cap¹

Clean Combustion
Gas And Evaporated
Water Vapor Exhaust

High Turbulence
Collection Sump



Limit of Hot Gas Zone -
Typically
600° to 1500°F

Extent of Direct Contact
Heat Exchange and
Evaporation Zone

Start of Cooled Gas
Zone - Typically
160° to 190°F

¹ LM-HT[™] Concentrators, Automated Flare Caps and Waste Heat Transfer Systems are manufactured under one or more U.S. and foreign patents and/or pending patents owned by Heartland Technology Partners, LLC

² LM-HT & Flex-Energy are trademarks and service marks of Heartland Technology Partners, LLC



LM-HT[®] Concentrator¹ in Flex-Energy^{™ 2} Configuration

Shown Connected to Flare

Automated Flare Cap¹

Clean Combustion Gas And Evaporated Water Vapor Exhaust

Concentrator Exhaust Stack

Flare

Multi-Zone High Efficiency Entrainment Separator

Waste Transfer System For Flare Connection¹

Limit of Hot Gas Zone - Typically 600° to 1500°F

Extent of Direct Contact Heat Exchange and Evaporation Zone

Start of Cooled Gas Zone - Typically 160° to 190°F

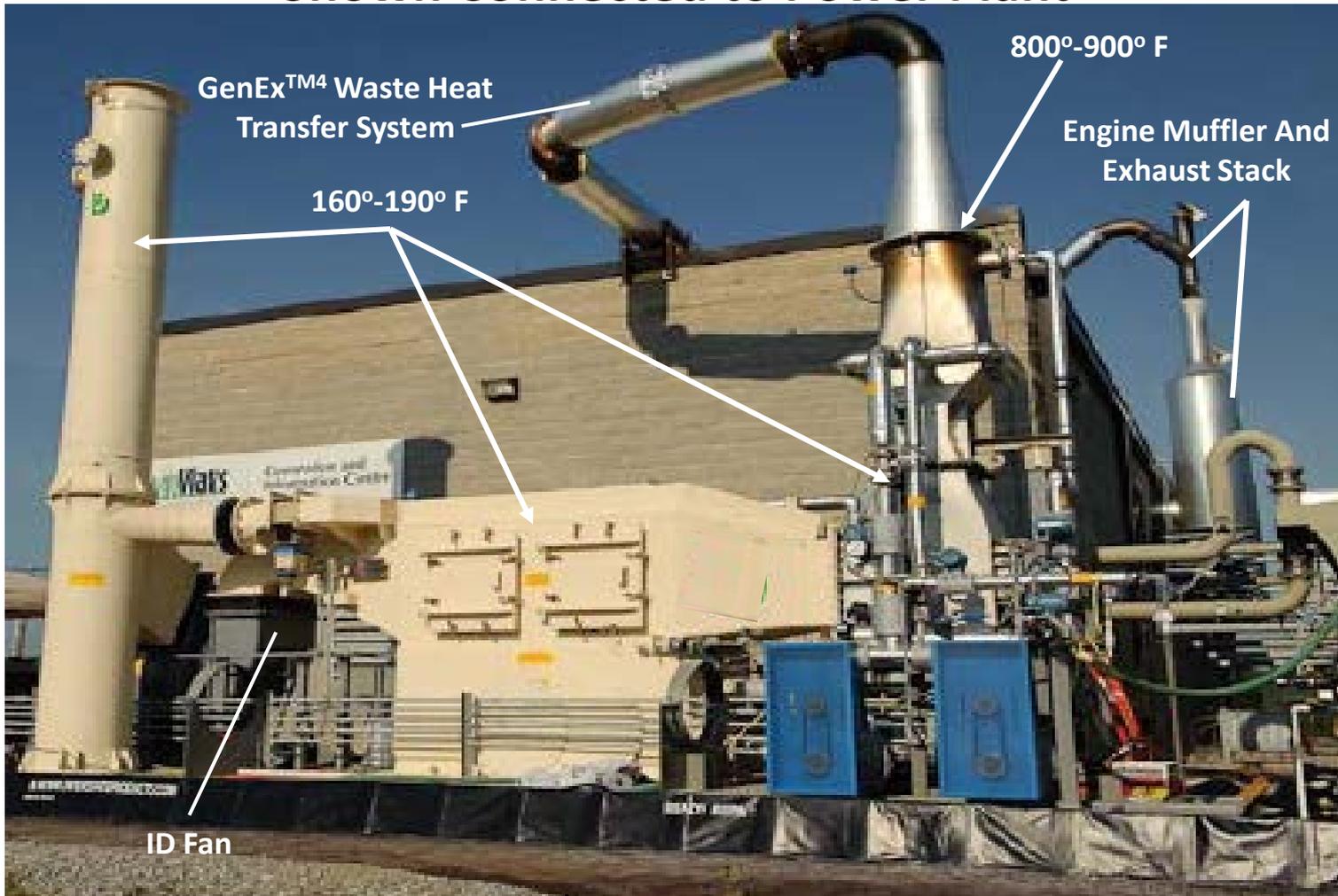


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LM-HT™ Concentrator in FlexEnergy™ Configuration Shown Connected to Power Plant



⁴ GenEx is a trademark and service mark of Heartland Technology Partners, LLC



Design Features

**“Plug and Play” Configuration
Connect Power Drop to MCC**

Compact Lightweight Design



**Portable Process System
Shown With Roll-Off Truck Compatible Skid**

Factory Wired On Single Skid



Design Features

**Minimum Process Fluid Holdup
Low Momentum Feature (LM)**



**No Moving Internal Parts One Fan
and One or Two Pumps**

**High Alloy Parts Fabricated
from Flat Stock**



**Minimal Amounts of High
Alloy Required**

**High Turbulence Key to Managing
Suspended Solids (HT)**

**Multiple Quick Opening Access
Doors to Process**



**Excellent Corrosion and
Erosion Resistance**

**Most All Maintenance Performed At
Or Near Grade Level**



20K GPD Unit – WMI's Turnkey Landfill



Utilizes ½ of Exhaust Gas from Centaur 40 Turbine



20K GPD Unit – South Canyon Landfill, Glenwood Springs, CO Septage Water Evaporation



Utilizes Thermal Energy from Burning C&D and Other Waste Wood