



Controlling Your Destiny:

Reduced Costs Through On-site Leachate Evaporation Utilizing Waste Heat



John Weigold – Director of Business Development



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 - Flexibility in thermal energy sources
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- Flexible Commercial Options
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 - Oil & Gas Produced Water
 - Coal-fired Power Generation
 - Flue Gas Desulphurization (FGD) blowdown water
 - Coal-combustion Residual (CCR) pond water





Leachate Management

Leachate Management Challenges

- Ever-increasing Treatment Costs
 - Expensive!
 - Significant portion of operating expenses
 - Increasing transportation costs
 - Fuel, labor, equipment O&M, insurance, etc.
 - Increasing disposal costs at 3rd party facilities
- Regulatory
 - Tighter, more restrictive POTW discharge regulations...
 - Federal, State, Local level
- Operational
 - Logistics coordination of vendors and disposal facilities
 - “It just keeps coming...”



How Big a Problem...?

- Multiple landfill operators
 - One of the largest expenses of landfill operations.
 - Logistical challenges
 - Trucking
 - Disposal locations
 - Operational headaches
 - Outside of core competency...
- Corporate level
 - Key Takeaways from Waste Management's Strong Q3 2016 Revenue Growth

*“The company is still dealing with managing liquids in landfills. It posted an **increase in leachate cost of about \$23 million.**”¹*



¹ <http://www.waste360.com/haulers/key-takeaways-waste-managements-strong-q3-2016-revenue-growth>



Leachate Management Economics...

- Broad range of costs dependent on multiple factors
 - Site specific infrastructure
 - Leachate chemistry
 - Available disposal / treatment options
 - Local regulations
 - Volume
 - Seasonality
 - Available on-site storage
 - Transportation vendor selection
- Cost Ranges – Off Site Transportation & Disposal
 - Informal market surveys
 - *\$0.04 - \$0.30+ / gallon*



Heartland Response...

Key Themes...

- ✓ *“Control your destiny...”*
- ✓ Simple response...don't utilize 3rd parties for discharge.
- ✓ Utilize previously “wasted” resources
 - ✓ Thermal energy – LFG Flare, Turbine/Engine Exhaust
- ✓ Reduce/Eliminate 3rd party Transportation & Disposal (T&D)
- ✓ Regulatory compliance / environmental stewardship...
- ✓ Cost-effective & cost-certainty
- ✓ *“Don't believe me...”* – come see Heartland in operation



The ‘Sweet Spot’...

- ✓ Generating leachate
- ✓ Off-site T&D
- ✓ Waste heat available
 - ✓ Thermal energy – LFG Flare, Turbine/Engine Exhaust
- ✓ Increasing costs
- ✓ Regulatory pressure





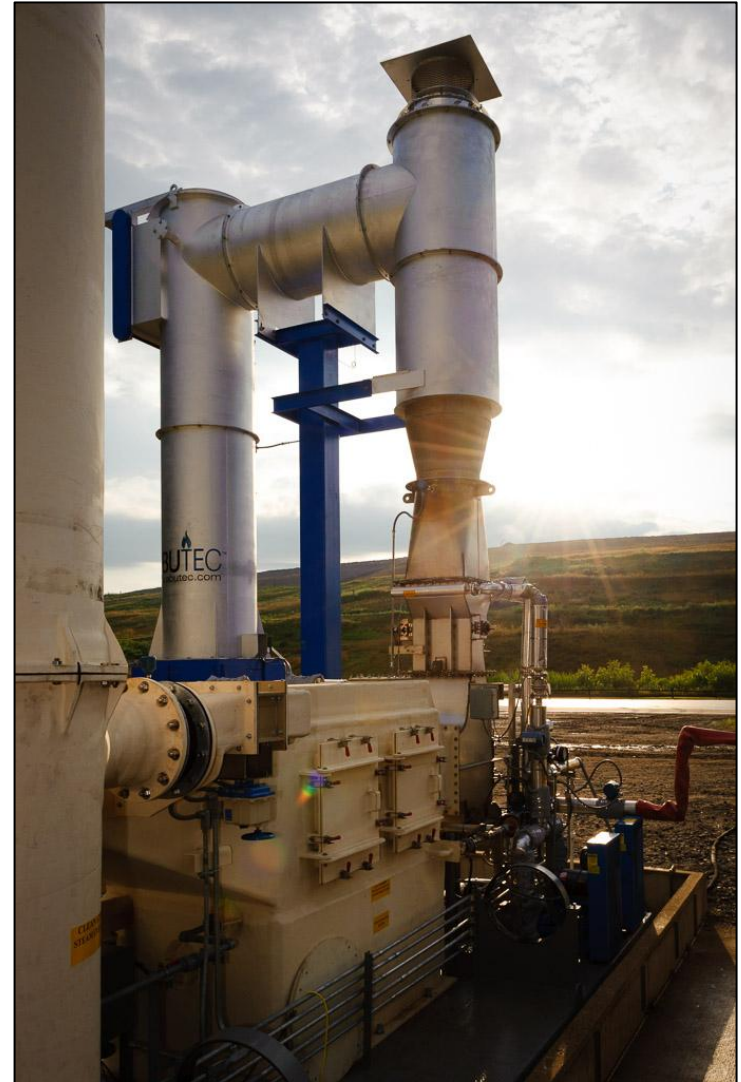
Executive Summary
Heartland Technology

Overview

Founded in 2008, Heartland Technology (“HT”) has patented and commercialized novel technology for treating difficult-to-treat industrial waste waters.

The HT ‘Concentrator’ is a direct contact evaporator that sets new benchmarks for reliability, ease of use and cost to treat.

Proven technology with marquee customers in key application verticals attesting to technology effectiveness.



Proven Applications



- Landfill Leachate
- FGD
- Produced Water
- Enhanced Pond Evaporation



Executive Summary

Heartland offers clients:

- ✓ Proven, reliable technology in use on commercial scale.
- ✓ Years of successful operating history.
- ✓ Unmatched flexibility on thermal heat sources.
- ✓ Reliable equipment performance with high one-line %.
- ✓ Robust, durable equipment with 15 years+ useful life.
- ✓ No technology or scale-up risk.
- ✓ Experienced team focused on successful project delivery.
- ✓ Flexible commercial terms.





Heartland Solution
Leachate Evaporation Technology
Low momentum, high turbulence (LM-HT) leachate concentrator

“The development program that led to the Concentrator began with a blank sheet of paper. The goal was to design the most universal process for aqueous wastewater treatment while setting new standards for combined performance, reliability, economy, mobility and environmental impact.”

--- Bernie Duesel, Founder, Heartland Technology



Heartland Concentrator

- Demonstrated ZLD process in 1 unit operation
 - Direct Contact Evaporation
 - *No heat exchangers* – prevents/mitigates scaling
 - *No membranes* to maintain/replace
 - Operates on waste heat or direct fired burners
 - Highly Reliable ... two moving parts
 - Saturated gas stream – precludes drying and scaling
 - Manages heavy scaling brines in continuous mode
 - Low cost materials
 - No or little pre-treatment required
 - Simple to operate
- ✓ *Built by Operators for Operators ... “Heartland Tough”*



Reliable, Rugged, Simple and Cost Effective Brine Concentration and Zero Liquid Discharge



LM-HT Concentrator



Heat Source
(Gas Flare)

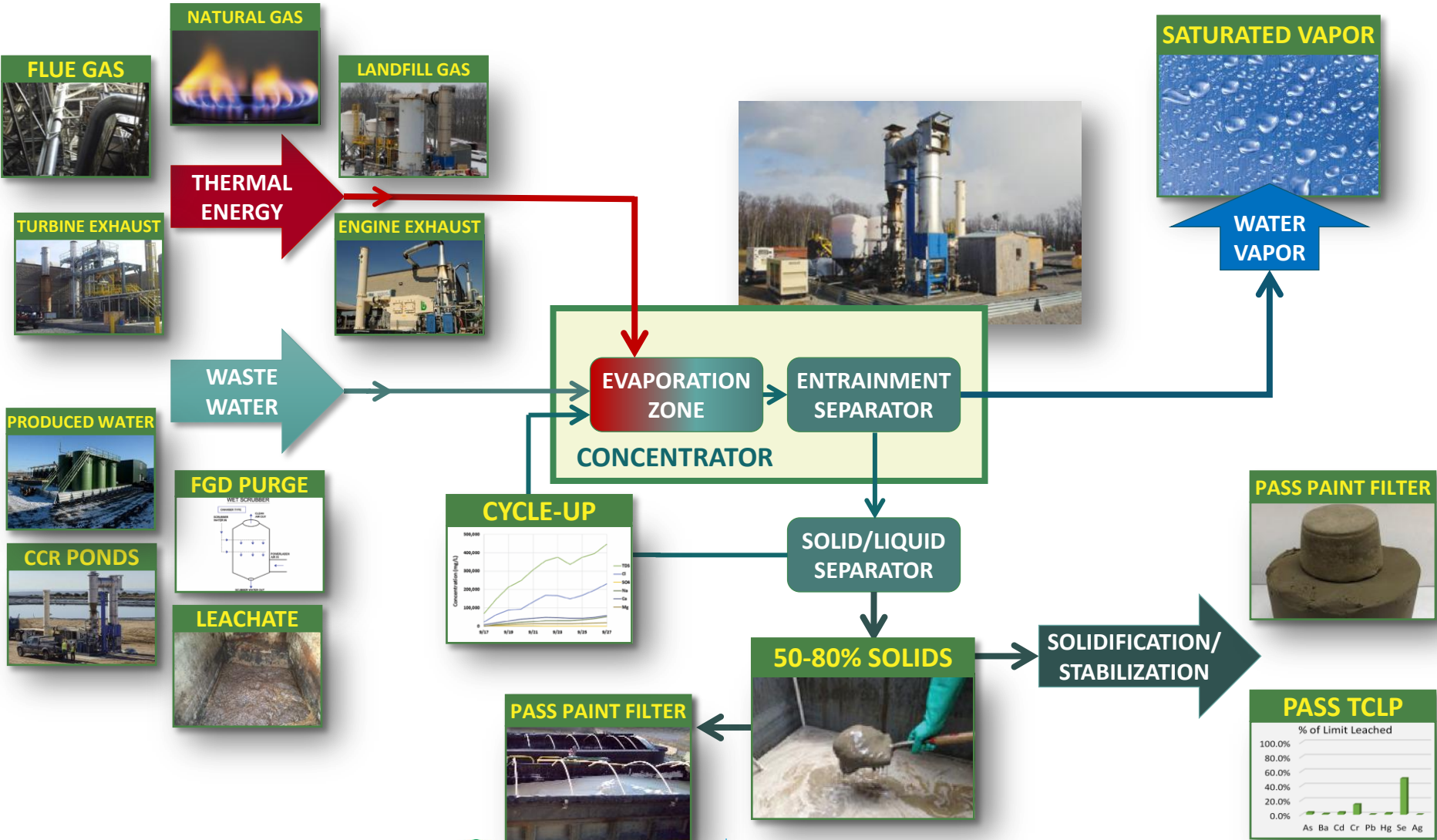
Concentrator
Section

Entrained
Droplet
Separators

Key Design Elements

- Saturated vapor + no surfaces where heat is driven into process prevent drying and caking on interior walls.
- At high total solids (TS), as long as liquid process phase is fluid (slurries OK) it drains to the sump.
- Multiple quick opening doors allow rapid access to process – no tools required & open in seconds.
- Cleaning is normally limited to rinsing from outside of doors with a hose using feed wastewater.
- Mild operating temperatures allow wash down to commence within minutes of shutdown.

Heartland Concentrator Process Flow



Process Flow



Preventing Backpressure...

1. Exhaust flow is drawn from the turbine stack by the concentrator ID fan.
2. The fan creates a slight vacuum duct to the turbine stack.
3. There is no diverter valve or obstruction in stack.
4. If concentrator is not running, turbine exhaust flow exit at normal discharge point.
5. Since the stack is open, excessive vacuum cannot be generated in turbine stack .
6. Pressure/vacuum can be monitored in stack.

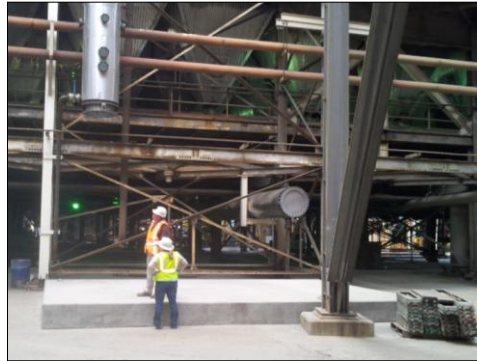


Thermal Energy Source Flexibility

IC Engine Exhaust



Flue Gas



Well Head Flare Gas



(Shale gas)

GT Exhaust



Electric Heater (pilot)



Biogas



(Landfill gas)



Intellectual Property

- Heartland maintains a comprehensive IP management program.
- Heartland currently owns 108 active US and foreign patents and patent applications, including:
 - 25 issued US patents, and
 - 26 issued foreign patents
- The HTP IP is generally directed to and covers various aspects of HTP's technology, which includes
 - Low momentum, high temperature (LM-HT) evaporative technology, and
 - The basic configuration and construction of the LM-HT evaporator, and
 - The use of the LM-HT evaporator with different types of fuel sources and at different temperatures, including low temperatures.
 - **The result: unmatched, proprietary ability to assist clients in solving their wastewater treatment needs using a broad range of previously 'wasted' thermal energy sources.**

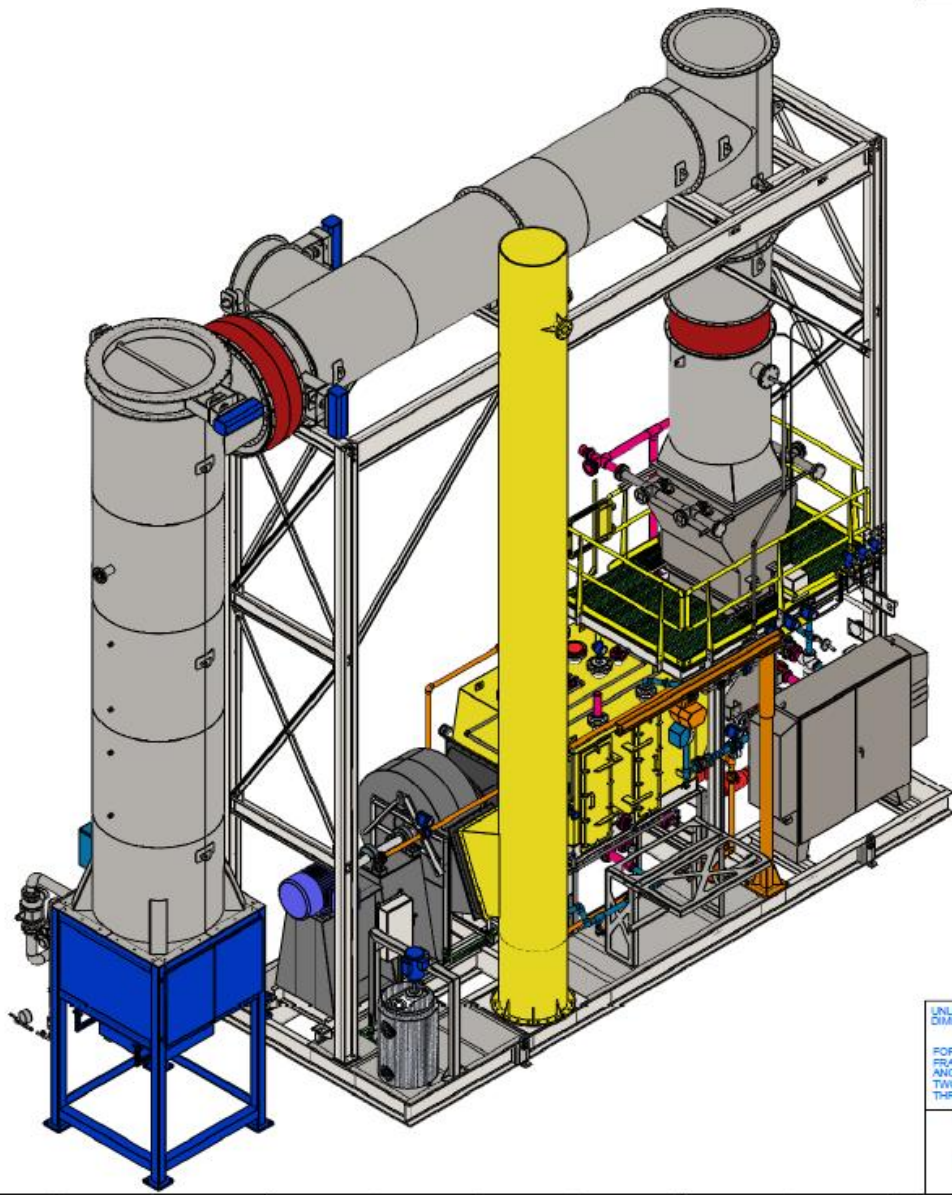



What is the footprint of a Heartland Concentrator?

- The footprint and process boundary developed based on:
 - System size
 - Infrastructure availability
 - Site-specific requirements
 - Process needs.
- In general, the Heartland system requires a small footprint of +/- 2,500 square feet and can be located indoors or outdoors.
- Individual Concentrators are self-contained on a pre-packaged skid conforming to requirements for highway transportation
- The concentrator equipment is assembled, packaged, and factory-tested at the point of manufacture.

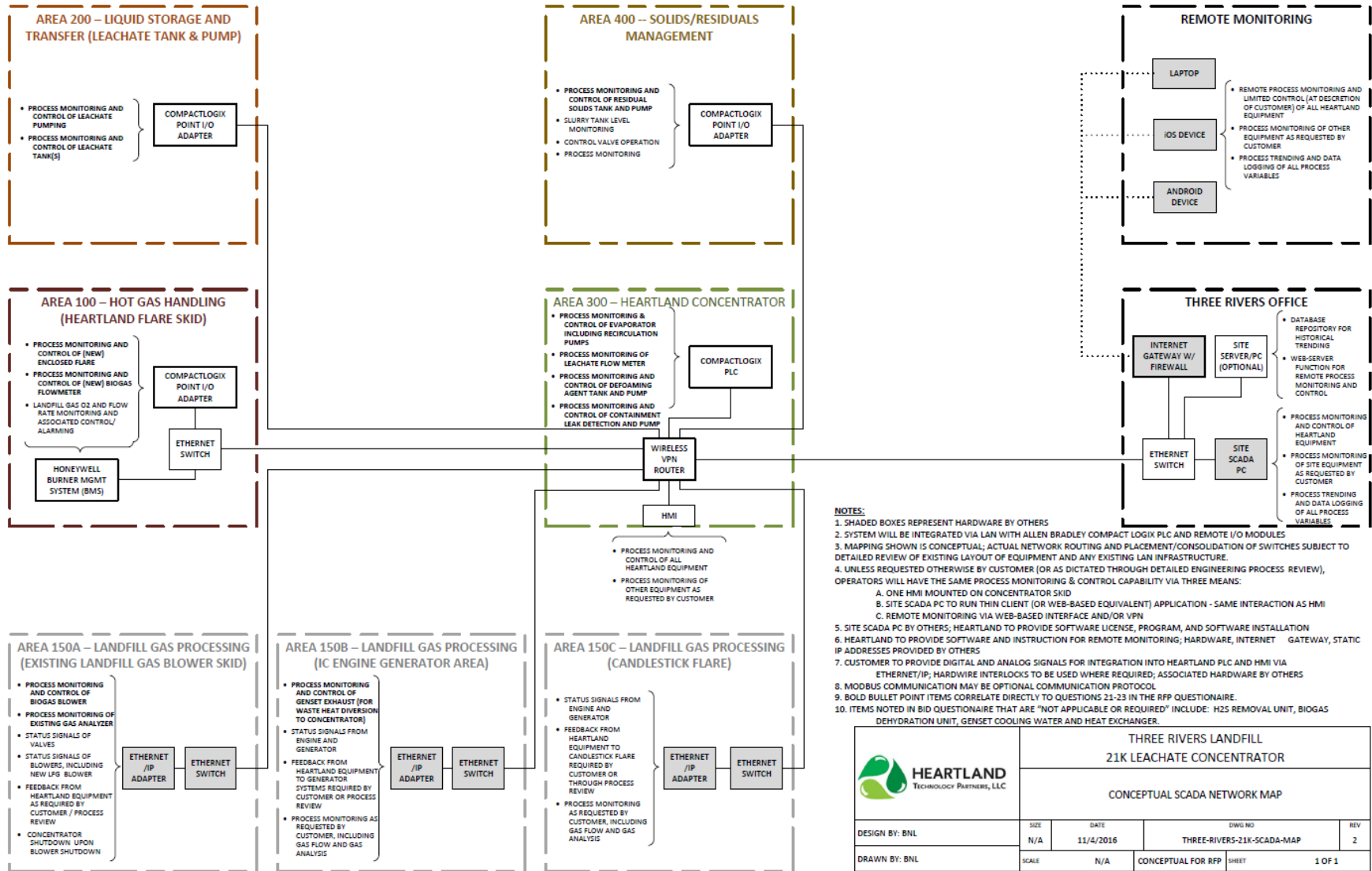


| REV. | DESCRIPTION | DATE | APPROVED |
|------|-----------------------------|------------|----------|
| 0 | INITIAL DESIGN FOR APPROVAL | 6/12/2015 | TFC |
| 1 | AS-BUILT | 11/24/2015 | TFC |



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| UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES | 081313 | INIT | DATE |  HEARTLAND Technology Partners, LLC |
| | DRAWN BY | TFC | 4/12/2015 | |
| FORMED TOLERANCES: FRACTIONAL: ±1/16 ANGULAR: MACH ±1 BEND ±1 TWO PLACE DECIMAL ±.03 THREE PLACE DECIMAL N/A | APPROVED BY | LVC | 11/23/2015 | DESC. 24K SEPERATOR TANK SKID ASSEMBLY |
| MATERIAL: | THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF HEARTLAND TECHNOLOGY PARTNERS LLC. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF HEARTLAND TECHNOLOGY PARTNERS LLC IS EXPRESSLY PROHIBITED. | | | PROJECT: 24K PROJECT PART NUMBER 24K UNIT GA |
| WEIGHT:(LBS.) | | | | REV: 1 SCALE = 1:96 SHEET: 1 OF 3 |

Network Map: Full SCADA and PLC Controls

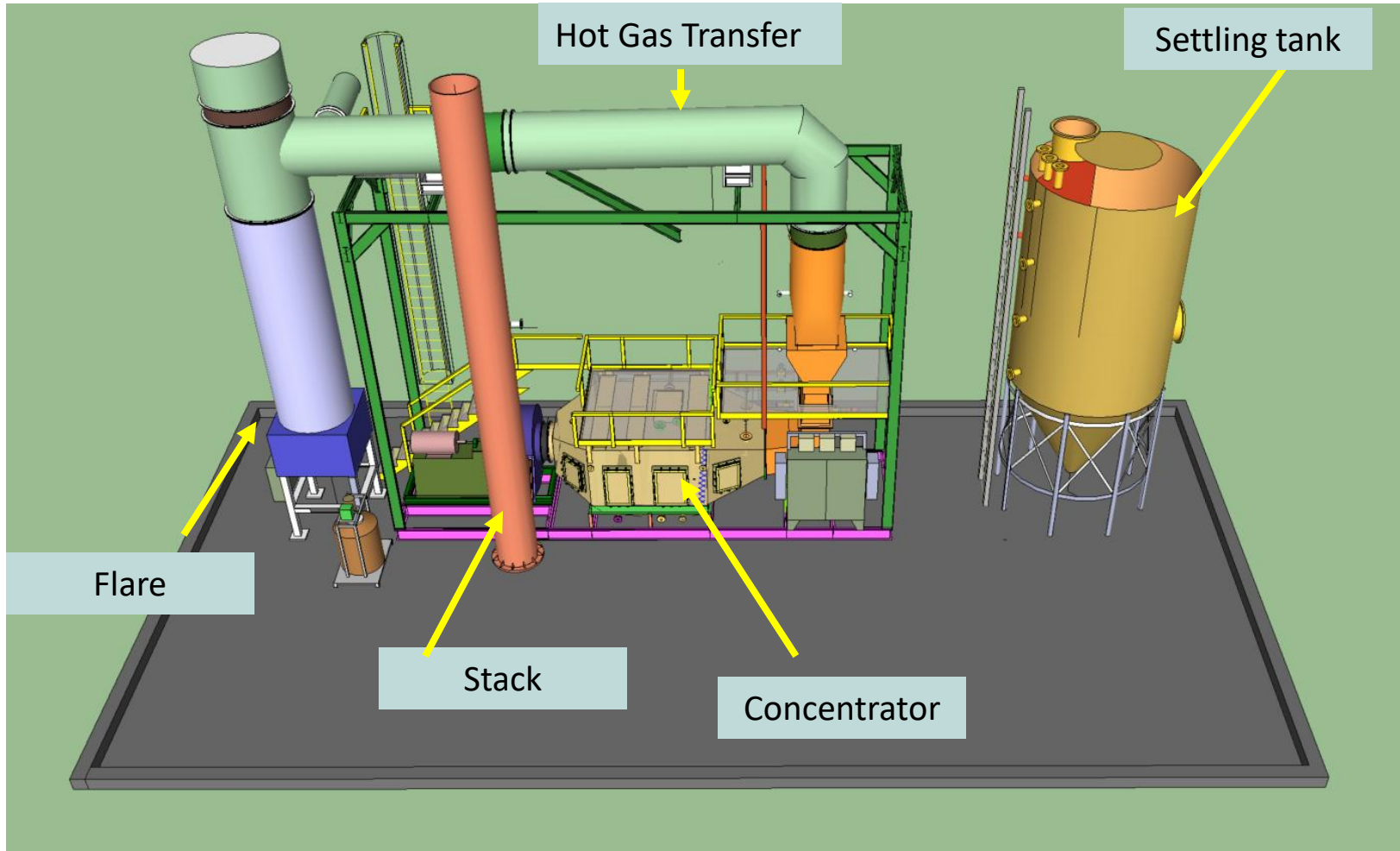


| THREE RIVERS LANDFILL 21K LEACHATE CONCENTRATOR CONCEPTUAL SCADA NETWORK MAP | | | | |
|--|------------|--------------------|------------------------------------|--------|
| DESIGN BY: BNL | SIZE: N/A | DATE: 11/4/2016 | DWG NO: THREE-RIVERS-21K-SCADA-MAP | REV: 2 |
| DRAWN BY: BNL | SCALE: N/A | CONCEPTUAL FOR RFP | SHEET | 1 OF 1 |

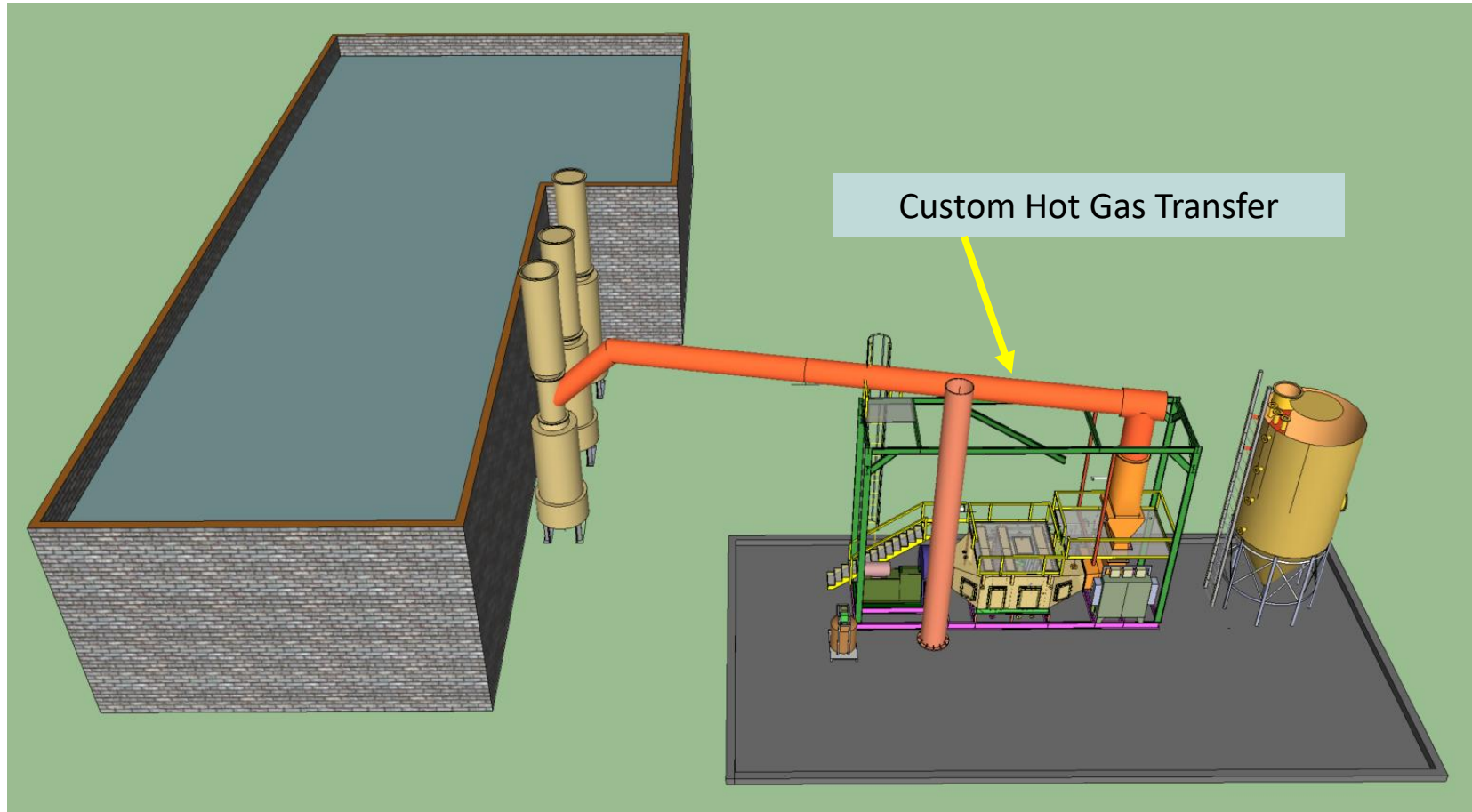


Configurations

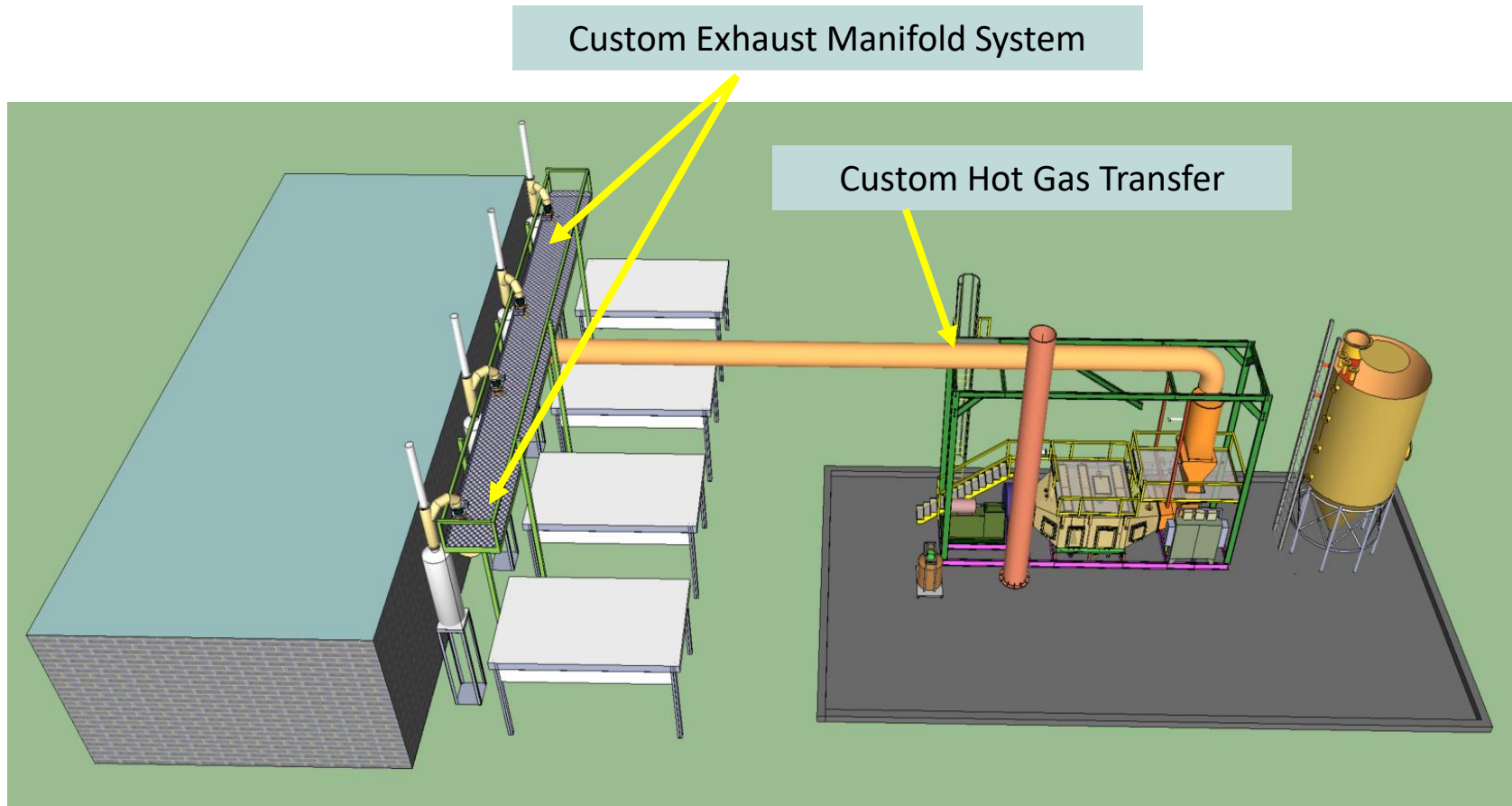
Leachate with LFG Flare for 100% of Thermal Energy



Turbine Exhaust System for 100% of Thermal Energy



Reciprocating Engine System for 100% of Thermal Energy





Case Studies

Proven Integration with Landfill Operations

Case Study - Turbine Exhaust System for 100% of Thermal Energy



Solar Turbines
A Caterpillar Company

WMI King George Landfill – Heartland Project Overview

- Existing Heartland Units: 2 X 30,000 GPD = 60,000 GPD.
- 2016: Installation of 3rd Heartland 30,000 GPD Unit.
- 100% of thermal energy supplied by Solar Centaur 40 Turbine exhaust.
- 3 separate process trains; full PLC controls.
- Consumes no LFG.
- No reduction in turbine performance.
- Installed & operating since 2012.
- Site tours available upon request.



Case Study – Gas Flare for 100% of Thermal Energy



Municipal Landfill – Heartland Project Overview

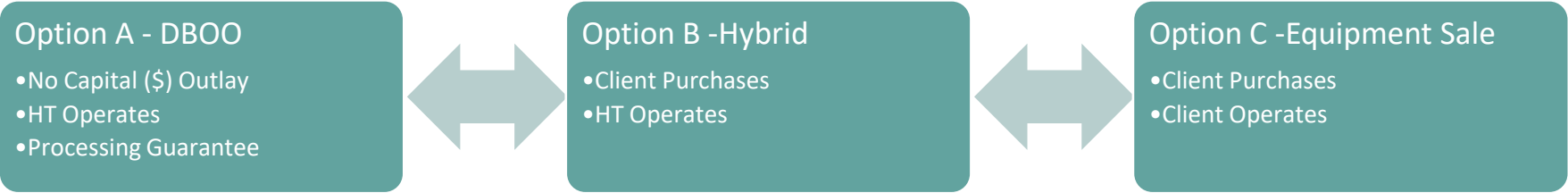
- Heartland Unit: 12,000 GPD.
- Located in Alaska
- Challenging climate - equipment located in custom designed building and heat traced.
- Load-out door for transferring residuals
- 100% of Thermal Energy Supplied by Flare Exhaust
- Flexibility: Ability to Operate on Natural Gas or LFG
- Installed & operating since 2014.





Commercial Options

Flexible Commercial Options



| | Option A | Option B | Option C |
|--------------------------------|---|--|---|
| | HT Supplies Equipment and provides O&M | Client Purchases Equipment and HT provides O&M | Client Purchases Equipment and provides for O&M |
| Concentrator Equipment Package | HT Provides | Client Buys | Client Buys |
| Installation & Start-Up | HT | HT | HT/Client |
| Operate & Maintain | HT | HT | Client (HT Training & F/Up) |
| Processing Guarantee | Yes | Yes | No |
| Warranty Terms | <i>Bumper-To Bumper for Contract Term</i> | <i>Bumper-To Bumper for Contract Term</i> | One Year |





Additional Uses

HT Focuses on the Growing Problem of Industrial Waste Water Treatment



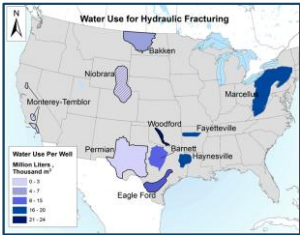
Power Industry

U.S. Power Industry set to spend \$3.1B on water and wastewater treatment¹



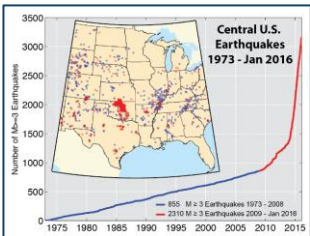
Landfill Leachate

Intensive treatment technologies have a play in \$2 billion U.S. landfill leachate market²



Oil & Gas

50 billion gallons per year of water used in the US annually for unconventional shale gas and oil extraction

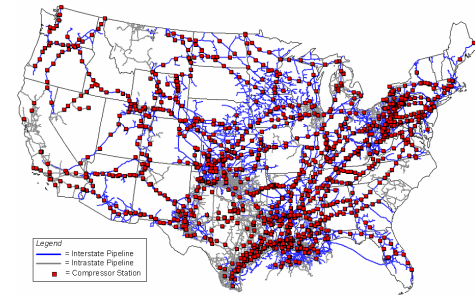
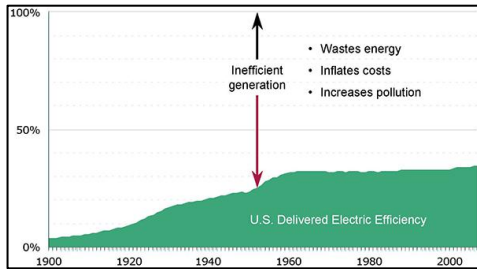


Deep Well Injection

“We find that the entire increase in earthquake rate is associated with fluid injection wells. High-rate injection wells (>300,000 barrels per month)”⁴



The Opportunity to Recover Waste Heat



The typical plant *throws out two of every three units of energy, largely in the form of waste heat*. The majority of the heat is released into the atmosphere or absorbed by the cooling water.”^{1, 2}

“More than 1,400 compressor stations maintain pressure on the natural gas pipeline network and assure continuous forward movement of supplies.”³



The typical plant *throws out two of every three units of energy, largely in the form of waste heat*. The majority of the heat is released into the atmosphere or absorbed by the cooling water.”^{1, 2}

Beneficial use of landfill gas: 648 active projects reusing over 300MM scfd, and ~400 candidate projects representing 440MM scfd⁵

1: http://www.ucsusa.org/clean_energy/coalvswind/c02d.html#_V2mC8rgrLic
 2: http://www.recycled-energy.com/resources/inefficient_us_electric_generation/

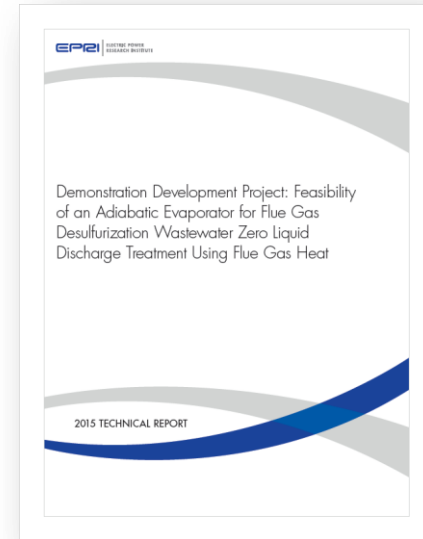
3: https://www.eia.gov/pub/oil_gas/natural_gas/analysis_publications/ngpipeline
 4: <http://www.nature.com/news/flaring-wastes-3-5-of-world-s-natural-gas-1.19141>
 5: EPA Landfill Methane Outreach Program

Coal-Fired Power Generation Independent Validation

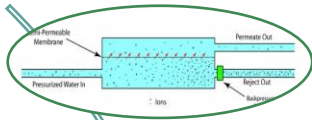
EPRI Pilot at Plant Bowen, Georgia

- Objective: Evaluate the effectiveness of the Heartland Concentrator for FGD wastewater treatment/concentration using flue gas heat:
 - Volume reduction of FGD blowdown
 - Integration of the concentrator process equipment with plant operations
 - Impact of utilizing flue gas (and fly ash) on the concentrator equipment/operation
 - Feasibility of ZLD-type treatment of the concentrated FGD wastewater

- Results:
 - The Heartland Concentrator was fully integrated into the power plant using flue gas as a waste heat source
 - 24/7 study realized 93% availability
 - Fly-ash benefited the process with improved mixing and better solids production
 - 97% volume reduction producing solids for disposal



Other Markets of Interest...



RO Brine Discharge



Pharmaceutical/Hospital Waste



Textile Waste



Refinery Spent Caustic



Aquaculture



Hydroponics



Poultry/Livestock Waste & Brine Ponds





Conclusions / Key Takeaways

Conclusions / Key Takeaways

- Leachate Management is an existing and growing problem
 - Operational, Regulatory & Financial Basis
 - Particularly acute when landfills deal with 3rd party T&D
- One alternative – ‘*Control Your Destiny*’
 - On-site leachate management
 - Utilize previously wasted resources
 - Cost certainty
 - Environmental sustainability – Combined Heat & Power (CHP)
- Heartland Solution
 - ✓ Works – proven applications, repeat purchasers, industry leaders
 - ✓ Scalable – fits to your needs
 - ✓ Favorable economics





Values & Organization

What we Value

Values are the enduring beliefs that form the basis of our culture. Our values guide us in making those daily decisions, both large and small, that over time determine our achievement.

Safety

In valuing safety, we acknowledge that the well-being of our team members, partners and customers is always our first and foremost priority

Customer First

In order to help our customers, we must first understand at a deep level what they value, and how they succeed. Only then can we develop and deliver appropriate solutions for them.

Service

Service is a mind-set that says we care for those around us more than we do ourselves. The abundance we create for ourselves is a multiplier of how much we give of ourselves to others.

Solving Important Problems

We work hard. With the time we have available in our careers, we want to work on problems that will help sustain our planet and society for our next generations.

Winning as a Team

The best teams win, not the best collection of athletes. To be an effective team we must perform our jobs at the highest levels, trust in individuals around us, practice and train like professionals, and execute with a quiet confidence. Our ability to play as a team is the cornerstone of our success.



How we Behave

The foundation of all good teams is Trust. How we behave determines the level of trust we build collectively.

$$\text{Trust} = f(\text{Integrity, Respect, and Candor})$$

In addition to Trust, great teams have an intangible quality of always achieving more than management practice would deem possible.

$$\text{Impact Multipliers} = \text{Optimism} + \text{Initiative}$$

Integrity

Integrity means *always* doing what is right ... even when no one is watching.

Respect

It is through respect that we acknowledge the value and worth of those around us. We show respect for others in how we communicate, how we listen, how we deliver on commitments, and how we own up to our mistakes

Candor

Candor is the quality of being open, honest, direct and sincere. Candor is bi-directional. Not only will 'I be candid with you' but I will have the confidence and defenselessness to allow 'you to be candid with me.'

Optimism

Optimism is a force multiplier. Optimistic teams are not bounded by the conventional wisdom of what is possible, and as a result, consistently achieve more... and have more fun along the way!

Initiative

Great teams and great team members do not wait around for direction. They seek to understand strategy and business intent, they "see around corners" to identify opportunities and threats, and move proactively to drive impact



What we do

Over and above our Values and Behaviors, our habits are the things we do each and every day irrespective of the goals and strategy of the company. Our habits, applied over time, are how we win.

We Win by:

Creating Value for our Customers

Having a Passion for Process Improvement

Simplifying the Complex

Being Insatiable Learners

Operationalizing Metrics and Scorecards

Embracing Problems and Challenges

Recognizing and Rewarding Impact



Board of Directors



**EARL
Jones**

Earl Jones is the Chief Executive Officer for Heartland Technology. Earl is a recognized thought-leader in the Water Industry, and has built and led high performing teams for the past 25 years.

Prior to Heartland, Earl helped co-found the Private Equity Fund Liberation Capital, which provided project financing for distributed energy and water infrastructure.

Earl is formerly a Senior Executive at GE, serving in a variety of leadership roles, including as the Global Commercial Leader for GE Water responsible for Sales, Partnerships, Risk, and Project Development. Earl led the global eHealth Solutions business for GE Healthcare IT, and was GE's Lean Six Sigma Leader for Supply-chain.

Prior to GE, Earl was a Partner and CFO in management consulting, a supply-chain leader at Dell, and served honorably as a Submarine Officer in the US Navy.

Earl holds a M.S. in EE/CS and an MBA from M.I.T., and a B.Sc. in EE from the US Naval Academy. Earl, his wife Sharon, and two sets of twins reside in Boston, MA.

Chairman



**Rob
Cawthorn**

Robert Cawthorn has over 50 years experience in the pharmaceutical, biotechnology and banking industries at Pfizer, Biogen (President), Rhone Poulenc Rorer—now part of Sanofi (Chairman and CEO) and Global Health Care Partners of DLJ Merchant Banking (Managing Director).

Rob has had extensive board experience including Actelion Pharmaceuticals (Chairman), CBS, The Vanguard Group of Mutual Funds, Sunoco, First Pennsylvania Bank—now part of Wells Fargo, Leerink Swann and several technology start-ups, including Biodesix (Chairman). He has been and is active on not-for-profit boards including The University of Pennsylvania, United Way of South Eastern Pennsylvania, Cambridge in America and the Bermuda Institute of Ocean Sciences.

Rob is a graduate of Cambridge University and lives in Bermuda and France.



**Bob
Irwin**

Robert Irwin is a founder, co-owner and financial consultant of Heartland and has over 20 years experience in the landfill industries.

Bob is also the Managing Member of Electrum Partners, LLC that invests and consults to 'green' companies. Prior to that, he was Chairman and Chief Executive Officer of Presque Isle Capital Management. He retired from Donaldson Lufkin and Jenrette which consummated a long career in the institutional brokerage business and in the investment banking business.

Bob was responsible for the reformation and financing of Envirofil which acquired USA Waste, where he was a Board member. USA Waste then acquired Waste Management in a reverse merger. He co-founded Brandywine Asset Management, Rocking Horse Child Care Centers of America (now Nobel Education).

Bob resides outside Philadelphia.

Heartland Leadership



Craig Clerkin

Craig Clerkin is a Founder and Chief Operating Officer for Heartland Technology. Craig has over 20 years of manufacturing experience including more than 15 years in the landfill gas industry.

Prior to joining Heartland, Craig served as Vice-President for ANGI International, a leading provider of compressed natural gas equipment (CNG) process systems for the alternative fuels industry.

Craig is the co-inventor of a series of patents and pending patents supporting Heartlands Intellectual Property (IP) portfolio and has received several awards for business development overseas including the Wisconsin Governor's Export Achievement Award, the World Trade Association Export Award for Wisconsin, the World Trade Association Export Award for Midwest and the SBA Export Award.

Craig is a Professional Engineer (PE). He received a BS in Mechanical Engineering from the University of Wisconsin.



Shubh Inamdar

Shubha Inamdar is the Chief Financial Officer for Heartland Technology. Shubha is a CPA and MBA (M.I.T.) and brings considerable experience in Controllershship, Tax, FP&A and Capital Structuring.

Prior to joining Heartland, Shubha was the VP of Finance and Analytics for Shipcom Wireless, where she is focused on financial operations, pricing and margin improvement.

Prior to Shipcom, Shubha spent 6 years at GE, where she was the CFO for the Thermal Products division of GE Water, and a Risk Leader for GE Transportation.

Shubha is a 2014 Graduate of MIT's Sloan Fellows Program, and holds a Bachelor of Commerce from Pune University. Shubha will be relocating to Boston and will join Heartland on August 1, 2016.



Nick Dyer

Nicholas Dyer is the Chief Commercial Officer for Heartland Technology. Nick has over 15 years of experience in commercial positions in various industries, the last 10 of which were in water treatment.

Prior to joining Heartland, Nick led all commercial activity including sales, marketing, application engineering and technical service for LG Chem Water Solutions, a company formed through LG's \$200MM acquisition of NanoH2O, a venture-backed manufacturer of Reverse Osmosis membranes. For six years at NanoH2O, Nick developed the Company's sales and brand strategy, led the first product launch, and personally did business in over 40-countries.

Nick spent 5-years with General Electric where he served as Product Manager for GE Water's Build, Own & Operate (BOO) product line, managing all outsourced water contracts.

Nick is a graduate of Cornell University, with degrees in Economics and in History. He and his family reside in Los Angeles, California.

Heartland Leadership



**Susan
Portin**

Susan Portin is the Vice President of Corporate Development for Heartland. Susan has more than 25 years of diverse global experience as a corporate attorney, M&A specialist, senior business leader and strategic management consultant.

She has a deep understanding of how companies operate and the challenges they face, particularly in the many areas where business intersects with law, risk, compliance and governance. She has worked in a broad array of traditional corporate and entrepreneurial business models across many industries and her experience spans a variety of key functional areas including business operations, legal, risk and compliance, M&A, administration, corporate communications, human resources, board and investor relations and strategic planning.

Ms. Portin has a BA degree from Union College, a Masters degree in Public Relations from Boston University and a Law Degree from Emory University. She is licensed to practice law in the District of Columbia and an inactive member of the Pennsylvania Bar.



**John
Weigold**

John Weigold is a Product Marketing Manager for Heartland. He joined Heartland in 2014 and has been affiliated with HTP since 2010.

An early investor in HTP, Mr. Weigold also played a major role in raising seed-stage equity capital for the company. Prior to joining HTP, Mr. Weigold held senior positions with P&L responsibility in the environmental services, institutional banking, and private equity worlds.

With a proven track record of bringing new businesses successfully to market, he has played a leadership role in completing multiple transactions, including an IPO and triple tax-exempt debt offering.

Mr. Weigold received an MBA in Finance/Marketing from Northeastern University with Beta Gamma Sigma honors and a BS in Management Science/Labor Relations from the State University of New York at Geneseo.



**Bob
Biggs**

Bob Biggs is a Leachate Sales Manager for Heartland. He joined Heartland in 2014 as the Chief Financial Officer (CFO).

Bob brings over 40 years of diverse and progressively responsible finance and transaction expertise to Heartland. He has proven executive level and 22 years with Waste Management, Inc., most recently as Vice President of Finance for the \$3.3 billion Eastern Group.

A successful team leader and strong business partner, he is dedicated to delivering results in fast-paced and changing environments. Mr. Biggs is known for innovative approaches that lead to measurable improvements and bottom-line impact with a solid track record of enhancing shareholder value.

Mr. Biggs is a CPA. He received an MS in Accounting and a Bachelor of Business Administration from Wichita State University.



Thank you!

For additional information, please contact:

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Director of Business Development

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