MEET OUR "CRANE"
Installing a pond HyperLoop requires no heavy machinery

High-Efficiency Pond Loop For Geothermal Heat Pumps
Thank you!

- ORNL - Xiaobing Liu
- OG&E - Michael Anderson
- Garen Eubank
- Bill Holloway
- Sean Hogan
Company Background

- 30-year experience in polymer heat exchange
- ISO 9001:2000 Quality Assurance Manufacturing
- ISO 14001:2004 Eco-wise Manufacturing
- In 47 countries
- 2.5 Acre Production Plant
- 200 Employees (20 Engineers)
Other Product Lines

Solar Exchangers

Industrial Exchangers & In-Ceiling Exchanger
Other Product Lines

- Agricultural Exchangers
- Aquaculture Exchangers
- Water Quality Management
Current Technology
Other Rack Options

4-Ton

10-Ton
Case Study Overview

Sample Size: Over 1000 units

Findings: Strong performance, but room for improvement on practical challenges
Performance

At least 2 Tons / Unit

- Has been successfully sized at 3 tons / unit in all three U.S. climates (Northern, South & West)

- But data set too small to draw conclusions yet, so sizing at 2 tons per loop for now.

- Extremely difficult to ice
  - Balanced exchange rate
  - Just don’t enclose in container (e.g. culvert pipe)
Very low backpressure (1/4 PSI @ 3.5 GPM)
Other Positive Findings

- Light & Compact
- “UPS-able”
- Saves Shipping Costs & CO$_2$
- Module Easy to stock
- Short Lead times
- Simple to size properly
Improvement Opportunities

- Construction of Racking on site
- Fear of Fish hooks, anchors & propellers
Improvement Opportunities

Deliberation

Decision
R2D4

“Ready 2 Drop 4-Ton”

Heavy-Gauge Aluminum Shield

Protection from fish hooks, anchors, propellers, etc.
Over 4 tons of capacity

2-HyperLoops plumbed in parallel

Small Footprint (28”)

[Image of a HyperLoop component]
No assembly – Fuse & Use

- Pre-plumbed Inlet & Outlet
- 1.25” HDPE Connection
- Extra pipe for “oops” fusions
R2D4

“Ready 2 Drop 4-Ton”

- Assembly - Fast and Simple
- No heavy equipment required
- 4-Ton durable rack complete in minutes
- Higher Capacity in Cooling Climates
In-Ground Applications
Benefits In Ground

- Short trenches
- Fast loop build & installation time
- Saved excavation and drilling costs
- Minimal yard damage
- Saved shipping costs and carbon emissions
- Minimal site-specific engineering costs
Challenges In Ground

- Dry sand – difficult to properly size with such low conductivity/diffusivity
- Rocky soil – need clean fill around loop
Tricks of the Trade

Flow – pressure-less flow center with reverse feed layout is ideal.

Flushing – sufficient pumping power is just as important as all other loops.

Trench refill methods – water & twine.
Simple stakes with twine hold loop snug against side wall of trench.

Stakes can be reused
Case Studies

- **Application:** Residential
- **Location:** Fort Wayne, Indiana
- **Soil Type:** Clay
- **GHP Size:** 3-Ton Install
- **Loop Sizing:** 6 HyperLoops – ½ ton / loop
Sample Installations
Sample Installations
<table>
<thead>
<tr>
<th>Case Studies</th>
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</thead>
<tbody>
<tr>
<td><strong>Application:</strong> Residential</td>
</tr>
<tr>
<td><strong>Location:</strong> Fort Wayne, Indiana</td>
</tr>
<tr>
<td><strong>Soil Type:</strong> Silt &amp; Clay</td>
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<tr>
<td><strong>GHP Size:</strong> 2-Ton Install</td>
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<tr>
<td><strong>Loop Sizing:</strong> 4 HyperLoops – ½ ton / loop</td>
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<tr>
<td><strong>Install Time:</strong> 5 Hours (8am-1pm)</td>
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Sample Installations
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Sample Installations

Simple rake & hose refill
Case Studies

- **Application:** Residential: Low Income
- **Location:** Oklahoma City, OK
- **Soil Type:** Sand & Clay
- **GHP Size:** 3-Ton Install
- **Loop Sizing:** 6 HyperLoops – ½ Ton / Loop
- **Hydration lines**
The National Weather Service reported that Guthrie, about 30 miles north of Oklahoma City, registered 114 degrees to break the statewide record of 113 degrees, set at Meeker in 1896 and tied in Ralston last year.
Case Studies

- Hottest temps in 116 years - undersized for this cooling climate in clay

- Even with hydration, clay shrank and pulled away from HyperLoop

- Resolution: Increased hydration level and continue monitoring.

- Currently operating at acceptable levels, but larger loop field needed for optimal operation.
Sample Installations
Case Studies

Application: Military Housing

Location: Fort Polk, LA (largest geo in U.S.)

Soil Type: Clay

GHP Size: 4-Ton Install

- deep well loops overheated

Loop Sizing: 2 HyperLoops
Case Studies

Loop temp dropped 15F immediately

Dropped another 5F after month of operation even though temperatures got hotter.

Enabled deep well loop to dissipate heat permanently.
Sample Installations – Fort Polk
Sample Installations – Fort Polk

Small backhoe with 10-inch bucket
Sample Installations – Fort Polk
Thank you!

955 Sunshine Lane
Altamonte Springs, Florida 32714
Ph: 407-831-2223
www.tevaenergy.com