Leachate Evaporation at a Large Landfill in the Southeast: Challenges & Solutions

EREF’s Regional Summit on Solid Waste Practice & Research

October 8, 2013

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Introduction

- Sampson County Disposal, LLC
- 205-acre permitted landfill boundary
- 55 million cubic yards of permitted airspace
- Began operations early 2000
- Purchased by Waste Industries in May 2000
- >10.5 million tons waste in place as of 2012
- Leachate recirculation approved by State in 2003
Leachate Management Challenges

- Rural municipality unable to accept pretreated leachate at desired disposal rate (>30,000 gpd)
- Pump and haul impractical due to volume and distance
- Leachate recirculation is a temporary solution
- Turn-key evaporation solution provides 10-year window to explore other solutions
- Approx. 90% reduction in volume
Residuals Management Concerns

- Leachate volume reduction = metals concentration increase
- Before and after evaporation sampling of leachate vs. residual
- All results are non-detect or well below RCRA thresholds
Residuals Management Concerns

- Analysis demonstrates residual is non-hazardous.
- State notification of analysis results as a special waste.
- Residual is recirculated into the landfill.
Three generations of patented technology:

- 1992: Original design
  - Evaporator with enclosed flare
  - ~2,400 scfm for 30,000 gpd
  - 14 installations
- 2004: Direct discharge design
  - Improved combustion efficiency
  - Direct discharge of vapor plume
  - ~500 scfm for 30,000 gpd
  - 7 installations
  - Optional plume suppression
- 2012: Waste heat design
  - Utilization of waste heat
  - Currently under development
## Domestic Sites

<table>
<thead>
<tr>
<th>Site Name</th>
<th>State</th>
<th>Year</th>
<th>GPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hunt Road</td>
<td>MA</td>
<td>1997</td>
<td>10,000</td>
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<tr>
<td>Olympic View</td>
<td>WA</td>
<td>2000</td>
<td>20,000</td>
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<tr>
<td>Okeechobee</td>
<td>FL</td>
<td>1998</td>
<td>20,000</td>
</tr>
<tr>
<td>Liberty</td>
<td>IN</td>
<td>1998</td>
<td>10,000</td>
</tr>
<tr>
<td>Earthmovers</td>
<td>IN</td>
<td>1998</td>
<td>10,000</td>
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<tr>
<td>Southern Allegheny</td>
<td>PA</td>
<td>1999</td>
<td>13,000</td>
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<tr>
<td>Okeechobee</td>
<td>FL</td>
<td>2003</td>
<td>20,000</td>
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<tr>
<td>Sauk Trail</td>
<td>MI</td>
<td>1999</td>
<td>20,000</td>
</tr>
<tr>
<td>Forest Lawn</td>
<td>MI</td>
<td>1999</td>
<td>20,000</td>
</tr>
<tr>
<td>Greenridge</td>
<td>PA</td>
<td>1999</td>
<td>30,000</td>
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<tr>
<td>Cherokee</td>
<td>OH</td>
<td>1998</td>
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<tr>
<td>Brunner</td>
<td>PA</td>
<td>2004</td>
<td>20,000</td>
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<tr>
<td>Waters</td>
<td>MI</td>
<td>2007</td>
<td>30,000</td>
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<tr>
<td>Northern Oaks</td>
<td>MI</td>
<td>2008</td>
<td>30,000</td>
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<tr>
<td>Glens</td>
<td>MI</td>
<td>2009</td>
<td>30,000</td>
</tr>
<tr>
<td>Sampson County</td>
<td>NC</td>
<td>2011</td>
<td>30,000</td>
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<tr>
<td>Forest Lawn</td>
<td>MI</td>
<td>2012</td>
<td>30,000</td>
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## International Sites

<table>
<thead>
<tr>
<th>Site Name</th>
<th>Year</th>
<th>GPD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Redvale, New Zealand</td>
<td>1999</td>
<td>20,000</td>
</tr>
<tr>
<td>Sao Paulo, Brazil</td>
<td>2001</td>
<td>5,000</td>
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<tr>
<td>Beijing, China</td>
<td>2004</td>
<td>10,000</td>
</tr>
<tr>
<td>Caracas, Venezuela</td>
<td>2005</td>
<td>30,000</td>
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</table>
Evaporator Overview

- LANDFILL GAS
- COMBUSTION AIR
- BURNER
- OFF-GAS VAPOR
- EVAPORATOR
- COMBUSTION TUBE
- DRAFT TUBE ASSEMBLY
- RESIDUAL
- **Electrical power**
  - 480v/3 phase, 350 amp service

- **Landfill Gas**
  - 500 scfm @ 50% methane

- **Leachate Tank**
  - Installed 30,000 gallon day tank adjacent to facility

- **Non-potable water (startup & maintenance activities)**
  - ~35 gpm from dedicated well, surface water or water supply

- **Communications**
  - Telephone and internet

- **Footprint** is typically 25’ by 50’
- Arranged meeting with NC DENR to discuss project.
- Estimated emissions of criteria pollutants and HAPs/toxics
  - NMOC < 20 PPMV, as hexane, or > 98% destruction
  - CO < 0.30 lbs/MMBTU fired
  - NO$_x$ < 0.05 lbs/MMBTU fired
  - Particulate < 20 tons per year
- Modeled ambient air impacts at the property boundary for:
  - chromium,
  - arsenic, and
  - ammonia.
- Source was demonstrated to be in compliance and was then permitted as a minor source under the control of CB&I.
- Air Permit was issued within 60 days.
- Leachate recirculation permit—TCLP performed on residuals
- Building Permit
Setting the Equipment
Installation complete, no building
<table>
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<tr>
<th>Event</th>
<th>Timeline</th>
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<tbody>
<tr>
<td>Air Permit Issued</td>
<td>December 20, 2011</td>
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<tr>
<td>Equipment Delivery</td>
<td>6 Months</td>
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<tr>
<td>Site Construction</td>
<td>3 months</td>
</tr>
<tr>
<td>Start-up and commissioning</td>
<td>1 month</td>
</tr>
<tr>
<td>Commercial Operation Date</td>
<td>September 15, 2012</td>
</tr>
<tr>
<td>10 months start to finish</td>
<td></td>
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</tbody>
</table>

**Project Schedule**
System Production
- September 15, 2012 through September 10, 2013 (361 days)
  - Processed 33,957 gpd of leachate
  - Discharged 3,314 gpd of residual (9.8%)
  - Evaporated 30,643 gpd of leachate
- 92% on line time since start up

Residual Management
- Total solids in influent range from 1-3%, typically 1%
- Daily samples taken in E-Vap vessel
- Managed to <8% total solids by increasing blow down
- Site utilizes a 3,300 gallon water truck to transport leachate
- 7 tankers per week

System is operated on temperature control, gas blower is adjusted to maintain temperature
- Burner operates at 1,900°F

Anti-foaming agent added in evaporator vessel, 230 gal/month
10 year term, with renewal options
  – Annual service fee and escalator
  – Ground Lease

CB&I provides
  – Complete E-Vap® system and building
  – Facility operator, including on-call coverage
  – All consumables & materials
  – 10 year warranty on all repairs and maintenance
  – Guaranteed operating capacity (annual basis)

Waste Industries provides
  – Leachate storage
  – Utilities (power and landfill gas)
  – Residual management

Total cost of operations including power and residual management is $0.055 to $0.065 per gallon