Clean Water for Haiti

May 14, 2009
Overview

• Background
• Desalination Technologies
  – Misc. Technologies
  – Humidification-Dehumidification (HDH)
  – Reverse Osmosis (RO)
• Improved Rainwater Collection
• Recommendations
Background

• Working with Mercy and Sharing to provide clean water to Phaeton and Paulette, Haiti
• Combined Pop: 4200 (~930 families)
• Daily Water Consumption: 4650 5 gal buckets (~90 m³)
• Average Family Income ~$2/day
# Desalination Technologies

<table>
<thead>
<tr>
<th>Technology</th>
<th>Driving Force</th>
<th>Notes</th>
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<tbody>
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Project Approach

• Modular design
  – Desalination system to produce ~30m³
• Improve situation
  – Improvement of rainwater collection
Humidification-Dehumidification

Seawater Stream

7

3

Heater

4

6

Humidifier

Dehumidifier

Brine

Air Stream

Product
Humidification-Dehumidification

- GOR = 3.4
- Heat Input = 163 kW
- Components
  - Diesel Combustor
  - Shell and Tube HX
  - Locally built Humidifier

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Please see http://www.tinox-watermanagement.de/typo3temp/GB/fe2d2bcea1.jpg
Humidification-Dehumidification

Without locally available fuel, HDH is prohibitively expensive.

<table>
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<th>Item</th>
<th>Type</th>
<th>Cost</th>
<th>Cost/bucket</th>
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<tr>
<td>Components</td>
<td>Fixed</td>
<td>&lt;$7500</td>
<td>$0.003</td>
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<tr>
<td></td>
<td></td>
<td>($4.94/day)</td>
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<tr>
<td>Fuel</td>
<td>Daily</td>
<td>$321/day</td>
<td>$0.20</td>
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<tr>
<td>Labor</td>
<td>Daily</td>
<td>$1/day</td>
<td>$0.0006</td>
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Reverse Osmosis

- GOR equivalent ~ 200
- Driven by high pressure and mechanical work
- Built by many companies as skid-mounted plants
Reverse Osmosis

• Seawater intake to avoid drying of wells
• 4.5 HP (3.35 kW) diesel pump: 60 bar inlet
• Total water cost: 1.7 ¢ per 5 gal bucket
  – diluted 2 to 1 with well water
• Risks
  – Complex technology easily susceptible to sabotage
  – High capital cost (~$15k) require consistent revenue to pay off
Rainwater Collection

- North Central Haiti: 1.6 m/year rainfall
  - Takes advantage of natural distillation process
- Repair existing cistern to hold ~100 m³ of rainwater
- Total Cost: $1740 + local materials
Rainwater Collection

- Expand cistern collection area to 290 m²
- Filter and Chlorinate water
- 0.3 L of drinking water per person per day

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Please see
http://ep.yimg.com/ca/I/yhst-75407647262528_2081_14963194
http://www.a1poolparts.com/stores/a/A1PoolParts/catalog/s244t_chart2.JPG
Recommendations

• HDH too expensive with current heat sources
• RO meets large need cost effectively
• Rainwater Collection is effective supplement for drinking use only
Thank you.

Questions?