Gills Onions
Advanced Energy Recovery System

Turning a Waste Liability into a Renewable Resource

Waste to Energy Using Fuel Cells Workshop
Washington, DC
January 13, 2011

Dave Reardon, P.E.
National Director - Water Sustainability
HDR Engineering, Inc., Folsom, CA
# Gills Onions Advanced Energy Recovery System: Turning a Waste Liability into a Renewable Resource

**ABSTRACT**


**16. SECURITY CLASSIFICATION OF:**

<table>
<thead>
<tr>
<th>a. REPORT</th>
<th>b. ABSTRACT</th>
<th>c. THIS PAGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>unclassified</td>
<td>unclassified</td>
<td>unclassified</td>
</tr>
</tbody>
</table>

**17. LIMITATION OF ABSTRACT**

Same as Report (SAR)

**18. NUMBER OF PAGES**

16

**19a. NAME OF RESPONSIBLE PERSON**

Standard Form 298 (Rev. 8-98)

Prescribed by ANSI Std Z39-18
Gills Onions Background

- 3rd largest onion producer in the nation
- 100,000 square-foot processing facility in Oxnard, CA
- 800,000 lbs of onions processed every day
- Prepackaged diced, sliced, whole, pureed, and ring product line
- Process is operational 6 days a week
The Problem…

- 250,000 lbs/day waste onion hauled off site
  - Hauled by tractor and wagon to local fields to incorporate into soil
  - Disrupted traffic
  - Trail of onion juice on roadway
  - Sulfur in onions led to acidic soils
- $400,000/year for off-site hauling
- Couldn't haul during heavy rain
  - Decomposing onions stored on-site
- Odors!!!

One-third incoming onions discarded as tail, top, and peel!
The Solution…
Advanced Energy Recovery System (AERS)

1. Grind Waste Onion to Extract Juice
   *Haul Remaining Onion Solids for Cattle Feed*

2. Treat Juice Using an Upflow Anaerobic Sludge Blanket (UASB) Reactor

3. Recover Biogas from UASB
   *Remove Sulfur and Moisture for Cattle Feed*

4. Convert Methane to Power
   *Fuel Cells*

5. Supplement Process Facility Power Demand
Simplified Process Schematic

1. Juice Extraction
2. Juice Preparation
3. BioReactor
4. Biogas Preparation
5. Fuel Cells
Fuel Cells

- 32 scfm of biogas per cell
- 15 psi
- Requires highly purified water (RO)
Methane and steam converted into hydrogen-rich gas

47% electrical efficiency 480 V, 3 PH
Fuel Cells

- Two 300 kW output fuel cells
- Dual fuel NG and BG
- Up to 930 Btu/cf gas can be utilized
- Non-combustion, electrochemical technology
Environmental and Process Benefits

- Increased energy independence
- Eliminated a waste stream
- Decreased Gill’s carbon footprint
- Reduced waste by 99%
## Overall Project Costs

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>AERS Total Cost Installed</td>
<td>$9.5 M</td>
</tr>
<tr>
<td>Sempra Energy Self Generation Incentive</td>
<td>($2.7 M)</td>
</tr>
<tr>
<td>Federal Fuel Cell Incentive (Tax Credit)</td>
<td>($2.0 M)</td>
</tr>
<tr>
<td>AERS Net Cost</td>
<td>$4.8 M</td>
</tr>
</tbody>
</table>
## Operational Savings & Return on Investment (ROI)

### 6-year ROI

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Savings from Energy and Hauling Cost</td>
<td>$1,100,000</td>
</tr>
<tr>
<td>Annual AERS O&amp;M Costs</td>
<td>($300,000)</td>
</tr>
<tr>
<td>Annual Savings</td>
<td>$800,000</td>
</tr>
</tbody>
</table>
The Bottom Line @ Gills Onions

- $9.5 million facility will pay for itself in less than six years
- $1.1 million in energy and hauling savings annually
- Cattle feed sales cover much of the cost of hauling feed to the Central Valley
- Fuel cells were $3,400 per kW installed
- Use minimum 75% biogas on annual basis
Industry Recognition - Grand Conceptor Award

*The highest honor from the American Council of Engineering Companies (ACEC)*

Why Did Gills Onions Win?

*It's Sustainable!*
What Does All This Mean for a Military Installation?

Think Holistically!
Your Take Away Points

Think of your waste streams as a potential renewable resource

Sustainable projects can be done economically, and have social and environmental benefits

Think holistically - How can your waste stream be integrated for the most efficient processing
Need More Details on Gills Onions or Resource Recovery at Your Installation?

Dave Reardon, PE
HDR Engineering, Inc.
(916) 817-4820
Dave.Reardon@hdrinc.com