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

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Report Documentation Page

Form Approved
OMB No. 0704-0188

1. REPORT DATE	2. REPORT TYPE	3. DATES COVERED
13 JAN 2011		**00-00-2011 to 00-00-2011**

4. TITLE AND SUBTITLE	5a. CONTRACT NUMBER
Gills Onions Advanced Energy Recovery System Turning a Waste Liability into a Renewable Resource	5b. GRANT NUMBER
	5c. PROGRAM ELEMENT NUMBER
6. AUTHOR(S)	5d. PROJECT NUMBER
	5e. TASK NUMBER
	5f. WORK UNIT NUMBER
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) **HDR Engineering, Inc,2365 Iron Point Rd Ste 300,Folsom,CA,95630-8709**	8. PERFORMING ORGANIZATION REPORT NUMBER
9. SPONSORING/MONITORING AGENCY NAME(S) AND ADDRESS(ES)	10. SPONSOR/MONITOR'S ACRONYM(S)
	11. SPONSOR/MONITOR'S REPORT NUMBER(S)

12. DISTRIBUTION/AVAILABILITY STATEMENT
Approved for public release; distribution unlimited

13. SUPPLEMENTARY NOTES
presented at the DOE-DOD Waste-to-Energy using Fuel Cells Workshop held Jan. 13, 2011 in Washington DC. U.S. Government or Federal Rights License

14. ABSTRACT

15. SUBJECT TERMS

16. SECURITY CLASSIFICATION OF:			17. LIMITATION OF ABSTRACT	18. NUMBER OF PAGES	19a. NAME OF RESPONSIBLE PERSON
a. REPORT	b. ABSTRACT	c. THIS PAGE			
unclassified	**unclassified**	**unclassified**	**Same as Report (SAR)**	**16**	

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!

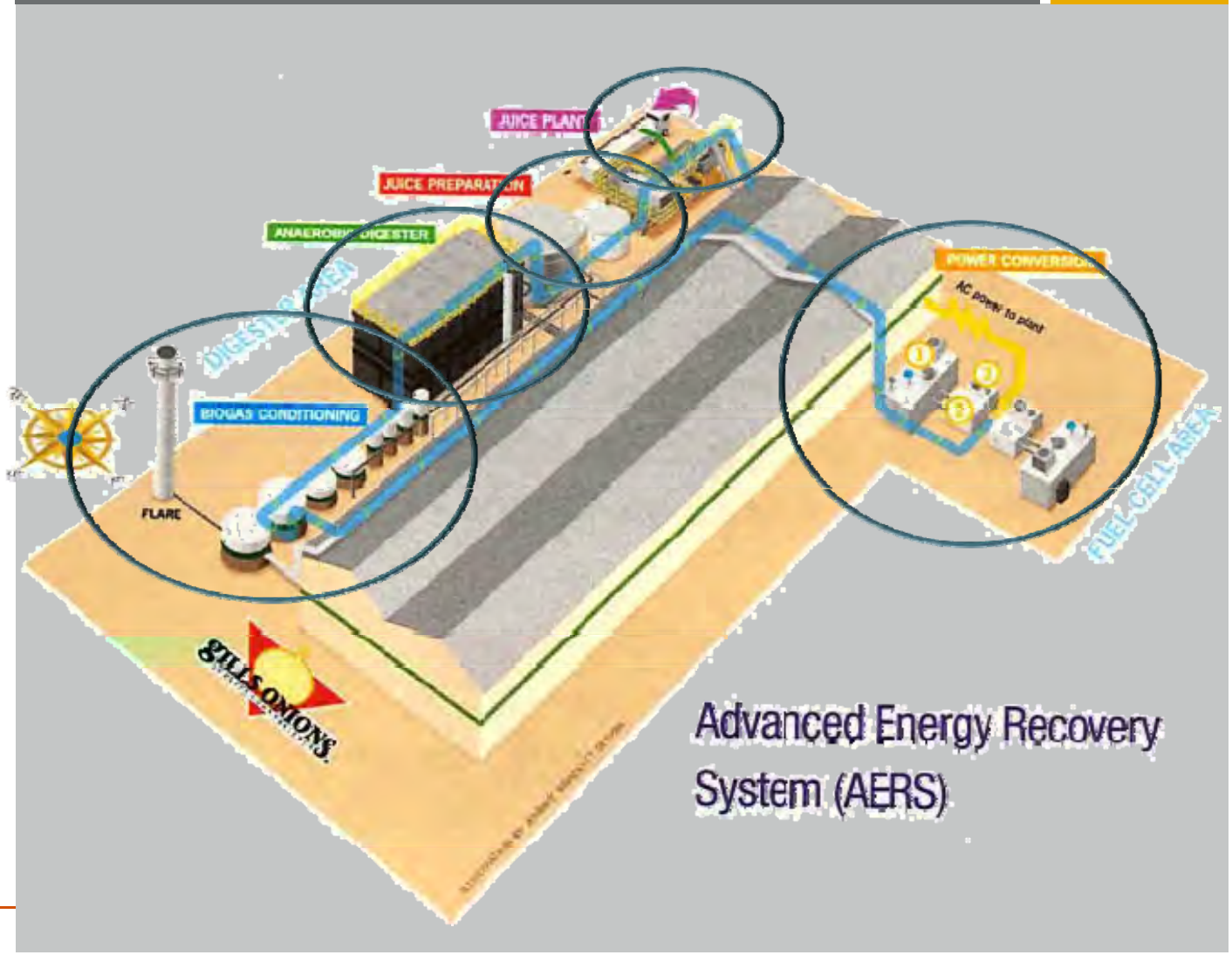
The Solution…

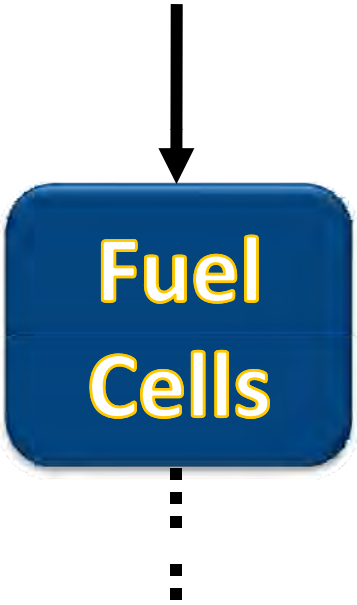
Advanced Energy Recovery System (AERS)

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

- Juice Extraction
- Juice Preparation
- BioReactor
- Biogas Preparation
- Fuel Cells

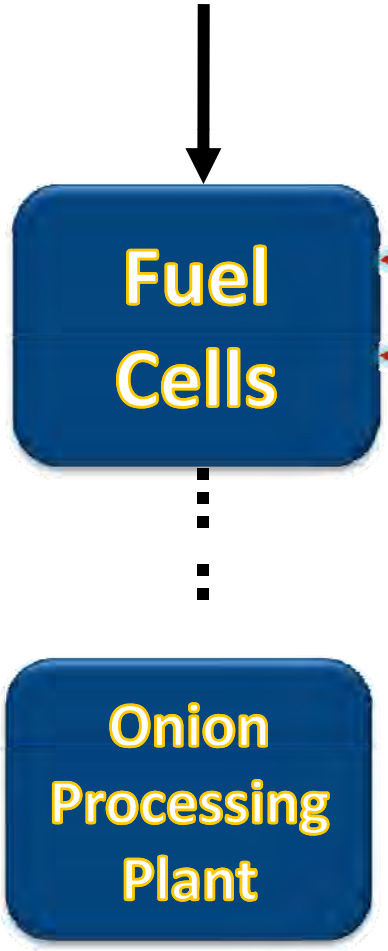


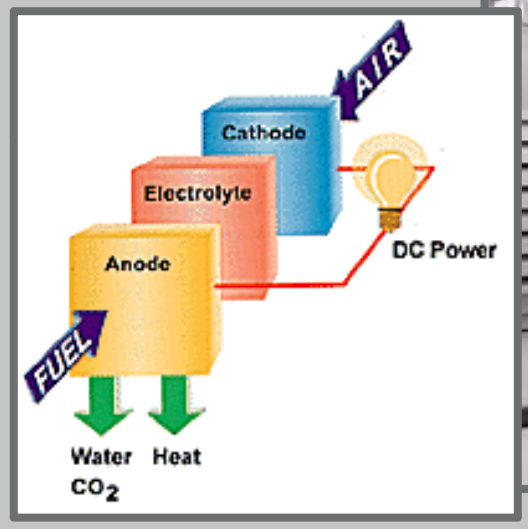


Fuel Cells

- 32 scfm of biogas per cell
- 15 psi
- Requires highly purified water (RO)

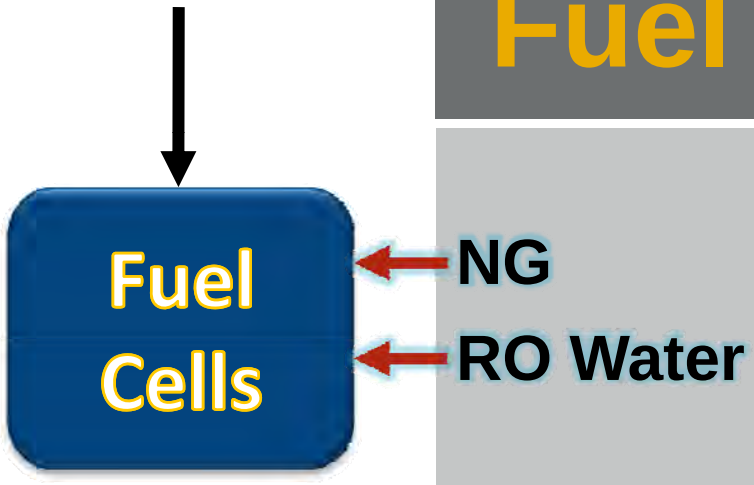
Energy





- 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

AERS Total Cost Installed	**$9.5 M**
Sempra Energy Self Generation Incentive	**($2.7 M)**
Federal Fuel Cell Incentive (Tax Credit)	**($2.0 M)**
AERS Net Cost	**$4.8 M**

Operational Savings & Return on Investment (ROI)

6-year ROI

Annual Savings from Energy and Hauling Cost	**$1,100,000**
Annual AERS O&M Costs	**($300,000)**
Annual Savings	**$800,000**

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**

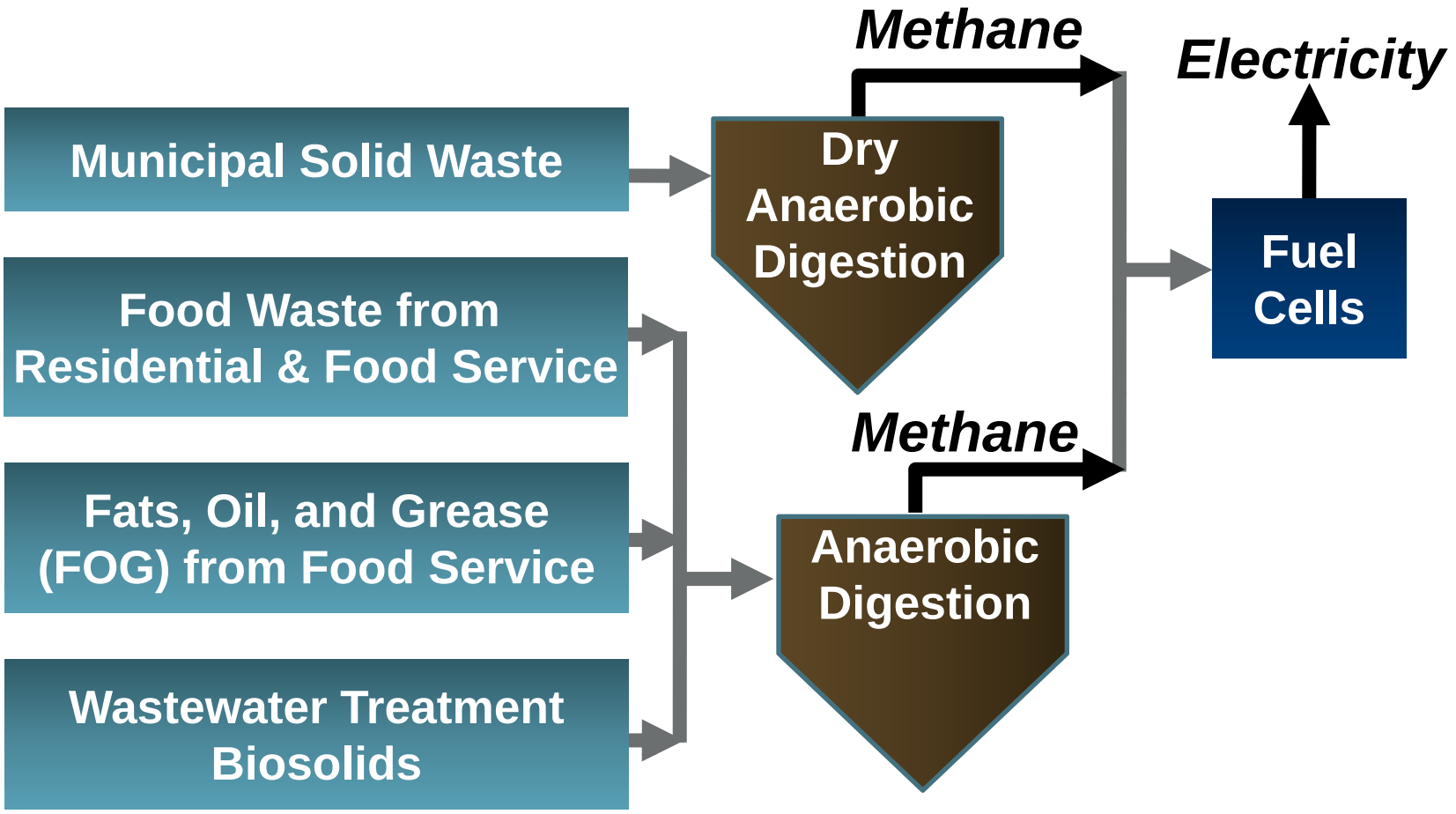
Industry Recognition - Grand Conceptor Award

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?

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