Objectives:

- Quantify the amount of onion waste generated at Gills Onions’ processing facility in 2008.
- Identify the environmental and economic impacts of converting onion waste to energy and cattle feed.

Methodology:

- Used Gills Onions’ 2008 production records to calculate theoretical onion waste generated.
- Conducted on-site waste audit to identify actual onion waste diversion practices.
- Characterized environmental impacts associated with land application of onion waste and compared them to using solid onion waste for cattle feed and using onion juice in biodigester and fuel cells for energy.

Baseline:

2008 Onions Baseline
217.8 Million lbs Processed

Onion Waste 54%
Finished Goods 46%

Findings:

- 54% of all onions theoretically become waste.
- Converting onion waste to energy and cattle feed could potentially reduce total solid waste by 99%.
- Onion waste was contaminating recyclables.
- Onion waste was found in dumpster going to landfill.
- Onion waste was increasing disposal costs due to additional labor, transportation and tipping fees.

Recommendations:

- Separate onion waste from film plastics to prevent contamination of recyclables, reduce disposal costs, and capture 100% of onion waste.
- Provide ongoing education for employees and supervisors to increase waste diversion.

2010 Projection:

- 30% of all onion waste will be sold as cattle feed.
- 70% of all onion waste will be used to produce energy.
- 0% of onion waste will contaminate recyclables.
- 0% of onion waste will be found in dumpster going to landfill.
- Gills Onions will reduce onion waste to zero.

Potential Benefits

- Convert 100% of Onion to Cattle Feed and Energy

Waste Reduction

- 118.2 Million Pounds of Onion Waste Annually

Potential Savings

<table>
<thead>
<tr>
<th>Resource Category</th>
<th>Annual Savings</th>
<th>Payback Period (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Onions</td>
<td>$507,000</td>
<td>0</td>
</tr>
</tbody>
</table>
Energy

Objectives:

- Identify the amount of energy consumed at Gills Onions’ processing facility for 2008.
- Quantify the greenhouse gas emissions associated with Gills Onions’ energy consumption.
- Identify the environmental and economic impacts of converting onion waste to cattle feed and to energy using a biodigester and fuel cell (Advanced Energy Recovery System—AERS).

Methodology:

- Used the Climate Registry Protocol to create an inventory of all of Gills Onions’ energy sources.
- Calculated greenhouse gas emissions associated with all energy sources and related equipment.
- Expanded system boundary to include transportation associated with delivering raw onions to the facility, disposing of onion waste, and Gills Onions controlled deliveries to customers.

2008 Baseline:

<table>
<thead>
<tr>
<th>Energy Consumption</th>
<th>155,280 GJ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>33%</td>
</tr>
<tr>
<td>Mobile Sources</td>
<td>41%</td>
</tr>
<tr>
<td>Stationary Sources</td>
<td>26%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Greenhouse Gas Emissions</th>
<th>11,152 mtCO₂e</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electricity</td>
<td>42%</td>
</tr>
<tr>
<td>Mobile Sources</td>
<td>39%</td>
</tr>
<tr>
<td>Stationary Sources</td>
<td>19%</td>
</tr>
</tbody>
</table>

Findings

- Electricity represented 33% of all energy consumed in 2008.
  - 50-75% of electricity used by refrigeration system.
- 41% of all energy consumption attributable to mobile sources.
  - 99% of mobile sources used diesel.
  - Virtually all diesel consumption was associated with Gills Transportation.
- Stationary sources (non-electric) consumed 26% of all energy used.
  - 98% of stationary sources used natural gas.
  - The air compressor used 99% of the natural gas.
- The emissions intensity (CO₂e/gigajoule) of purchased electricity was much higher than other energy sources.
- Implementing the biodigester and fuel cells (AERS) will reduce purchased electricity demand by 5.26 million kWh and eliminate 1,855 mtCO₂e.
Recommendations:

- Reduce greenhouse gas emissions associated with transportation.
- Reuse waste heat from air compressor and fuel cells onsite.
- Conduct a comprehensive energy audit to identify where energy efficiency improvements can be made.
- Implement key performance indicators (KPI) based on production to quantify, track and reduce energy consumption.
- Ensure Yard Dog truck engines are not running continuously.
- Consider installing time-of-use battery system to store self-generated electricity for use during peak periods.

2010 Projection:

- Gills Onions will generate 600 kW of electricity from onion waste using biodigester and fuel cell (AERS), satisfying 100% of base-load electricity requirements.
- Gills Onions will reduce 47% of purchased onsite electricity demand.
- Greenhouse gas emissions will be reduced by 1,855 metric tons of CO₂e.
- Implementation of biodigester and fuel cells (AERS) will result in an annual net savings of more than $500,000.

Potential Benefits

1. Convert Onion Waste to Energy
2. Reduce Greenhouse Gas Emissions

Greenhouse Gas Reduction

1,855 Metric Tons of CO₂e

Potential Savings

<table>
<thead>
<tr>
<th>Resource Category</th>
<th>Annual Savings</th>
<th>Payback Period (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Energy</td>
<td>$537,000</td>
<td>6 - 7</td>
</tr>
</tbody>
</table>
Zero Waste Strategies and Innovation for Sustainability

Water

Objectives:
- Identify the amount of water consumed at Gills Onions’ processing facility and the associated costs for 2008.
- Quantify the amount of wastewater generated in 2008 and the associated costs.
- Find opportunities to reduce water consumption onsite and provide recommendations that are economically beneficial.

Methodology:
- Used Gills Onions’ utility bills and data provided by the city of Oxnard.
- Calculated usage for cooling tower, biodigester and cleaning based on company records.

2008 Baseline:

Water Consumption: 81 Million Gallons
Consumption Cost: $266,000

- Processing 66%
- Cleaning 19%
- Cooling Tower 13%
- Irrigation 1%
- Restrooms 1%

Wastewater Discharge: 79 Million Gallons
Wastewater Cost: $250,000

2010 Projections:
- Water consumption will increase by at least 15 million gallons or 19% due to implementation of the biodigester.
- Water costs will increase.

Findings:
- The refrigeration system (cooling tower) represented 13% of all water consumption in 2008.
- The implementation of the biodigester in 2010 will increase water consumption by 15 million gallons annually.
- End-of-night cleaning represented 19% of all water consumption in 2008.
- We were unable to estimate water usage by process due to a lack of individual flow meters in the facility.
- Water rates in the city of Oxnard have been and are continuing to increase.
- Wastewater treatment plant on-site could provide source of water.

Recommendations:
- Reuse water from wastewater treatment plant as source of water for biodigester, cooling tower and irrigation.
- Install flow meters on all water consuming processes to measure water efficiency.
- Implement key performance indicators (KPI) based on production to quantify, track and reduce water consumption.

Potential Benefits

Reduce Water Consumption by 30% Annually

Waste Reduction

25 Million Gallons of Fresh Water

Potential Savings

<table>
<thead>
<tr>
<th>Resource Category</th>
<th>Annual Savings</th>
<th>Payback Period (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>$215,000</td>
<td>3 - 4</td>
</tr>
</tbody>
</table>
Materials

Objectives:

- Establish the amount of material waste generated in 2008 and the amount diverted through recycling.
- Calculate the costs associated with material waste generation.
- Identify opportunities to reduce, reuse, recycle, or substitute materials.
- Provide cost-effective recommendations that reduce material waste generation and increase diversion.

Methodology:

- Conducted waste characterizations of materials going to landfill and diverted through recycling.
- Performed visual assessments to identify where specific materials originated.
- Conducted desktop audits of purchasing records to quantify volume and cost of material waste.

Baseline:

2008 Materials Baseline
566 Tons

<table>
<thead>
<tr>
<th>Material Category</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food Waste</td>
<td>5%</td>
</tr>
<tr>
<td>Cardboard &amp; Chipboard</td>
<td>5%</td>
</tr>
<tr>
<td>Film Plastic</td>
<td>10%</td>
</tr>
<tr>
<td>C&amp;D Landscape</td>
<td>10%</td>
</tr>
<tr>
<td>Mixed Waste</td>
<td>30%</td>
</tr>
<tr>
<td>Onion Waste</td>
<td>12%</td>
</tr>
<tr>
<td>Recyclables</td>
<td>25%</td>
</tr>
<tr>
<td>Label Liners &amp; Ink Rolls</td>
<td>3%</td>
</tr>
<tr>
<td>25% Recycled</td>
<td></td>
</tr>
<tr>
<td>75% Landfill</td>
<td></td>
</tr>
</tbody>
</table>

Findings:

- Classified eight categories of material waste (see pie chart).
- 25% of material waste was being recycled; 75% was going to landfill.
- Light-weight materials were pervasive in the waste stream and represented a high cost for the company (for example; gloves, label backing, tissues, and paper towels).
- Significant contamination issues were impeding recycling opportunities, despite existing diversion programs.
- By addressing onion contamination, diversion rate could increase from 25% to 53%.

Potential Benefits

- Reduce Waste Generation Onsite and at Customer Location

Waste Reduction

- 200 Tons of Material Waste Annually

Potential Savings

<table>
<thead>
<tr>
<th>Resource Category</th>
<th>Annual Savings</th>
<th>Payback Period (Years)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Material Waste</td>
<td>$211,000</td>
<td>1 - 2</td>
</tr>
</tbody>
</table>
Recommendations:

- Install disposable glove dispenser system to reduce unnecessary waste.
- Replace single-use blue bags used internally for transporting onions with reusable containers.
- Install energy efficiency electric hand driers in restrooms to eliminate paper towels.
- Install a drinking fountain to eliminate single-use cone cups and encourage employees to use reusable canteens.
- Purchase tissues in bulk to reduce cardboard waste associated with single-use boxes. Implement tissue dispenser system to prevent wasteful practices.
- Reduce paper towel use in the lunchroom by implementing a central dispensing system and remove paper towels rolls from lunch room tables.
- Reduce frequency of lunchroom garbage removal to reduce the amount of plastic can liners used.

- Modify printing practices to reduce paper waste by instituting double-sided printing, using smaller fonts and including more text per page.
- Utilize on-site baler to increase recyclability of rigid plastics and chipboard.
- Require removal and proper disposal of landscape waste.
- Eliminate illegal (non-Gills Onions) waste by enclosing and securing dumpster area.
- Monitor opportunity to implement liner-less label system to reduce label liner waste.
- Monitor opportunity to compost food waste off-site.
- Institute reusable containers and a reverse logistics system for large industrial customers to replace single-use corrugated cardboard.
- Purchase environmentally preferred supplies based on reputable eco-labeling designation (i.e. Green Seal, EcoLogo).
- Include recycling number designation on all clear plastic commercial product bags.
- Establish a comprehensive, ongoing employee training and communication program to inform and reinforce commitment to the company’s sustainability goals.

2010 Projection:

- Gills Onions will reduce material generation from 566 tons to 498 tons.
- Gills Onions will increase diversion from 25% to 53%.