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Zero Waste Strategies and Innovation for Sustainability

Background

“Zero waste” is a strategy to minimize the amount of materials and resources consumed, in order to conserve water and energy and to ultimately mitigate climate change. Businesses such as Toyota and Walmart, as well as cities including San Francisco and Seattle, are adopting zero waste initiatives for a number of different reasons. Zero waste offers an opportunity for reducing the cost and amount of waste sent to landfill, and provides a framework for reducing greenhouse gas emissions. In addition, businesses perceive zero waste as a tool for demonstrating environmental stewardship and for anticipating regulations that may make them responsible for the waste that they generate.



ZEROWASTE

Case Study: Gills Onions

In 2009, our client, Gills Onions, set a zero waste goal for its processing and office facilities in Oxnard, California. As the largest onion processor in the nation, the company peels, slices and dices up to one million pounds of onions daily. Gills Onions took a major first step towards achieving zero waste by implementing a strategy to convert its onion waste to energy using a biodigester and fuel cell technology. However, while onion waste was the most conspicuous aspect of the operation, the company sought out our expertise at the Bren School to take a systematic approach to analyzing all of its waste streams.

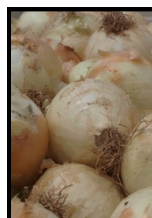
Our Role and Objectives

We created a comprehensive inventory of all of Gills Onions’ waste streams and provided the company with a set of recommendations that would move it closer to its zero waste goal. We identified three critical components to

achieving zero waste; establishing a baseline to determine how much waste is generated; analyzing the company’s waste streams; and identifying opportunities to reduce reuse, and recycle. For all of our recommendations we considered the economic, practical, and environmental implications.

Methodology

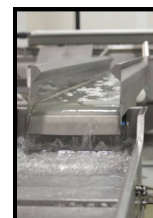
To establish a baseline, it was necessary to define a system boundary to distinguish what would be included within our project analysis. We set the system boundary to coincide with the company’s facility in Oxnard, encompassing those elements over which Gills Onions has complete operational control. We divided the company’s waste streams into the four resource categories that are critical to its operation: Onions, Energy, Water, and Materials. For each category, we established the 2008 baseline using comprehensive audits including waste characterizations and company record analyses. For the energy category, we also calculated, verified and publicly reported Gills Onions’ complete greenhouse gas inventory to the Climate Registry. To identify opportunities for reducing, reusing, and recycling, we used cost-benefit and environmental analyses including resource reduction evaluations, green supply chain management, and previously conducted life cycle assessments. Based on these analyses we provided Gills Onions with an extensive set of recommendations that would not only move the company closer to achieving zero waste but are also feasible and economically beneficial.



Onions



Energy



Water

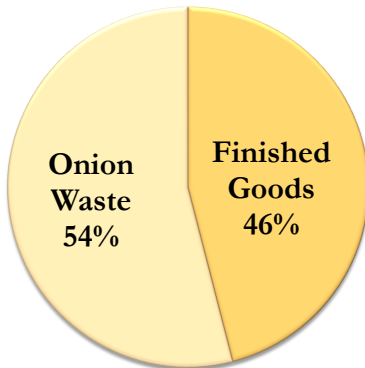


Materials

Onions

Baseline:

2008 Onions Baseline
217.8 Million lbs Processed



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 contaminated recyclables.
- Onion waste found in dumpster going to landfill.
- Onion waste increased disposal costs due to additional labor, transportation and tipping fees.

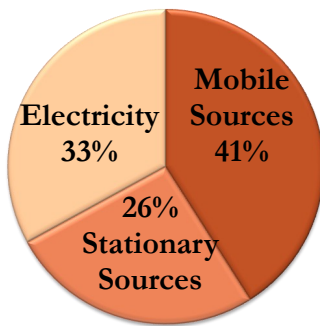
Recommendations:

- 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.

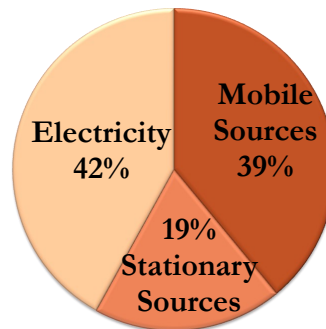
Energy

Baseline:

Energy Consumption
2008 Baseline 155,280 GJ



Greenhouse Gas Emissions
2008 Baseline 11,152 mtCO_{2e}



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.
- 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 (CO_{2e}/gigajoule) of purchased electricity was much higher than other energy sources.
- Implementing the biodigester and fuel cells will reduce purchased electricity demand by 5.26 million kWh.

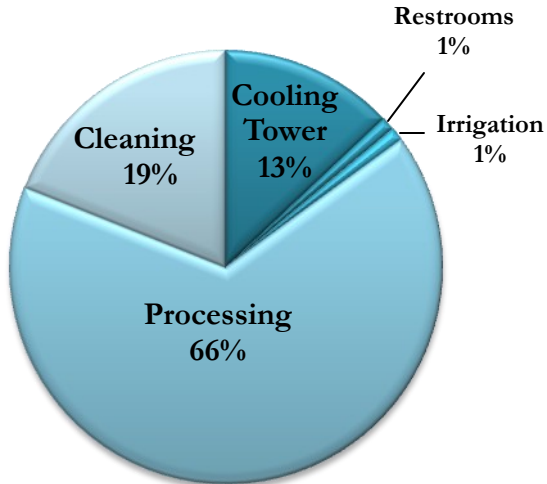
Recommendations:

- Reduce greenhouse gas emissions associated with transportation elements.
- Reuse waste heat from on-site air compressor and fuel cells.
- Conduct a comprehensive energy audit to identify where energy efficiency improvements can be made.
- Implement key performance indicators (KPI) 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.

Water

Baseline:

2008 Water Consumption
81 Million Gallons



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 continue to increase.
- Wastewater treatment plant on-site could provide source of water for re-use.

Recommendations:

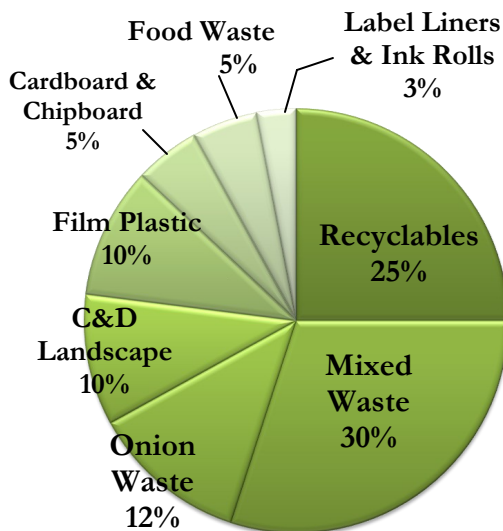
- Reuse water from wastewater treatment plant as source of water for biodigester, cooling tower and irrigation.
- Install flow meters on all water consuming processes to measure water efficiency.
- Implement key performance indicators (KPI) to quantify, track and reduce water consumption.

Materials

Baseline:

2008 Materials Baseline
566 Tons

25% Recycled
75% Landfill



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%.

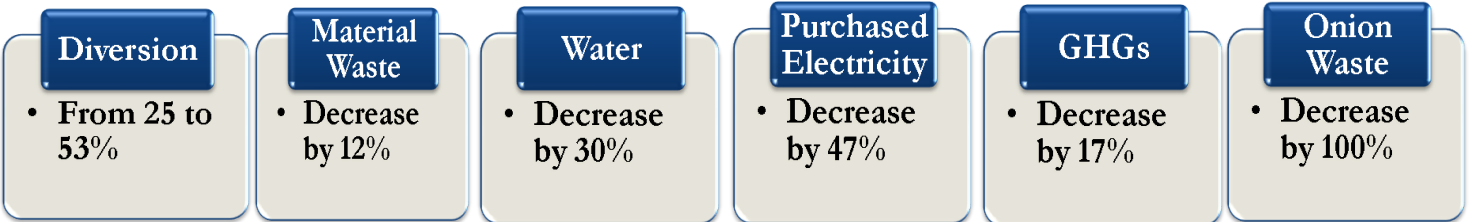
Sample of Recommendations¹:

- Replace internally used single-use bags with reusable containers.
- Install energy efficient electric hand driers to eliminate paper towels.
- Replace single-use cardboard containers for industrial customers with reusable bins and implement a reverse logistics system.
- Establish ongoing employee training to communicate sustainability goals.
- Eliminate illegal dumping of waste by enclosing dumpster area.
- Install disposable glove dispenser system to reduce use by 50%.

¹ Please see Final Report for complete list of all recommendations

Results

Our recommendations will help Gills Onions increase diversion from landfill from 25% to 53%. In addition, the company will be able to reduce material waste by 12%; cut water consumption by 30%; decrease purchased electricity by 47%, lower greenhouse gas emissions by 17% and eliminate 100% of its onion waste by converting it to energy and cattle feed.



We calculated that our recommendations can result in a net savings for Gills Onions exceeding \$900,000 annually. Combined with the company's own initiative to convert onion waste to energy, the total net savings from the zero waste initiative will exceed \$1.4 million annually.

Potential Savings		
Resource Category	Annual Savings	Payback Period (Years)
Onions	\$ 507,000	0
Materials	\$ 211,000	1 - 2
Water	\$ 215,000	3 - 4
Savings from Recommendations	\$ 933,000	
Energy	\$ 537,000	6 - 7
Savings Including Waste-to-Energy Project	\$ 1,470,000	



Our group project results have implications beyond Gills Onions for the larger business community and we have drawn one definitive conclusion about a zero waste initiative:



**Zero Waste is
Good for the Environment
and Great for Business**