Sustainability in Food Processing

Rochester Institute of Technology
Tuesday, June 18, 2013
The food processing cluster is defined as a business that directly impacts the food processing supply chain. It entails growing of crops or raising livestock, manufacturing of agricultural or food processing equipment, processing of food, support of the process (producing labels, boxes, cans, bottles, etc.), and/or the selling of the finished product; often referred to as “Farm-to-Fork.”
Agenda

9:00 – 9:15am  Welcome
Andy Harlan, Center for Integrated Manufacturing Studies
What is sustainability? How does it apply to the food sector?
Dr. Anahita Williamson, New York State Pollution Prevention Institute

9:15 – 10:00am  Panel 1: Solid organic waste reduction or repurposing
Moderator: Andy Harlan, CIMS

10:00 – 10:05am  Break

10:05 – 10:50am  Panel 2: Water Recovery
Moderator: Rajiv Ramchandra, NYSP2I

10:50 – 10:55am  Break

10:55-11:40am  Panel 3: Food Waste to Energy
Moderator: Dr. Tom Trabold, Golisano Institute for Sustainability

11:40 – 12:00pm  How to get started and Available Programs

12:00 – 12:30pm  Golisano Institute for Sustainability (GIS) Building Tour - Optional
Sustainability

Brundtland Commission: Convened by United Nations in 1983

- Commission created to address growing concern ‘about the accelerating deterioration of the human environment & natural resources and the consequences of that deterioration’ for economic & social development
- Recognized that environmental problems were global in nature & determined that it was the common interest of all nations to establish policies for sustainable development
  
  “..development that meets the needs of the present without compromising the ability of future generations to meet their own needs”

Green engineering:

- The design, commercialization, and use of processes and products, which are feasible and economical while minimizing
  
  1) generation of pollution at the source
  2) risk to human health and the environment.
Many terms for addressing social, environmental and economic initiatives:

• “3Ps” – People, Planet, Profit
• Social, Economic, Environmental
• “Corporate Social Responsibility”
• “Corporate Citizenship”
• “Sustainable Growth”

Each company or organization should define how they address “sustainability”. 

Sustainability is actualized
Product Life Cycle and Environmental Impacts: Internal & External

- Resource extraction
- Suppliers
- Food processing
- Consumer
- Future Generations

- Transportation
- Packaging
- Energy
- Water

- Waste water
- Air emissions
- All other wastes
4. Measure and monitor - Environment

Environmental Assessment -

- Solid Wastes
- Water use & Wastewater
- Hazardous Wastes
- Energy Usage
- Air Emissions
- Material Usage
Food Processor (NYC)

About the Company: A food processor located in Brooklyn, NY, is a producer of various specialty fish products such as smoked salmon. They purchase frozen fish and thaw them with city water as the first processing step. Processor uses approximately 30 million gallons of water per year at a cost of $245,000.

Work Performed: The NYSP2I, in collaboration with ITAC, Acme, and Energy Concepts:

• Determined the amount of heat available from an on-site CHP system
• Developed fish thawing models
• Ran fish thawing tests
• Documented incoming city water temperatures: 54°F average for 2009 with a low of 35°F

Results: The Analysis determined that:

Additional waste heat from the CHP can provide enough hot water to thaw fish year round with 63°F water. The estimated water use would become 7.8 million gallons per year at a cost of $57,000.

• Water reduction of 74%.
• Cost savings of $188,000 per year.
Panel 1: Solid organic waste reduction or repurposing

Moderator:
Andy Harlan, CIMS

Panelists:
Mike Coia, Seneca BioEnergy - Finger Lakes Grape Seed Oil
Dave Fister, NYSP2I - Cheese Manufacturer Case Study
Kathleen Draper, Finger Lakes Lakes Biochar
Practicing Sustainable Manufacturing
Waste Beneficial Reuse and Renewable Energy
@ Seneca AgBio Green Energy Park

Seneca BioEnergy, LLC
500 Technology Farm Drive – Suite 12
Geneva, New York 14456

Michael Coia – CEO
William Gray – Business Development Manager
www.senecabioenergy.com

June 2013
Practicing Sustainable Manufacturing
Corporate Philosophies

• **Incorporate “Brownfields Redevelopment”**
  – *Site Selection @ Previous Industrial Facility*
  – *Infrastructure Rehab – Utilize “Green Practices”*

• **Develop “Green Energy Park” Concept**
  – *Apply Closed-Loop Utilities & Infrastructure*
  – *Attract “Like-Minded” Startups – Cost Avoidance*

• **Apply Waste Beneficial Reuse Concepts**
  – *Regional Wastes – Appropriate Product Feedstocks*
  – *Manufacture Useful Local “Green Products”*

• **Match “Savor Local” Culture w/ New Products**
  – *Local Supplies of Biodiesel Biofuels*
  – *First Finger Lakes Grape Seed Oil*
Seneca AgBio Green Energy Park
Layout of Our 55-Acre Site
Integrated Biorefinery
“Seneca AgBio Green Energy Park”

• **Redevelop Site – Regional Green Energy Park**
  – 55-Acres – 400,000sf Buildings – Dedicated Rail Service
  – Multiple Renewable Energy and Agri-Businesses

• **Supports Finger Lakes Regional Agriculture**
  – Grape Seed Oil Processing + Wineries Waste Reuse
  – Regional Dairies – Bedding Materials & Dairy Manure

• **Vertical Integration of Operations**
  – Waste Oils Feedstock Processing
  – Biodiesel Production

• **Attract “Green-Sector Manufacturing”**
  – Complimentary Renewable Energy + Agri-Businesses
Facility Infrastructure Rehab Completed
Manufacturing Space Ready for Equipment
Grape Pomace – Organic Waste Repurposing

• Pomace Processing – “Grape Seed Separation”
  – Mechanical Processes / Screening Techniques
  – Multiple Wineries - Various Feedstocks
  – Heterogeneous Mixtures & Removal of Wastes

• Food Grade Products – “Natural Products”
  – Grape Seeds Separation & Drying
  – Grape Seed Oil Pressing – Cold Press – Extra Virgin Oils
  – Lightly Filtered Grape Seed Oils – Varietals & Blended
  – Grape Extracts – High-Value Meal + Dried Pomace

• Facility Process – “No Wastes”
  – 100% Feedstocks Processed Into Natural Products
  – No Wastes for Disposal
Winery Grape Press Operations
Waste Pomace Generation and Hauling
Commercial Pomace Deliveries
Truck Loads @ 5-10ton Capacities
Commercial Grape Seed Separation Screening @ 25tph Processing
Grape Seed Operations
Screening / Pressing / Oils & Extract
Cheese Trim Recovery

Dave Fister
New York State Pollution Prevention Institute at RIT
Cheese Trim

Identified Opportunities:

• Cheese trim losses ranged from 5-10% of the block weight (30-60 lbs per block)
• Sold below cost as trim rather than retail value
• Consists of side and top trim and broken or misshapen bricks of cheese
• Estimated revenue lost per year is $500,000
Cheese Trim Locations

- 21 rows
- 12 rows
- Trim on all edges
Potential Improvements

1. Reduction in the total trim losses (process optimization)
2. Conversion to other products such as shredded or crumbled cheese
3. Extrusion to convert the trim back to original cheese brick product (8 or 16 oz.)
Analysis

It was determined, based on cheese weight measurements, that the trim could not be reduced without producing higher weight variation in the final cut pieces.

Floor space limitations and equipment costs did not make it economically feasible to use the trim for other cheese products such as shredded cheese.
Best Solution

Off-the-shelf equipment available specifically for trim reprocessing (extrusion). Therefore, only a single piece of equipment needed; followed by normal packaging.

Equipment shown is approximately $200,000
Economics

• Retail losses were ~$500,000
• Equipment cost to reprocess trim ~$200,000
• Simple payback is less than 5 months
Current Status

The company is in the process of testing the extrusion equipment with the various cheese types to develop the process parameters.
Upcycling Organic Waste into Biochar

Biochar: a carbon negative charcoal-like substance with many possible uses:
• Soil Conditioner
• Soil Remediation
• Odor Control
• Compost Accelerator
• Water Filtration

Characteristics of ideal types of waste:
• Uniformity of waste (source separation)
• Moisture content <30%
Current State

• R&D Mode including identification of:
  • Appropriate waste streams
  • Processing requirements, procedures, costs
  • Characteristics of char created from different waste streams

• Exploring closed loop biochar production models with:
  • Food producers: Vineyards, Dairy, Orchards
  • Food processors: Cherry Juice Maker, Coffee Roaster
How can FLB improve Sustainability in Food Processing?

Food Processor

COST SAVINGS
• Reduced Tipping Fees
• Reduced Heating/Electricity Costs

GHG REDUCTIONS
• Reduced Fossil Fuel Usage
• Reduced Transportation of Waste
• Reduced CH4 from Waste @ Landfill
• CO2 sequestration from Biochar

Syngas

• Biochar

CHAB

• Heat/Electricity
• Bio-Oil

WRE & Walker Renewable Energy

Finger Lakes Biochar

Plant Waste Wisely®
Barriers

- Small scale, decentralized pyrolysis technology which optimizes biochar is still evolving
- Limited market awareness of biochar
Path Forward

Research
- Quantify benefits to food processors
- Assess air quality regulations
- Characterize char from different feedstocks
- Identify best end use for various chars

Demonstration/Pilot Projects
Panel 2: Water Recovery

Moderator:
Rajiv Ramchandra, NYSP2I

Panelists:
Dennis Burdette, LiDestri Foods
Dr. Eugene Park, NYSP2I – Perry’s Ice Cream Case Study
Ron Rausch, Deputy Commissioner, NYS Dept. of Agriculture & Markets
Conserving Water in Food Production

Dennis Burdette
June 18, 2013
What does LiDestri Foods Make?

- Spaghetti Sauces
- Salsas
- Spirits/Other beverages
- Other Sauces (such as Chinese sauces)

These are made under LiDestri Foods brands or for other companies at six sites.
Water Usage
>5% per year improvement!!!!

Production Lbs/Gallon

<table>
<thead>
<tr>
<th>Year</th>
<th>2008</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
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</thead>
<tbody>
<tr>
<td>Lbs/Gallon</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Graph showing water usage from 2008 to 2013, indicating a >5% per year improvement.
In determining how to reduce significant water, a review of our water pareto provides significant insight into our next necessary steps.

<table>
<thead>
<tr>
<th>Water Usage</th>
<th>% of Water</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sanitary</td>
<td>1.3%</td>
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<tr>
<td>Evaporative Loss</td>
<td>6.0%</td>
</tr>
<tr>
<td>Water in Product</td>
<td>5.0%</td>
</tr>
<tr>
<td>Water in Waste</td>
<td>0.9%</td>
</tr>
<tr>
<td>Landscape Irrigation</td>
<td>0.0%</td>
</tr>
<tr>
<td>Retort</td>
<td>26.8%</td>
</tr>
<tr>
<td>Hydrocoolers</td>
<td>32.3%</td>
</tr>
<tr>
<td>Sanitation</td>
<td>2.2%</td>
</tr>
<tr>
<td>Condensate Lost</td>
<td>5.0%</td>
</tr>
<tr>
<td>Total</td>
<td>81.4%</td>
</tr>
<tr>
<td>Missing</td>
<td>18.6%</td>
</tr>
</tbody>
</table>
Water Usage Goals/Performance

Ultimate Goal  50% reduction by 2014

Annual Goal  2% reduction annually
Simple Statement of Strategy

Two aspects to strategy:

Short – Term Strategy: Procedural adherence

Smaller percent Associate involvement

Long – Term Strategy: Redesign of process

Larger percent Capital improvements

These two paths will be presented separately.
Procedural Adherence/Associate Awareness

In the short term, we wanted to get started with our water-reduction efforts. The quickest way was through enhanced associate awareness, and improvement in procedures and adherence to them. Some of the efforts put into place were:

- Spraying Policy
- Monthly Water and Steam Audits
- Water sub-metering
- Daily Measures/Utility Huddles
- Improved Water-Efficient Sanitation
- Associate Awareness/Inter-Plant Sustainability Contest
- Posters/Weekly newsletters
- Associate Leak Detection Emphasis
- Improved Site Communications
- Championship Support System
- Training, including twice annual sustainability review
Longer-Term Strategy

Water reuse, water reuse, water reuse!

The two major users of water are the hydro-cooler and retort operations.

Water reuse for Lee Road hydro-cooler use is in place.

Our Fresno plant reuses water slightly, but a broad plan for the reuse of water, especially for retorts and hydro-coolers, is on the books...implementation in 2014.
Product Water Footprint

Metric(s) that quantify the potential environmental impacts related to water (ISO/ID 14046). Products, Processes, Organization.
Perry’s Ice Cream
Akron, NY
Water Reclamation Project
2013
Project Background & Goals

• Perry’s seeking to become more sustainable by relying less on natural resources and reducing impacts on the environment

• Water seen as one area where improvements can be made

• Reducing water purchase and discharge of dairy process wastewater became primary focus through in-process recycling of potable water
Project Background & Goals, cont

• Initial pilot studies with reverse osmosis (RO) indicated feasibility
  – But closer analysis of application revealed higher than expected capital and operating costs
  – Also quality of RO water might be “too clean” for equipment cleaning (CIP) applications

• Current system produces relatively clean water

• Decided to evaluate a simpler system using multimedia filtration (MMF), activated carbon (GAC), and chlorine (if necessary)
Waste Water Pre-Treatment

• Maximum Capacity 120,000 GPD
• Discharge Limits BOD & TSS 250 mg/L
• Nominal Discharge Conditions
  – 60,000 GPD
  – BOD & TSS: “Double Digits or Less” mg/L
  – Close to direct discharge concentrations (SPDES)
Current System

Manufacturing

EQ → DAF 1 → LG 2 → DAF 2

LG 3

Drain
Pilot Test Set Up

Manufacturing

EQ → DAF 1 → LG 2 → DAF 2

LG 3 → MMF → GAC → Chlorine → Drain

Pilot Test
Reduction Goals

Water Purchase

Reduce Water Use

Manufacturing

Process Water Treatment

Reuse

Filtration System

Municipal Waste Discharge

Reduce Waste Discharge
GAC & MM Filters
Pilot Considerations

• One Month Test (2X turnover)
• Effluent Quality
• Allergens/Virus/Bacteria
• Sampling & Analysis
• Cost & Technical Design Basis
• Operations
• Regulatory
Moving your project forward

Ron Rausch
Deputy Commissioner
NYS Dept. of Agriculture & Markets
Panel 3: Food Waste to Energy

Moderator:
Dr. Tom Trabold, Golisano Institute for Sustainability

Panelists:
Bill Gray, Seneca Bioenergy
John Noble, Synergy Biogas
Graham Fennie, Epiphergy
Food Waste To Energy – Sustainable Manufacturing Operations

• Develop Products that Create Value from Wastes
• Reduce Ultimate Wastes
• Create A Series of Value-Added Products
  – Waste Oils – Biodiesel
  – Farm Fiber & Short Fiber Paper Pulp – Agri-Products
  – Food Waste Processing – Recyclables & Electricity
  – Food Grade Dehydration – High Value Grain Feedstocks

• Capture the “Value Pyramid”
  – Low-Value Agricultural Products $
  – Medium-Value Feed Products $$
  – High-Value Food-Grade Products $$$
Requirements – Multiple Operations
Common Infrastructure

• All Operations Require “Feedstocks”
• Synergies of Incoming Wastes – Agri & Food
• Operations Utilize Common Materials Handling
  – Receiving Systems – Rail / Truck / Storage / Conveyance
  – Processing Systems – Storage Tanks / Truck Scale
• All Operations Require “Utilities Infrastructure”
  – AgBio Park – Plans for Synergistic Cluster of Processes
  – Expanded Electric Service
  – Expanded Natural Gas Service
  – Future Expansion – Biomass Combustion
  – Future Expansion – Anaerobic Digestion & Electric
Waste Vegetable Oils Biodiesel Production Commercial Operations

• Expand Upon Previous Pilot-Scale Testing 2011
• System Construction & Contracting Feedstocks
• 2013 Activities
  – Receiving Systems – Rail / Truck / Storage
  – Processing Systems – Design/Build Contract
  – B100 Biodiesel Production – 1000 gallons per shift
• Biodiesel Customers
  – Local School Bus Fleets
  – Regional Finger Lakes Railroad
  – Local Bioheat Suppliers
  – Local Agri-Businesses
Commercial Biodiesel Construction
Prepping for Large-Capacity Biodiesel
Agricultural Wastes Processing Operations
Thermal Dehydration

• 2012 Pilot Drying Operations
  – Short Fiber Paper Pulp – Drying 70% Moisture
  – Processing for Bovine Bedding Products – 30% M

• 2013 Toll Operations
  – Paper Pulp Dehydration – Commercial Blending & Sales
  – Farm Fiber Dehydration – Process & Tenant Blending
  – Processing Other Waste Feedstocks – Ingredients

• Planned Food-Grade Dehydration
  – Stainless Steel Rotary Drum Dryer + Roaster Polishing
  – High-Value Grain Dehydration
  – Multiple Tenants for Process & Warehousing Storage
Agricultural Dehydration
Paper Pulp & Farm Fiber Toll Operations
Food and Dairy Wastes ADG
Planned Expansion Commercial Operations

• Recently Awarded NYSERDA Capital Grant
• Mixed Wastes ADG System – Electric + Products
• Planned Activities
  – Receiving Multiple Wastes – Rail / Truck / Storage
  – Processing Systems – Wastes / Recyclables / ADG
  – Products Planned – Electric / Farm Fiber / Digestate
• Linkages
  – RIT Collaboration with Treatability Testing
  – Multiple Food Wastes Contracts + Dairy Wastes
  – Ongoing Design/Build ADG Vendors Negotiations
  – Construction & Operations in 2014
Planned Seneca AgBio ADG System

Feedstock
- Cow Manure (off site)
- Swine Manure (off site)
- Food Sources (off site)
- Agri-Waste (off site)
- Grape Pomace (on site)
- Biodiesel Glycerin (on site)

Future Feedstock
- Algae (on site)
- Biochar (on site)
- Whey (on/off site)

Macerator

Blending Food Waste Tank

Manure Holding Tank

Pasteurization Tank

Biodigester
- CH4 Gas
- Biodigester 2 Million Gallons

Separator

Solids
- Animal Bedding
- Compost Solids

Reduced Odor Liquids
- Algae Growth Tank
- Water to Treatment Plant
- No further treatment

Whey Liquids
- Unused Whey Solids

Algae Biomass
- Lipid Extraction Pressed Algae
- Algae Residual

Gas Cleaning

Clean Down

Gas Storage
- Co-generation of Electricity - Jenbacher Engines
- Finger Lakes BioEnergy 250-500 KW Fuel Cell

Gas Purification

Return to Farm
- Store in Holding Pond

Product

Biochar Manufacturing
- Pyrolysis
- Biodiesel for Electricity
- Biochar Products

Biodiesel Manufacturing Process
- Glycerin Waste
- Biodiesel Fuel

Excess Gas Storage for potential sale to State Facilities
Synergy: is the creation of a whole which is greater than the sum of its parts.
By bringing together the strengths and complementary nature of large-scale dairy and field crop businesses, Synergy captures efficiencies in management, human resources, and the utilization of capital assets.

Currently, Synergy is comprised of a 1,900 cow dairy farm located on 750 acres in Covington, NY.
WE’RE IN THE DAIRY BUSINESS

As farmers we care:
  about our local neighbors and economy
  about our cows
  about our quality
  about our employees
  about our consumers
  about our environment
On Farm Digester

Synergy Anaerobic Digester processes 100,000 gallons per day of manure, food grade and organic waste.

8 tractor-trailer loads/day
On Farm Anaerobic co-digestion:
Multiple economic and environmental benefits

Manure management and disposal
  reduces odors
  decrease greenhouse gas emissions – 7000 tons CO2/year
  improves nutrient management and water/air quality
  generates livestock bedding

Food waste disposal
  additional farm revenue source
  another “synergy”: Utilization of food wastes that could otherwise go to landfill or POTW

Energy production
  Jenbacher J420 engine: generates 1.4 megawatts
  estimated to power 1000 homes
  Displace fossil natural gas to produce renewable electricity

Job creation
Technology Implementation
Technology Benefits

Synergy Anaerobic Digester is now running at or near a 95% capacity factor

• Annual “green” electricity production of 11,650 MWh
• Based on analysis conducted by RIT, assuming non-baseload power in the upstate New York region, this enables reduction of nearly 7000 metric tons of greenhouse gas emissions
• This benefit is realized even when transporting food waste from as far as 264 miles (Wind Gap, PA)
## Food Waste Inputs to Synergy Anaerobic Digester

### Assumptions
- 1-way driving route
- no combined trips
- vehicle types and fuel efficiency

<table>
<thead>
<tr>
<th>Waste Source Location</th>
<th>Feedstock Category</th>
<th>One-way Distance (mi)</th>
<th># of Trips</th>
<th>Total Distance Traveled</th>
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<tbody>
<tr>
<td>Burlington, ON</td>
<td>Pig Slaughterhouse Waste</td>
<td>121</td>
<td>115</td>
<td>27,726</td>
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<tr>
<td>Mount Morris, NY</td>
<td>Agricultural Wastes</td>
<td>22</td>
<td>76</td>
<td>3,306</td>
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<tr>
<td>Avon, NY</td>
<td>Whey DAF Effluent</td>
<td>21</td>
<td>184</td>
<td>7,775</td>
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<tr>
<td>Rochester, NY</td>
<td>Bakery Waste</td>
<td>34</td>
<td>155</td>
<td>10,594</td>
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<td>Rochester, NY</td>
<td>Grease Trap Waste</td>
<td>39</td>
<td>62</td>
<td>4,777</td>
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<td>45</td>
<td>95</td>
<td>8,500</td>
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<td>Fairport, NY</td>
<td>Tomato Products</td>
<td>48</td>
<td>15</td>
<td>1,454</td>
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<td>Campbell, NY</td>
<td>Cheese / Whey Waste</td>
<td>73</td>
<td>12</td>
<td>1,745</td>
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<tr>
<td>Wind Gap, PA</td>
<td>Biodiesel Derived Glycerol</td>
<td>264</td>
<td>50</td>
<td>26,408</td>
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<tr>
<td>Toronto, ON</td>
<td>Pork / Bakery Waste</td>
<td>153</td>
<td>3</td>
<td>917</td>
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<tr>
<td>Rochester, NY</td>
<td>Bakery Waste</td>
<td>41</td>
<td>2</td>
<td>164</td>
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<td>New Berline, NY</td>
<td>Yogurt Waste</td>
<td>189</td>
<td>9</td>
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<td>Batavia, NY</td>
<td>Dairy Waste</td>
<td>15</td>
<td>40</td>
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<td>Rochester, NY</td>
<td>Grease Trap Waste</td>
<td>40</td>
<td>11</td>
<td>869</td>
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<tr>
<td>Honeoye Falls, NY</td>
<td>Bakery Waste</td>
<td>30</td>
<td>1</td>
<td>60</td>
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<td>Geneva, NY</td>
<td>Grease Trap Waste</td>
<td>75</td>
<td>1</td>
<td>150</td>
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<tr>
<td>Corfu, NY</td>
<td>Cheese Waste</td>
<td>26</td>
<td>4</td>
<td>206</td>
</tr>
</tbody>
</table>

**Total Hauling Distance = 99,245 miles**

*Includes data from 1/1/12 – 12/10/12*
Barriers

Permit Process –
numbers, scope, variety of state and federal agencies involved

Utility Companies –
Age of infrastructure and interconnection issues
Control of rate structure
Fees

Access to Capital –

Need for Scale/Size of Projects for ROI -

Outdated Federal and State Energy Policy –

Under current conditions:
Value of electricity isn’t enough to keep a digester viable.
Selling composted solids and selling or utilizing waste heat are also vital to a healthy bottom line.
Path Forward

Convergence of the agriculture, livestock, waste management and organics recycling sectors.

Larger community based anaerobic digesters.

**Anaerobic digestion is an opportunity to meet our combined goals:**
- greenhouse gas reduction
- green energy production
- improved waste management
- building a supply chain that’s more sustainable
- providing a home for the organics waste stream

*It is definitely moving beyond just an idea at the farmer level.*
Sustainability in Food Processing

“Waste to energy... and more”

June, 2013
Fewer Options = Higher Costs

Active U.S. Landfills Accepting MSW

Average U.S. Tipping Fees


epiphergy
## MSW Composition & Recycling Rates

<table>
<thead>
<tr>
<th>Category</th>
<th>Generated</th>
<th>Recycled</th>
<th>Landfilled</th>
<th>Recycle %</th>
<th>Landfill %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paper &amp; Paperboard</td>
<td>68.43</td>
<td>42.50</td>
<td>25.93</td>
<td>62.1%</td>
<td>37.9%</td>
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<tr>
<td>Glass</td>
<td>11.78</td>
<td>3.00</td>
<td>8.78</td>
<td>25.5%</td>
<td>74.5%</td>
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<tr>
<td>Metals</td>
<td>20.91</td>
<td>7.22</td>
<td>13.69</td>
<td></td>
<td></td>
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<tr>
<td>Steel</td>
<td>15.62</td>
<td>5.23</td>
<td>10.39</td>
<td>33.5%</td>
<td>66.5%</td>
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<tr>
<td>Aluminum</td>
<td>3.40</td>
<td>0.69</td>
<td>2.71</td>
<td>20.3%</td>
<td>79.7%</td>
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<tr>
<td>Other Metals</td>
<td>1.89</td>
<td>1.30</td>
<td>0.59</td>
<td>68.8%</td>
<td>31.2%</td>
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<tr>
<td>Plastics</td>
<td>29.83</td>
<td>2.12</td>
<td>27.71</td>
<td>7.1%</td>
<td>92.9%</td>
</tr>
<tr>
<td>Rubber &amp; Leather</td>
<td>7.49</td>
<td>1.07</td>
<td>6.42</td>
<td>14.3%</td>
<td>85.7%</td>
</tr>
<tr>
<td>Textiles</td>
<td>12.73</td>
<td>1.90</td>
<td>10.83</td>
<td>14.9%</td>
<td>85.1%</td>
</tr>
<tr>
<td>Wood</td>
<td>15.84</td>
<td>2.23</td>
<td>13.61</td>
<td>14.1%</td>
<td>85.9%</td>
</tr>
<tr>
<td>Other Product Waste</td>
<td>4.64</td>
<td>1.23</td>
<td>3.41</td>
<td>26.5%</td>
<td>73.5%</td>
</tr>
<tr>
<td>Food Waste</td>
<td>34.29</td>
<td>0.85</td>
<td>33.44</td>
<td>2.5%</td>
<td>97.5%</td>
</tr>
<tr>
<td>Yard Trimmings</td>
<td>33.20</td>
<td>19.90</td>
<td>13.30</td>
<td>59.9%</td>
<td>40.1%</td>
</tr>
<tr>
<td>Misc. Inorganic Waste</td>
<td>3.82</td>
<td>0.00</td>
<td>3.82</td>
<td>0.0%</td>
<td>100.0%</td>
</tr>
<tr>
<td><strong>SubTotal</strong></td>
<td><strong>263.87</strong></td>
<td><strong>89.24</strong></td>
<td><strong>174.63</strong></td>
<td><strong>33.8%</strong></td>
<td><strong>66.2%</strong></td>
</tr>
</tbody>
</table>

Food Waste recycling challenges have not been adequately addressed to date.
Maximizing Value

Epiphergy follows the Food Recovery Hierarchy by finding highest and best uses.

Epiphergy produces approximately 15 gallons of ethanol fuel from each ton of organic waste material that we process. This ethanol is used as a renewable alternative to gasoline. It can also be used as lighter fluid, cooking fuel, weed killer, and hand sanitizer.

Epiphergy uses 100% of the organic materials that we receive. There is no "waste" left-over at the end of our process.

Epiphergy produces approximately 30 pounds of high-quality finished compost from each ton of organic waste material that we process. Our compost product is high in nutrients while being free of seeds, pathogens, and foreign debris.

Epiphergy reclams vegetable oil from food waste and works with local biodiesel producers to ensure that this resource is used to produce biofuels that are sold, and used locally.

Epiphergy produces approximately 100 pounds of high-protein animal feed from each ton of organic waste material that we process. This feed product is used by local farms as a nutrition supplement in dairy, beef, and poultry applications.

The over-production of food is a necessary evil. Without a comfortable "surplus", food prices would increase significantly... especially for staple products such as grain, dairy, meat, etc.

Epiphergy works in partnership with food banks and other community organizations to ensure that any edible food and/or beverages are used to provide nutrition to those in need.
Waste Transport Cost

Vehicle/method, transport distance, and collection frequency ALL affect transport costs.

Confidential Investor Presentation
Distributed Bioprocessing

Greatly reduces transportation distance and cost for both waste and products.

2,000# of Organic Waste IN becomes:

- 400# Ethanol (to biorefinery)
- 300# Animal Feed (to farm)
- 50# Compost (to farm)

1,250# Pre-Treated Wastewater OUT
More than energy...

1. Minimize the costs of organic waste “disposal”:
   a) Maximize value creation
   b) Minimize the cost of waste processing
   c) Accept the widest possible range of materials

2. Minimize the cost of organic waste collection & transportation:
   a) Minimize transportation distance
   b) Minimize mass/volume of waste material
   c) Minimize the frequency of waste pick-ups

3. Sustainability Considerations:
How To Get Started and Available Programs

*NYSP2I Direct Client Assistance Program* – Dr. Gene Park, NYSP2I

*NYSP2I Sustainable Supply Chain Program* - Patricia Donohue, NYSP2I

*NYSP2I Green Technology Accelerator Center* – Dan Smith, CIMS/NYSP2I

*NYSERDA/EDGE Program* – Haley Rotter and Ana Liss, Greater Rochester Enterprise
Direct Client Assistance Program

NYSP2I works with New York State companies to develop cost-effective and environmentally preferable solutions.

**Program Benefits**

- Reduced costs through:
  - Efficient resource utilization
  - Reduction or elimination of waste generation, disposal and/or regulatory fees
- Innovative engineering solutions
- Reduced environmental impact
- Competitive positioning as an environmentally conscious business
The Sustainable Supply Chain & Technology Program provides:

✓ Sustainable manufacturing assessment and implementation assistance
✓ Marketing and awareness in the green marketplace for NYS manufacturing companies meeting environmental standards
✓ Information regarding non-regulatory, voluntary standards and certification requirements necessary to enter new and emerging “green” markets via a user-friendly website (currently under development)

Completed Sustainable Supply Chain Project

<table>
<thead>
<tr>
<th>Business</th>
<th>Food Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>NYSP2I conducted a gap assessment and provided recommendations to enable company to answer and achieve higher scores on customer Supply Chain Scorecards</td>
</tr>
<tr>
<td>Expected Outcome</td>
<td>Company will remain a supplier to their key local and global customers while making continuous improvements towards their environmental impacts and becoming a more sustainable supplier</td>
</tr>
<tr>
<td>Metrics</td>
<td>Company expects to retain 213 employees and potentially add one job</td>
</tr>
</tbody>
</table>
The Green Technology Accelerator Center (GTAC) program at NYSP2I helps companies accelerate their introduction of green technologies into the market. New York State companies can take advantage of emerging market opportunities for environmentally preferable products by receiving assistance in a variety of areas.

The Green Technology Accelerator Center Provides:

- Support to both start-up companies and established organizations in their effort to develop and market product offerings utilizing green technologies

- Technical development assistance by leveraging an existing network of innovation resources including state-of-the-art NYS University facilities and Regional Technical Development Centers (RTDC)
  - Rochester Institute of Technology
  - Rensselaer Polytechnic Institute
  - University of Buffalo (SUNY)
  - Clarkson University
**Program Status**

Since GTAC program’s inception in 2011:

- NYSP2I has **screened 55** companies for potential acceptance
- Of these 55, NYSP2I has identified **18** qualifying projects
- NYSP2I has **completed 4 projects** with **7 projects active** as of June 2013

### GTAC Project - Examples

<table>
<thead>
<tr>
<th>Food Processing Equipment Business</th>
<th>Sustainable Packaging Business</th>
<th>Food Waste to Bio-Fuel Business</th>
</tr>
</thead>
<tbody>
<tr>
<td>Activity</td>
<td>Activity</td>
<td>Activity</td>
</tr>
<tr>
<td>NYSP2I provided product energy evaluation of cider pasteurization</td>
<td>NYSP2I supported manufacturing process optimization with Life Cycle Assessment techniques</td>
<td>NYSP2I provided process mapping and environmental impact analysis</td>
</tr>
<tr>
<td><strong>Expected Outcome</strong></td>
<td><strong>Expected Outcome</strong></td>
<td><strong>Expected Outcome</strong></td>
</tr>
<tr>
<td>99% less energy consumed per gallon of cider processed</td>
<td>Decreasing environmental footprint with manufacturing process optimization</td>
<td>GHG reduction of &gt;500% compared to corn-based ethanol</td>
</tr>
<tr>
<td><strong>Metrics</strong></td>
<td><strong>Metrics</strong></td>
<td><strong>Metrics</strong></td>
</tr>
<tr>
<td>Company expects to <strong>retain 1</strong> employees and potentially <strong>add 1-2 jobs</strong></td>
<td>Company expects to <strong>retain 46 employees and potentially add 14 jobs</strong></td>
<td>Company expects to <strong>retain 5 employees and potentially add 40 jobs</strong></td>
</tr>
</tbody>
</table>
“EDGE” Program
WHAT IS “EDGE”?  
Economic Development Growth Extension  
Building Community Support for Energy Projects

- Matching energy projects to available $$$
- Creating partnerships to encourage the implementation of projects that spur job growth and investment
- Assisting with the *Consolidated Funding Application*
- Educating Business Owners, Community Leaders & the public on the benefits of energy efficiency & renewable energy
- Assisting energy-related businesses and entrepreneurs access NYSERDA funding
NYSERDA EDGE Activities

• Working with community partners to identify projects in the Finger Lakes region
  - County IDAs, Chambers of Commerce, Rotary, Real Estate, Trade Associations, etc.

• Supporting the efforts of the FL-REDC, including the implementation of the “Regional Sustainability Plan”
  - Identifying regionally significant projects
  - Helping applicants apply through 3rd round (6/17 on...)

• Outreach and Education
  • Presentations, marketing, tabling, events
Examples of on-going projects:

• Company is renovating an existing facility & upgrading equipment (Existing Facilities program)

• New building construction/Substantial Renovation (New Construction program)

• Company is wondering HOW to save $ and energy in their facility (FlexTech program)

• Manufacturer/Data Center interested in improving process efficiency (Industrial & Process Efficiency)
EDGE and Agriculture

PON 2644: Agriculture Energy Efficiency Program:

Identify and implement energy efficient measures (electric/natural gas)

• Available to farms and on-farm producers (orchards, greenhouses, vegetables, vineyards, grain dryers, poultry/egg/dairy farms)
• **Free Energy Audits** at **NO COST** ($2,500 value)
• **Project implementation**: Incentives for up to 75% of eligible project costs (capped at $250,000)
NYSERDA R&D

**Current:**
PON 2112: Solar PV

PON 2149: Solar Thermal

PON 2439: On-Site Wind

**Past:**
PON 2684: Anaerobic Digester

**Future:** .....T.B.D?
Thank you!

Haley Rotter
Greater Rochester Enterprise
Haley@RochesterBiz.com
585-530-6205
Questions?
Sustainability in Food Processing

Workshop presentation will be available at:

www.nysp2i.rit.edu and
http://www.rit.edu/gis/flfpci/

For additional information, contact:
Kathy Kosciolek, Business Manager, NYSP2I
(585) 475-4325
kxkasp@rit.edu

This workshop was funded by a grant to the NYS Pollution Prevention Institute from the NYS Department of Environmental Conservation.