Mixed Waste Organics Extraction and Integrated Organics Management

Los Angeles County
March 17, 2016
Anaergia’s Global Footprint

1,600 Projects, 380 MW, 12 Facilities, 29 Patents, 20 Years
The Anaergia Vision

- Wastewater Biosolids
- Source Separated Organics
- Municipal Solid Waste
- Food Processing Waste
- Agricultural Waste

Integrated Organics Solutions

- Renewable Power
- Renewable Gas
- Organic Fertilizer
- Clean Water
AB 939 – California Leading the Way in Recycling

AB 341 – 75% recycling goal and Mandatory Commercial Recycling

Recycling Rates Flat since 2008

Anaergia
California Organics Regulations

*Everything is driven by Climate Change*

By 2019 – Organics Recycling will require a mixed waste processing solution. SSO becomes uneconomical.

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- **AB 1826** – Commercial Organics
- **AB 876** – Organics Infrastructure Plan
- **AB 1594** – Green Waste ADC Diversion Credit Eliminated
- **SB 605** – Short Lived Climate Pollutants
  - {Eliminate Organics from Landfills by 2025}
Difficulties in Achieving High Organics Recycling Rates

“Communities Struggle to Enact Residential Food Waste Collection Programs”¹

• Low Participation & Capture Rates
• High Cost – compostable bags, collection
• High Contamination – up to 25%
• Difficult to implement in commercial and multifamily sector
SSO Programs Challenged to meet Climate Change Goals

- Alameda County has instituted residential food waste programs since 2008.
- Alarming dip in participation shows fatigue in participation.
- Regardless, still has a tremendous amount of food waste in disposal.

**Trash separation dips**
Percentage of trash that is food scraps inside Alameda County residential garbage cans, instead of green waste bins:

<table>
<thead>
<tr>
<th>City</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fremont</td>
<td>21%</td>
<td>43%</td>
</tr>
<tr>
<td>Berkeley</td>
<td>15%</td>
<td>39%</td>
</tr>
<tr>
<td>Emeryville</td>
<td>18%</td>
<td>39%</td>
</tr>
<tr>
<td>Piedmont</td>
<td>17%</td>
<td>39%</td>
</tr>
<tr>
<td>Alameda</td>
<td>14%</td>
<td>38%</td>
</tr>
<tr>
<td>Dublin</td>
<td>14%</td>
<td>38%</td>
</tr>
<tr>
<td>Hayward</td>
<td>16%</td>
<td>38%</td>
</tr>
<tr>
<td>Livermore</td>
<td>19%</td>
<td>38%</td>
</tr>
<tr>
<td>Oakland</td>
<td>16%</td>
<td>38%</td>
</tr>
<tr>
<td>Pleasanton</td>
<td>18%</td>
<td>38%</td>
</tr>
<tr>
<td>Castro Valley</td>
<td>13%</td>
<td>37%</td>
</tr>
<tr>
<td>San Leandro</td>
<td>17%</td>
<td>37%</td>
</tr>
<tr>
<td>Albany</td>
<td>16%</td>
<td>36%</td>
</tr>
<tr>
<td>Union City</td>
<td>34%</td>
<td>36%</td>
</tr>
<tr>
<td>Newark</td>
<td>26%</td>
<td>35%</td>
</tr>
</tbody>
</table>

Source: StopWaste

*BAY AREA NEWS GROUP*
Integrated Organics Solutions

Organic Waste Processing

Residential Waste
Commercial Waste
SSO

Water Fraction
OREX
Dry Fraction

Material Recovery
Residual

Upgrade to Renewable Solid Fuel

Energy Recovery

Biogas Treatment
Vehicle Fuel

Renewable Gas

Electricity

Residual Recovery

Dewatering
Drying

Ammonia Stripping
Acid Scrubbing

Fertilizer

Anaerobic Digestion

Biogas

CHP
Organic Waste Processing (OREX)

**Generation 1**

Kaiserslautern, Germany

**Generation 2**

Ventspils, Latvia

**Generation 3**

OREX 500 Gescher, Germany
OREX Operating Principal

Feed phase (low pressure)

Compression phase (high pressure 250 bar)

Expulsion phase (low pressure)

90%+ putrescible organics recovery

- 18 to 22 second cycle time.
- Continuous operation.
## OREX Commercial Operating Units

<table>
<thead>
<tr>
<th>Description of experience/reference</th>
<th>Country</th>
<th>Capacity</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sorting and treatment of mixed MSW</td>
<td>Kaiserslautern (Germany)</td>
<td>50,000 t/a</td>
<td>2006</td>
</tr>
<tr>
<td>Sorting and treatment of mixed MSW</td>
<td>Alessandria (Italy)</td>
<td>100,000 t/a</td>
<td>2007</td>
</tr>
<tr>
<td>Treatment of separately collected bio-waste</td>
<td>Castelceriolo (Italy)</td>
<td>25,000 t/a</td>
<td>2008</td>
</tr>
<tr>
<td>Treatment of separately collected bio-waste</td>
<td>Viareggio (Italy)</td>
<td>20,000 t/a</td>
<td>2008</td>
</tr>
<tr>
<td>Sorting and treatment of mixed MSW / industrial waste</td>
<td>Premier Waste (UK)</td>
<td>100,000 t/a</td>
<td>2008</td>
</tr>
<tr>
<td>Treatment of mixed MSW, RDF production</td>
<td>VamWijster (Netherland)</td>
<td>200,000 t/a</td>
<td>last changes 2009</td>
</tr>
<tr>
<td>Vagron (MBT) anaerobic digestion of organic fraction from MSW</td>
<td>Groningen (Netherland)</td>
<td>100,000 t/a</td>
<td>last changes 2009</td>
</tr>
</tbody>
</table>

*1st OREX Line in North America installed in San Francisco*
OREX Processing Line

- Reduces Collection Cost vs SSO Collection w/Wet/Dry Routing
- Achieves Maximum Organics Recovery
- Complements Dry/MF Commercial Recycling Line
- Organics Polishing System cleans Wet Fraction, ensuring beneficial use of digestate (ensures full value of diversion by exceeding CA compost regulations).
Installation of First North America OREX
Clean Digestate is a Marketable Resource
Dirty digestate is waste regardless of nutrient value

Conventional organics separation processes do not meet CalRecycle standards for land application

Hammer Mill
(SSO Digestate Compost)

Trommel Screen
(MSW Digestate Compost)

ANAERGIA ORGANICS RECOVERY PRODUCES CLEAN DIGESTATE
OREX Flexible to Any Level of Contamination

Wet Fraction from MSW or WCW
30-35% TS
30 to 35% recovery from MSW
50 to 70% recovery from WCW (wet commercial waste)

Wet Fraction from SSO
20 – 25% TS
70 to 95% recovery from SSO
Organics Polishing System (OPS)
Two stage plastic film and grit removal system

Min. - 85% removal of plastic film and grit
Mini OREX Testing in North America

OREX Test Press – Test Scale

- Anaergia tested at eight sites in North America
- 5 in CA and now at LACSD
- Complements *standard* waste characterization

Waste to be Sampled
North America Testing Results

- New York City *(New Yorkers call it the “Garlic Press”)*
- General results of the tests indicate that with material fed in the < 6 to 8” range:
  - Single Family Residential – 30 to 35% organics recovery
  - Multifamily Residential – 35 to 55% organics recovery
  - Wet Commercial Waste – 50 to 70% organics recovery
  - Source Separated Organics – 70 to 95% organics recovery

  - <2% physical contaminants > 2mm and low metals content
  - Highly digestable with VS/TS in the 85 to 92% range
Dedicated Digestion - London

- **Dagenham, UK (London)**
- **Substrate:** Municipal Source Separated Organic Waste
- **Capacity:** 30,000 TPY
- **Energy Output:** 1.4 MWe, 2.8 MW Total
High Solids Anaerobic Digestion is Capital Efficient
Omnivore™ Retrofit Creates Capacity

High solids retrofit:
1. High Solids Mixers
2. Recuperative- or Pre-thickening

- Increase capacity by 3x
  - HRT = 8-10 d
  - SRT = 24-30 d
- Low power
- Low polymer
- Customize capacity

- Isolated service boxes for safe in-situ mixer adjustment
- Adjust position while operating

- High torque, constant torque mixers
- Intermittent operation for less power
Omnivore Concentrates Biomass

Conventional Omnivore
- HRT = SRT ~ 25 d
- SRT > HRT
- SRT = 25-30 days
- HRT = 8-10 days

SRT = Solids Retention Time
HRT = Hydraulic Retention Time

- OLR: Conventional 1.5 kg/m$^3$/d, Omnivore 4.5 kg/m$^3$/d
- TS: Conventional 2%, Omnivore 6%
- Sludge/External Waste: Conventional 90/10, Omnivore 60/40

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HRT = Hydraulic Retention Time
SRT = Solids Retention Time
Utilizing WWTP Infrastructure – Omnivore
3X Capacity Increase at VVWRA
Anaheim Energy – 2017
(Republic Services)

- Phase I: 85,000 TPY wet fraction, Phase II: 170,000 TPY wet fraction
- 4 MW PPA with Anaheim Public Utilities
- Digester Site on < 2 acres
Rialto BioEnergy Facility
(Athens Services)

300 ton/day organics

300 ton/day biosolids

5 MWe export

Energy Independent
Summary

• OREX Processing Lines offers a key technology for diverting organics from MSW – regardless of contamination. Maximum recovery/lowest collection cost.
• Preprocessing Organics is just one part of the puzzle of an Integrated Organics Solution – must consider digestion, and maximizing energy & residual recovery (contamination is biggest threat).
• Organic specific testing should be done to complement standard waste characterization.
• All technologies proposed are commercially proven at multiple facilities globally.
Questions