Co-Digestion Results in Net Energy Producer

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East Bay Municipal Utility District
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Presentation Overview

• EBMUD Background
• Intro to Resource Recovery (R2) Program
• Biogas Production and Utilization
• On-site Renewable Energy Generation
• Feedstock Portfolio and Food Waste
• Co-digestion Challenges
• Next Steps and Lessons Learned
EBMUD Background
Service Area

Main WWTP
- ~50 MGD average dry weather flow
- 168 MGD capacity

650,000 WW customers
EBMUD Background
Excess Digestion Capacity

- 11 in-service anaerobic digesters (1.8 MG each)
- Canneries facility was designed to serve: 20
- Remaining canneries: 0
R2 Program Overview
Trucked Waste

- Began accepting trucked waste in 2002
- 4,000 trucks/month
- 20 million gallons/month non-hazardous liquids
- Trucked wastes received 24-7, 365 days/year

2002 Septage Receiving $1M
2004 Solid-Liquid Receiving $7M
2014 Blend Tank Receiving $13M
R2 Program Overview
Renewable Energy Generation

- Savings of ~$2M on plant power costs
- Electricity export revenue of ~$1M/year
- First wastewater treatment plant in N. America to produce more electricity than plant demand

1985
Three 2.2 MW engines

2013
4.5 MW Turbine $13M
R2 Program: Materials Accepted

- Septage
- FOG
- Process Water
- Grey Water
- Sludge
- Liquid Organics
- Solid Organics (food waste)

Material Acceptance Procedure

EBMUD follows a rigorous procedure designed to:

- Protect wastewater treatment plant personnel
- Meet operational needs, including:
  - Process considerations
  - Odors
  - Biological systems
- Ensure compliance with all environmental permits and regulations (NPDES, air, biosolids, and pretreatment)
Materials Acceptance Steps

1. Material characterization
2. Material evaluation
3. Permitting
4. Load and material tracking
5. Site orientation
6. First load confirmation sample
7. Field audit program
Current R2 Program Status

- 250 customers
- 30 material sub-types
- 100-150 trucks per day
- 3-4 MW generated continuously from trucked-in high-strength materials
Biogas Production
High strength waste contribution

Roughly 2/3 of the biogas from R2 wastes
Biogas Utilization
Current Flaring Patterns

<table>
<thead>
<tr>
<th>Biogas Utilization</th>
<th>2015 Volume (cubic ft)</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Turbine</td>
<td>533,000,000</td>
<td>47%</td>
</tr>
<tr>
<td>Engines</td>
<td>471,000,000</td>
<td>41%</td>
</tr>
<tr>
<td>Boiler</td>
<td>5,000,000</td>
<td>0.4%</td>
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<tr>
<td>Flare</td>
<td>137,000,000</td>
<td>12%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,145,000,000</strong></td>
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</tbody>
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High strength wastes are delivered on no particular schedule. EBMUD often flares at the end of the week as deliveries increase and biogas production exceeds generation capacity.

Flaring - Week of April 24, 2016

[Graph showing standard cubic feet per minute (scfm) over the week from 4/24/2016 to 5/1/2016]
Onsite Renewable Energy Generation

% of WWTP demand met by onsite generation

Before R2 = 40% - 50%

After turbine = 100% + export
R2 Program Feedstock Portfolio

- Fats, Oils & Grease (FOG)
  - Breweries
  - Wineries
  - Soda Making
- Beverage industry wastewaters
- Other food processing wastewaters
- Dairy/cheese processing wastewaters
- Rendering /blood waste

Food Waste

FY 2016 High-Strength Wastes
Welcome to Food Waste
Existing Food Waste Program
Preprocessing SSO Offsite

1. Source separated organics (SSO) on transfer station tip floor

2. Food waste after grinding

3. Off-loading at EBMUD

4. Contaminant removal at EBMUD
MSW Organics Fraction
Ongoing Pilot Study

1. Press at offsite facility

2. Reject from offsite press

3. Off-loading at EBMUD

4. Contaminant removal at EBMUD
Codigestion Challenge
Food Waste Contamination

Key need: Pre-processing trains that remove contaminants to protect infrastructure
Codigestion Challenge
Poultry Blood – Ammonia Toxicity

Date

0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 8,000 9,000 10,000 11,000 12,000 13,000 14,000 15,000 16,000

Total Ammonia mg/L as N

Control Feed  Test Feed  Thermo Test  Meso Test  Meso Control  Thermo Control


8.5%  12%  18%  25%  35%  50%  75%  100%  100% to Controls
Codigestion Challenge
Fats, Oils, and Greases (FOG)

Meso Test Digester
Developed indigestible scum layer

Thermo Test Digester
Greater ability to digest long-chain fatty acids
Next Steps and Lessons Learned

• Continue focus on food waste with:
  – Pilot studies
  – Development of partnerships
  – Investigation of FW program expansion

• Keeping in mind:
  – Resource Recovery requires innovative thinking and problem-solving approach
  – Adaptive management is key to addressing multiple, unanticipated challenges
  – Resource Recovery is not without risk, competition is real
Q&A

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