CO-DIGESTION EVALUATIONS

TWO FACILITIES
DIFFERENT DRIVERS
SIMILAR EVALUATION APPROACH

Topics presented:
• Fresno-Clovis and Las Vegas facilities
• Study drivers
• Evaluation components
• Outcomes
FRESNO-CLOVIS REGIONAL WATER RECLAMATION FACILITY

- 13 anaerobic digesters
- HSW receiving program in place
  - FOG and food waste
  - Permanent receiving station with 3 holding tanks
  - Mix 50/50 primary sludge and HSW prior to pumping to digesters
- Feed only Digesters 9 - 13
LAS VEGAS WATER POLLUTION CONTROL FACILITY

- 8 anaerobic digesters
- HSW receiving pilot plant
  - FOG and liquid food waste
  - Inadequate capacity for available HSW material
  - Slow HSW off-loading
  - Aging components
## DRIVERS FOR EVALUATION

**Fresno-Clovis (CA) Regional Water Reclamation Facility**
- More digester capacity needed by 2026
  - Population growth
  - CA Senate Bill 1383 mandated cities decrease volume of landfilled organics
- Maximize digester gas production
  - Existing HSW program - digester gas for use in boilers and for combustion turbine fuel (electricity)

**Las Vegas Water Pollution Control Facility**
- Increase digester gas production
  - Existing pilot HSW receiving station boosted gas production
  - Improvements needed to make it permanent and increase capacity
  - Digester gas used in boilers and for engine generator fuel (electricity)
  - Excess digester volume & abundant sources of FOG

**More HSW = More digester gas = More heat & power**
THE APPROACH

1. Gather data and ask questions
2. Availability and characteristics of material
3. Digester capacity (volume)
4. Solids retention time
5. Volatile solids loading rate
6. HSW VS/Total VS
7. Digester gas
DATA GATHERING AND SYSTEM UNDERSTANDING

• At least 3 years of data:
  - Flows and loads (gpm, %TS, %VS) into and out of each solids process
  - Digester gas production; volume and gas constituents
  - Use Excel instead of modeling software
  - Operating methods; maintenance periods
• Get to know the system through discussion with operators & supervisors

<table>
<thead>
<tr>
<th>Year</th>
<th>TPS TSS</th>
<th>TPS VSS</th>
<th>TPS Flow</th>
<th>TWAS TSS</th>
<th>TWAS VSS</th>
<th>TWAS Flow</th>
<th>Sludge TSS</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>lb/d</td>
<td>lb/d</td>
<td>gpd</td>
<td>lb/d</td>
<td>lb/d</td>
<td>gpd</td>
<td>lb/d</td>
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<tr>
<td>2015</td>
<td>69,585</td>
<td>59,527</td>
<td>247,437</td>
<td>42,608</td>
<td>31,993</td>
<td>113,462</td>
<td>112,193</td>
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<td>2016</td>
<td>70,723</td>
<td>60,508</td>
<td>253,121</td>
<td>43,545</td>
<td>32,704</td>
<td>115,958</td>
<td>114,368</td>
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<tr>
<td>2017</td>
<td>71,861</td>
<td>61,490</td>
<td>258,804</td>
<td>44,483</td>
<td>33,416</td>
<td>118,455</td>
<td>116,344</td>
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<tr>
<td>2018</td>
<td>73,000</td>
<td>62,471</td>
<td>264,886</td>
<td>45,420</td>
<td>34,127</td>
<td>120,952</td>
<td>118,420</td>
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<tr>
<td>2019</td>
<td>74,138</td>
<td>63,453</td>
<td>270,171</td>
<td>46,358</td>
<td>34,819</td>
<td>123,448</td>
<td>120,496</td>
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<tr>
<td>2020</td>
<td>75,276</td>
<td>64,434</td>
<td>275,865</td>
<td>47,296</td>
<td>35,550</td>
<td>125,945</td>
<td>122,572</td>
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WHAT HSW IS AVAILABLE?

Las Vegas WPCF - Organic Solution Management (OSM) provided a market analysis

Volume of Organic Waste Stream Material Available in the Las Vegas Region (Table Adapted from CLV Feed Stock Report by OSM, June 2017)

<table>
<thead>
<tr>
<th>ORGANIC WASTE STREAM NAME</th>
<th>SOLID/ LIQUID</th>
<th>VOLUME ESTIMATED (GALLONS PER YEAR)</th>
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<tbody>
<tr>
<td>Grease Trap</td>
<td>Liquid</td>
<td>42,000,000</td>
</tr>
<tr>
<td>Grease Trap Processing Sludge</td>
<td>Solid</td>
<td>6,200,000</td>
</tr>
<tr>
<td>Yellow Oil Processing Material</td>
<td>Liquid</td>
<td>1,400,000</td>
</tr>
<tr>
<td>Food Manufacturing</td>
<td>Liquid</td>
<td>3,500,000</td>
</tr>
<tr>
<td>Food Manufacturing</td>
<td>Solid</td>
<td>8,000,000</td>
</tr>
<tr>
<td>Casino Food Waste</td>
<td>Solid</td>
<td>50,000,000</td>
</tr>
<tr>
<td>Grocery Food Waste</td>
<td>Solid</td>
<td>40,000,000</td>
</tr>
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</table>

Considerations
- Volume
- Schedule of availability
- Size of collection area
- Extent of preprocessing needed
- %TS and %VS

A Market Assessment is a valuable planning tool.

OSM operates and maintains the pilot HSW receiving facility at Las Vegas. They are the HSW collector and hauler.
FRESNO-CLOVIS RWRF – B&V PREPARED 7 CASE STUDIES

- East Bay MUD, Oakland, CA
- Central Marin Sanitation Agency, Marin, CA
- Joint WPCP, Carson, CA
- Silicon Valley Clean Water, Redwood City, CA
- Victor Valley Reclamation Authority, Victorville, CA
- West Lafayette WWTP, West Lafayette, IN
- Saint-Hyacinthe WWTP, Saint Hyacinthe, Quebec

Food Waste (lb/month)  Liquid HSW (gal/month)
For this project we assumed historical performance was indicative of future process performance. Example of engineering judgement: data shows that 90% of the influent TSS is dropping out in the primary clarifier. That’s too high. We’d back that off to 70%.
SOLIDS RETENTION TIME (SRT)

Typical SRT of mesophilic digester: 15 – 20 days

SRT=FLOW/VOLUME. 40 CFR 503 requires 15 days at 95 - 131 deg to achieve Class B. Las Vegas noted they had excess digester capacity but the data showed that it would not last long. Recommended they thicken TWAS more, which could be done with existing equipment. Dewatered sludge is landfilled and not required to be class B, so 12 days of SRT is the minimum for stable digester operation.
VOLATILE SOLIDS LOADING RATE

VS loading rate = lb VS/cf/day

Industry knowledge: 0.16 – 0.19 lb VS/cf/day

Varies greatly

Poor outcome if VS loading rate is exceeded

Mabel
Methanogen
RATIO OF HSW VS : TOTAL VS

- Limited documentation of upper limit
- Des Moines Wastewater Reclamation Facility co-digests 25% - 35% of Total VS
- Foaming required submerged fixed covers, large diameter overflow pipes and spray nozzles

Las Vegas WPCF – Sludge + HSW to all 12 digesters
DIGESTER GAS

Develop digester gas projections for the feasible alternatives

ASSUMPTIONS

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>SLUDGE</th>
<th>HSW</th>
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<tbody>
<tr>
<td>Volatile solids reduction (%VSS)</td>
<td>54%</td>
<td>93%</td>
</tr>
<tr>
<td>VS to gas conversion (scf/lb VS)</td>
<td>15</td>
<td>17</td>
</tr>
<tr>
<td>Methane content (%)</td>
<td>60%</td>
<td>72%</td>
</tr>
</tbody>
</table>

Can the existing system use the projected volume of gas?
Explore improvements or changes to technology.
OUTCOMES

Fresno – Clovis RWRF

• Feed HSW to all digesters on a 15 minute cycle
• Add HSW unloading and storage capacity
• Serve as a reliable, long term HSW accepter by adding new digesters in 2026, 2033 and 2039
• Digester gas analysis was not part of the study

Las Vegas: Acid phase digester has a 24 – 48 hour detention time. A small amount of WAS is added to promote hydrolysis.
Questions?

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