Energy Demands and Opportunities for Wastewater Utilities

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Wastewater Treatment

• Average American creates 100 gallons of wastewater per day
• 16,000 wastewater treatment plants in the U.S.
• 3,500 plants use anaerobic digestion
National Association of Clean Water Agencies (NACWA)

• Represents nearly 300 publicly owned treatment works (POTWs)

• Members serve:
  – Populations ranging from 1,700 to 7.5 million
  – The majority of the sewered population in the U.S.
Electric Energy Use

58 agencies serving 47 million people:
100 kWh/person/year
Plant Energy Use per MG Treated

2007 Average: 1,766
2004 Average: 1,792

kWh per Million Gallons Treated

Percent of Utilities

0-1000 1,000-2,000 2,000-3,000 3,000-4,000 4,000-5,000

0 10 20 30 40 50 60
Breakdown of Energy Usage

Plant vs. Collection System

- Collection System, 15%
- Plant, 85%

Plant Process Use

- Aeration, 19%
- In-Plant Pumping, 70%
- Disinfection, 1%
- Effluent Reuse Pumping, 2%
- Solids Processing, 8%
## Energy Conservation and Cost Reduction

<table>
<thead>
<tr>
<th>Method</th>
<th>Implemented</th>
<th>Planned</th>
<th>Energy Savings (MWh/yr)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation of high-efficiency pumps, motors, &amp; variable frequency drives</td>
<td>70%</td>
<td>28%</td>
<td>24,270</td>
</tr>
<tr>
<td>Using SCADA systems to monitor and optimize energy needs</td>
<td>68%</td>
<td>24%</td>
<td>10,703</td>
</tr>
<tr>
<td>Use of efficient lighting and HVAC for plant and administrative buildings</td>
<td>60%</td>
<td>25%</td>
<td>10,080</td>
</tr>
<tr>
<td>Reduction of inflow/infiltration (I/I) to reduce plant flows</td>
<td>53%</td>
<td>26%</td>
<td>No data</td>
</tr>
<tr>
<td>Other plant process modifications to reduce energy use</td>
<td>43%</td>
<td>34%</td>
<td>1,990</td>
</tr>
</tbody>
</table>
## Energy Conservation and Cost Reduction

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<tr>
<td>Optimized purchasing strategies and load shifting to reduce peak demand</td>
<td>41%</td>
<td>14%</td>
<td>82</td>
</tr>
<tr>
<td>Heat recovery</td>
<td>39%</td>
<td>10%</td>
<td>14,330</td>
</tr>
<tr>
<td>Electricity generation – biogas fueled engines, microturbine, fuel cells</td>
<td>35%</td>
<td>24%</td>
<td>31,812</td>
</tr>
<tr>
<td>Installation of equalization basins to reduce peak demand</td>
<td>31%</td>
<td>11%</td>
<td>No data</td>
</tr>
<tr>
<td>Electricity generation – solar, wind turbine, hydropower</td>
<td>4%</td>
<td>14%</td>
<td>5,810</td>
</tr>
</tbody>
</table>
Biogas Recovery and Use

• 57% of agencies recover biogas
• Uses for these agencies:
  – Digester Heating - 55%
  – Electric Power Generation - 50%
  – Building Heat/Cooling - 41%
  – Incineration - 9%
Onsite Energy Production

- 45% of agencies generate electricity onsite
- Percentage of electricity needs generated onsite:
  - Average - 34%
  - Maximum - 96%
Los Angeles County Sanitation District

• Joint Water Pollution Control Plant
  – Serves 3.5 million people
  – Produces 95% of energy needs (22 MW/yr)
    • 3 solar gas turbines
    • Turbines exhaust into heat recovery steam generators
      – Digester heating
      – Electricity production
  – Saves $20 million/yr in retail power purchases
East Bay Municipal Utility District

- Food scraps are added to anaerobic digesters to increase energy production
  - 100 tons of food scraps per day
  - Plans to increase to 200 tons/day
  - Produces 6 MW/yr (up from 2.5 MW/yr)
Energy Potential of Biosolids

• Gasification of biosolids
  – Biosolids dried, pelletized, and converted to charcoal-like substance
  – Converted to gas at high temperatures
• Fuel for cement kilns
• Land application/compost
Other Energy Issues

• Potentially higher energy costs due to climate change legislation
• Water quality impacts from production of ethanol
Thank You

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