Energy Efficiency In The Water Industry

Harriet Fletcher - Arup
Energy Efficiency in the Water Industry

- Definition
- Generation
- Operational Efficiency
  - Benchmarking
  - Operation & Maintenance
  - Energy Saving Control
Energy efficiency means using less net energy to provide the same service.

The water industry accounts for 3% of the UK energy consumption (Water UK, 2015)

GHG emissions are equivalent to all the busses in the UK (2010, Ofwat)
The Challenge

- Water companies have committed to reducing greenhouse gas emissions 20% by 2020
- Population growth is expected to be 16% by 2033
- Stricter environmental discharge limits driven by EU legislation
- Increased pressure on drinking water supplies driving the use of more challenging source waters
- Increased rainfall leading to higher flows in wastewater and higher pumping costs
Wind turbines at WTW
Stage Two

Inlet Works

Hydro-turbine (190kW)

Primary Settlement

Activated Sludge Process

ATC (190kW)

Anaerobic Digestion (14,100m³)

Incineration

CHP (2.5MW)

Site Energy Demand: 2.7MW
Energy Generation: 2.9MW
Hydroturbine Example
Treatment technology options

Thermal Hydrolysis

- CAMBI™
- BioThelys™ - Veolia Water Solutions

Enzyme Hydrolysis

- Enhanced Enzymic Hydrolysis (EEH) – Monsal

Cell Destruction

- Cellruptor™ – Eco Solids Ltd
- Sonix™ - Enpure
## Evaluation Results

**Cost Comparison of Advanced & Conventional AD for 15,000tds/a plant (with energy requirement on site of 15,000MW/a)**

<table>
<thead>
<tr>
<th></th>
<th>MAD</th>
<th>Cambi THP+MAD</th>
<th>Biothelys THP+MAD</th>
<th>EEH+MAD</th>
<th>Cellruptor+ MAD</th>
<th>Sonix</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Capex for system from thickeners to dewatering</strong></td>
<td>£</td>
<td>£££</td>
<td>££</td>
<td>££</td>
<td>£</td>
<td>£</td>
</tr>
<tr>
<td><strong>Total Opex for the system</strong></td>
<td>£315,000</td>
<td>£623,066</td>
<td>£529,143</td>
<td>£627,500</td>
<td>£340,000</td>
<td>£510,000</td>
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<tr>
<td><strong>Gas production m³/day</strong></td>
<td>12,658</td>
<td>19,145</td>
<td>19,145</td>
<td>17,404</td>
<td>16,455</td>
<td>16,455</td>
</tr>
<tr>
<td><strong>Payback yrs</strong></td>
<td>7.2</td>
<td>8.2</td>
<td>6.7</td>
<td>8.0</td>
<td>5.9</td>
<td>6.6</td>
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</tbody>
</table>
Part 2: Energy Reduction

How much does it cost to treat 1000 peoples wastewater?

How much to deliver 1 ML of treated drinking water?

Industry wide benchmarking is in progress But more data is needed to understand the issues.
Aeration - Wastewater
<table>
<thead>
<tr>
<th>Control Type</th>
<th>Total during period (m$^3$)</th>
<th>Average (m$^3$/h)</th>
<th>Max (m$^3$/h)</th>
<th>Min (m$^3$/h)</th>
<th>Effluent Ammonia (mg/l)</th>
<th>Effluent P (mg/l)</th>
<th>Effluent Ammonia (mg/l)</th>
<th>Effluent P (mg/l)</th>
<th>% Aeration saving</th>
<th>% chemical Saving</th>
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</thead>
<tbody>
<tr>
<td>1 Point DO Control</td>
<td>34064705</td>
<td>42957</td>
<td>50364</td>
<td>28620</td>
<td>0.03</td>
<td>0.69</td>
<td>0.04</td>
<td>0.94</td>
<td>0%</td>
<td>0%</td>
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<tr>
<td>3 Point DO Control</td>
<td>33953380</td>
<td>42809</td>
<td>50432</td>
<td>25734</td>
<td>0.03</td>
<td>0.68</td>
<td>0.04</td>
<td>0.90</td>
<td>0.33%</td>
<td>1.26%</td>
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<tr>
<td>Ammonia Control</td>
<td>23545094</td>
<td>29696</td>
<td>45069</td>
<td>21808</td>
<td>0.69</td>
<td>0.25</td>
<td>0.95</td>
<td>1.24</td>
<td>31%</td>
<td>64%</td>
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<tr>
<td>Ammonia and SRT Control</td>
<td>21959485</td>
<td>27698</td>
<td>50392</td>
<td>5429</td>
<td>1.05</td>
<td>0.17</td>
<td>2.41</td>
<td>0.62</td>
<td>36%</td>
<td>76%</td>
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</tbody>
</table>
Wastewater Process Audits
Drinking Water Process Audits
Brilliant Biogas
Thanks and any Questions