Not your typical fine bubble retrofit: Midwest Cheese producer improves efficiency and performance with an aeration system overhaul.

Wisconsin Wastewater Operators Association
2013 Annual Conference
Stevens Point, WI
What We Will Be Covering

- Introduction to Grande Cheese Company
- Introduction to the Anaerobic Digester Project
- Treating Digester Effluent
  - Aeration Challenges
  - New Design
  - What Makes This So Unique?
- Summary of the Results
Grande Cheese Company - Brownsville, WI
Anaerobic Digester Project - Goals

- Eliminate hauling and land application of HSW
- Anaerobically digest HSW and produce biogas
  - Utilize biogas as a renewable fuel
- Treat digester effluent in existing aerobic treatment system
- Improve phosphorus removal
- Add post aeration of effluent
- Reduce our carbon footprint
New WWT Process Flow Diagram
New WWT Process Flow Diagram
Wastewater Treatment – During Construction
Wastewater Treatment – Post Construction
Treating Digester Effluent in the Existing Aerobic Treatment System - Challenges

- Significant increase in influent organic loading
  - Oxygen demand increased to 98% above design
  - Supplemental aeration added in summer
- Poor dissolved oxygen control
- Cooling and drift issues with existing splash aeration
- Repairs, maintenance and energy with splash aeration
- Must keep system in service
- Site limitations
Disk Type Splash Aeration

Disk Type Aeration

Additional aeration added in 2010 to try to help the oxygen shortage.

New loading required 904 Lbs O2/hr vs. 457 Lbs O2/hr of existing equipment (clean water).

<table>
<thead>
<tr>
<th>Ring</th>
<th>Number of Disks</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>108</td>
</tr>
<tr>
<td>2</td>
<td>40</td>
</tr>
<tr>
<td>1</td>
<td>35</td>
</tr>
<tr>
<td>Total</td>
<td>183</td>
</tr>
</tbody>
</table>

Dissolved Oxygen in Rings of Ditch, 2009

Figure 14: Variation in Dissolved Oxygen

Dissolved Oxygen (mg/L) vs. Date

- Ring 3
- Ring 2
- Ring 1
Clearly need more Oxygen, but how?

- Add disks
  - Number of disks needed almost double current number
  - Significant increase in HP
- Alternative mechanical systems
  - Significant increase in HP
- Fine Bubble
  - Solids movement in the ditch?
  - Installation challenge?
  - Air compression?
  - Potential of little if any increase in HP
What Made This Project Unique? - Design
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What Made This Project Unique? - Design
What Made This Project Unique? - Divers

- Removed underwater obstructions
- Installed supports for mixers
What Made This Project Unique? - Installation
Results

Aeration installation completed in 11 days once obstructions in rings were removed.

Figure 4: Grande Cheese Dissolved Oxygen Concentration
Figure 14: Variation in Dissolved Oxygen

Dissolved Oxygen in Rings of Ditch, 2009

Figure 4: Grande Cheese Dissolved Oxygen Concentration
## Energy Comparison: Before vs. After

<table>
<thead>
<tr>
<th>Year</th>
<th>Organic loading to the Oxidation Ditch (#/Day BOD)</th>
<th>Annual Energy (kWh)</th>
<th>Energy Consumption (kW/BOD/day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2009</td>
<td>3,339</td>
<td>919,800</td>
<td>0.031</td>
</tr>
<tr>
<td>2010</td>
<td>3,798</td>
<td>1,006,632</td>
<td>0.031</td>
</tr>
<tr>
<td>2011</td>
<td>3,653</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td>3,877</td>
<td>656,124</td>
<td>0.019</td>
</tr>
</tbody>
</table>

- > 15% more Organic Load
- > 28% less energy
- > 38% less energy per BOD

Also, 10% higher oxygen demand because of ammonia
Other Benefits?

- Mixed liquor settles better
- No filaments
- No maintenance around ditch
- Less cooling of mixed liquor during the winter
- Better DO control in all rings
- Safer work environment
Project Summary

- Converted to membrane fine bubble aeration
  - Reduced energy consumption
  - Expansion built in
  - Other process benefits
- Converted to turbo type air compressors
  - More reliable and energy efficient
  - Provides 100% backup
- Completed modifications without taking treatment system off line
  - Use of industrial divers
  - Maintain permit compliance throughout conversion
Project Benefits

- Project received Focus on Energy Efficiency incentive of $32,700.
- Oxidation ditch energy savings: $48,000/yr
- HSW trucking/disposal savings: $1,300,000/yr
  - Savings about 126,000 gallons of diesel fuel/year
  - Reduced overall carbon footprint by 1,647 metric tons CO$_{2}$eq

1 Environmental Defense Fund Fleet Emission Calculator:
Thank you!

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