A Fly In Your Ointment

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Presented by
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Acknowledgement

- Bruce Neerhof-Operator, Lakeland College
Wastewater Plant Capacities

• Design Flow
  – Average 0.083 MGD
  – Maximum Month 0.117 MGD
  – Peak 0.358 MGD

• Daily Flow
  – Summer 0.035-0.055 MGD
  – School Year 0.055-0.070 MGD

• Design BOD 138 pounds per day
Anoxic Selector
Aeration Tank
Clarifier
Building
Approach to Identifying Problem

- Review plant effluent data
- Review operational daily data
- Discuss chemical cleaning with college
- Check selector for soluble BOD
- Microscopic analysis of sludge
Results of Investigation

• Data showed increased Sludge Volume Index
• Sludge age increased to over 15 days
• Oxygen level good 2-4 mg/l - higher at night
• Decant of Aerobic Holding tank - no change
• Microscopic examination showed filaments
Micrographs from a Sample Received
March 4, 2011
Lakeland College Treatment Facility

By Jeff MacDonald, Microbiologist
250X The Stalked Ciliate *Vorticella*
250X Stalked Ciliate \textit{Carchesium}
250X  Free-swimming Ciliate
*Trachelophyllum*
250X Amoeba Mayorella
250X  Floc and Filaments
980X *Haliscomenobacter hydrossis*
980X  Filament Type 0041
980X *Sphaerotilus natans*
980X  Wood Fibers
TABLE 3.6
Relationship of Specific Filamentous Organisms to MCRT and F/M in Activated Sludge

<table>
<thead>
<tr>
<th>MCRT, d</th>
<th>1.9</th>
<th>2.2</th>
<th>2.5</th>
<th>3.0</th>
<th>4.0</th>
<th>5.0</th>
<th>8.0</th>
<th>20</th>
<th>50</th>
</tr>
</thead>
<tbody>
<tr>
<td>F/M&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.8</td>
<td>0.7</td>
<td>0.6</td>
<td>0.5</td>
<td>0.4</td>
<td>0.3</td>
<td>0.2</td>
<td>0.1</td>
<td>0.05</td>
</tr>
</tbody>
</table>

- **Type 1701**
- **S. natans**
- **H. hydrossis**
- **Thiothrix spp.**
- **Type 021N**
- **Nocardioforms**
- **Type 0411**
- **N. limicola II**
- **Type 1863**
- **Type 0041**
- **Type 0675**
- **M. parvicella**
- **Type 0092**
- **Type 1851**
- **Type 0914**
- **Type 0803**
- **Type 0581**

<sup>a</sup>F/M as kg BOD<sub>5</sub>/kg MLSS, d.

Action in 2011 to Address Filaments

• Automated Aeration - More Uniform D.O.
• Lower SRT to 5 days
Blower VFD’s for D.O. Control
Impact of Process Changes

Monthly Average Effluent TSS, mg/L

Permit limit
Data to Show Results

- Effluent Quality Improved
- College on Summer Break
- Winter of 2011-12 Poor Effluent TSS
Poor Effluent Quality

Monthly Average Effluent TSS, mg/L

SRT-DO Control

Permit limit
The Fly

• Operator Reads TPO Magazine June 2012 –
  – “Where Have All The Solids Gone?” by Ron Trygar, Trainer, Florida TREEO
  – Relates to clarifier observations
    • Clumps
    • Gray shaggy mop heads
  – Midge Fly
Life Cycle of the Midge Fly

- Adult female: 2 days
- Larva: 28 days
- Pupa: 5 - 10 days
- Egg mass: 3 days
Biting Fly
Larvae
Larvae
Larvae
Problem

- Larvae develop sticky cocoon in sludge and walls
- Sludge in clarifier is a sticky mass
  - Anaerobic conditions
  - Filaments related to low DO and Sulfide
- Sludge in large clumps float as straggler floc
Treatment Methods

• Control Adult Fly
  – Low light
  – Keep clean
  – Fog room

• Control Larvae and Eggs
  – Bti (Bacillus thuringiensis) “Aquabac XT3” – Impacts larvae digestive system and dies
  – Methoprene “Strike” - mimics growth hormone
  – Monomolecular Film “Agnigue MMF” - reduces surface tension
Bti

- “Aquabac XT3”— Aquafix located in Madison, WI. Phone 888-757-9577
- Registered by US EPA
  - EPA Registration Number: 62637-1
- Approved by WDNR
Bti Dosage

• Dosage
  – Initially 1 quart to aeration and one to clarifier
  – 8 to 16 oz. per day for two months in summer

• Cost $24/day

• Added to Plant July and August 2012
Impact of Process Changes

Monthly Average Effluent TSS, mg/L

Permit limit

SRT-DO
Control

Add Bti

Jan-10, Apr-10, Jul-10, Oct-10, Jan-11, Apr-11, Jul-11, Oct-11, Jan-12, Apr-12, Jul-12, Oct-12
Results

- Effluent TSS within limits
- Good settling sludge
- Bti addition again June 2013 for two weeks
- No Bti addition in 2014.
Questions

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