Integrated Fixed Film Activated Sludge (IFAS) System for Additional Nitrification at the Coldwater WWTP
Coldwater WWTP

- Owned by Coldwater BPU
- Design Average Flow is 3.2 MGD
  Peak Flow is 8 MGD
- BOD, TSS, Ammonia, Phosphorus, and Pathogen Removal
- Surface Water Discharge
Coldwater WWTP
What Drove Project?

- New discharge permit issued August 2007
- Included seasonal ammonia limits
  - 2 mg/l from May through November
  - Previously was report only
- Routine violations through spring and summer 2007
- BPU hired FTC&H to investigate possible solutions
Reviewed secondary treatment system
- Trickling Filter/Solids Contact (TF/SC) process
- Three, 115 ft. dia \( \times \) trickling filters filled with 7 ft. of cross flow plastic media
- Followed by two parallel 152,000-gallon aeration basins (each 70’ \( \times \) 20’ \( \times \) 14.5’ deep)
Expansion of aeration basins difficult due to high groundwater level at site.

Evaluated expansion of trickling filters
- Discussed options with Brentwood Industries
- Concrete tanks with aluminum domes
- 4th trickling filter would be expensive

Investigated potential for upgrading aeration basins with IFAS media
IFAS Systems

- Submerged media carriers added to activated sludge aeration basins
- Significantly increases biomass inventory
- Little to no increase in solids loading to final clarifiers
- Increases sludge age – good for nitrifying bacteria
- Come in different varieties
IFAS Systems

- Suspended media
  - Poured into aeration basin
  - Moves freely in mixed liquor
  - Retained in basin typically with in-basin screens
  - Various manufacturers
IFAS Systems

- Fixed Media – i.e. AccuFAS IFAS (Brentwood Industries)
Preliminary Design

- BioWin Modeling
  - Used to size aeration requirements and predict effluent quality under various flow scenarios.
    - Both basins in operation
    - One aeration grid out of service
    - One basin in operation, one out of service
### BioWin Results

<table>
<thead>
<tr>
<th>Basin Number(s)</th>
<th>Two Basins - Both at Full Capacity</th>
<th>One Basin at Full Capacity; One Basin with One Aeration Grid Out-of-Service</th>
<th>One Basin Only (To Meet Winter Requirements)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum Influent Ammonia Load per Basin, ppd</td>
<td>#1 and #2</td>
<td>#1 (Full Capacity)</td>
<td>#2 (Reduced Capacity)</td>
</tr>
<tr>
<td>280</td>
<td>280</td>
<td>170</td>
<td>NA</td>
</tr>
<tr>
<td>Total Maximum Influent Ammonia Load, ppd</td>
<td>560</td>
<td>450</td>
<td>400</td>
</tr>
<tr>
<td>Effluent Ammonia per Basin, mg/l</td>
<td>1.3</td>
<td>1.3</td>
<td>2.8</td>
</tr>
<tr>
<td>Combined Effluent Ammonia, mg/l</td>
<td>1.3</td>
<td>2.0</td>
<td>12.0</td>
</tr>
<tr>
<td>Effluent Ammonia Load per Basin, ppd</td>
<td>17</td>
<td>17</td>
<td>37</td>
</tr>
<tr>
<td>Total Effluent Ammonia Load, ppd</td>
<td>34</td>
<td>54</td>
<td>320</td>
</tr>
<tr>
<td>Air Supply Rate per Basin, scfm</td>
<td>1,269</td>
<td>1,269</td>
<td>1,990</td>
</tr>
<tr>
<td>Total Air Supply Rate, scfm</td>
<td>2,538</td>
<td>3,259</td>
<td>1,410</td>
</tr>
</tbody>
</table>

* - Assuming the following trickling filter effluent characteristics and operating conditions: Flowrate = 3.2 mgd; Total BOD = 40 mg/l; TSS = 165 mg/l; Alkalinity (as CaCO₃) = 5 mmol/l; Temperature = 18 degrees C; MLSS = 4,000 – 4,250 mg/l; RAS/Q = 65%
Final Design

- Tank volume was fixed and maximum media fill possible was 60%.
- Existing blowers had a firm capacity of 900 scfm; firm capacity required = 2,538 scfm.
- Redundancy requirements needed to be met for both diffuser and blower capacity.
- Additional blower capacity required – presentation Session 2 at 2:30 pm today.
Final Design
Final Design
Installation
Installation
Installation
Installation
Installation
Installation
Results

Secondary effluent > discharge limit 60 times before IFAS

Secondary effluent > discharge limit 43 times after IFAS startup ...

... 41 of those times were as a result of industrial plant failure
Conclusions

- IFAS can be applied to existing secondary systems to reduce effluent ammonia concentrations.
- IFAS increases sludge age, increasing the total inventory of nitrifiers, without increasing loads to secondary clarifiers.
- These systems are very robust.
- Fixed media IFAS systems (such as the AccuFAS system) can be added without affecting existing hydraulic profiles.
THANK YOU!

Any Questions?