Filaments and Clarifier Bulking

#2

Activated Sludge Plant that was close to having high flow washouts due to filamentous bacteria infestation.
Plant Layout

• Two Plants with the same layout
  – Headworks that serve both plants
  – Plug Flow Activated Sludge
  – Clarification
    • RAS pumped with air lift pump

• Aerobic Digestion
Can-Tex Style Plant
Thick Clarifier Blanket

- Very fluffy blanket
- Hydraulic surge resulted in solids washout
- High SVI (above 200), filaments suspected
- Settleometer, $SSV_{30} = 700$
- Filament positively identified
- Chlorination was chosen as treatment
How much Chlorine

- The Manual on Causes and Control of Activated Sludge Foaming and Bulking and Other Solids Separation Problems, Jenkins, et. al.
- Maintenance dose, 2 lbs Cl$_2$/1000 lbs solids in the system.
- This is the combination of aerator and clarifier solids.
Calculations

• Aerator had 3947 lbs of solids
• Clarifier had 1795 lbs of solids

\[
\frac{5.7 \, (1000 \text{ lbs solids}) \times 2 \, \text{ lbs Cl}_2}{.125 \, (\% \text{ Cl}_2 \text{ in Bleach as decimal}) \times 10 \, \text{ lbs/gal Bleach}} = 9.12 \, \text{ gal}
\]

• 10 gallons per day of 12.5% Bleach is chosen
Another Feeding Detail

• Dr Jenkins recommends that the Cl₂ be dosed in such a way that the mixed liquor receive three doses of Chlorine per day.

• In this plant the return sludge flow was not sufficient to achieve this so an alternative feed location was chosen.

• Bleach is to be feed into the clarifier stilling well
Chlorination System
## Operational Data

<table>
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<tr>
<th>Date</th>
<th>MLSS, mg/L</th>
<th>SSV 30min</th>
<th>SVI</th>
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<td>680</td>
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</table>
SVI Graph

Chlorine dose to 13 gpd

Chlorine dose 10 gpd
Success in One Month

• The SVI declined rapidly at first then slowed.
• A higher dose was chosen 13 gpd.
• SVI dropped to 100 in 30 days.
• The threat of blanket washout was gone.
  – Settleometer values in 30 min., 250
Settling Much Improved
Four Months Latter

• SVI and Settleometer values remain low
• Chlorination system has been dismantled and is now being used for effluent chlorination replacing the gas chlorinators
• Effluent quality is very high.
• Wastewater effluent that looks like a clear mountain stream.
Summary

- Plant operator wanted to prevent a future problem, washouts. He determined the root cause, filaments. Then took careful steps to correct the root cause while closely watching the process control indicator, SVI.