# Causes and Control of Foaming in the Secondary Process

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# Agenda

- Introduction to Foaming
- Types of foam
- Causes of foaming
- Control of foaming in the Secondary Process
- Operational Considerations
- Experiences with Foaming – General Discussion

# Introduction to foaming

- Most Operations personnel think that foam on the surface of an aeration basin means that there is Nocardia present, however; not all plants have foam due to Nocardia- Some may have too many solids or not enough solids, and some low D.O.

- Foam is a mass of small bubbles of gas formed on the surface of a liquid, such as the froth produced by agitating a solution of soap or detergent in water . In the case of activated sludge, it can be several factors that cause foaming. Operational or non-operational problems can lead to all types of foaming.

# Types of Foaming

- Normal Activated Sludge Foam – Normal activated sludge will have a light tan color and cover anywhere from 10 to 25% of the surface of the tank. The bubbles on the surface will disperse quickly.

# Types of Foaming (cont)

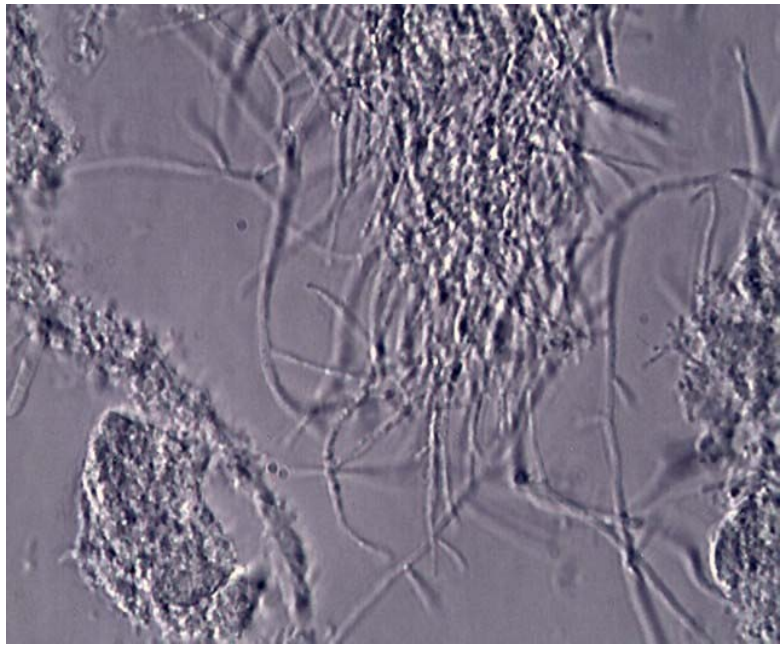
- Normal Activated Sludge – Oxidation Ditch and Complete Mix

# Types of Foaming (cont)

- Stiff White Foam – Stiff white, billowing foam, indicating a young sludge (low MCRT) is usually found in a new plant or an overloaded plant.

# Types of Foam (cont)

- Heavy Brown Foam – A heavy dark scummy foam is typical in plants that practice sludge re-aeration. the scummy dark foam indicates an older sludge and can result is other problems downstream of the aeration tank. There could also be a presence of Nocardia in the sludge.



# Types of Foam (cont)

- M parvicella foam - Stable dark brown greasy foam that can get thick enough to have a crust- plant with Microthrix problems due to grease problems in the lift stations, or collection systems.

# Types of Foam (cont)

- Other foaming – Foam can be caused by an industrial user who is overloading the facility.

# Types of Foaming (cont)

- Foaming from Septicity – Foam can be caused from septic condition throughout the municipality.

# Causes of Foaming

- Causes of Stiff White Foam - Stiff white, billowing foam, indicating a young sludge (low MCRT) is found in either a new plant or an overloaded plant. This means that the MLSS concentration is low and the FM is high. Some probable causes of a stiff white foam include:
  - Activated sludge not being returned to the aeration tank
  - Low MLSS resulting from process start-up
  - Low MLSS for the current organic loading, caused by excessive wasting of activated sludge or high organic load from an industry. Most prominent during weekends.
  - The presence of unfavorable conditions in the activated sludge system, such as toxic conditions (pH below 6.5 or above 9.0), insufficient DO, nutrient deficiencies, or seasonal (winter/summer) temperatures.
  - Unintentional loss of solids from the secondary clarifier
    - *Excessive or shock hydraulic loads*
    - *Biological Upset*
    - *High sludge blanket in secondary clarifier resulting in solids washout*
    - *Mechanical deficiencies in the secondary clarifier (leaking seals, open de-watering valves)*
    - *Improper distribution of flows or solids loadings to multiple clarifiers.*

# Causes of Foaming (cont)

- Causes of Excessive Brown Foam – These types of foams are usually associated with plants operating at low loading range. Plants designed to nitrify and operating in the nitrification mode will normally have low to moderate amounts of dark brown foam. (BNR Plants)

  Plants with filamentous organisms Nocardia will have a strong greasy dark tan foam that will carry over onto the clarifier surface. Scum containing filamentous organisms should be wasted from the system rather than returned to the aeration tank.

  A heavy dark brown greasy foam is usually normal while operating in the re-aeration mode of operation.

# Causes of Foaming (cont)

Thick scummy dark brown foam indicates an old sludge (high MCRT) and can result in additional problems in the clarifier by building up behind the influent baffles and creating a scum disposal problem as shown below:

# Causes of Foaming (cont)

Some probable causes of excessive Brown Foaming problems include the following:

- Aeration tank is being operated at a low FM, possible because nitrification is required by the regulatory agency.
- Build-up of a high MLSS concentration as a result of insufficient sludge wasting. This condition could unintentionally occur between the winter and summer seasons when wastewater temperatures change, which effects microorganism growth and activity.
- Operating in sludge re-aeration mode.
- Improper wasting control program

# Controlling Foam in the Secondary Process

- Controlling a Stiff White Foam – The following measures can be tried when applicable to correct the foaming problem:
  - Verify that the return sludge is flowing to the aeration tank. Maintain a sufficient return sludge rate to keep secondary clarifier blanket to normal levels (1ft to 3 ft).
  - Stop wasting activated sludge for a short time to build the MLSS levels back up and MCRT to desired range.
  - Control air flow rates to control DO in the 1.0 to 3.0 mg/l range. Foaming may persist longer with fine bubble aeration compared to course bubble aeration.
  - Consider hauling in seed activated sludge if warranted
  - Actively enforce sewer use ordinances to avoid process upset and deterioration of the secondary system. Check out the distribution of return sludge, and influent into the basin for proper flow split.
  - If flow meters are not provided, visually check the return sludge flow and compare to the following:
    - *The sludge blanket levels in each clarifier*
    - *The return sludge TSS concentration from each clarifier*
    - *The MLSS concentration in each aeration tank.*

# Controlling Foam in the Secondary Process

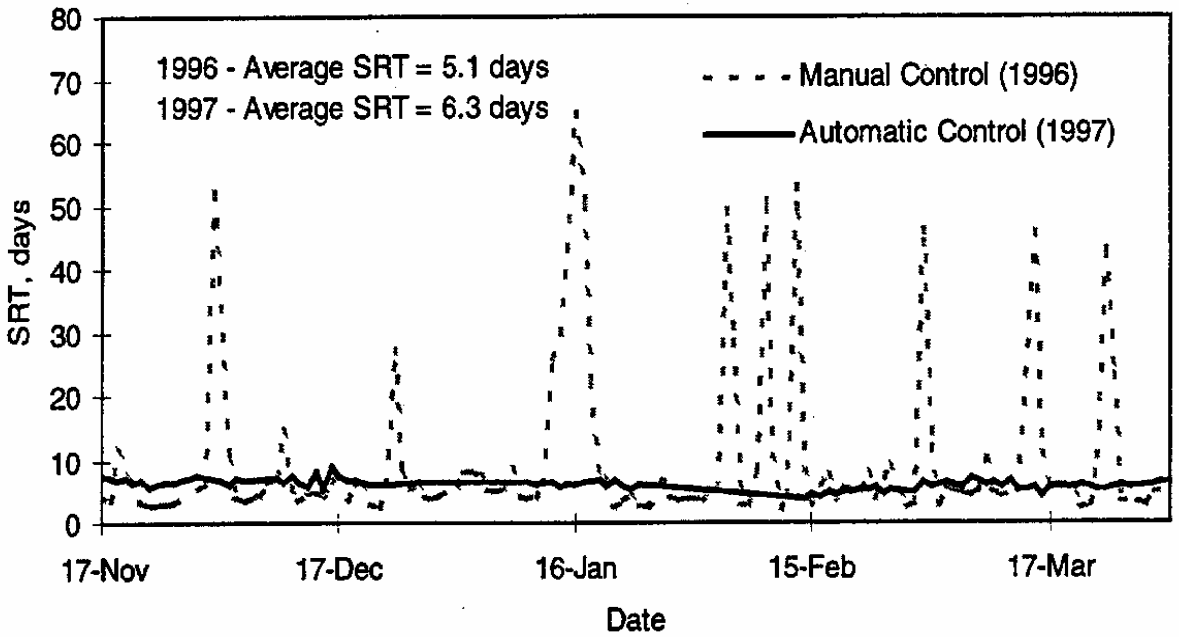
- Controlling Excessive Brown Foam - The following measures can be tried when applicable to correct the foaming problem:
  - If nitrification is not required, gradually increase the F/M and decrease the MCRT.
  - If the scum is not returned to the aeration tanks, include the volatile solids removed in the scum in the waste sludge calculations. During normal operation, the amount of volatile solids removed with the scum is to small to matter. However during periods of high foam, 10 to 15% of the solids may be removed with the scum.
  - If filaments appear, try to identify the cause. There are several books on the market that will help you identify the type of filament and how to control it. A microscope is a must in identification of filaments.

# Controlling Foam in the Secondary Process

- Nocardia foaming – Nocardia can cause issues from foaming.

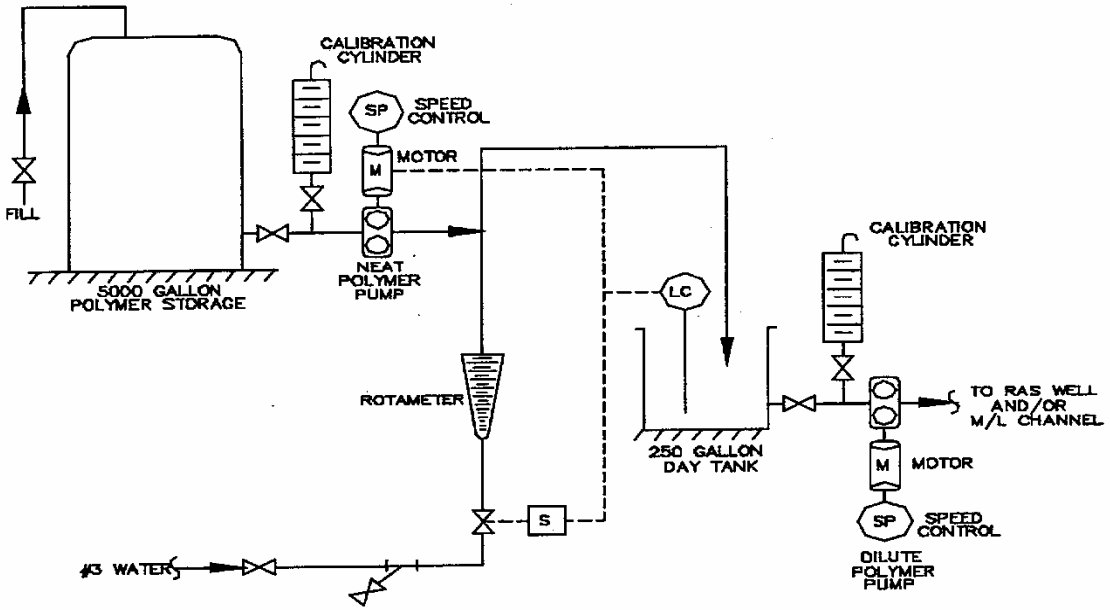
# Operational Considerations

- There are several Operational Considerations that can be done to help control filamentous foaming
  - Automatic SRT Control
    - *Consider installing a SRT meter for automatic wasting. (San Jose, CA)*



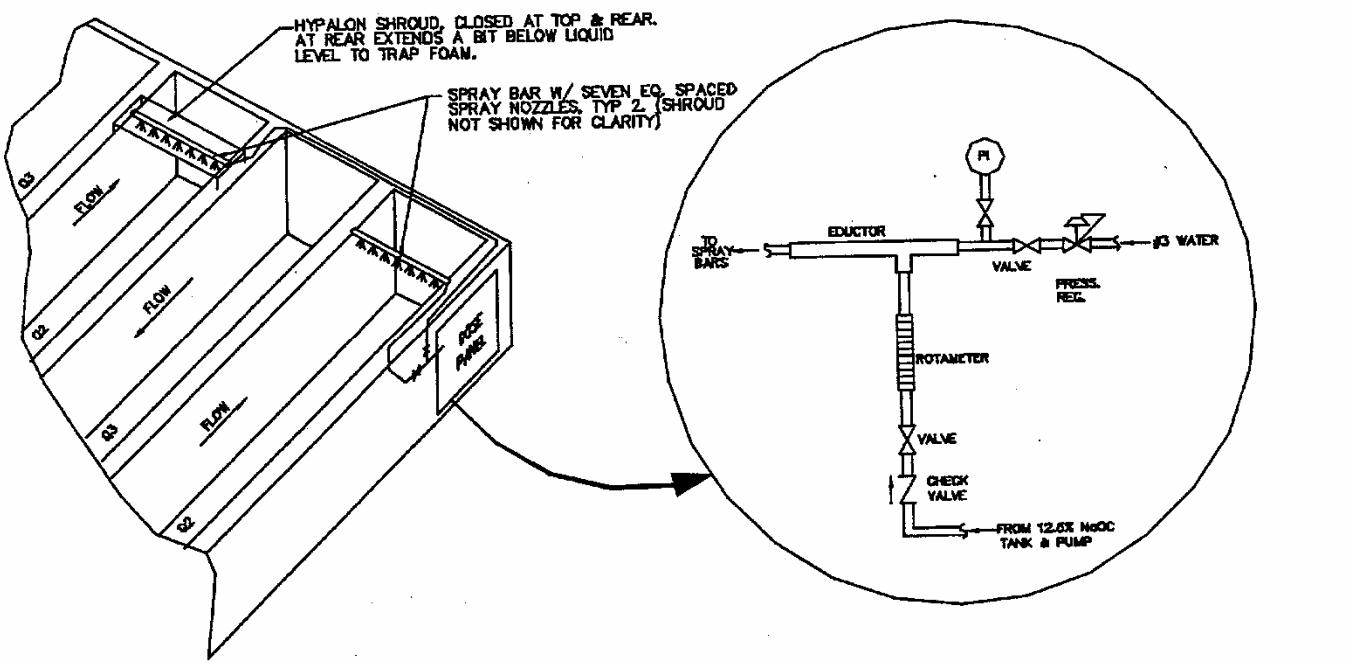
# Operational Considerations (cont)

- Chemical Addition – Chemicals can be used to help control foam, but special attention to the process must be completed or the process could have adverse effects.
  - Polymer addition - Adding polymer to the RAS or MLSS will incorporate the foam into the MLSS, and then it can be wasted out of the system.



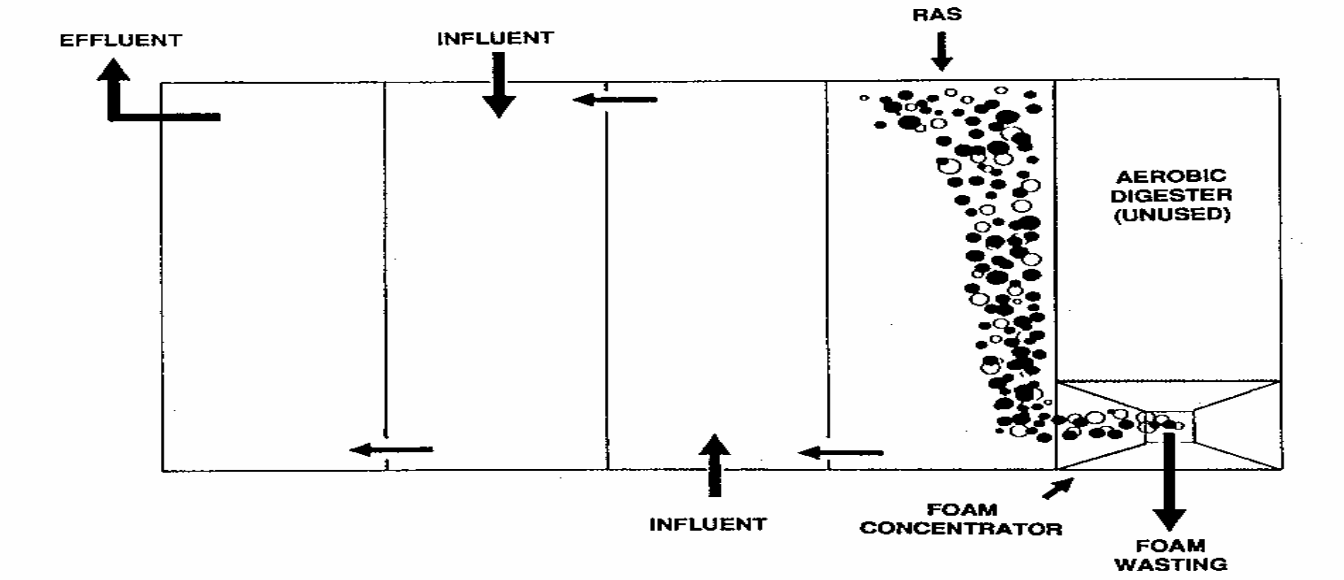
# Operational Considerations (cont)

- Chlorine solution of either Gas or Sodium Hypochlorite can help with foaming if applied right. Incorporating the solution into the RAS will help control filamentous organisms but not control foaming. Spraying a solution on the surface of the aeration tank will help control foam.



# Operational Considerations (cont)

- Antifoaming agents - The application of antifoaming agents is a rather costly and uncertain method, because the biological foams are much more stable than the foams against which the commercial antifoams were developed.
- Skimming the foam – Skimming the foam to a place to get rid of it would help.



# Operational Considerations (cont)

- Use of water sprays – The use of water sprays do help in the fight with foam if properly positioned in the right spots. A sprinkler on the aeration basin can also help.
- Submerged and surface overflows – Submerged aeration basin gates can contain foam from exiting to the secondary clarifier. This makes getting rid of foam much more difficult. Surface overflows out of the aeration basin can help get foam to the secondary clarifier and then skimmed off the surface.
- Impacts on Digestion – Foam generated from the secondary process, especially Norcardia foaming can present many issues in a digestion system. Foam can overflow a digester on the ground, cause volume issues, gas piping issues, and digester operations. to correct digester foaming, the secondary process must be corrected of nocardia in the system.

# General Discussion

What experiences have you had with foaming and what did you do to control it?

Questions?