

# Filaments:

## MONITORING AND TREATMENT



by James Barnes

In my travels around the state these past few months I've come across a few activated sludge plants that were struggling with filamentous bacteria. Since I've found these few, I would imagine there might be more out there dealing with the same problem. If so, I'm hopeful that this article might help someone. I've been dealing with filaments for many years now, so seeing them in abundance doesn't scare me anymore, but I can easily recall how terrifying they can be when you're not sure what to do.

First of all, filaments are not always bad. It's the filamentous growths that are the backbone for floc development. It's only when the filaments grow out beyond the floc and eventually attach to other floc particles (bridging) that they cause us problems. As far as I know, the only reason we, as operators, shouldn't allow this to happen is because at some point in any activated sludge plant I've ever seen, we need to have our solids settle to remove the clear water. If we allow the filaments to grow wild, settling can become so poor that before you know it we have solids coming over the weirs.

What causes these filaments to grow beyond the floc? Many books have been written on this question and even if I was an expert on the subject (I'm not) there isn't room in this article to begin addressing it. Suffice it to say, the bacteria that we work with seem to like boredom. Anything out of the norm; swings in temperature, dissolved oxygen, food, and toxic loads seem to promote too many filaments.

There are two ways in which to monitor your filaments. The first one is very simple and doesn't require any math. All it requires is a microscope and five minutes each day. If you're operating an activated sludge plant and don't have a microscope, you need to acquire one. You need to be monitoring your indicator organisms and your filaments on a regular basis. They should never be allowed to get so out of control that when you do decide to brush the dust off your microscope and take a look at your mixed liquor, you see more hair-like objects (filaments) than anything else. One other thing, you don't have to be concerned so much with the TYPE of filament that you have. It's enough to know that you're getting too many, which means you'll also see your settling slowing down. This leads to the second way to monitor filaments. This one involves a little math. It's called Sludge Volume Index (S.V.I.). If you're not familiar with this, it involves two tests that you should already be running; MLSS and 30 minute Settleability. The math is:  $30 \text{ min. Sett.} / 2000 = \% \text{Sett.Solids}$ . Then,  $\text{SVI} = \% \text{Sett.Solids}$

$\times 1,000,000 / \text{MLSS}$ . This works as long as you're using a 2000ml settleometer. Good settling mixed liquor should have a SVI around 150. From my experience, if the SVI drops below 100, you're settling too fast and you will have a cloudy supernatant. If you allow the SVI to get up around 200 you might not be settling fast enough to keep your solids in the clarifiers when you have that next rain event. Keep in mind these numbers are only from my limited experience. All plants are different and I would never try to tell you exactly where to run yours.

Now, let's assume you've done your monitoring and you've determined that you have too many filaments. Let's see how we can get rid of them. I only know of two ways to get rid of filaments. The one way is to waste, waste, waste and then waste some more. Now for most of you this just isn't feasible or cost effective. The preferred method is to add sodium hypochlorite (bleach). For our purposes let's assume the concentration is 12%. The trick is to add enough bleach to kill off some filaments without killing the other bacteria. I believe in keeping things as simple as possible, so following is a formula that involves adding 10-ppm bleach to the MLSS volume under aeration. I've used this for many years with good results:

- I) aeration volume MG  $\times 10 \text{ ppm} \times 8.34 = \text{lbs of bleach}$
- II)  $\text{lbs of bleach} / .12 = \text{lbs of 12\% bleach}$
- III)  $\text{lbs of 12\% bleach} / 8.34 = \text{gallons of 12\% bleach / day}$
- IV)  $\text{gallons of 12\% bleach / day} \times 2.6 = \text{ml / minute}$

This gives you millimeters / minute of 12% bleach to add to your system. Many will tell you to add this to the return sludge stream. I've had better results dividing the dosage in half and adding it to two different locations directly into the aeration basin at points where there is good mixing. Whichever you choose, it's important to continue monitoring the microscope and SVI. You can sometimes see the filaments breaking into pieces and eventually dissipating. This bleaching will often cause the effluent to become cloudy and the operator to be very nervous. If you stay committed you'll come through this period happy and relieved, with a good settling mixed liquor and a clear supernatant.

I hope this helps someone. If you have any questions, don't hesitate to call me. 💧