

The Wastewater Insight

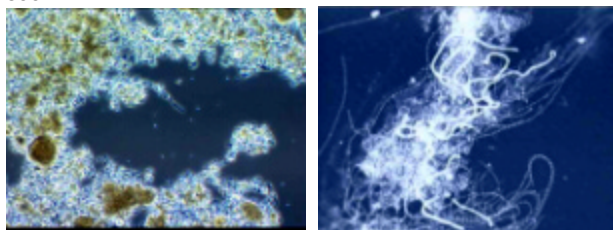


FILAMENTOUS BACTERIA

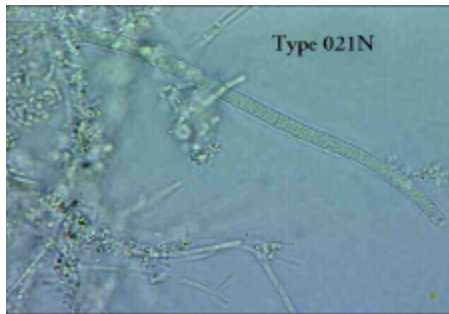
I don't have filaments at my plant You might want to check again.

A common misnomer in many wastewater treatment plants is that unless they have filaments that are bridging and they can see them between the floc structures, they do not have problem filaments. In reality, internal bulking can cause more problems than slight bridging.

Magnification of filaments is the easiest way to tell the difference. Many plants only use low power, 40x or 100x. Go up to a higher magnification. You might be surprised at what you see.



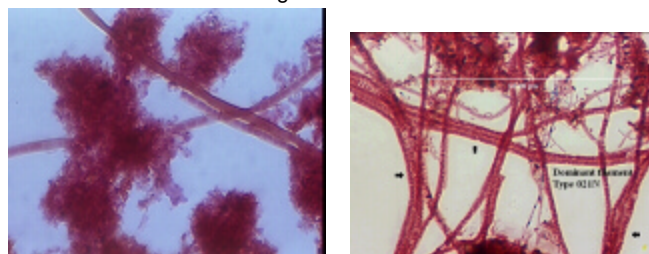
At 100x the floc looks pretty compact and some nice golden color. When you blow it up, you see that the majority of the floc is filaments.



At 1000x, you can even see the cells on the filaments.

Well what is the difference between bulking or bridging?

Bridging is when the filaments are external to the normal floc structure and cause a bridge between the floc structures.

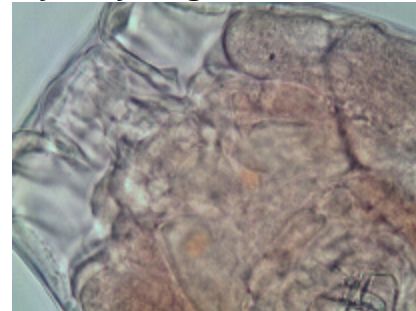


These are examples of filaments that are external to the floc structures and are bridging the floc particles.

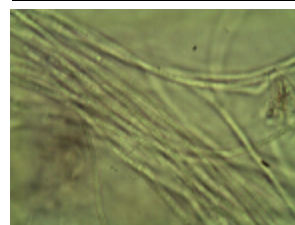
Low levels vs. Abundant to Excessive levels

MYSTERY BUG OF THE MONTH

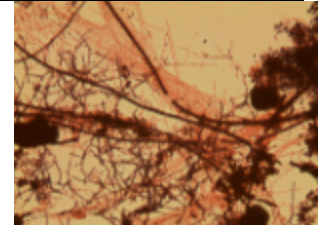
We started this month out with a new **Mystery Bug of the month!**



Check out our website for more photos of our new mystery bug!!!! WWW.EnvironmentalLeverage.com



1000x Bright Field
bridging and internal



1000x Gram Stains-

Most operators are well aware of bridging and this is usually what is thought of for filamentous problems. But you need to check again. While bridging can cause settling issues in the clarifier, technically it is a bit easier to dewater bridging filaments, unless they are too excessive, than internal filaments.

Sometimes you need to go to a much higher level on the microscope objective.

Staining the sample helps, but some skill is required. A quick and dirty way to help bring out some of the fine details on the sample without having to go to all the trouble of drying a slide and going through all the difficulties of staining is to use Lactophenol Cotton Blue stain. It can be purchased at VWR, USA Bluebook, Fisher, Scientific or any of your favorite supply chains. Use the stain along with one drop of wastewater on the slide. The stain will

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Bug Of the Month

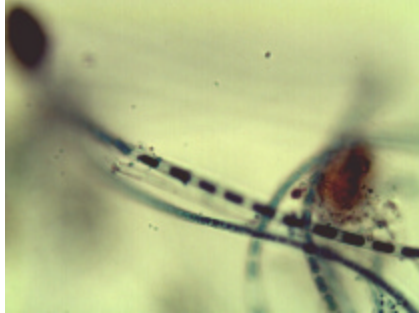
Filamentous Bacteria

WEFTEC

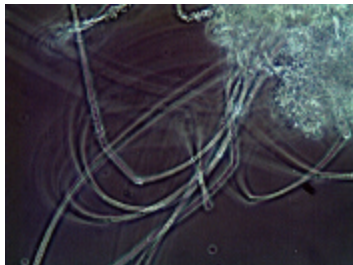
Thanks to Des Moines

New Websites

help bring out any fine details, internal filaments, and characteristics such as sheath, cell walls or shape and size.



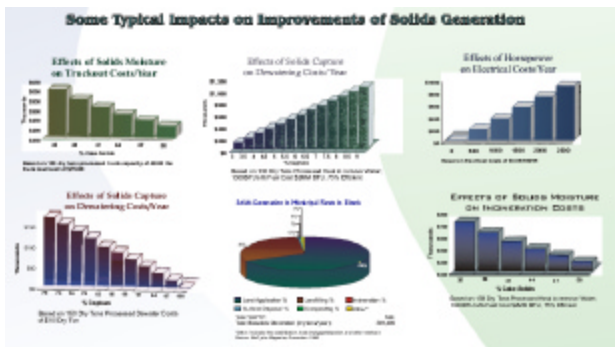
*****Note-** if you use this stain, all the higher life forms will slow down and die. Do not worry, that is supposed to happen. Just keep it in mind if doing a wastewater biomass analyses and make sure to use a normal sample when checking higher life forms for count and identification. This stain will make it easier to spot higher life forms and to photograph them since it does slow them down.



Sometimes, just using phase contrast or dark field can bring out the filaments more so you can see them.

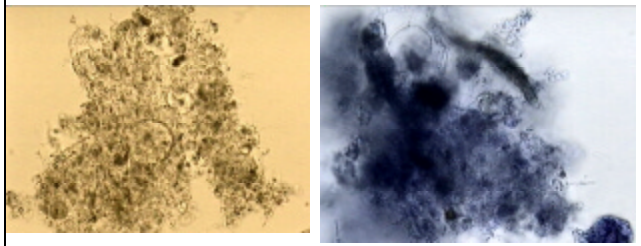
Internal bulking is when

the filaments are inside the floc structure and make up a backbone for the floc. In a small amount, internal filaments are a great plus. They help keep the floc together, help avoid shear and give stability to the floc. Filaments are good BOD degraders, they just take up too much space compared to floc formers. In large amounts, they can create a floc that is more like a sponge. It is very hard to dewater and compress. It can take large amounts of polymer to get the floc to settle in the clarifier. Solids can build up. Carryover or washout can occur quite easily. Polymer consumption on a belt press can increase. Solids dewatering is harder to achieve. Dryer cake solids are harder to achieve. With solids handling costs on the rise and a big part of a budget at any wastewater treatment plant, filaments can add a significant chunk to any budget.

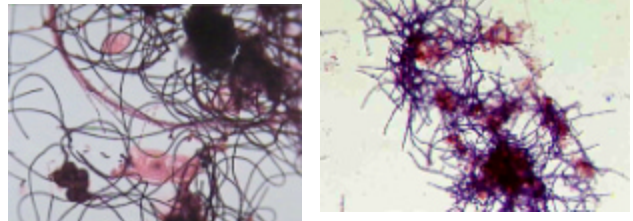
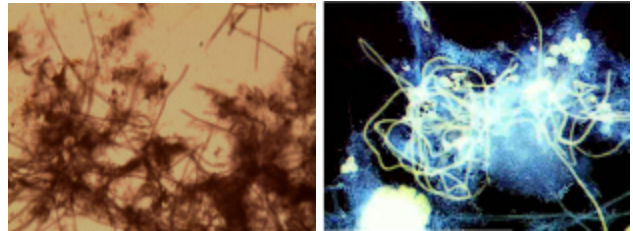


Internal filaments are very common, often overlooked and ignored and yet many operators or supervisors of wastewater plants cannot figure out why they have too many solids, overloading or problems and high costs with solids handling.

Look closer, use stains or call your local lab to help you with an identification or training.

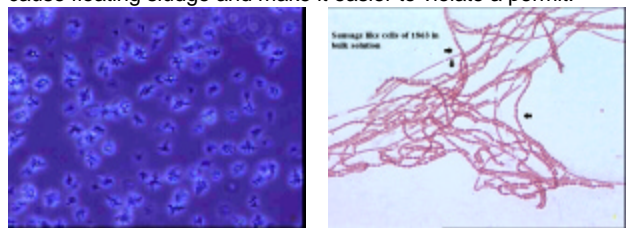


Examples of floc with low levels, medium levels or excessive levels of filaments



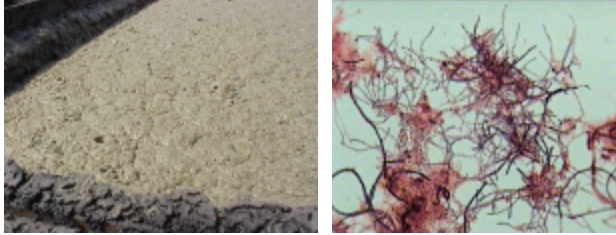
When there are excessive levels of filaments, chlorination or peroxide will take forever to burn off these filaments. It is actually better to find out the cause, make a process change, slowly waste alongside chlorination and reseed with a commercial product if necessary. Otherwise, it could take 6 months to a year to make these filaments go away. A process change is always necessary, even if heavy chlorination is used. If the condition that caused the filaments to grow does not change, the filaments will always come back. Technically, filaments are good BOD degraders, they just cause too many solids, dewatering problems and bulking in the clarifier, so it costs more to have these types of bacteria in your system. Another thing to be wary of, many plants, especially municipalities now have to worry about nutrient removal. Many of the filaments do not have the luxury uptake of nutrients like some of the floc formers.

Wait, there also can be **Free floating filaments**. These can cause TSS problems. They can cause floating sludge and make it easier to violate a permit.

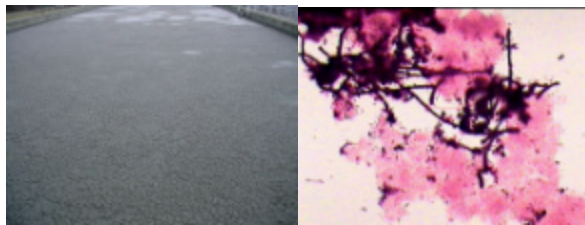


Filaments can also cause foaming.

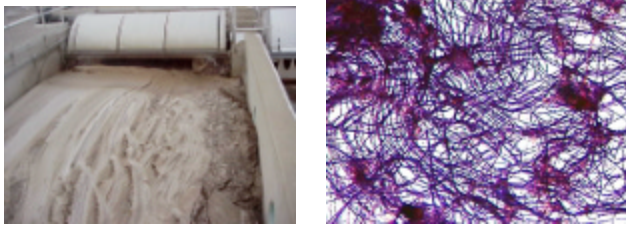
Foaming can be caused by *Nocardia* and *Microthrix* to a point that controlling the plant becomes very difficult. Type 1863 can also cause foaming. We have seen *N. limicola* cause foaming as well as Type 0914.



Nocardia Foaming



Zoogleal foaming



Foaming due to septicity

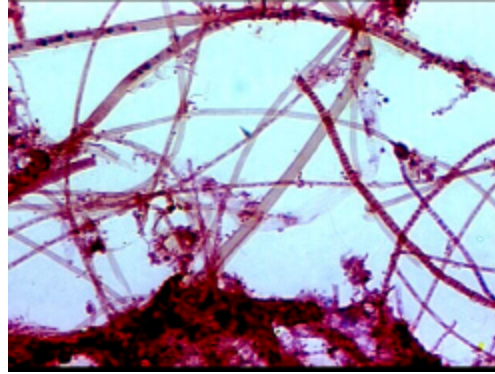


Foaming due to *M. parvicella*

Without using the microscope, you would not be able to tell just by looking at the foam, which filaments were present. Each of these plants had foaming, but different process changes needed to be made. Zooglea foam was due to industry at a municipal and they actually had to add ammonia to the plant.

Septicity is due to solids handling issues. *Nocardia* was grease, so a program to treat grease upstream and optimize primaries helped that plant. Not all filaments can be controlled the same way. Different causes require different controls and areas to focus on.

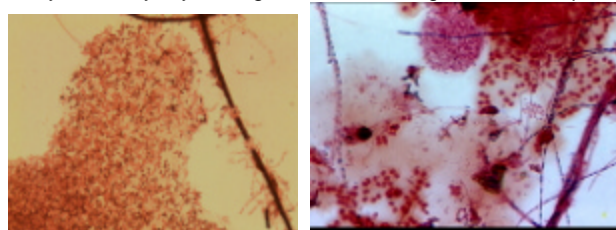
Chlorination vs. Spray and process changes



Some filaments have a sheath. When you chlorinate, you may kill the internal cells, but it still will take 2-3 sludge ages to waste out the sheath that remains.

Chlorine is a strong oxidizing agent, and non-selective, so it will kill your filaments as well as your floc if in high enough concentration. The best way to use chlorine is to add it 2-3 times in the RAS line per day. Also certain filaments are more susceptible to Chlorine than others. *Nocardia* is very hard to kill with chlorine. You need to spray the chlorine on the surface of the aeration basin or the clarifier. Adding chlorine to the RAS will not work, since most of your *Nocardia* is floating on the surface and not in the RAS.

DO NOT ADD CHLORINE to zooglear bulking. If you have slime due to septicity or nutrient deficiency and try to chlorinate, you will only double or triple the slime. The slime or excess polysaccharide coating is formed by the bacteria due to stress conditions. If you stress them out more with chlorine, they will produce more slime, not die off. Instead, find out why they are there and make a process change. Adding nutrients will make them go away quickly if that is the cause. We had a plant that had turned the entire clarifier to jelly and were hauling sludge away each day. By adding nutrients, overnight it cleared up.



Some plants use effluent water in the clarifier or centerwell to weigh down the filaments, knock off any air bubbles that cause

the sludge to rise to the surface and physically help them to waste out the sludge.



Other plants use water or the miss in the aeration basin to knock down the foam.

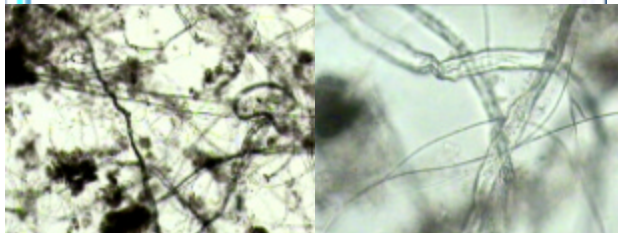
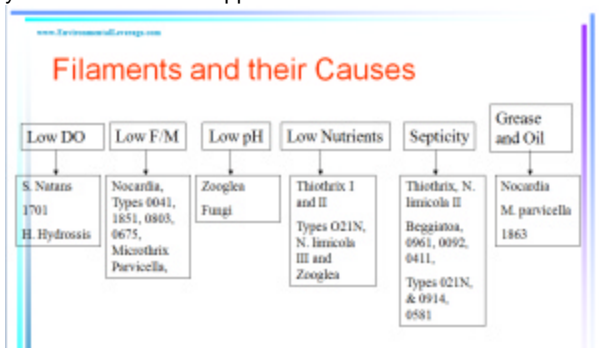
These can short term help with a foaming situation while you are making process changes or help with equipment shortchanges that cannot be avoided.

Anaerobic vs. Facultative vs. Aerobic

It was thought in the past that all filaments except for *N. limicola* are strict aerobes. That is turning out to be false. Many species have been found to thrive in anaerobic reactors. *Nocardia*, *M. parvicella*, 1851, *Thiothrix* are just a few, so obviously they cannot be strict aerobes. Also selectors, which were designed to kill filaments since they are strict aerobes do not work, since all they do is create a low D.O. environment and more filaments grow instead.

Types of filaments and causes and controls

There are only 23 major categories of filaments and only so many causes. If you look closely, many of the causes and controls get back to your critical 5, regardless of the piece of equipment, from the lift station down to the dewatering. Check those variables throughout your system, usually many of your filaments will disappear.



Fiber and fungi 100x and 400x

Fiber that can make it thru the system due to breaks in screening or fungi due to low pH are worse than filaments.

Filaments tend to make your floc like a sponge that holds water and does not want to compress. Fiber and fungi make it more like

a steel wool pad that really does not want to compress during settling or dewatering.

Lab Testing

Contact Environmental Leverage about a Filamentous Identification if you do not have the capabilities at your own lab. Contact our lab at- 630-906-9791- to set up sampling.

What will I need to send in?

Send in 100 mls of MLSS in a small, plastic bottle with at least 1-2 inches of headspace in the bottle. Seal the bottle carefully. Send overnight by UPS, Fed ex- etc. If possible, pack with blue ice to keep refrigerated. Ship to 812 Dogwood Drive Suite A North Aurora, IL 60542 Attn: Laurie

What will the analyses contain:

The Standard Wastewater biomass Analyses will contain a cover letter with comments, recommendations and troubleshooting tips. Additional training materials may be included if conditions at the plant require it. A Higher life form sheet will be included as well as a floc structure analyses. A CD with photos and videos of your biomass is included. This analyses costs \$250.00

A Wastewater Biomass Analyses with Filamentous Identification including Gram and Neisser stains, as well as the above standard analyses costs \$350.00

We would like to tanks Des Moines WRA Wastewater Reclamation Facility for hosting our Two Day Hands on Seminar

It was sold out and we have a waiting list. They did decide to schedule a second class in the spring. Stay tuned to coming monthly newsletters for more details. Activated Sludge Process Control September 23rd and 24th 2008

Des Moines WRA Wastewater Reclamation Facility
3000 Vandalia Road
Des Moines, IA 50317-1346
Office: 515-323-8130
Cell: 515-313-1159
Email: semoehlmann@dmgov.org
Web: www.dmmwra.org



WEFTEC.08 on the Horizon
McCormick Place · Chicago, Illinois

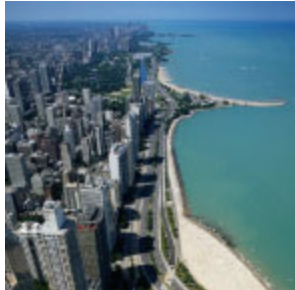
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Conference: October 18-22, 2008

Exhibition: October 19-22, 2008

Come join us at WEFTEC this year. We will have a booth.
#30180 Hall B Hope to see you there.

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<http://www.wefnet.org/weftec/VIPInvitation/index.asp>

This invitation is only valid for complimentary registration on Wednesday, October 22.

For registration locations and hours or more information on WEFTEC, visit www.weftec.org.

Misc. websites



We found a new website with a filamentous ID Key
<http://www.asissludge.com/>

The key is ok, but a little confusing
But there are some great photos and info on plants, filaments, troubleshooting, etc

<http://www.microscopeworld.com/MSWorld/publicresources.aspx>



Information on many topics relating to microscopy and the use of a microscope.

Environmental Leverage Inc. offers consulting services, beneficial reuse, training and bioaugmentation programs that can help reduce your surcharges.

Contact our office today to find out how you can start saving money and become more efficient at your plant!!! Many times we have suggested articles for the next months issues. Sometimes we change what we will be featuring based upon critical issues that surface during our contacts with our customers. We hope this does not inconvenience you. If you have a specific topic you are interested and do not want to wait to see if it shows up in our newsletters, call us direct. We do have over 20 gigabytes of information on file on every subject around on water and waste issues.

COMING IN THE NEXT MONTHS

Winter impact on wastewater treatment plants