December 2017

The Wastewater Insight

Environmental Leverage INC.

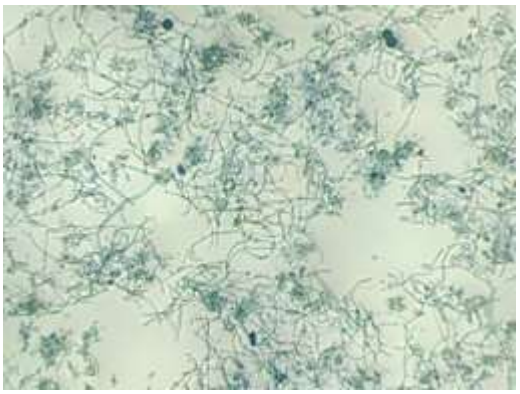
Turning Liabilities into Leverage

Foaming, what is the cause and the correct process control

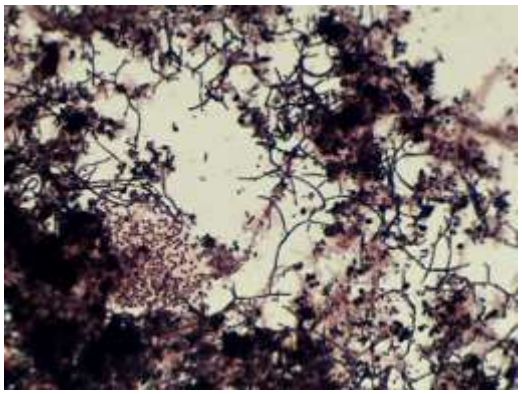
The general rule of thumb in the past always seemed to be if you had dark foaming you had Nocardia. We teach people to not only look at the MLSS, but look at the foam as well. Many times the majority of some of the free floating filaments may be in extremely high levels in the foam, but low levels in the MLSS, so often overlooked.

Here is a perfect example of a plant.

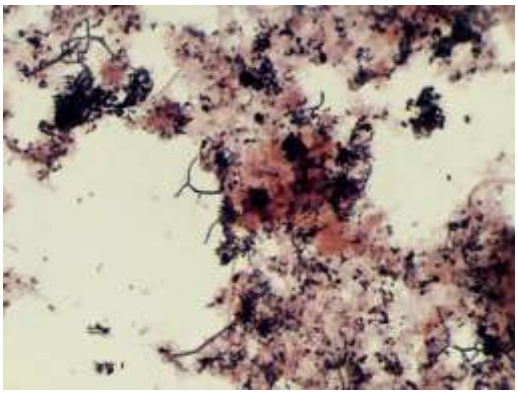
These stains are of the foam. You may have to dilute the foam in order to see what is there, but keep your dilution ratio in mind when interpreting changes and results.

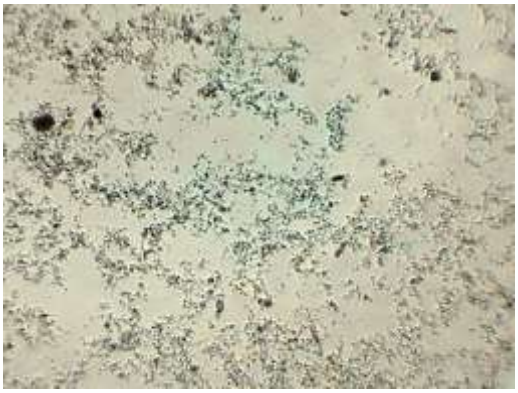


High levels of Nocardia even when diluted.



Notice the zooglea as well on the gram stain?





MLSS sample- Some Nocardia present but not the high levels shown in the foam.

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!!!!

EnvironmentalLeverage.com

Always pull a sample of your foam if you have stable foam. Usually white crisp foam is young, but any other colors can be many different causes and controls. Don't just assume, use your microscope to make the correct interpretations and the proper process controls.

Here are the typical old charts used to guess at the problem and process controls.

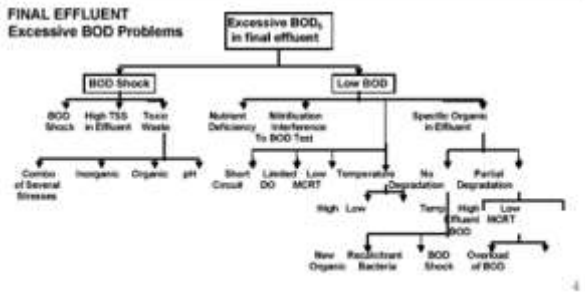
The problems with this is that all foam is not alike. Not all foam is bad- but it usually indicates a condition that is going on in your basin- learn what the colors mean. . .

The fix here is to adjust nutrients. One case it was a municipal with industry that just sent them a high slug of organics from a beverage facility. N and P levels were low, mainly N. Rather than go out and purchase some nutrients, we told them to decant some of their supernatant off their aerobic digester back to the head of the plant short term to try to use some of their own excess nutrients and only supplement if needed.

The second case was a pig farm which had low nutrients as well as low pH, as you can see by the fungi. pH adjustment was required as well. Neither case definitely was Nocardia or grease though.

Troubleshooting Secondary Wastewater Treatment Systems:
Activated Sludge Systems:
AERATION BASIN
Foaming Problems - continued:

PROBLEM	PROBABLE CAUSE	CORRECTIVE ACTION
Thick, greasy dark-tan foam covering most of the aeration basin surface, and carries over to the clarifier (and sometimes over the basin sidewalls).	Filamentous organisms (Nocardia, M. parvicella)	Increase WAS rate (not more than 10% per day) to reduce MCRT. Normal filamentous control with chlorine or peroxide must include treatment (in water spray) and removal of surface scum (foam) in addition to RASS/MLSS as these organisms tend to concentrate in the foam. Check MLVSS and F/M ratio to optimize process parameters.
Dark brown,almost black sudsy foam with detectable septic or sour odor. Mixed liquor is also very dark brown to black in color.	a) Anaerobic conditions within the aeration basin. b) Industrial waste containing dyes or inks.	a) Check DO levels in basin, and increase aeration / mixing. Reduce organic loading if possible. b) Investigate pre-treatment strategies.
Modest amount of fresh, light tan foam.	Not a problem! Usually a sign of a well operated process.	"If it ain't broke, don't fix it!"



We are going to compare 4 different scenarios that we encountered at different plants. All of these had thick brown foam.

By using the microscope we were able to help each plant with the correct process control instead of just guessing at what the problem was

Here is scenario #1 There is slimy brown foam on the surface at these plants.

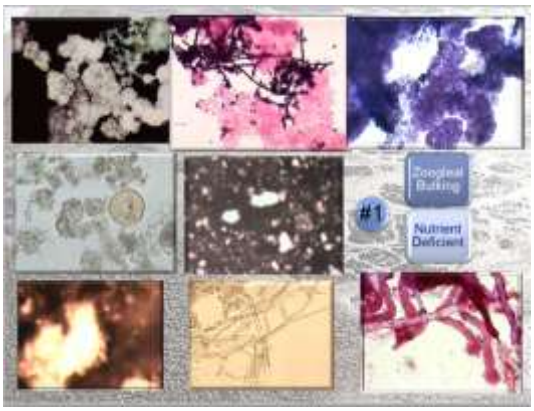
Plant #1 actually had zoogleal bulking. Under the microscope you can see the zooglea. This is due to high organic loading and low nutrients

All dark brown foam does not mean Nocardia. It can be due to zooglea, M. parvicella, septicity, nutrient deficiency, low pH, etc.

There are only so many conditions that can cause the growth of filamentous bacteria. Usually something is not quite right at the plant or upstream.

These conditions are:

Low Dissolved Oxygen	**Low F/M**
Septicity	**Low pH**
Low nutrients	**Grease and oil**



Notice any correlations to the "critical 5"?

Looking at the surface of the aeration basin cannot really tell you what is causing your foam. Here are examples of plants and why we want you to use the microscope instead.

The second case was a pig farm which had low nutrients as well as low pH, as you can see by the fungi. pH adjustment was required as well. Neither case definitely was Nocardia or grease though.

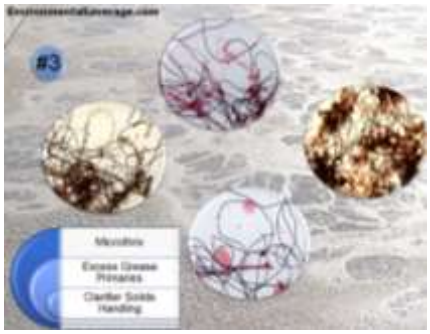
#2 was a municipality with high levels of grease as well as septicity due to holding solids too long in the primary as well as the secondary.

Primary grease and clarifier solids recommendations were to remove solids quicker. Lowering DO in the digestor by using on/off air caused septicity issues and was discontinued. The small amount of savings for pH adjustment did not account for the significant increase in solids and dewatering costs. Clarifier solids were moved out of the clarifier more quickly, either to the RAS or WAS depending upon influent loading and sludge age was calculated by the microscope now instead. Primary grease control was monitored and adjusted faster. Primary was skimmed more often. Nocardia was the main filament here and excess grease was the issue. Returning supernatant to increase N and P in this case would not have helped.

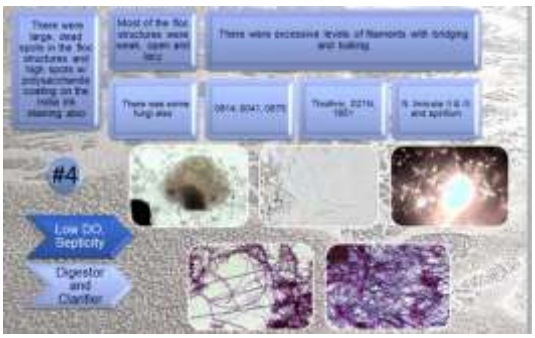
#3 had a problem with M. parvicella

Excess grease in the primaries and holding solids too long in the clarifier were some of the main issues. This was a smaller plant and only ran 5 days a week. Grease would build up on the primary skimmers. Grease also was sent from the primary to the digestor.

By modifying the grease removal program, basically by taking ~ A 5 gallon bucket a day of grease off the primary and sending to the landfill instead, made the equivalent of 1-2 truckloads of dewatered sludge difference each month!



#4 was completely different causes and process controls in order to solve the problem. This was a brand new facility- an oxidation ditch. We pulled a sample and looked under the microscope. There were large, dead spots in the floc structures and high spots w/ polysaccharide coating on the India ink staining also. Most of the floc structures were weak, open and lacy. There was some fungi present also. There were excessive levels of filaments with bridging and bulking: Types 0914, 0041, 0675, Thiothrix, 021N, 1851, N. limicola II & III and Spirillum.



Solids handling was the only issue here. They were holding solids too long in the clarifier initially. Solids started to build. Digestor decant time was up to two days with the air off since it would not settle or decant.

Short term, the digestor was hit heavy with chlorine to kill the filaments so

the solids could be wasted out of the system. Clarifier bed depths were adjusted until no ashing or gassing was visible. This plant did not have problems with grease. Did not have problems with N and P or pH control. Simply solids handling issues and new employee training

Check your critical 5 at your plant. Most of the filaments are usually due to one of the Critical 5 or grease and oils.

Don't just use chlorine. It is a temporary bandaid. If you don't make the correct process control, they will just come back. If you have zooglea, you will actually make things worse.

Overall Your wastewater treatment plant is a Bug Factory. Look under the microscope! It is the most powerful tool you have to run your plant! 10 minutes a day is all it takes once you get practice! Be proactive vs. reactive. Significant cost savings can easily be achieved and it will be easier to run!!

Make sure what is causing your foam. Make sure what the correct filaments are. Make sure to perform the correct process control to permanently remove the filaments.

If you need help with microscope work or filamentous ID, you can always contact our lab.

Product Corner

Appling bioaugmentation MicroBlocks, liquid or free flowing powdered bacteria can keep your system clear of these issues. Biological products offer a more efficient alternative to chemicals. They actually degrade the grease and organics at the source while significantly reducing malodors. The bacteria also will help breakdown amines and organics.

There are tons of issues with collection systems, lift stations, wet wells and wastewater treatment plants. We have staff that can help you with product application. We are always a phone call or email away to assist. With this information you can think of some possible things that might be going on in your system and a few options that are available to you besides constant maintenance and chemicals. Sometimes a small amount of preventative maintenance or proactive treatment can eliminate some of the repetitive maintenance.

Check out our new Elearning Website www.WastewaterElearning.com/elearning

All new training classes have been approved in more states. More to come

These courses have been pre-approved for Wastewater CEU's in Alaska, Arkansas, California, Connecticut, Georgia, Idaho, Indiana, Louisiana, Maine, Massachusetts, Minnesota, Nevada, New York, North Carolina, South Dakota, Tennessee, Vermont, Washington, Wisconsin and West Virginia. Some states do not require pre-approval. If you need these approved for your state, please contact our office.

These courses are eligible for CEU's, Contact Hours or PDH (Professional development hour) in Alabama, Arizona, Maryland, Virginia and more to come.

Now approved in Canada for Nova Scotia and Saskatchewan.

****Some states give different credits than others. Not all states give credits solely based upon contact hours. Please contact our office if you need to know the approval codes and credit hours for your specific state.**

Did you guess what this was? This is Beggiatoa. This is the only moving filament. This indicates septicity. Notice what looks like pepper dots on the filaments. Those are sulfur granules.

November - Beggiatoa

Check out our website for more photos of our new mystery bug!!!!

EnvironmentalLeverage.com

Environmental Leverage
812 Dogwood Drive
North Aurora, IL 60542

Phone: 630-906-9791
Fax: 630-906-9792
E-mail: ELFEnvironmental@aol.com