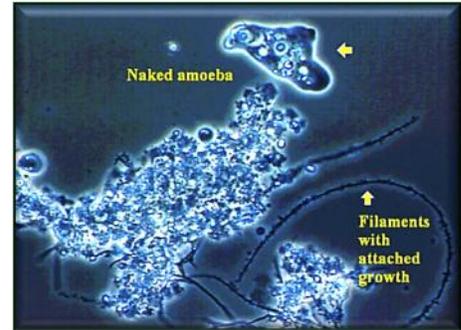


What exactly is going on in my system? How do I know what I am looking at?

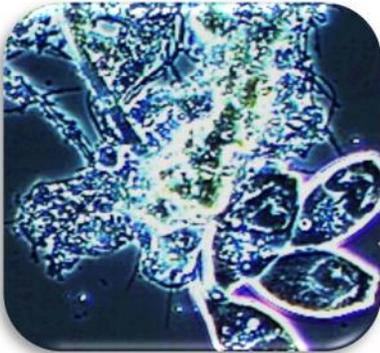


Microscopic analyses of any biological system should be a critical component of any ongoing daily monitor and control programs. Lab sheets to correlate health of the system, any changes in floc structures, higher life forms, filamentous identification, polysaccharide coating of the bacteria and suspended solids can be determined by using a microscope and examining the biomass. This is a tool that can help not only show exactly what the health of the system is at a given time, but can also help predict which direction the plant is headed if used daily. It is a tool that can also help prevent critical upsets, or be used as an early warning. In the cases of filamentous problems, staining and identification of the filamentous can help with troubleshooting and help avoid costly chemical consumption.



Well, I do not know how to do that myself, what can I do? . . . You can always send in a sample to our lab for an analysis.

Environmental Leverage Inc.
812 Dogwood Dr. Suite A • North Aurora, IL 60542
630-906-9791
Elfenvironmental@aol.com



What would that wastewater biomass analysis consist of?

A wastewater biomass analyses would consist of a number of different things. A brief cover letter explaining the overall health of your system as observed through the sample. Any suggestions for troubleshooting that might be indicated by the observations noted. The report includes an analysis of the floc, the higher life forms and possible filamentous identifications if requested.

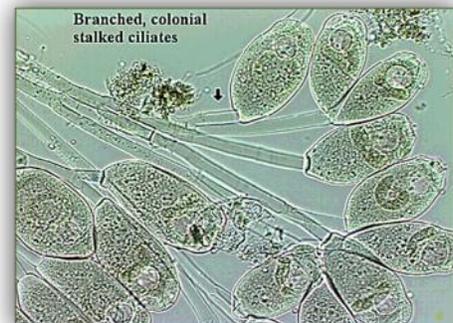
What is a wastewater biomass analysis? The Wastewater Biomass Analyses consists of two sheets, a Higher Life Form sheet and the Floc Characterization Sheet.

What is the Higher Life Form or "Indicator Organism" Sheet?

The Higher Life Forms Sheet shows the number and types of higher life forms found in the wastewater sample. It is usually performed under the microscope at 100x. An average of 10 fields is used to determine the number and types of life forms. The purpose of recording the number of higher life forms is to determine the health and age of the system. Typically the organisms represent only 5% of the biomass. These organisms are exactly what they are called-Indicator organisms. They are usually the last to come and the first to go in a system if it is not running properly. They usually correlate to the plant performance. They can indicate if the sludge is young, old or medium aged. They can sometimes indicate if there had been a recent slug of high BOD loading.

Some things that may be noted on your sheet:

1. Loss of all higher life forms can indicate a recent high BOD loading or toxic shock.
2. Many rotifers and nematodes usually indicate an older sludge age unless the system is a fixed film type.
3. Increase in amoeba and flagellates from normal numbers of higher life forms can indicate a change to a younger sludge (lower MLSS), high F/M ratios or BOD loading.
4. Suctorians are usually excellent indicators of good BOD removal.
5. Many stalked ciliates can be an indication of middle aged sludge.



6. Fungi or yeast can indicate low pH, fermentative conditions or severe phosphorous deficiency. Sometimes if present with high numbers of Thiothrix, it can indicate septic conditions in midstream clarifiers or process units that feed into the aeration section of the wastewater treatment plant.

7. Tetrads can indicate a nutrient deficiency, usually nitrogen. These cause high levels of TSS and require lots of polymer in final clarifier.

8. The presence of spirillum or spirochaetes usually indicates septicity. The presence of high organic acids or low DO is usually associated with

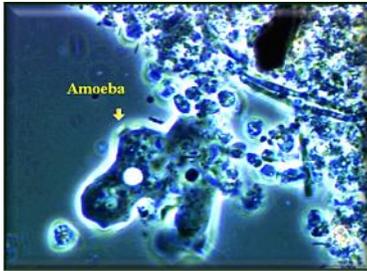
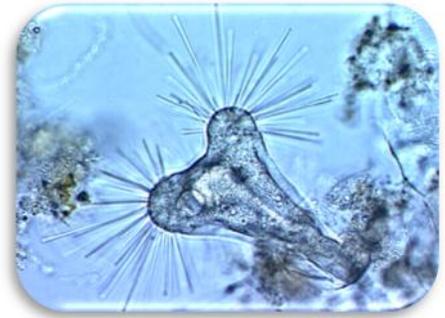
septicity. Again, check your clarifier for holding solids too long.

9. Hyphomicrobium looks like “beans on a stalk”. They are an indication that denitrification is going on or septicity is present.

10. The presence of heavy metals can result in dispersed growth of floc structures. Check to see if Arcella are present.

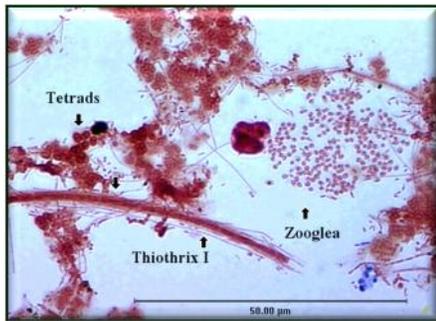
11. Zooglea is extremely large, non-motile bacteria. The bacteria staining are usually Gram negative and Neisser negative. No sulfur granules are present. They can be “fingered or amorphous”. Zooglea has the presence of excessive amounts of polysaccharide coating. Zooglea grows usually as “amorphous” clumps or “fingered” like

a tree. They can indicate low pH. This bacteria is usually found in environments where there is a high F/M ratio where the soluble organic compounds are readily bio-degradable. Often present in selector systems in activated sludge. Also an indication of nutrient deficiency (N or P).



The Floc Characterization Sheet

The Floc Characterization Sheet is used to identify outstanding characteristics of the floc structures found in the biomass, including size, morphology, filament abundance, etc.



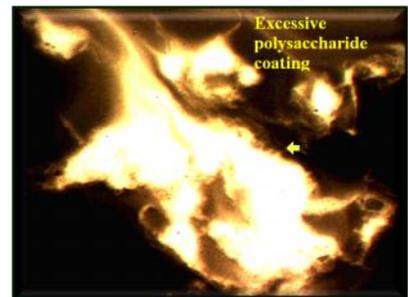
Floc Structures and Filaments

Because every wastewater has a different bacterial population as its biomass, every wastewater has a different floc structure. What is good floc structure in one wastewater may be poor floc structure in another wastewater. It can be difficult to tell good or poor structure by looking at a specimen through the microscope one time. Generally, the more that is known about a particular wastewater, the more comments can be made about its structure.

Nonetheless, some characteristics can be examined to determine relative floc condition. Generally, the more firm and compact a floc is, the better it will settle. The more lacy and dispersed a floc is, the less likely it will be to settle. The

presence or absence of pin or straggler floc, which can be responsible for high suspended solids (TSS) in wastewater, is also an important observation when examining floc structure. The presence of many filamentous bacteria is also examined to determine if filamentous bulking is responsible for poor settling.

A microscopic evaluation is carried out by our Bioengineering Laboratory Specialists and is documented by photomicrographs. Depending on the type of sample, various staining techniques may be utilized to determine biopolymer levels and filament types. Microscopic examination is critical for filamentous identification, since filamentous organisms typically cannot be grown on agar media plates.



Filamentous Identification

Filaments can be internal or external and they can be free of the floc structures or found intertwined in the floc. Filaments present in the system do not always have to mean a problem. Some filaments are good if they form a strong backbone and add a rigid network to the floc. They help give the floc more structure and settle faster. Filaments are good BOD degraders also. They are only a problem when they become dominant. If filament abundance is in the abundant or excessive range, having a Filamentous Identification performed is recommended.



One reason to identify filaments is to determine the filaments characteristics and then determine the type present. If the type is found out, a root cause can usually be associated with a particular filament. If the cause is known, then a correction can be made to alleviate problems. Chlorination is only a quick fix. Without process changes, filaments will grow back after chlorination.

A Filamentous Worksheet may be included if necessary. When Gram and Neisser stains are performed for filamentous Identification, the types of filaments found present will be noted on the Floc Characterization sheet to the right of the filament section and will be noted on the Cover Sheet. A Filament Causes sheet,

Filamentous Predominance sheet and corrective actions will be given and included also with the report. Individual sheets on the actual filaments present in the sample will be included with more information on that particular filament.

Start your way now to a cleaner, brighter effluent with fewer hassles in your waste treatment plant.

Ok, you convinced me. How do I go about sending in a sample?

Contact: **Environmental Leverage Inc. Phone: 630-906-9791**
 812 Dogwood Drive, Suite A
 North Aurora, IL 60542
Elfenvironmental@aol.com

What will I need to send in?

Send in 100 mls of MLSS in a small, plastic bottle with at least 2-3 inches of headspace in the bottle so that the bacteria have sufficient oxygen during transit and do not turn septic. Seal the bottle carefully. Send overnight by UPS, Fed ex- etc. If possible, pack with blue ice to keep refrigerated during warm weather. Do Not pack with ice cubes.

See our website or call for a Chain Of Command form to fill out, if necessary.

For Trickling filters or RBC's please collect supernatant with biomass that sloughs off.

For foam or scum samples, collect foam or scum off surface, place in plastic container, again leave air space in container.



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

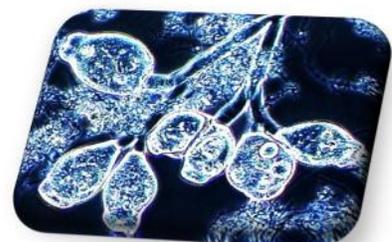
A Wastewater Biomass Analyses with Filamentous Identification including Gram and Neisser stains, as well as the above standard analyses costs \$350.00

<p>Custom formulations can be developed to fit your specific needs. Programs are always developed and customized to your situation.</p>	<p>Excel based dosing Wizard included for all programs. Nutrient dosing wizard available</p>	<p>Programs include technical support, computer based training. Long term programs include periodic Wastewater Biomass Analyses of your system.</p>
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Orders can be faxed directly to 630-906-9792 Ask for Pricing, Consultant & Sales 630-906-9791
Long term programs include training, process recommendations and periodic lab analyses.



Turning Liabilities Into Leverage!™



At Environmental Leverage, our goal is to bring the latest technology to you in order to make your biological systems plant more efficient and successful. Teaching our customers to look for the right choice of treatment starts with knowing the basics. Doing research is necessary, but you have to know what to look for. Developing a sound, successful program is very important.



System Optimization

BOD Removal Optimization
TSS reduction
Solids Handling, Polymers
Beneficial Reuse
Biosolids Optimization
Bioaugmentation, Odor Control

Professional Guidance

Onsite system audits, training, consulting, lab analyses, microscopic and filamentous identification, product program development are just a few ways we can provide service to your company.

Environmental Liability

Permit violations can get costly & can require forced shutdowns. We can help with Optimizing your treatment system & Achieving Total Compliance while still developing a sound economic program is our goal.

Defining Your Goal

Whether your goal is BOD removal, TSS reduction, Solids Handling, Environmental Compliance, Beneficial Reuse or Total Cost Optimization, we can help you set and achieve your goal.



***Look to Environmental Leverage in the future for these services.
“Let Us Simplify Your Solution”***

- ***Onsite Training***
 - ***Consulting***
- ***Audits of WWTP***
 - ***Lab Services***
- ***Training Materials***
- ***Bioaugmentation Products***
 - ***Contract Labor***
 - ***Beneficial Reuse***
- ***Remediation: Soil, Lagoons, rivers, etc.***