Environmental Leverage INC.

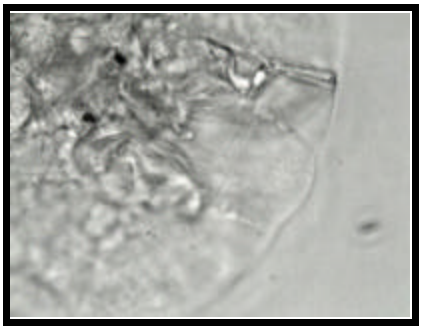
Turning Liabilities into Leverage

October 2010

The Wastewater Insight

The wastewater insight

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

Inside this issue:

Solids handling- Equipment optimization

Last month we talked about the microbiology and how it impacted solids handling. This month we will go into some of the pieces of equipment in your system that can impact the microbiology and solids handling.

Let's review some of the main causes of bulking and growth of some of the organisms that can generate more solids:

High BOD

High Grease and Oil

Low Nutrients

Low pH

Low D.O. and Septicity

Hey this almost sounds like our "Critical 5" plus grease!

Let's start with **High BOD**: This is one thing that you can even out by two methods. Decrease your RAS, thicken up the solids and return more biomass to the front end. Some plants have huge swings, and they could completely cut off wasting, yet still not be capable of returning enough sludge back to the front end when there is a spill. That is where bioaugmentation can help with balancing out the high swings of loading. Remember, it always is a time and numbers game in wastewater. Time is limited by your equipment hydraulic loading; the only thing you can change is numbers.

Equalization will help with high BOD swings also. If you have an EQ tank and can lower or raise the levels in the tank to help even out the flow, which also will allow you to lower the roller coaster effect.

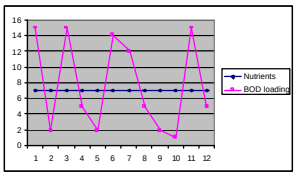
High Grease and oil are two very important issues at any plant. They can cause the worst problems, foaming and bulking. Grease and oil can come from collection systems in municipalities, production processes at industrial facilities, hydraulic leaks from machinery or equipment. If you have high grease and oil, Nocardia and M. parvicella can grow significantly in your plant. There are numerous ways to optimize grease removal. Primary clarifiers, DAF, or API depending upon your facility are the cheapest physical way to remove grease and oil. Make sure any oil you remove you do not put back into your system such as a digestor unless you actually generate methane and use the grease. Otherwise it is cheaper to physically haul off the grease you just took out of your system then to "feed" it back into your system and generate tons of solids that you have to dewater and landfill anyhow!

Make sure to remove grease quickly from the surface of your primary. The longer you let the grease or oil stay in your system, the longer the water washes over it, and dissolves the grease into microscopic particles that pass through into your aeration basins and the bacteria will have to consume, generate more solids, maybe grow filaments and make your life miserable!

Ask for our newsletters on grease, primaries, collection systems and lift stations, and bioaugmentation to help with grease removal.

Low nutrients are caused by two things, influent loading and not enough N and P to meet the 100-5-1 ratio or too much alum, lime or ferric used to chemical pH adjustment or nutrient removal that have taken too much out and had the opposite impact on the system. Low nutrients can grow Zooglea, which can be pretty slimy and hard to dewater and cause a very wet heavy sludge. Filaments that grow on low nutrients can grow relative fast and are long large filaments, thus you generate 40-60% more solids than necessary. This is the easiest to adjust out of many of the problems at a plant. Make sure to measure influent flow and loading, then do the math- 100 C to5 N to1P.

A typical loading of nutrients is 100-5-1 of carbon, to nitrogen to phosphorus in order for optimal bacterial growth. During wide swing loads, nutrients should be increased. Nutrient deficiency can cause serious problems. It is already harder for the floc forming bacteria to work when organic acids are present, but add the stress of nutrient deficiency and septicity increases the problems. This creates a climate that is difficult for the floc forming biomass to grow in, but enables filamentous bacteria to take over.



Even though final measurements on the effluents may indicate sufficient nutrients are eventually present, the way the nutrients are added as well as the significant slugs of BOD from the food plants that are sent to the biomass may be causing the bacteria to be deficient when they really need the nutrients.

Correlation of Nutrient loading to BOD loading to help create an idea that even though nutrients may be measured at the final effluent by a residual, they are not present in sufficient amounts when the bacteria need them based upon loading. TOC should be measured so correlations could be made in order to optimize nutrient addition. A recommendation of TOC using Hach Test N Tube reagents on the influent daily to get immediate approximations of loading is recommended to develop a pattern and curve to help run the process more efficiently in the primary and secondary systems. Ask for nutrient dosing wizard that can be used to help regulate addition of nutrients. It might be necessary to overdose a bit closer upstream, at the food plant sites or to pH adjust or add bioaugmentation upstream, in order to help even out the significant BOD swings. Any time a change is made at a plant of more than 10%, it is significant to the bacteria. Ask for our newsletters on nutrient deficiency or our nutrient dosing wizard.

Low pH you would not think should be such a problem. Yet surprisingly this is a very common issue at some plants but in different parts of the plant than in the aeration basins. Primary clarifiers often can get a low pH when they hold solids too long and turn septic, same for secondary clarifiers and digestors.

Many plants turn off the air in their digestors to settle and decant, yet if they turn it off too long, it starts to turn anaerobic, lowers the pH, and turns septic. This grows not only filaments but fungi, which can defeat the purpose of a digestor. The purpose of a digestor is to reduce the amount of solids you have to dewater. If you let the conditions deteriorate, you actually generate more solids that are harder to dewater!

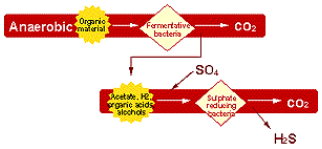
To adjust pH requires commodity chemicals. Make the investment! It will be worth it to keep the pH above 7 throughout the plant. You will save a ton of money in polymers, as well as solids handling/ haul off costs! See newsletter on digestors

Low D.O. and Septicity- This is a big area that can cause filaments and very rarely is the condition present in the aeration basin. Usually it is in an EQ tank, a primary clarifier, a secondary clarifier, a DAF or even in the solids handling portion of the system.

Equalization tanks are a big area where septicity and low D.O. conditions can occur, especially if there is no mixing and solids settle in the bottom of the tank. Biological activity will occur anywhere, from the minute the water leaves the source, through the collection system, in EQ tanks, primaries, and all the way through clarifiers and even sand filters. There is no sterile place.

Make sure you have sufficient mixing and even some air. If you cannot get sufficient D.O. or use aerators due to air regulations, consider putting a Venturi in an influent line. This can sometimes bump up the D.O. at least .5 or more so it will not go septic.

What is septicity?



The presence of hydrogen sulfide (H2S) in waste water and sludge is defined as a septic condition. Septicity is a result of anaerobic bacterial activity in absence of oxygen or nitrate. By preventing septic conditions from arising, negative effects like odors, health hazards, corrosion and reduced efficiency of the treatment plant, can be eliminated or reduced.

See full newsletter on Equalization tanks 10-06, or Filaments and Septicity.

Primary clarifiers are many times a source of septicity that can cause filaments as well as grease that can cause filaments, foaming and Zooglea. Holding solids too long in the primary can cause septic influent to be sent to the aeration basin. This septicity can instantly place a high demand on your oxygen, thus lowering the amount available to the bacteria for BOD and nitrification. Organic acids generated in the primary can also promote the growth of many filaments. Make sure to adjust the rate at which you take solids off the primary. Speed up or slow down the rakes depending upon whether you are going too fast and just stirring up solids, or going too slow and letting them sit too long.

Moving parts are allowed to be adjusted! Many times we see equipment that is set up at certain speeds or levels when the plant is built, and then never tweaked again! Your influent changes daily, with flow as well as rain, so make changes to your equipment to optimize your plant!

Little changes can help make big improvements! Ask for our newsletter on primary clarifiers.

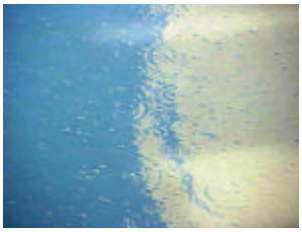
Secondary clarifiers are often a big source of holding solids too long. A huge amount of biological activity takes place in the aeration basin, but there still is biological activity in the clarifier. Again, they do not just shut down because they are not in the right box! Bacteria will keep digesting any food present in the clarifier or even go into endogenous respiration if the entire BOD is gone. Either way, they still are active. Sometimes if you increase the air at the end of the aeration basin so that you at least have a 1-2 ppm D.O. entering the clarifier, you should have more than sufficient D.O. in the clarifier to help allow your clarifier to work as a thickener and a settling tank. If you still have too much BOD though or too many solids, you may have to shorten the time you hold your solids in the clarifier.

The center well is critical not to let the solids build up there. If they run out of air there, then before they even start to settle in the system, they already have turned septic and have dead spots. This is actually the most important spot to spray. This is the first area that the floc is supposed to be forming and settling in the clarifier. This is the most critical to keep clean. Move the spray there first. Suck out from another area if need be temporarily, but keep that clean.

If need be, add a sprayer to your clarifier if your clarifier is old, and you do not have the capability to completely handle the solids. The weight of the water alone will knock down any solids and help with gassing, ashing and high effluent TSS.

Ashing and Gassing what is this?

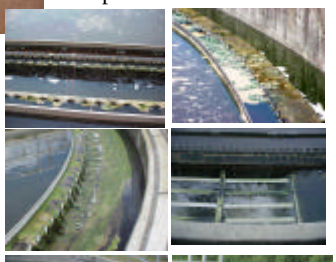
Gassing is the first sign that the bacteria are running out of air in the clarifier. You can call it an early warning system. Bacteria first will go for free oxygen, then nitrates, then sulfates. One way or another they will find a source. If you run out of air in the clarifier, and they have to use nitrates, they give off N2 gas. This will show up as gassing or air bubbles rising to the surface. Same with sulfates; H2S gas is generated, which if too high, can cause serious health problems.



Ashing is when tiny particles of floc trap that gas, and rise to the surface. Pay attention to those signs.

First you will see small tiny pin floc that looks like cigarette ash, and then clumps.

Then larger clumps finally the entire bed can burp and rise up.



Did you know that the solids that go over the weirs could impact your final effluent BOD results along with the TSS?

False high BOD readings can occur if biological material or algae are present in a BOD sample. These will increase the final BOD reading and potentially increase your final effluent values, which, in turn can mean permit violations or surcharge increases.

A clarifier is not a digestor or hold tank for solids. If you allow solids to float to the surface, you are holding solids too long. Either waste them out or return them, you must decide based upon your biomass sludge age in your system, but you must remove them from the clarifier, or you will generate low, septic conditions that will promote the growth of filaments or fungi. Just by optimizing this piece of equipment, you can save a ton of money on solids handling!

Scum removal, pits, troughs and RAS

Where does your scum go when it is removed from your clarifier? Basically it is bacteria that are dead or dying. Many plants unfortunately return the scum to the front of the plant. If it is dead, why not just get it out of the system? Dewater it ASAP and send it away.

Some plants have scum troughs that the scum is collected in. It sits in these troughs and gets in even worse condition. Unfortunately, we have even then seen this dead material mixed with RAS and returned to the front.

Septicity, filaments, fungi can all increase in these pits. See newsletters on clarifiers.

Obviously, we could go on and on about each piece of equipment, but I think you are starting to get the idea how each piece of equipment is all interconnected in wastewater and how small improvements in each place can add up to a very large overall change in your process and how much money you spend on solids handling!

Please let us know if you need help with the microbiological evaluation of your plant or even a full audit of your plant.

Websites:

Chemical Reactivity Worksheet (CRW)

The Chemical Reactivity Worksheet (CRW) is a free program you can use to find out about the reactivity of substances or mixtures of substances (reactivity is the tendency of substances to undergo chemical change).

http://response.restoration.noaa.gov/index.php

NIOSH Pocket Guide to Chemical Hazards

http://www.cdc.gov/niosh/npg/

The NIOSH Pocket Guide to Chemical Hazards (NPG) is intended as a source of general industrial hygiene information on several hundred chemicals/classes for workers, employers, and occupational health professionals. The NPG does not contain an analysis of all pertinent data, rather it presents key information and data in abbreviated or tabular form for chemicals or substance groupings (e.g. cyanides, fluorides, manganese compounds) that are found in the work environment. The information found in the NPG should help users recognize and control occupational chemical hazards.

http://www.plingfactory.de/Science/GruKlaOeko/Teichleben/Rotatoria/TL5RotMonGnes1.html

This website is in German, but who cares. It has amazing photos. Just click the links on the left side of the page, and you will see many different, great photos pop up. This page has more rotifers on it.

Last Month's
MYSTERY BUG OF THE MONTH

Last months Bug of the Month

This is a flagellate

Did you look closely and can you see the long flagella? What do flagellates mean if they are dominant in your system? That you have a very young sludge or you may have gotten hit with a recent high BOD loading.

Mystery Bug of the month!

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