Environmental Leverage INC.

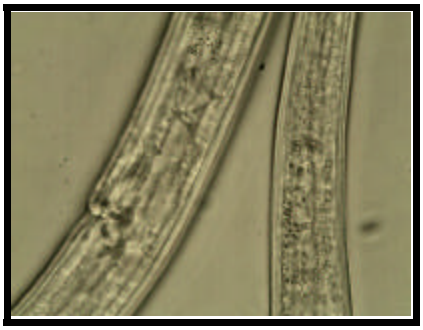
Turning Liabilities into Leverage

August 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

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Data collection and sample interpretation

We have seen many cases where the wrong interpretations have been made at wastewater plants due to sample errors or even data misinterpretation.

When you pull, where you pull and how quickly you test are important. Was the sample filtered or not filtered? That can make a completely different result.

Did you "fix" the sample? Many of the preservatives used for specific tests, should not be used for normal BOD, COD, TSS or microscopic analyses. They can change the results.

Some of the major testing that can give you false readings or be misinterpreted are BOD, TSS, N and P, MLSS, as well as reading a sludge judge.

All biological activity is impacted by the critical 5- Temperature, pH, ammonia, D.O. and phosphorus.

Critical 5 parameters will impact on BOD testing but are often overlooked.

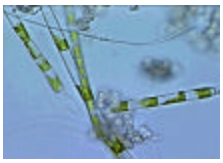
Below are some areas that should be adjusted when performing a BOD test.

BOD-Biochemical oxygen demand

*As with any biological system, **pH** affects the efficiency of the bacteria breaking down organic matter in the sample. Adjust the pH of all samples for BOD analysis to between 6.5 and 7.5 SU using 1 N sulfuric acid or 1 N sodium hydroxide.*

This is from standard methods. Technically if you start a pH at 6.5, pH is already relatively low. Run the test for 5 days, and the pH will drop. Try instead to keep it above 7 and you will see higher BOD results.

Bubbles in a BOD bottle also invalidate that bottle's D.O. measurement.



Algae in a BOD sample and left out on a lab bench exposed to sunlight can be a source of bubbles. Always put the BOD bottle in a dark incubator soon after the initial D.O. is measured and the bottle sealed. But a more common source of bubbles is from dirty glassware. Even though we should try to fill BOD bottles with sample and dilution water as bubble free as possible, there always seems to be tiny bubbles generated.

If the glassware is not thoroughly cleaned, then the bubbles stick to the side of the glass and will eventually collect near the bottle's seal during the five-day incubation period.

Failing to keep samples in a cool place and adjust pH before testing will severely limit the accuracy of the test .

Another source of bubbles can come from aerated dilution water or from samples that are at a lower temperature than 20° C. Since cold water will hold more dissolved air, aerating cold dilution water will give a higher oxygen content than if the dilution water was aerated at 20° C.

After placing the samples in an incubator at 20° C, the water will warm and not be able to hold as much D.O. As a result, bubbles may form in the bottles. This can also happen with a low dilution sample, such as an effluent composite sample that was collected at 4° C and not warmed to temperature. It's important to always warm samples to 20° C, and then shake the sample to remove excess dissolved oxygen before setting up for BOD.

If your laboratory has heating problems, as they all seem to have, try storing the dilution water in your incubator overnight to stabilize the temperature to 20° C. This will help remove excess dissolved oxygen from the dilution water.

Other items that can impact BOD

Sulfide will increase the BOD in the final effluent. The synergistic effect of manganese (II) and oil & grease will increase BOD. Manganese (II) or Cobalt (II) present with excess sulfur dioxide did not cause high BOD. Septic samples tested for BOD will interfere with BOD testing and give a false consumption of O2. Sulfur compounds can consume quite a bit of oxygen very quickly in a BOD test.

Typical Oxygen requirements in a wastewater plant

- 5 lbs. oxygen oxidizes 1 lb. nitrogen
- 3 lbs. oxygen oxidizes 1 lb. carbon
- 1-1.5 lbs. oxygen oxidizes 1 lb. B.O.D.
- 1 lb. oxygen oxidizes 1 lb. hydrogen sulfide
- .67 lb. oxygen oxidizes 1 lb. manganese
- .4 lb. oxygen oxidizes 1 lb. iron

Available nitrogen can interfere with the BOD test if nitrifiers are present.

Any sample that has been chlorinated, even if no chlorine residual is left, must be seeded with viable bacteria so that the organic strength, or BOD, of the sample can be measured. Samples that show chlorine residual must also be dechlorinated using sodium sulfite (see Standard Methods for the recipe). But be careful, excess sodium sulfite in the sample will exert an oxygen demand giving false high BOD readings. It's important to remember that the dechlorinating agent for coliform/ E. coli analysis cannot be used for BODs. It is not the same chemical.

We have seen food plants that use COD as their method of nutrient dosing. Many times they underestimate the COD/BOD ratio. Food plants do not have a lot of inorganics in their influent that can be oxidized and contribute to COD. Many times BOD should be 80-90% of their COD, so they wind up under dosing nutrients. Make sure you realistically approximate your load. If you have a high influent of simple sugars, like many food and beverage plants, or even high grease in your influent at a municipal after a high rain, you may not even get a correct BOD.

It is very hard for one tiny little pill of seed BOD to consume 6000, 20,000 or even 80,0000 BOD in 5 days without excess N, P and pH adjustment, not to mention the time and numbers game is extremely off. How much MLSS do you need in your plant in order to handle extremely high loading? Does your BOD test realistically have that high ratio of MLSS to loading? How can you possibly expect such a small amount of bacteria to really consume all the organics in the flask? Have you really added the correct 100-5-1 ratio of nutrients? Was the pH continually kept above 5? BOD does not really work well and cannot approximate the amount of organics in a very highly loaded system.

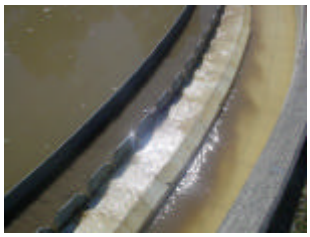
Analytical Report

Client:				**Date**	09/06/07
Project ID:	VA - WWTP PO# 64120			**Time**	10:15
Sample	Primary Tank #1 Pass 3			**Date Received:**	09/07/07
Sample	7-3986-001			**Date**	09/12/07

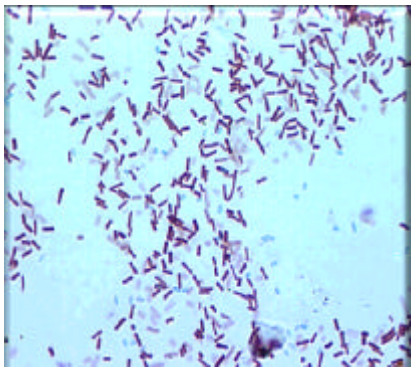
Results are reported on a dry weight basis.

Analyte	Result	R.L.	Units	Date Analyzed	Method	Flag
Oil & Grease	748,000	10	mg/kg	09/12/0	9071B	P
Specific Gravity	1.00	1.00		09/11/0	2710F	N
COD	3,690,000	100	mg/kg	09/10/0	5220D	

We had a municipality pull a sample of grease directly from the primary. The COD was extremely high. How can a BOD test really degrade that much organics in a small time with only a small amount of bacteria? It can't! Think about what your influent really has, what your COD really shows, and how much you think might be organics vs. inorganics. Then run your plant accordingly.



TSS and BOD in the final effluent



Single celled bacteria in the final effluent easily contribute to TSS, but they also can contribute to BOD, N and P residuals depending upon what method you are using for testing. The bacteria may die off in your test, and rerelease nutrients and give you higher readings. If you have a young sludge and you are testing for N and P residuals in the final effluent, yet you have extremely high TSS, you may think you really have very high N and P numbers, yet your test method might have killed your single celled bacteria, and contributed some of the value.

You really did not have free N and P. Use a filtered sample instead to test for ammonia and o-PO4.

Measuring nutrients in final effluent or in the influent can easily be misinterpreted. Ferric and alum can bind nutrients and cause nutrient deficiency in a plant. If you measure influent readings, adjust your nutrients, then use lime or ferric for pH adjustment, that can bind up your phosphorus and cause nutrient deficiency. If you are using final effluent readings as a residual way to adjust nutrients, you may get false readings as the nutrients will be bound up, and not really available for the bacteria to use, thus again you have nutrient deficiency.

This is a food plant that used ferric to remove phosphorus. So much was added, as well as bound up and returned in the RAS that eventually the entire basin was bright red!

Do not grab your MLSS sample after polymer feed. It will make your floc look better.

Where you grab the sample, when you look at it, how long it has sat and when you test it are very important. Very small details can make a huge impact on data testing as well as interpretation!!

Please see past issues of newsletters to get more details on some of these areas discussed in this newsletter.

Misc websites:

Lagoons Online

http://www.lagoonsonline.com/laboratory-articles/tss.htm

Lab testing procedures

WET effluent testing

http://www.ecy.wa.gov/pubs/9580.pdf

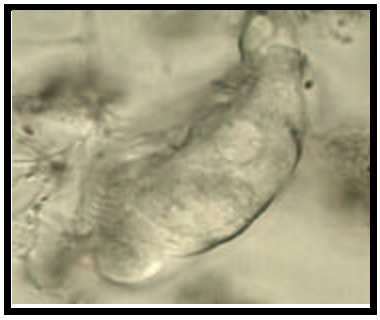
We would like to thank

Alpha Omega Winery, 1155 Mee Lane, Rutherford, CA 94578 for hosting our class in Napa. It was a great success. We toured their plant, had a great hands-on class, and even had some wine tasting after wards. A break from traditional classes!




We have had a ton of people ask when we are going to teach another Filamentous Identification the Easy Way class. We are looking for host plants. Please let us know if you are interested in hosting the class at your plant.

Last Month's
MYSTERY BUG OF THE MONTH



This was a crawling ciliate. If you have a predominance of crawling ciliates, you are still at a young to medium sludge age. You are not usually winning the "time and numbers" game. Slightly decrease wasting or use bioaugmentation to supplement your bacteria and increase your MLSS short term.

Mystery Bug of the month!

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