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EBS
An Employee-Owned Company
Comprehensive Wastewater Solutions

ISSUE 5

LAB LINES

Wastewater Consultants Like No Other

IN THIS ISSUE

WHAT'S THE PRICE OF BAD BOD DATA?

A BOD INVESTIGATION CASE STUDY

THE PROBLEM

EBS conducted a treatability study for a POTW that was tasked with treating biodiesel waste and was struggling with poor lagoon performance. They sent samples to EBS for further investigation and were surprised to discover that the BOD concentrations were significantly higher than originally reported by their contract lab. The discrepancy stemmed from the lab's failure to account for potential bacterial inhibition caused by the high-strength wastewater and their "one-size fits all" approach to dilution selection during BOD setups. Bacterial inhibition occurs when substances in wastewater, such as toxins or excessive organics commonly associated with biodiesel waste suppress microbial activity, reducing their ability to break down pollutants. This can lead to skewed lab results and impaired system performance if not properly accounted for.

THE IMPACT

Financial Consequences: Underreported BOD levels meant the POTW wasn't charging the waste generator appropriately for the cost of treatment. After correcting the BOD method, the POTW was able to recover these costs, significantly improving its financial standing.

Operational Challenges: The inaccurate data masked the true organic load in the lagoon, causing undiagnosed overloading and insufficient aeration capacity. With the correct data in hand, the facility initiated further investigations to identify ways to enhance their treatment strategies and improve overall system performance.

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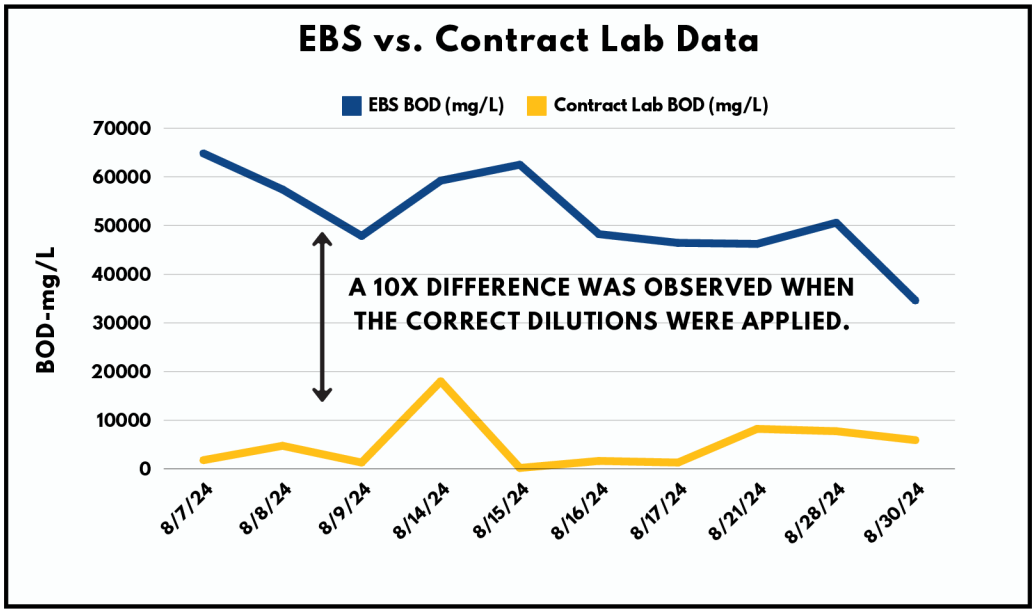
THE METHODOLOGY

EBS conducted a thorough investigation by performing ten split-sample analyses alongside the POTW's contract lab. Each sample was tested by both labs under their respective protocols, revealing critical differences in methodology and results. The contract lab used preset dilutions intended for typical POTW samples without accounting for the high strength of the biodiesel wastes. This resulted in inhibited activity by the bacteria which was reflected as lower BOD concentrations at the end of 5 days. In contrast, EBS pre-diluted the samples before testing, ensuring the seed bacteria could function optimally and accurately reflect the organic load of the samples. This critical step allowed EBS to obtain accurate BOD5 values, which were much more accurate and revealed the true strength of the waste.



The accompanying graph illustrates the stark contrast between the two labs. The EBS lab measured BOD concentrations averaging 51,792 mg/L, nearly 10 X higher than the contract lab's average of just 5,082mg/L. This discrepancy was due to bacterial inhibition in the contract lab's samples, caused by improper pre-dilution of the high-strength waste.

THE OUTCOME

This case illustrates the dual benefits of accurate data, ensuring financial fairness and supporting informed operational decisions. The POTW gained the insights needed to optimize treatment and enhance its bottom line!

>>> THE RESILIENT WATER BEARS

HOW TO SPOT THEM & WHAT DO THEY MEAN

Wastewater treatment plants are home to an incredible range of microorganisms, from the tiniest bacteria to slightly more complex creatures like protozoa, metazoa and nematodes. Perhaps one of the most fascinating microscopic residents of these ecosystems is the tardigrade, affectionately known as the "water bear."

At EBS, they hold a special place in our hearts!

What Are Their Roles?

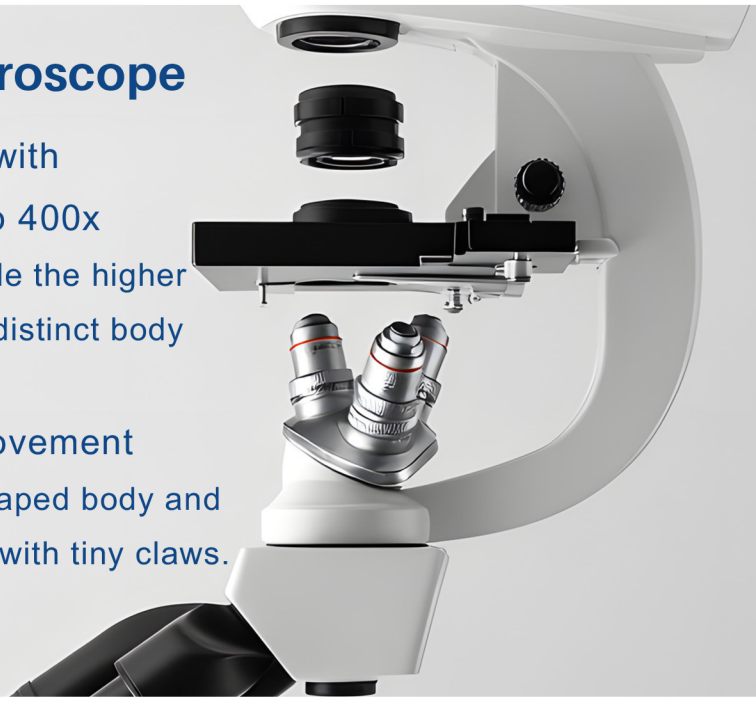
They are scavengers, feeding on bacteria, protozoa, and detritus. While they may not directly influence the breakdown of organic waste as much as bacteria or protozoa, their presence is an important indicator of system health.

What Are They?

Tardigrades are microscopic eight-legged invertebrates, measuring 0.3 to 0.5 millimeters. Renowned for their resilience as they can survive extreme conditions, including freezing temperatures, radiation, and the vacuum of space!

Identifying Under A Microscope

1. Make sure you have a microscope with magnifications ranging from 100x to 400x
   - Use low power to scan the slide, while the higher magnification can help identify their distinct body segments
2. Look for their distinct shape and movement
   - Tardigrades have a plump, barrel-shaped body and short, stubby legs that are equipped with tiny claws.
3. Look in dense areas of the floc



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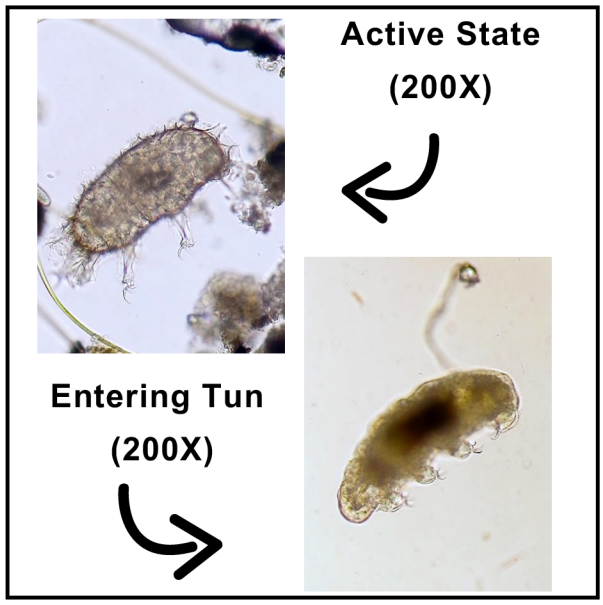
Watch out for the "Tun State"

One of the most fascinating aspects of tardigrades is their ability to enter a cryptobiotic state, known as the "tun" state, when environmental conditions become unfavorable (e.g., desiccation, oxygen depletion). In this state, they retract their limbs and contract into a small, dehydrated ball, essentially shutting down their metabolism to survive. Spotting a tun-form tardigrade in your sludge may indicate harmful or stressful conditions, such as temperature, pH or low oxygen.



What Do They Indicate About Wastewater?

When healthy tardigrades are found in wastewater treatment sludge, it's often a positive sign that the system is balanced and biologically active.

They also indicate:

- Mature Biomass
- Good Organic Breakdown
- Stable Conditions

Next time you're examining your sludge microscopically, keep an eye out for our little friends. Not only are tardigrades a fascinating reminder of the diverse life beyond our naked eye, but they're also an indicator that your wastewater treatment plant's ecosystem is flourishing. Who knew that wastewater could be home to one of the toughest creatures on the planet?

FREE VS BOUND CHEMICAL ANALYSIS

The return of healthy biological solids is crucial for the effective performance of activated sludge systems. However, along with the concentrated biomass, solids may also carry inhibitory or toxic chemicals back to the aeration basin. Determining if inhibitory chemicals exist free in the bulk water or bound to the suspended solids within the system is beneficial to the plant operator.

If these chemicals are *bound* to solids through bioaccumulation, it is recommended to remove additional suspended solids through the sludge wasting process during secondary treatment, rather than returning them to the aeration basin. This process of sludge wasting is effective because these chemicals have already been neutralized, allowing for their safe removal. Alternatively, too much bioaccumulation can hinder BOD removal and cause settling issues. Loss of solids or *free* inhibitory chemicals in bulk water may lead to WET testing toxicity or permit violation.

As shown in the graph, the proportion of bound and free chemicals shifts as wastewater moves through the treatment system. For example, in the **Influent**, most inhibitory chemicals (83%) are *free* in the bulk water, while only 17% are *bound* to solids. However, in the **MLSS,** bacteria actively bind these chemicals leading to 85% of the chemicals being bound and only 15% remaining free. By the time the water reaches the **Secondary Clarifier,** 40% of the chemicals are bound, while 60% remain free.

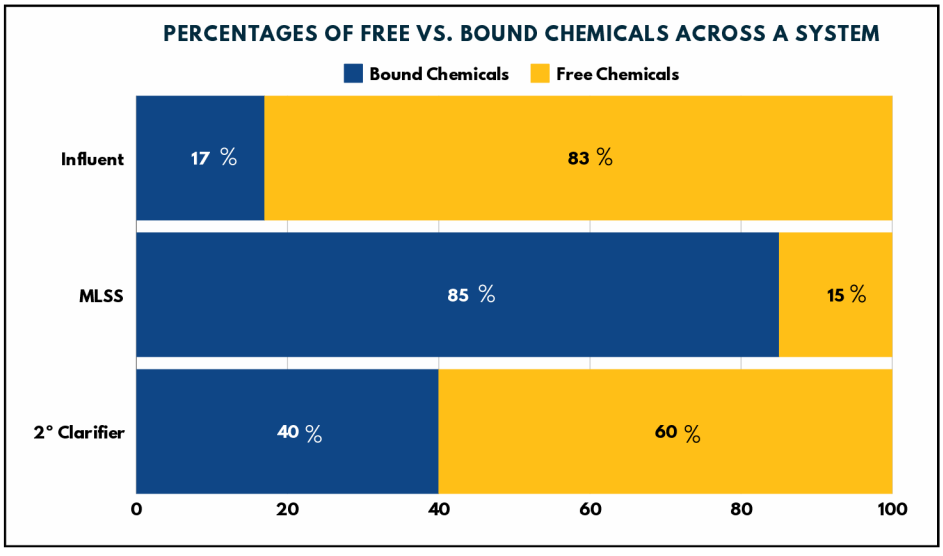


Figure 1. The change in inhibitory compounds being bound to suspended solids versus free in bulk water throughout the treatment system.

In the laboratory, a monthly or quarterly representative sample set can be used to determine these relationships to get a more precise idea of how chemicals are bioaccumulating in a system operating under normal conditions. In upset events, abnormalities can help plant operators take appropriate corrective action.

>>> ASK THE BIOWIZARD

WHAT ARE THE BENEFITS OF USING A BENCH-SCALE REACTOR STUDY?

Bench-scale studies are a widely used method for assessing wastewater treatability in a laboratory setting. Unlike respirometry studies, which are typically completed in a few hours or days, bench-scale studies take longer, often lasting several weeks or months, depending on their objectives.

Although bench-scale studies are often more labor-intensive and costly, they provide deeper insights compared to short-term respirometry studies or jar testing

What Can Bench-Scale Studies Answer?

- How would changes in Hydraulic Retention Time (HRT) affect the performance of my plant?
- What impact would adjusting the MCRT have on the efficiency and effectiveness of my WWTP?
- If a new waste stream is introduced, how will it affect the amount of sludge generated? Could it lead to long-term inhibition?
- What kinetic parameters are essential for effective WWTP design or upgrades?

Why Choose Us?

With decades of experience in bench-scale design and fieldwork, EBS can operate bench-scale reactors to simulate Activated Sludge (AST) or Aerated Stabilization Basin (ASB) systems.

The information gathered from bench-scale studies is crucial for addressing a wide variety of challenges related to both current and future WWTP operations. Whenever questions or problems arise in biological wastewater treatment, conducting a treatability study should be considered to provide the essential data needed for confident and informed decision-making. Before you make a change, call us!

Mark Your Calendar

2025 Training Events

April 8-10 | Mandeville, LA
3-Day Seminar

Activated Sludge/ Aerated Stabilization Basins

July 16-17 | Savannah, GA
2-Day Workshop

Activated Sludge/ Aerated Stabilization Basins

Summer - Lake Charles, LA
1-Day Workshop

CPI/Refining Wastewater Training

October 7-9 | Mandeville, LA
3-Day Seminar

Activated Sludge

WHAT'S COVERED?

- Introduction to Pulp and Paper Wastewater Treatment
- The Eight Biological Growth Pressures for Optimizing BOD Removal
- Troubleshooting Treatment Issues
- Solids Managment & More!

Expand Your Network & Earn CEUs

SCAN HERE TO JOIN US!