An Employee-Owned Company
Comprehensive Wastewater Solutions

INTRODUCTION:

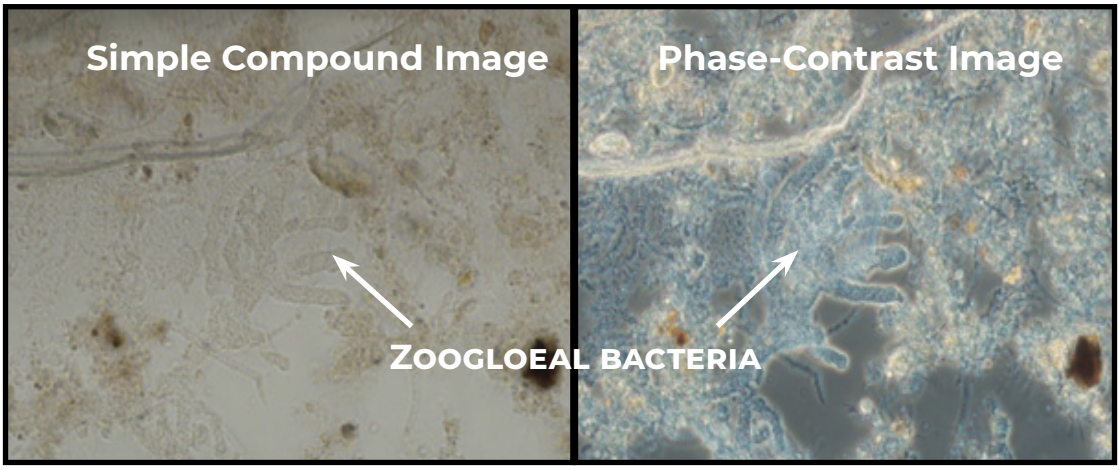
Lab Lines was created to help inform and inspire our clients to take a comprehensive approach when faced with solving some of their most difficult wastewater treatment problems. In addition to conducting chemical, microbiological, and advanced analytical assessments of operating wastewater systems, EBS offers our clients a wide array of treatability and wastewater characterization options. Over the past 25+ years, EBS has gained invaluable experience identifying and solving even the most complex wastewater treatment issues. We hope sharing our stories will inspire you to reach out during your next challenge.

INSIDE THIS ISSUE:

THE DETAILS MATTER!

PHASE-CONTRAST VS. SIMPLE COMPOUND MICROSCOPY

EBS utilizes phase-contrast microscopy (PCM) when conducting microscopic exams. This technique has many advantages when compared to a simple light microscope by improving the visualization of bacterial cells, higher life forms, and inert material that are transparent or colorless. This enhanced technology allows the examiner to look at bacterial flocs in-depth and distinguish between species of filamentous bacteria and higher life forms often found in wastewater samples.



Note the increased contrast created under a phase contrast microscope (right) that helped distinguish the unique features of the Zoogloeal bacteria that would otherwise be hidden.

In the example above, a client was being challenged with sludge bulking conditions on-site. When observing their sample through a simple compound microscope, it was hard to distinguish the details of the biomass. Samples were sent to EBS and examined by our experienced microbiologists under a phase contrast microscope. In addition, India Ink stains and an Exocellular Polymeric Substances (EPS) extraction method was also used on the samples. was determined that the bulking was likely caused by a high level of polysaccharides produced by the Zoogloeal bacteria within the system. EBS then consulted with the mill operators to help address loading and nutrient imbalances within the system which can often lead to elevated polysaccharide production.

ASK THE BIOWIZARD

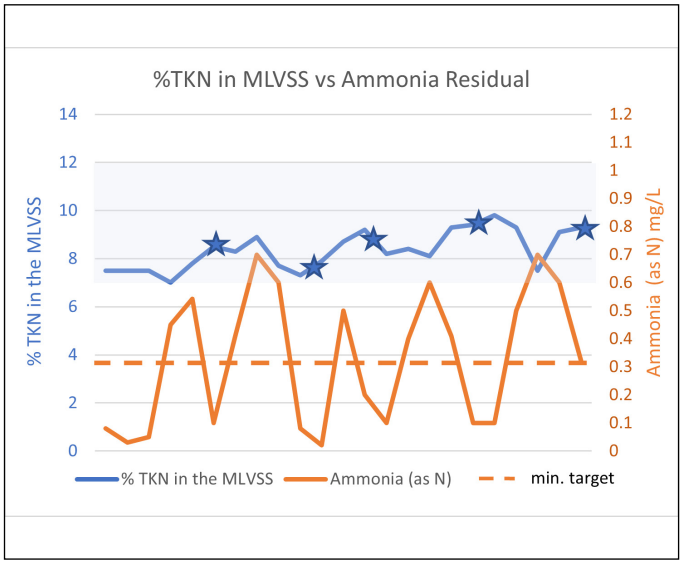
Is testing the residual nutrients in my system enough?

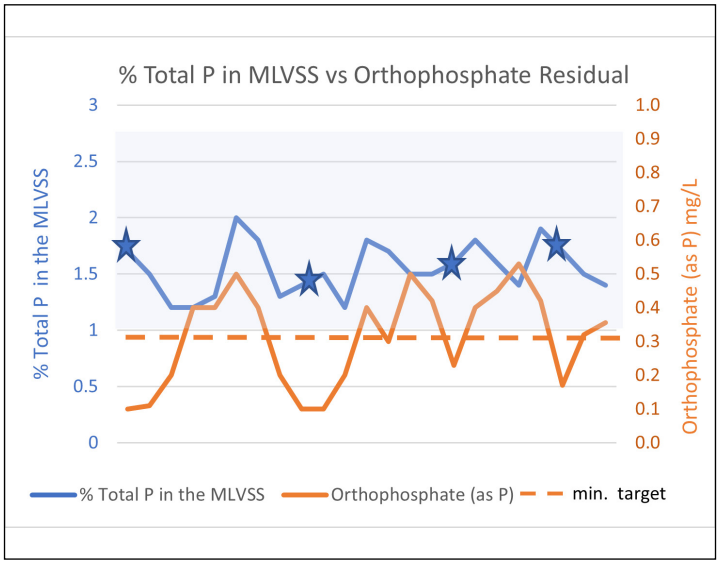
Activated sludge bacteria require nitrogen and phosphorus (macronutrients) to reduce the BOD5 and create a settleable biomass and acceptable effluent quality. Most operators test residual nutrients (N and P) daily to determine nutrient availability and ensure that effluent nutrient concentrations are not excessive. However, testing nutrient residuals is a reactive tool, only providing a snapshot of current nutrient availability. A typical healthy bacterial cell is approximately 7-12% N and 1-2.6 % P and understanding the biomass nutrient uptake and composition is as important as knowing bulk water residuals. EBS determines cellular concentrations of the total nitrogen and phosphorus in the MLSS on a percentage basis. While this is also a lagging indicator, the results provide a snapshot of bacteria:nutrient relationship for the past 1 – 2 sludge ages (SRTs).

While the C:N:P of 100:5:1 relationship is a great starting point to determine nutrient demand, it has limited value as a dosing tool. To ensure nutrient requirements have been met, most operators will target nitrogen and phosphorus residuals between 0.3 - 1.0 mg/L. Excess nutrient residuals may correlate with sufficient N and P, and the inverse can also be true; depleted residuals do not always indicate a nutrient-deficient biomass.

Relying solely on nutrient residuals may lead to underfeeding or overfeeding of nutrients. By combining regular residual monitoring with biomass nutrient composition and feed-forward dosing strategies, EBS can assist you in optimizing both biomass health and nutrient economics.

In the example below, EBS tracked the total and residual nutrients in a Pulp and Paper Activated Sludge system for two years. During this time, the residual nutrient data often fell below the targeted 0.3-1.0 mg/L range. However, the % total nutrient in the MLVSS data remained consistently in the target ranges.





The above graphs show the comparison of the percent total nutrients vs. residual nutrient data for two years. The shaded areas represent the expected ranges for healthy bacterial cells. The blue stars represent the data points with the highest disjunction between % Total Nutrients in the MLVSS and the nutrient residuals..

Have a question for our experts? We want to hear from you! To participate in our "Ask the BioWizard" questions, please contact us by phone, email info@ebsbiowizard.com or through our Contact Us form located on our website. Your questions can be featured anonymously in future editions!

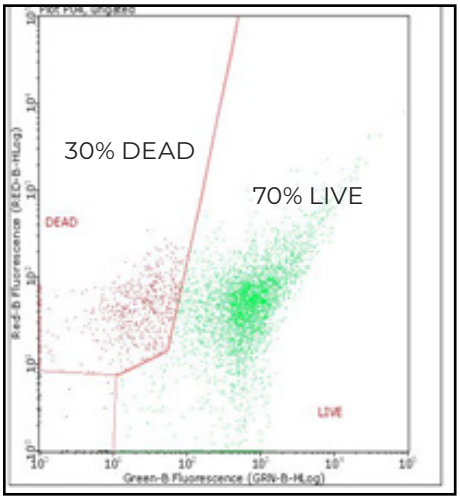
TECHNOLOGY CORNER

TESTING BACTERIAL HEALTH WITH FLOW CYTOMETRY

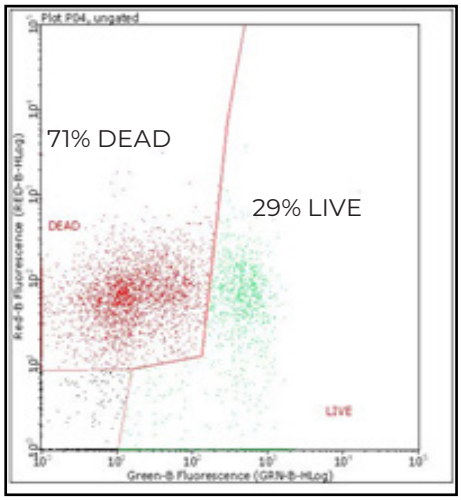
Flow cytometry is a laser-based technology that rapidly analyzes a single cell or particle of interest using fluorescent nucleic acid stains. This powerful tool has been used in the medical field for decades to help advance the understanding of immunology, virology, cancer biology, infectious disease monitoring, and more. The use of flow cytometry has been adapted for use in wastewater to quantify live and dead bacterial populations, taking health assessments to the next level. Our clients utilize this data to assess the current state of their biomass health. This data can become increasingly important after major events, such as liquor spills, mill shutdowns, or startups, which may impact the productivity of biological treatment.

Recently a routine client faced a black liquor spill on-site, resulting in a BOD breakthrough to the final effluent. Immediately following the event, samples were collected and sent to EBS headquarters for advanced testing. With the use of Flow cytometry, our microbiologists measured a significant decrease in the live bacterial population within one hour after sample arrival. Roughly 41% of the live population had been lost due to this spill. A plan was immediately put into action to mediate any further impacts. This plan included a combination of pH control, bioaugmentation, and nutrient addition to encourage the growth of new bacterial cells. Once the system stabilized, the live cell counts increased back to the system's historical average of nearly 67%. Below is the dot-plot representation of the live vs. dead counts measured before, during, and after the Black Liquor spill event.

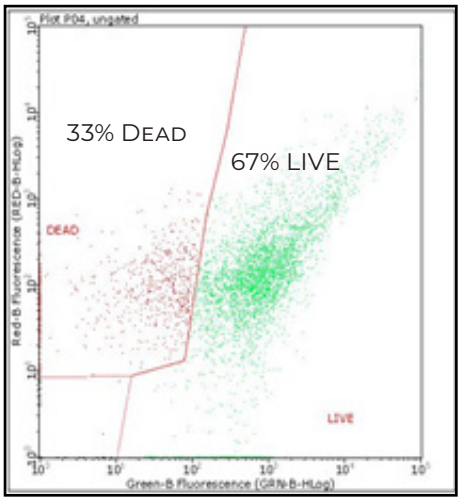
BEFORE



DURING



AFTER



EBS offers a wide variety of effective bacterial formulations, in both dry and liquid forms to meet clients' specific needs. These formulations are specifically developed for applications in the pulp and paper, chemical processing, refining, and food and beverage industries.

Our bacteria product line includes:

- BioStar™ P
- BioStar™ R
- BioStar™ GT
- BioStar™ DSL
- CryoStart™
- MicroStar™ 2.0
- MicroStart™
- NitriFire™

SPOTLIGHT ON ALLIANCE PARTNER

T. MAYES STARKE, P.E.

After working for 25 years with Georgia-Pacific in 2018, Mayes joined the EBS Technical Advisory Council in 2019. Mayes has 42 years of experience in the Water and Wastewater field. Mayes graduated with a BA in Microbiology from the University of Tennessee and completed his MS in Sanitary Engineering from the Georgia Institute of Technology. Mayes also completed the Executive Business Program from the University of Michigan Business School and is a registered Professional Engineer in the State of Georgia.

He served as chairman of the Water Resources Committee of the American Forest & Paper Association (AF&PA). In 2001, Mayes co-authored a paper receiving the TAPPI Best Paper award in the Water Quality Category, "Understanding and Improving Secondary Biological Systems with State Point Analysis". from the University of Michigan Business School.

INSIDE THE NEXT ISSUE:

- Treatibility Assessments
  Powdered Activated Carbon Study
- Fecal Indicator testing
- Ask the biowizard question
- Wastewater Trivia
- Upcoming training events

SPECIALIZED TRAINING PROGRAMS OFFERED

Join us for our upcoming training programs for a chance to partcipate in person and earn CEUs!

Program	Dates	Location
Spring Seminar	April 11-13	EBS HQ - Mandeville, LA
Nashville Workshop	June 21-22	Nashville, TN
Savannah Workshop	July 19-20	Savannah, GA
Birmingham Workshop	August 9-10	Birmingham, AL
Fall Seminar	October 10-12	EBS HQ - Mandeville, LA

www.ebsbiowizard.com/training-seminars

We want to hear from you! For more information regarding upcoming training programs, operational issues at your facility, request a specific article topic, or want to participate in our "Ask the BioWizard" questions, please contact us by phone, email info@ebsbiowizard.com or through our Contact Us form located on our website.