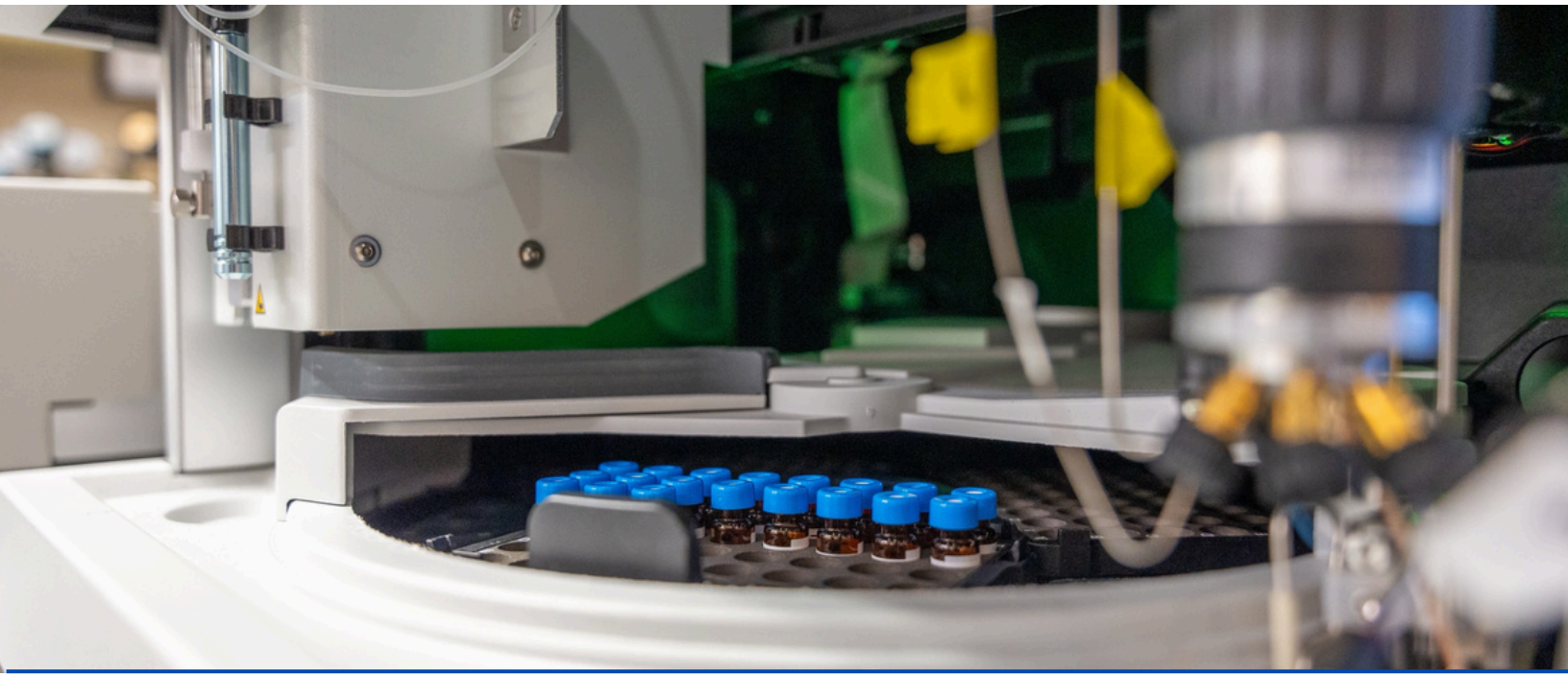
July 2024

EBS
An Employee-Owned Company
Comprehensive Wastewater Solutions

ISSUE 4

LAB LINES

Wastewater Consultants Like No Other

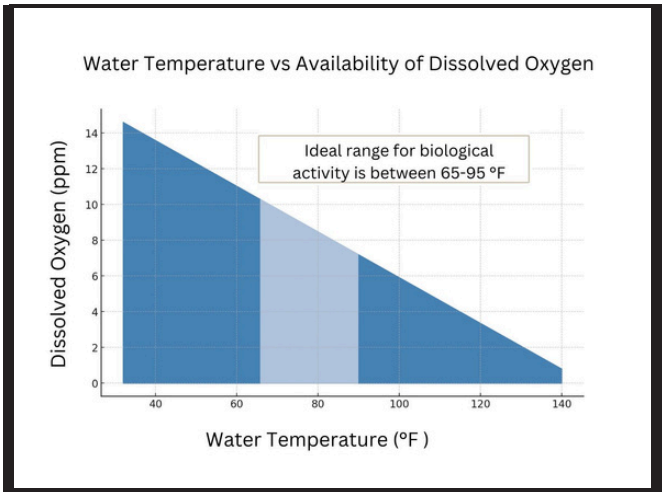


IN THIS ISSUE

SUMMER SIZZLE AND OXYGEN FIZZLE

THE INFLUENCE OF HEAT ON BACTERIAL METABOLISM IN WATER

The presence or absence of dissolved oxygen determines the type of metabolism used by the bacteria. During the summer, dissolved oxygen (DO) levels in water bodies can be significantly impacted by the increased heat. The relationship between DO and temperature in wastewater is inversely proportional, meaning that as temperature increases, the solubility of oxygen in water decreases. DO levels dictate bacterial metabolism.



HOW DOES LOW DO LEVELS IMPACT BACTERIA?

Low DO creates an anoxic environment, while the absence of DO leads to anaerobic conditions. In low DO environments, aerobic bacteria struggle to metabolize properly, which can result in reduced reproduction rates and possible BOD breakthrough. Anoxic conditions allow some bacteria and simple organisms like flagellates and amoebas to survive, with limited BOD conversion and possible denitrification. Adequate DO supports aerobic bacteria and complete BOD conversion, and permits nitrification if ammonia is high.

As water temperature rises, its ability to retain DO diminishes. In such cases, alternative terminal electron acceptors like EBS CalNit™ offer a scientifically validated solution to maintain compliance with BOD permit limits during oxygen deficient conditions!!

Below is a chart that explains how DO Levels impact bacteria metabolism.

DO Levels	No DO (<0 mg/L)	Low DO (<0.5 mg/L)	Sufficient DO
Metabolism	Anaerobic	Anoxic	Aerobic
Electron Acceptor	CO_2	NO_3 then SO_4	Dissolved O_2
Higher life forms	None	Few/some	Some/Abundant
Byproduct	Organic acids or Methane	Sulfides or Nitrogen Gas	Water

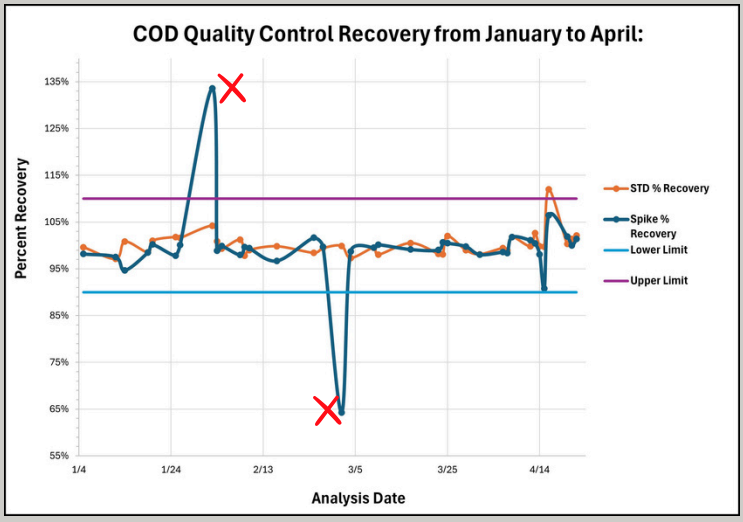
DOUBLE-CHECK DELIGHT:

MASTERING THE ART OF QA/QC DATA

Quality Assurance (QA) and Quality Control (QC) practices are essential components of wastewater treatment testing, forming the backbone of actionable data collection. These practices are not just routine procedures; they are critical checkpoints that ensure the integrity of data used by decision-makers in managing and optimizing. At EBS, our QA/QC procedures consist of Standards, Duplicates, and Spikes and are used to ensure the accuracy, precision, and reliability of our laboratory results.

HOW DO WE USE OUR RESULTS?

In the graph below, note how the spike percent recovery briefly exceeded the upper and lower limits in January and March. Given the variability of wastewater across industries encountered in our lab, the presence of interfering substances in the sample matrix can impact the accuracy of the COD test, causing the spike recovery to be lower or higher than originally anticipated. When this occurs, we adjust the sample dilutions until we arrive within the 10% margin of error once more.



STANDARD

A standard is a sample that contains a known concentration of an analyte (the substance being measured). It is used to calibrate analytical instruments and to validate the accuracy of a testing method. Standards provide a reference point to confirm that the method is correctly measuring the analyte at known concentrations.

DUPLICATE

A duplicate refers to the process of analyzing a sample twice, creating two separate measurements from the same original sample, to assess the analytical method's precision. Comparing the results from duplicate analyses helps identify any variability in the process and ensures the reliability of the testing procedure.

SPIKE

A spike involves adding a known quantity of an analyte to a sample before it is tested. This is done to assess the method's accuracy in a specific matrix and identify any effects the matrix may have on the analyte's measurement. The percent recovery of the analyte is evaluated, which is crucial for understanding how well the method can detect and quantify the analyte in different sample types.

At EBS, our chemists take pride in their ability to implement swift and precise corrective actions whenever such misalignments occur, ensuring the production of the highest quality data possible. We are more than data producers; each sample we receive in our lab helps our clients get one step closer to a solution.

If you suspect issues within your laboratory data, give us a call, we'd be happy to help!

DETERMINING ACTIVATED SLUDGE KINETICS

Wastewater treatment is not a one-size fits all solution. Each waste stream is unique, and each biological treatment system must be designed for the treatment a specific wastewater. A key component of a new wastewater treatment system design is determining reactor size, as this can have a significant impact on the quality of the effluent produced.

Laboratory treatability work can generate kinetic constants to be used in design models and sizing of new systems.

A k-rate constant describes the rate of substrate removal and is unique for every waste. The faster a substrate is degraded, the higher the k-rate constant value. The rate at which a substrate is removed is directly related to the retention time that a system will require to meet effluent permit limitations. The equation relates the substrate concentrations (influent and effluent), k-rate constant, biomass concentration, and retention time.

Equation: $S = S_0(e)^{-k\times \frac{XT}{S_0}}$

Where:
S = the effluent substrate concentration
$S0$ = the influent substrate concentration
X = the solids concentration,
t = the theoretical required hydraulic retention time
k = the k-rate constant.

Using this formula, it's possible to calculate the time required for the biomass to reduce the influent substrate concentration $S0$ to a desired effluent level. This calculation aids in determining the appropriate size for the biological treatment system based on retention time and influent flow.

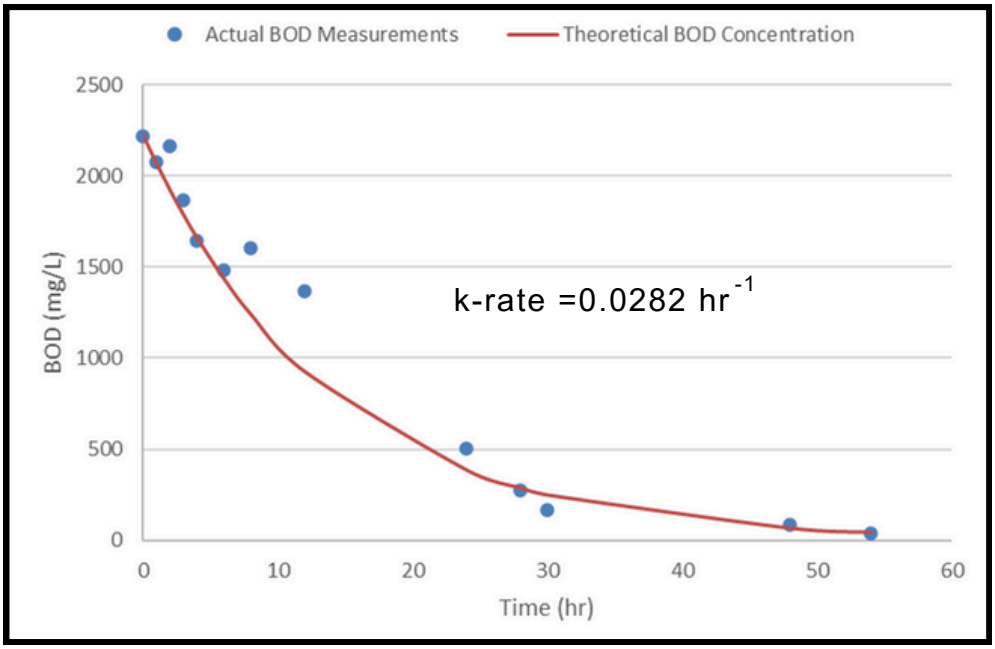
Continued on page 4

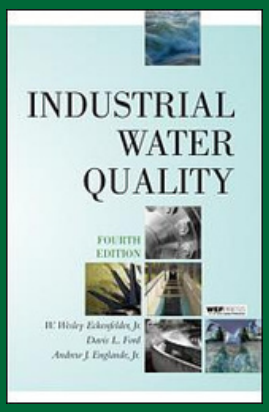
Determining Activated Sludge Kinetics Continued

>>> KINETICS CASE STUDY

EBS conducted a treatability study to determine the k-rate constant for a client who was interested in installing a plug flow fixed-film reactor. To generate the data required to determine the k-rate constant of this waste, EBS conducted a time-series batch test and measured the rate of biodegradation of the influent biological oxygen demand (BOD) over the course of 55 hours. At each of the 12 time points taken over this time, BOD and mixed liquor volatile suspended solids (MLVSS) were measured, in addition to temperature, pH, and DO to ensure the environmental parameters were not limiting the rate of the reaction. Using this data and equations defined in Industrial Water Quality by W Wesley Eckenfelder et al., 2009, EBS was able to calculate the k-rate constant for this wastewater.

EBS used the k-rate constant, the starting BOD concentration of the wastewater, and the MLVSS concentration of the reactor to calculate the theoretical BOD concentration over time. Overlayed with the measured BOD values collected in this study, the actual and theoretical values aligned closely (figure 1). EBS was able to confidently provide this client with the information they needed to size the reactor they were planning to install on-site.





EBS leverages a variety of highly accredited resources when designing new treatability studies for our clients. Among these, *"Industrial Water Quality" by W. Wesley Eckenfelder et al., 2009*, stands out as a key reference. We are fortunate to collaborate closely with one of the co-authors, Dr. Andrew Englande, at our EBS headquarters in Mandeville, LA. His expertise has been instrumental in ensuring the successful outcomes of these intricately detailed studies. If you would like to learn more about how our studies can benefit you, please email us today at info@ebsbiowizard.com.

DID YOU KNOW?

Ensuring top-level client support is our primary focus at EBS. Each department collaborates closely to provide the best consulting experience.

DID YOU KNOW IN THE PAST 6 MONTHS WE'VE.....

Our Operations Team

Provided onsite support to complete:

- **17** lagoon depth surveys
- **5** river quality surveys
- **2** system profile studies
- Competed **371** routine support visits
- Competed **2** full system evaluations
- 3 Drone surveys

Wastewater Training

Hosted several wastewater training events including:

- 3-day Spring Seminar
- 2 workshops
- Onsite lab trainings

>>> Register now for Fall Seminar hosted on Oct 8-10th

Our Lab Team

Analyzed Clients samples:

- Completed over **1,261** samples for microbiological, chemical, and advanced chemical analyses
- Completed **23** inhibition, biodegradability and respirometry assessments

Products Team

Provided clients with customized wastewater treatment products as needed

- Successfully delivered **36,567,442 lbs** of specialized wastewater treatment products across the US and Canada without any incidents.

We're Hiring! Contact us today.

As our company expands, we strive to hire top-tier candidates eager to pursue careers in wastewater treatment. We have opportunities at our Mandeville, LA headquarters and remote locations across the United States.

Philanthropy

Community support offered:

- Established a philanthropy fund that enables employees to personally contribute to their chosen charities.
- Completed 8 philanthropy projects in our community

Fall 2024 Wastewater Seminar

INDUSTRIAL ACTIVATED SLUDGE SEMINAR

JOIN US FOR A COMPREHENSIVE TRAINING COURSE LED BY EXPERTS IN WASTEWATER TREATMENT TROUBLESHOOTING AND RESEARCH.

$100 OFF REGISTRATION UNTIL 9/01/2024

OCTOBER 8-10 TH MANDEVILLE, LA

SEMINAR HIGHLIGHTS

- INTRO TO ACTIVATED SLUDGE SYSTEMS
- PROCESS CONTROL TESTING AND DATA INTERPRETATION
- SOLIDS MANAGEMENT
- MICROBIOLOGY
- SECONDARY CLARIFICATION TROUBLESHOOTING
- & MORE!

SEMINAR BENEFITS

- GAIN VALUABLE KNOWLEDGE AND ADVICE FROM FIELD EXPERTS
- NETWORKING OPPORTUNITIES
- INTERACTIVE DISCUSSIONS
- PERSONALIZED MICROSCOPE TRAINING OPPORTUNITIES
- LONG-TERM ACCESS TO COURSE MATERIAL

DON'T MISS OUT! REGISTER TODAY AT EBSBIOWIZARD.COM 1930 SURGI DRIVE MANDEVILLE, LA