ARCADIAN CHEMISTRY SOLUTIONS
SHINE BRIGHTER, SPEND SMARTER

Optimal Dissolved Oxygen (DO) Levels for Sludge Reduction and Biological Growth in Recovered Wash Water

When optimizing **biological treatment** for **sludge reduction** and **microbial colony growth**, the **DO concentration** must be carefully controlled. The ideal DO level depends on whether the system relies primarily on **aerobic, anaerobic, or facultative** microbial processes.

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1. DO Requirements for Different Microbial Processes, Inoculation Stage

Process Type	Optimal DO Range (mg/L)	Purpose in Recovered Wash Water
Aerobic Digestion	**2.0 – 4.0 mg/L**	Promotes rapid breakdown of organic matter, reduces BOD
Facultative Processes	**0.5 – 2.0 mg/L**	Supports both aerobic and anaerobic microbes for balanced degradation
Anaerobic Digestion	**< 0.5 mg/L**	Enhance sludge breakdown by anaerobic microbes (methanogens, fermenters)

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2. Recommended DO Levels for Different Treatment Phases

A. Initial Sludge Reduction Phase (First 10 Days)

- **Target DO: 0.5 – 1.5 mg/L**
- **Why?** Low oxygen favors **facultative and anaerobic bacteria**, which effectively break down **organic solids**.
- **Results:** Encourages **denitrification**, promotes **anaerobic sludge digestion**, and limits excessive aerobic sludge buildup.

B. Microbial Colony Growth and Stabilization (Day 10 – 30)

- **Target DO: 2.0 – 4.0 mg/L**
- **Why?** A moderate DO level supports **aerobic microbial growth**, helping to degrade remaining **organic matter** and stabilize the water.
- **Results:** Builds a robust **microbial community**, ensuring continuous **BOD reduction** and **biological equilibrium**.

C. Microbial Colony Control (Separator Tanks) and DO Oxygen Needs (Day 30 & Beyond)

- **Target DO: 4.0 – 7.0 mg/L**
- **Why?** A Strong DO level provides additional energy for aerobic **microbial digestion**, accelerating the degrading of **organic matter** and enhances stability of the recovered wash water.

- **Results:** Builds a robust **aerobic microbial community**, ensuring continuous **BOD reduction** through increased ORP (Redox**), blocking the ability of microbiology from returning to a anoxic water condition, thus creating biological equilibrium**.

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3. Why Not Keep DO Too High?

- If **DO > 5.0 mg/L**, anaerobic and facultative microbes **die off**, limiting sludge digestion and promoting **excessive biomass (aerobic sludge)** instead of breakdown.
- If **DO < 0.5 mg/L**, anaerobic conditions dominate, but **processes slow down** due to oxygen limitations.

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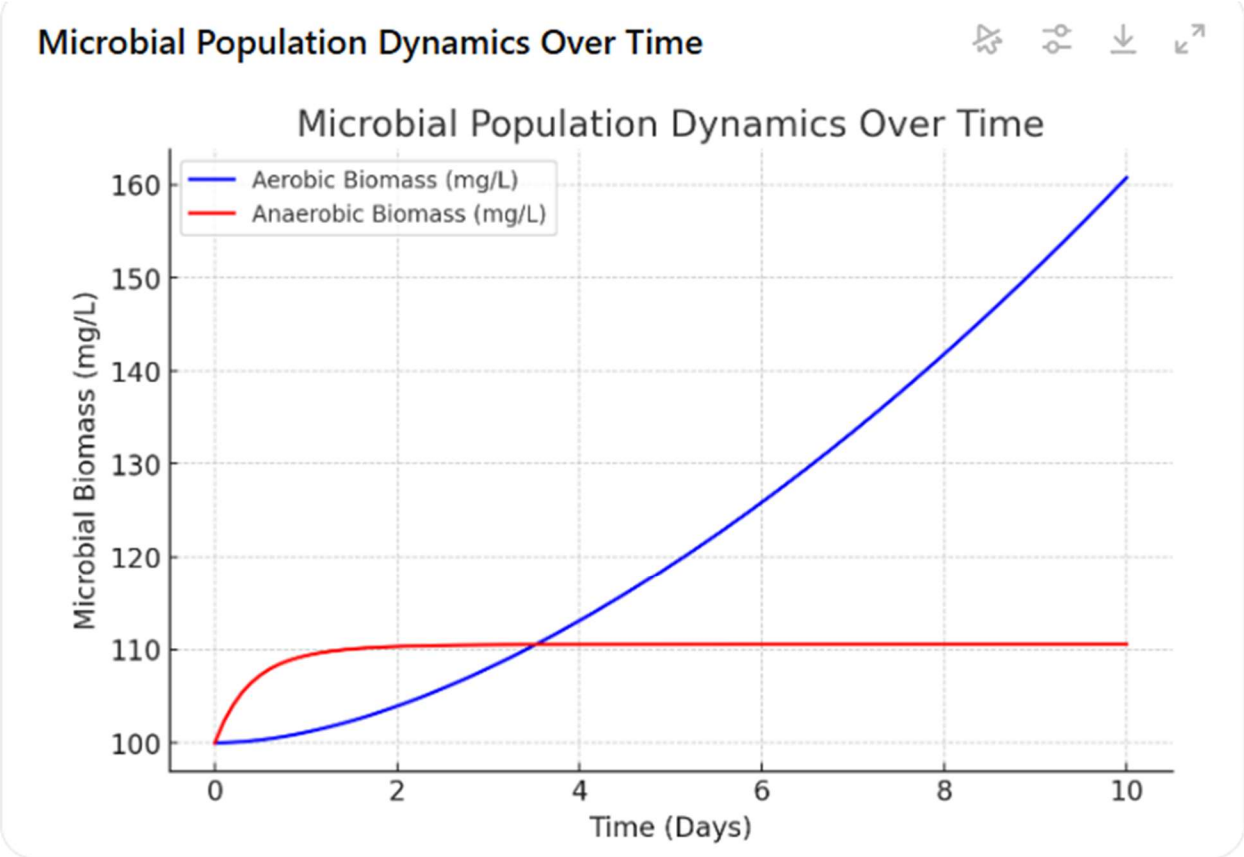
4. Key Takeaways for Optimized Biological Treatment

✓ **For sludge reduction: Keep DO between 0.5 – 1.5 mg/L** in early stages.
✓ **For microbial colony growth: Increase DO to 2.0 – 4.0 mg/L** gradually.
✓ **Avoid extremes:** Too much DO promote sludge accumulation, while too little slows microbial efficiency.

Appendix: *Dissolved Oxygen (DO) Needs as biomass grows.*



The chart above illustrates the microbial **population growth model**, showing how **aerobic and anaerobic biomass** evolve over time as **DO increases**:

- **Blue Line (Aerobic Biomass Growth)**:
  - Starts low but **grows exponentially** as DO increases, favoring aerobic conditions.
  - Aerobic bacteria **dominate after a few days**.
  - Adding **Reclaim Defender Bio-SludgeBane (2G or 2F)** ensures microbial digestion and denitrification throughout the separator tanks as DO Levels increase.
- **Red Line (Anaerobic Biomass Growth)**:
  - Starts growing slightly but **plateaus quickly** as DO inhibit anaerobic metabolism.
  - Anaerobic biomass **stabilizes or declines** over time.
  - Adding **Reclaim Defender Bio-Vorax (1G or 1F)** in smaller and smaller doses aids in the growth of the biomass replacing expired species.

Key Takeaways:

- **Anaerobic bacteria are active only in the first phase** before being outcompeted.
- **Aerobic bacteria thrive in the rising DO environment**, leading to system dominance.
- **DO control is crucial** for maintaining anaerobic processes in a treatment system.

Review Microbial sub straight plan to insure microbial growth mirrors water analysis reports. If variance is observed, please contact ACS Technical Services for assistance.

Reclaim Water Purification Process

Microbial decomposition in reclaim water is a natural, proven process with a 100% success rate — when basic water conditions are maintained. By avoiding oxidizers like ozone or hydrogen peroxide and keeping pH balanced, the system allows beneficial microbes to thrive. With these simple measures in place, the lab results below speak for themselves.