DON'T GO WITH THE FLOW:

4 KEY LESSONS IN RAS WASTEWATER TREATMENT

Wastewater treatment is a crucial yet often overlooked component of recirculating aquaculture systems (RAS). And yet, it may be one of the most important investments in RAS, critical to both ensuring the health of the system and the species that grow in them, and to the producer's bottomline as regulatory and environmental risks carry financial consequences.

As the aquaculture industry continues to grow, understanding and properly managing wastewater treatment becomes increasingly important for successful operations, says Trevor Gent, director of engineered solutions at Alumichem, a global wastewater treatment solutions provider headquartered in Denmark and with offices in Canada, USA, Brazil, Belgium, UK and Ghana.

With decades of experience providing water treatment solutions for multiple industries, Alumichem is leveraging lessons learned to provide not just technology but the knowledge to help RAS producers optimize their water treatment systems. Here are four essential lessons learned from years of experience building RAS wastewater treatment.

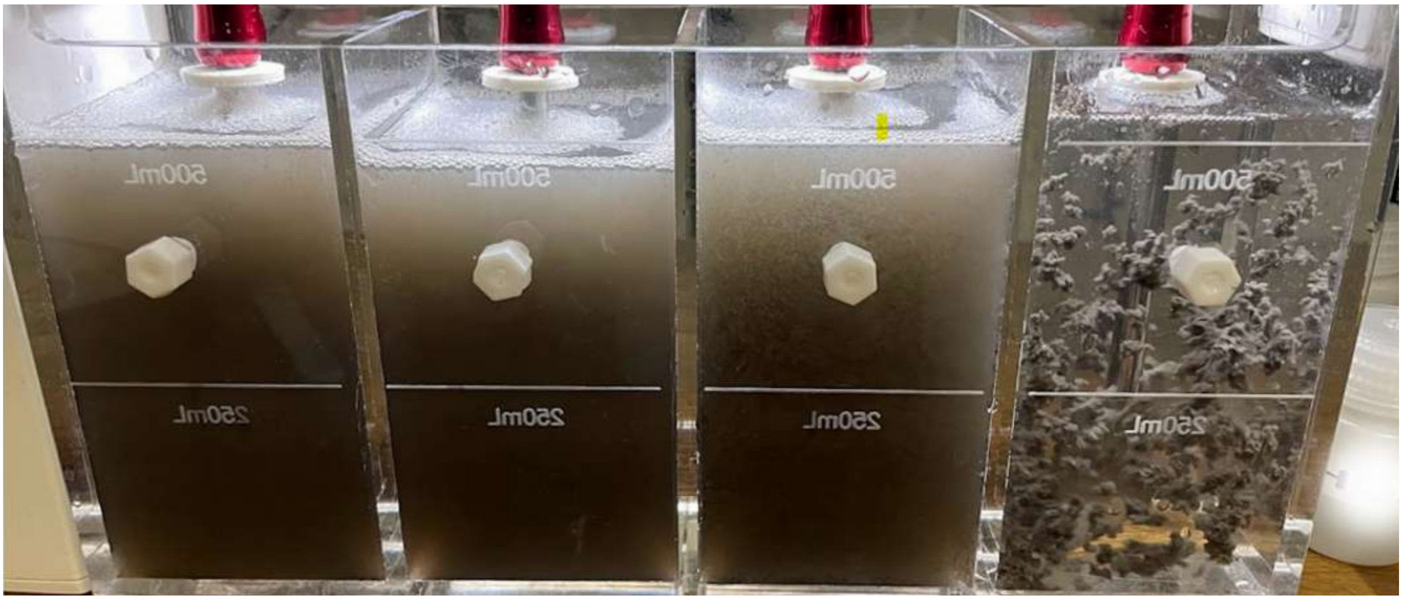
1. Understanding biomass fluctuations is critical

Unlike traditional wastewater treatment plants that operate in relatively steady states, RAS facilities experience significant variations in their waste output. These fluctuations occur naturally as fish grow from hatchery to harvest size, creating a cyclical pattern of increasing and decreasing waste volumes.

> *"Environmental permitting is an ever-changing beast."*
>
> - Trevor Gent

"The thing about a traditional wastewater plant is they run relatively in a steady state," explains Gent. "If you're talking about an industrial facility, oil and gas plant, textile plant, they turn on and run under constant conditions. Whereas in a RAS facility, you're starting with hatchery and growing to a certain size and then you take the entire mass and send it out and start over again." The wastewater treatment system needs to be able to manage these fluctuations effectively, and these changes don't happen overnight. "Because what we treat is ultimately excess food and fish feces in a RAS wastewater treatment system." And the volume of waste gets bigger as the fish grows bigger. "RAS facilities are inherently dynamic," Gent notes. "It's really important to understand that those fluctuations can impact how the system operates and that you

1 Fish sludge 2 Coagulation 3 Ph adjustment 4 Flocculation



Jar test of fish sludge from a RAS facility. The image shows the different stages of chemical treatment: 1. Raw water from the RAS system containing suspended solids and organic matter; 2. Coagulation, where particles begin to clump together; 3. pH adjustment to optimize treatment conditions; and 4. Flocculation with polymer addition, resulting in the formation of visible flocs that can be easily separated.

have to be prepared for those changes."

2. Build redundancy and flexibility

The variable nature of RAS operations demands flexible wastewater treatment systems. Single-equipment solutions often fall short when managing the ups and downs of waste production. Instead, successful systems incorporate redundancy and adaptability in their design. As Gent explains, "If you just build a system with a single piece of equipment and a single dewatering process, it gets very hard to manage those ups and downs. A lot of wastewater treatment is based on retention time or holding time through the process."

Flexibility can take many forms, from multiple treatment units to adjustable retention times. This adaptability ensures the system can handle varying loads while maintaining treatment efficiency. The goal is to create a system that can scale up or down as needed, accommodating the natural fluctuations in biomass without compromising treatment quality.

3. Don't leave wastewater treatment as an afterthought

One of the costliest mistakes in RAS facility planning is treating wastewater management as a secondary consideration. "We get brought in after the fact a lot of times because we're not the most expensive part of the process," Gent explains.

Often, producers are so focused on their ultimate goal of producing fish and building the systems that produce the fish and leave the wastewater treatment aspect as an afterthought. This oversight can lead to significant challenges. "A lot of times we get brought in and they say, 'Well, this is the size of the building you can have' versus 'What size of building do you need?' And so we end up having to design around a building versus designing the right system," Gent points out.

Bringing in all the engineering pieces, including wastewater treatment, early in the planning process helps producers build a better system that can meet not just production goals but satisfy environmental regulations, both now and into the future. "Environmental permitting is an everchanging beast," Gent says. "So planning for now and planning for the future are really important. Don't bring us in late. Bring us in on the forefront so that we can think through what can come."

4. Become an informed and educated owner-operator

While it might be tempting to outsource wastewater treatment entirely, successful RAS facilities understand the importance of maintaining ownership and knowledge of their treatment systems.

Gent shares an insight from a client: "When we first bought the plant with you guys, we had no idea what this meant, what this entailed. We're now informed buyers. We know what we want, what to think about and look for."

Being an informed operator means understanding the full scope of the operation and having a dedicated team or person operating the wastewater treatment system. "That doesn't mean they have to be there 24 hours a day, seven days a week. But you have to make sure that you have people on your team that are going to get trained, that are going to listen to the training, be interested in the training and execute on what it is," Gent says.

THE SOLUTION

- Turnkey sludge treatment and water management systems
- Turning sludge into a valuable resource and reducing disposal costs
- Meeting and exceeding local government regulations
- Support before & after start-up

ABOUT ALUMICHEM

With more than 40 years of experience in the industry, and an established and broad international network of knowledge intensive employees and partners, Alumichem is built on solid expertise in water chemistry, equipment, and consulting.

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