

MOLEAER NANOBUBBLES REDUCE OXYGEN USE AND IMPROVE WATER QUALITY IN RAS AQUACULTURE

Client: **RAS Facility**

Dates:	Location:	Unit:	Key Results:
December 2022 – January 2024	Puerto Varas, Chile	Trinity L1	• 100% of oxygen demand met using nanobubbles • 42.9% reduction in oxygen consumption • 50% reduction in electricity costs related to oxygenation • Significant improvement in water quality

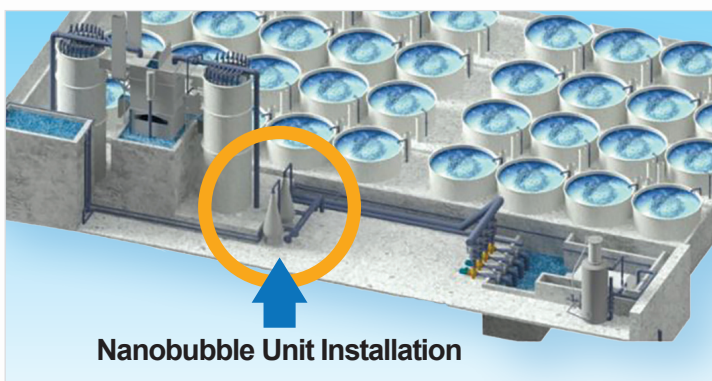


Figure 1. Installation site of the Trinity L1 nanobubble generator within the RAS facility.



Figure 2. Integration of the Trinity L1 nanobubble generator into the existing system, replacing the traditional oxygenation cone.

One of the world's leading salmon producers—renowned for its expertise in land-based aquaculture across Chile and other countries—conducted a trial to evaluate Moleaer's nanobubble technology as a replacement for traditional cone oxygenation systems, aiming to optimize oxygen levels for fish welfare and reduce oxygenation costs. At the RAS facility, the Trinity L1 nanobubble generator was installed in Sector R1, where two oxygen cones had previously been operating (see **Figures 1** and **2**). The nanobubble system used the same piping and one of the existing pumps, while the second pump was deactivated. Emergency oxygen diffusers, designed to activate when dissolved oxygen (DO) levels fall below 7 ppm, remained in place throughout the trial.

Assessing the Impact: Oxygen Transfer & Water Quality

Compared to the previous system—which combined oxygen cones with low-load oxygenation (LHO)—the Trinity L1 nanobubble generator delivered significantly greater efficiency. It achieved optimal DO levels using up to 49% less oxygen (**Figure 3**). This translated to a 40% reduction in oxygenation costs (**Figure 4**), along with a 50% energy savings by operating only one pump instead of two.

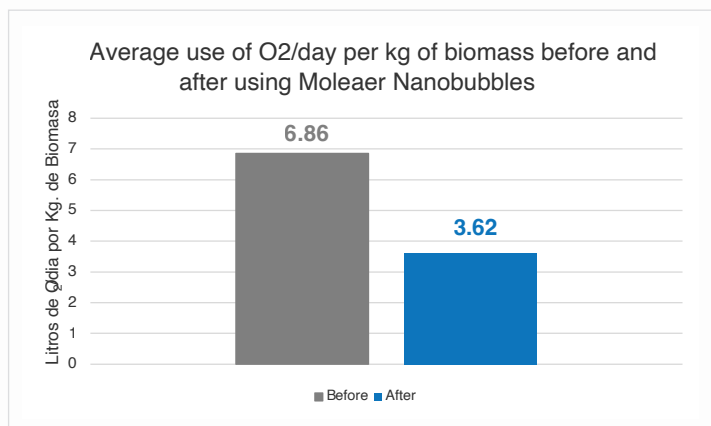


Figure 3. Average O₂ use/day per kg of biomass before and after the use of Moleaer nanobubbles

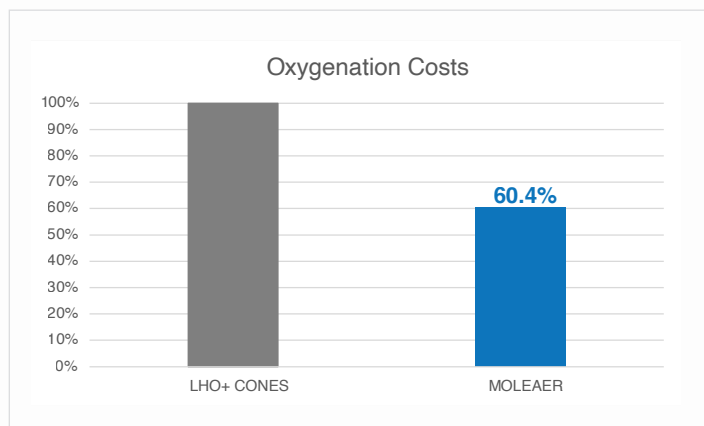


Figure 4. Percentage reduction in oxygenation costs achieved with the Trinity L1 nanobubble generator compared to the previous system.



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Notably, throughout the trial, the emergency diffuser system never activated, as DO levels consistently remained above the critical threshold. In contrast, the older system frequently triggered the emergency diffusers, increasing oxygen use unpredictably. This suggests that actual oxygen savings with nanobubbles may be even greater than measured—while also offering clear benefits to fish health through stable, optimal oxygen levels.

Moreover, the nanobubble generator achieved target DO levels in just minutes, streamlining the oxygenation process with a single unit.

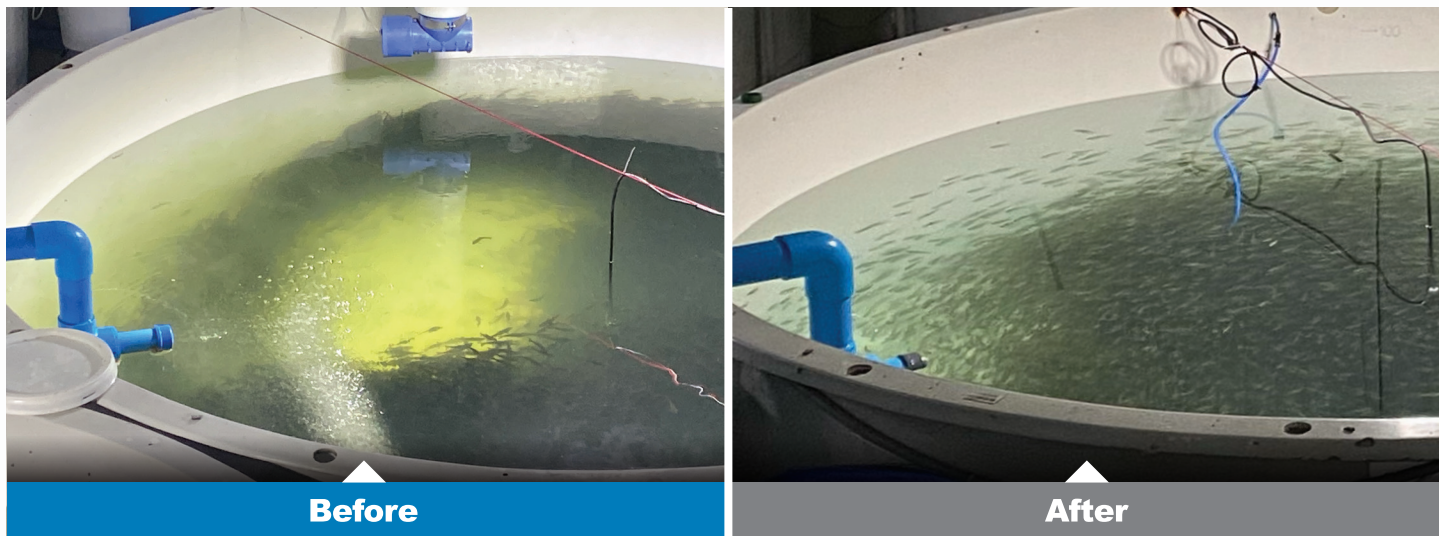


Figure 5. Improved water quality and clarity in fish tanks before and after treatment with Moleaer nanobubble technology.

Why Moleaer Nanobubbles are a Game-Changer in Aquaculture

Moleaer nanobubbles are exceptionally small—typically less than 200 nanometers in diameter—even smaller than standard ultra-fine bubbles. Their tiny size gives them unique properties: they remain suspended in water for long periods rather than rising and bursting like larger bubbles, making them highly stable. This stability is further enhanced by their negative surface charge and high internal pressure, which prevent coalescence and promote consistent gas transfer.

Moleaer's nanobubble technology generates a higher concentration of nanobubbles and achieves greater gas-to-liquid transfer efficiency than any other system available, making it the most effective solution for delivering dissolved gases such as oxygen into water.

In aquaculture systems, this leads to several key benefits. Nanobubble technology improves oxygen transfer efficiency and supports essential biological processes, such as the activity of nitrifying bacteria that convert toxic ammonia and nitrite into less harmful nitrate. This is particularly valuable in systems with high biomass, where maintaining oxygen availability is critical.

By enhancing organic matter decomposition and boosting biofiltration, Moleaer's nanobubbles contribute to improved water quality, healthier fish, and more efficient operations. They can also support higher stocking densities without compromising fish welfare, offering a path to increased productivity and lower operating costs.



Curious to learn more about how nanobubbles could improve your RAS operation? Connect with one of our experts to explore how Moleaer technology can be tailored to your specific needs:
info.moleaer.com/moleaer-background-information

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