

Nanobubble Technology in Recirculating Aquaculture Systems (RAS)

Objective

To evaluate the effects of oxygen nanobubble technology on fish health, growth performance, and system efficiency compared to conventional oxygenation methods (ceramic diffusers and air stones) in a recirculating aquaculture system. This trial was conducted in cooperation between Nano Bubble Technologies Pty Ltd and the Fisheries Research and Development Corporation (FRDC) in Australia.

Trial Design

Three controlled trials were conducted using 500 L cylindroconical tanks integrated into individual RAS units. The trials tested key variables relevant to commercial aquaculture:

- **Trial 1:** Yellowtail Kingfish (*Seriola lalandi*, initial weight 52g) at low and high stocking densities.
- **Trial 2:** Barramundi (*Lates calcarifer*, initial weight 103g) in freshwater and saltwater.
- **Trial 3:** Barramundi (initial weight 360 g) at 20°C and 30°C.

Key Results

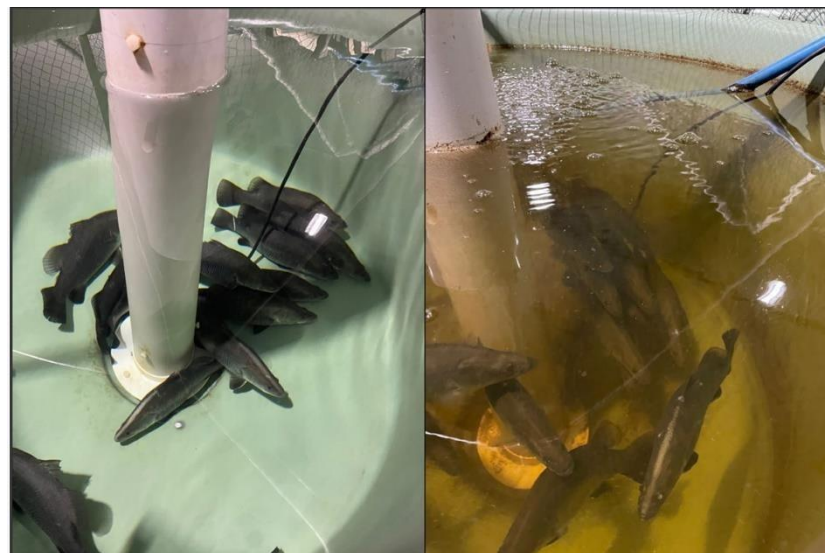
- Standard Oxygen Transfer Efficiency (SOTE) ranged from 17.4% to 54.2%. Preliminary testing in a 5,000 L tank demonstrated that the nanobubble injector achieved a **71.4% lower operating cost** per kg of oxygen transferred compared to a standard ceramic diffuser (\$5.51 vs \$19.26 per kg O₂).
- Fish in nanobubble-treated water showed excellent growth rates with **zero mortalities** across all trials.
- Histological examination of gill, eye, heart, and fin tissues revealed no significant differences; all tissues were normal and similar between the control and nanobubble groups.

Conclusion

Nanobubble technology proved to be safe and suitable for use in aquaculture. It delivered equivalent fish health, growth, and water quality outcomes to conventional systems, with no adverse effects observed. Our nanobubble technology offers a promising alternative to traditional oxygenation methods, particularly where energy efficiency, improved fish health, and lower operating costs are priorities.



500 L tank setup with NB injector



Barramundi in nanobubble water tank (left) vs control group (right)