

Improving fish welfare environment during sea lice treatment



APPLICATION

Oxygenation
for Delousing Vessel

UNIT

Trinity L2

RESULTS ▶

COMPARED TO CONES: DURING NORMAL OPERATIONS

63% REDUCED
energy consumption
(vs. Cone Pump + PSA
O2 Generator)

57.1% REDUCED
oxygen consumption

COMPARED TO DIFFUSER HOSES AT MAXIMUM CAPACITY

22.9% REDUCED
energy consumption
from PSA O2 Generator
(While adding a Pump).

73.2% REDUCED
oxygen consumption

MOLEAER'S NANOBUBBLE TECHNOLOGY: A SOLUTION FOR AQUACULTURE ENVIRONMENTAL GAINS

Moleaer's nanobubble technology provides a viable solution for aquaculture companies seeking a substantial reduction in CO₂ emissions. In the operation of oxygenation systems on aquaculture vessels, essential compressors and pumps, powered by diesel, contribute significantly to energy consumption. Direct mitigation of CO₂ emissions is achievable by addressing the energy demand and diesel consumption using Moleaer's technology. In a specific study, Moleaer demonstrated over 60% reduction in CO₂ emissions compared to cones, factoring in both energy and oxygen consumption during operations.

CHALLENGES IN SEA LICE MANAGEMENT AND ENVIRONMENTAL IMPACT

Managing sea lice in ocean aquaculture systems presents a significant challenge, requiring effective, economical, and environmentally sustainable methods. In Norway, aquaculture companies commonly utilize delousing systems, employing a natural and chemical-free approach. This involves using nets to gather fish near the vessel, subsequently pumping them into a delousing system for the removal and capture of sea lice

and their eggs. Despite the sustainability advantages over chemical treatments, this process has drawbacks. During delousing operations, salmon must be concentrated within pens before suctioning them into delousing lines for treatment. This crowding leads to stress and often results in low oxygen levels. Maintaining optimal oxygen levels during crowding procedures is challenging, given the primary importance of fish welfare to operators.

INEFFECTIVENESS OF CONES AND DIFFUSERS IN ADDRESSING OXYGENATION CHALLENGES

In attempting to address persistent low oxygen levels and improve fish welfare, a Norwegian aquaculture company initially equipped its vessels with four oxygen cones, powered by two 31 kW pumps, delivering 220 m³ of water



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at 3 bar each. While the cones succeeded in adequately oxygenating the water, the process proved to be highly energy-intensive and costly. Shifting strategies, the company transitioned to injecting oxygen with diffuser hoses. While this eliminated the energy consumption of cone pumps, the significantly lower oxygen transfer efficiency required much larger volumes of oxygen, driving up production costs. Additionally, the bubble sizes generated by the diffuser hoses hindered the accuracy of the fish counting system.

ADOPTION OF MOLEAER'S NANOBUBBLE TECHNOLOGY FOR ENHANCED OXYGENATION

In pursuit of a more effective solution, the company opted to try Moleaer's nanobubble technology. In the spring of 2021, the company installed Moleaer's Trinity L2 nanobubble generator, strategically positioned on a support structure above the connection point of the loading hoses to the delousing system. The Trinity L2 demonstrated superior oxygen transfer efficacy by injecting only a fraction of the typical amount of oxygen needed to support 200 tons of fish. The successful integration of Moleaer's nanobubble technology marked a significant advancement in not only addressing the company's oxygenation requirements but also in its initiatives to lower CO₂ emissions.

MORE ABOUT MOLEAER'S NANOBUBBLE TECHNOLOGY IN AQUACULTURE SYSTEMS

This system operates in line with water flow, employing high-efficiency gas-to-liquid injection technology. It converts bulk oxygen into nanobubbles, saturating water with elevated levels of dissolved oxygen. The negatively charged nanobubbles, possessing neutral buoyancy, linger in the water for extended periods, serving as an oxygen buffer that stabilizes dissolved oxygen levels. The generator, designed for permanent operation, boasts no moving parts, ensuring easy installation and seamless integration with existing pump systems. It can be directly installed in the flow line or in a side stream to enhance oxygen levels in any process.

KEY FEATURES

- Best-in-class oxygen transfer rates
- Highest concentration of nanobubbles in a single pass
- Compatible for use with saltwater/freshwater
- Horizontal or vertical installation
- Low maintenance

The global leader in nanobubbles technology, Moleaer offers the most efficient and cost-effective



oxygenation technology on the market, with significantly lower operating costs achieved through reduced oxygen and energy consumption. This technology elevates dissolved oxygen levels throughout the water, enhancing growth rates when deployed during feeding, thereby increasing biomass and improving a company's bottom line. Studies indicate that nanobubbles minimize pathogens, foster an environment conducive to reduced disease, enhance gill health, and lower mortality rates. Nanobubbles can also neutralize toxins and waste in water, while concurrently scrubbing surfaces and inhibiting biofilm formation. Compared to traditional oxygenation systems such as cones and diffusers, nanobubbles are significantly more efficient. This advanced and scientifically proven solution is backed by research and aids aquaculture facilities in operating sustainably. The Norwegian aquaculture company improved oxygen and energy consumption, reducing CO₂ emissions while providing increased oxygenation to their salmon during delousing crowding. The potential payback period for investing in Moleaer's technology instead of diffuser hoses is estimated to be approximately 18 months. Moleaer's local Norwegian team, headquartered in Trondheim, Norway, is committed to delivering nanobubble oxygenation solutions to empower fish farmers to meet increasingly stringent legislation, reduce inputs, improve sustainability, and mitigate the impacts of aquaculture to support a growing population.



To learn more about how nanobubble technology can help improve resource efficiency and improve fish welfare while increasing production visit our website:

<https://www.moleaer.com/industries/aquaculture>

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