

Indian Institute of Technology-Ropar
IIT- Technology and Innovation Foundation(AWaDH)
Website: <https://ihub-awadh.in/>

Technology: NanoAqua Nanobubble Generator

Expression of Interest (EOI) for Collaboration/Adoption of NanoAqua Nanobubble Generator

Deployed by: IIT Ropar-TIF AWaDH
Domain Coordinator: Dr. Neelkanth Nirmalkar
TRL Level: 9
NanoAqua Nanobubble Generator:

As the first-of-its-kind in India, our cutting-edge **NanoAqua Nanobubble Generators** provide eco-friendly and sustainable approaches to water treatment, pond and lake restoration, aquaculture, agriculture, and industrial applications. By combining advanced engineering with eco-conscious practices, we aim to address pressing water management challenges in both urban and rural contexts.

Nanobubble generator NanoAqua, N- 50 was installed as part of the pond management plan to improve water quality and fight the issues at the source. Nanobubble technology delivers efficient oxygenation and chemical-free, mild oxidation to sustainably decrease organic sediment and improve muck digestion, improving water quality. Nanobubbles promote the growth of beneficial bacteria. These bacteria help convert excess nutrients into less harmful forms, reducing the availability of nutrients for algae. In the first month of operation, notable improvements have been observed in the quality of the pond water. The local residents' decision to adopt a sustainable solution to address the root cause of their water quality issues is a testament to their unwavering commitment to long-term environmental well-being and cost-effectiveness. NanoAqua Technologies invites expressions of interest from organizations and stakeholders across industries to collaborate on implementing innovative nanobubble technology solutions.

About Nanokriti Nanobubble Technology

Nanobubbles are ultra-small bubbles, typically tens to hundreds of nanometers in size, that can be either gas-filled or liquid-filled. These bubbles provide revolutionary

benefits in oxygenation, mild oxidation, and sediment reduction, promoting water quality improvements without chemical treatments.

Our flagship product, the **NanoAqua Nanobubble Generator (N-50)**, enhances water ecosystems sustainably by:

- Decreasing organic sediment and improving muck digestion
- Promoting beneficial bacterial growth
- Limiting algae growth by increasing oxygen in deeper water layers
- Reducing reliance on harmful chemical treatments

This breakthrough technology promotes biodiversity, stabilizes aquatic ecosystems, and provides significant long-term economic and environmental benefits.

Distinct Features

1. **Mean Bubble Diameter:** 120 nm
2. **Oxygen Transfer Efficiency (OTE):** 75-80%
3. **Nanobubble Concentration:** $>1 \times 10^8$ Nanobubbles/mL
4. **Ease of Use:** Plug-and-play installation with low maintenance
5. **Energy Efficiency:** Uses 1kW to 10kW of power, significantly improving energy efficiency. In aquaculture, it supports seafood densities up to 70 kg per cubic meter, double that of conventional systems, which typically consume 25 to 250 horsepower per hectare.
6. **Improved Water Quality:** Introducing high concentrations of nanobubbles into the water increases oxygen levels, especially in deeper layers where oxygen is limited.
7. **Chemical-Free Solution:** This reduces the need for chemical treatments, reduces algae growth offering an eco-friendly and sustainable approach to water management.
8. **Cost-Effective and Exclusive to India:** Our nanobubble technology is the only product of its kind available in India, offering unparalleled innovation at a significantly lower cost compared to international and domestic alternatives.
9. **Material of Construction:** SS304 and SS316 for durability
10. **IoT System (Optional):** Enables smart monitoring and operation

Technical Specifications

	NanoAqua 10	NanoAqua 30	NanoAqua 50	NanoAqua 100	NanoAqua 200
ELECTRICAL POWER					
Voltage	220V	415V	415V	415V	415V
Phase	Single	3+N	3+N	3+N	3+N
Hz	50	50	50	50	50
Pump Motor Power (hp)	1.0	1.0	2.0	3.0	7.5
Compressor Power (hp)	1.0	1.0	1.0	1.0	1.0
Concentrator current (Amps)	3.5	3.5	3.5	3.5	3.5
Total Current (Amps)	12.2 A	8.5 A, 1.5 A, 1.5 A	10.0 A, 3.0 A, 3.0 A	17.5 A, 10.5 A, 10.5 A	17.5 A, 10.5 A, 10.5 A
Pump					
Pump Type	Centrifugal pump				
Material of construction	SS 304				
UNIT CONNECTIONS					
Suction (inch)	2.0	2.5	2.5	4.0	3.0
Discharge (inch)	2.0	2.5	2.5	4.0	3.0
DIMENSIONS AND WEIGHT					
Height, ft	2.08	3.25		3.25	
Width, ft	1.00	2.15		2.15	
Length, ft	1.50	2.50		2.85	
Weight, kg	30	50	80	120	160

OXYGEN CONCENTRATOR					
Capacity (lpm)	10.0	10.0	10.0	10.0	20.0
Oxygen concentration (%)	95.0%	95.0%	95.0%	95.0%	95.0%
Operating temperature (oC)	10-50	10-50	10-50	10-50	10-50
Humidity (%)	10-90	10-90	10-90	10-90	10-90
Power (Watts)	800	800	800	800	800
Operating altitude, ft	6000	6000	6000	6000	6000
CAPACITY					
Flow rate, m3/hr	5.0	15	30	50	100
Head, m	40	10	10	25	10

Unique Selling Points

- Proprietary Technology with No Domestic Competition:** NanoAqua's nanobubble technology is the first-of-its-kind in India. Our proprietary solutions stand out in the market with no local competitors, ensuring exclusivity and innovation.
- Patent-Protected and 100% Made in India:** Our technology is patent-protected and proudly developed entirely in India, showcasing our commitment to indigenous innovation and self-reliance.
- Scalable and Cost-Effective:** Our solutions are designed to be easily scalable across different applications, while offering a 50% cost advantage over existing technologies, both domestically and internationally.
- Research-Driven Innovation:** Backed by comprehensive in-house research and development, our technology integrates the latest advancements in

nanotechnology, ensuring high efficiency and reliability without relying on third-party services.

5. **Versatility Across Multiple Sectors:** Our technology is adaptable to a wide range of industries, including agriculture, aquaculture, water treatment, and industrial processes, making it a versatile solution for diverse challenges.

Impact of NanoAqua Nanobubble Technology

- **Water Treated:** We have so far treated over 1 million m³ (approximately 106 m³) of water using advanced ozone nanobubble technology.
- **Environmental:** The use of ozone nanobubbles has significantly improved water quality, increased biodiversity, and stabilized ecosystems. This technology helps restore natural ecosystems, mitigating environmental challenges linked to climate change through enhanced oxygenation and pollutant removal.
- **Economic:** Boosted tourism, recreation, and property values while offering cost-effective, long-term water treatment solutions for industries and municipalities.
- **Social:** By providing clean, safe, and revitalized water environments, we have enhanced community spaces for recreation and leisure, fostering a sense of well-being and community pride.
- **Health:** Ozone nanobubbles reduce exposure to pollutants and pathogens, resulting in better public health outcomes. The chemical-free nature of ozone also ensures a safer environment for aquatic life and human health, offering a direct link between cleaner water and improved health.
- **Food Security:**
 - **Agriculture & Horticulture:** Nanobubbles enhance nutrient delivery to plant roots, improving uptake efficiency, reducing fertilizer use, and boosting crop yields sustainably.
 - **Aquaculture:** Advanced nano bubble aeration supports higher stock densities and yields for salmon, tilapia, and shrimp, ensuring healthier and sustainable seafood production.

Collaborations and Installations

- **Government Projects:** Collaboration with multiple state governments including UP, HP, RJ, PB, and MP
- **Pilot Installations:**

- Rang Sagar Lake, Udaipur
 - Phool Kalan, Ropar, Punjab (community pond restoration)
 - **Self-Financed Projects:** Successfully implemented in 7 locations
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Applications and Useability:

Artificial aeration is a widely used approach in lake treatment to provide improved aeration, however, traditional aeration techniques like fountains have been challenging due to the low oxygen transfer rate (OTR). Nanobubble aeration has emerged as a promising technology that utilizes nano-scale bubbles to achieve higher OTRs owing to their large surface area and unique properties such as longevity and reactive oxygen species generation.

- **Water Treatment:** Ozone is a powerful disinfectant and oxidizer, over 50% stronger and 3000 times faster than chlorine. It eliminates the odor and taste left by chlorine and doesn't form harmful by-products like trihalomethanes, making it a cleaner, safer alternative for water treatment.
 - **Lake and Pond Restoration:** Effective oxygenation for algae control and biodiversity enhancement. Ozone nanobubbles improve water quality by providing oxygen, helping restore ecosystems in lakes and ponds.
 - **Aquaculture and Agriculture:** Enhanced oxygen levels for crop and fish productivity. Using ozone nanobubbles helps increase dissolved oxygen in water, improving both plant and fish health.
 - **Drinking Water Sanitation:** Chemical-free ozone nanobubble solutions for safe and clean water. Ozone is a powerful and eco-friendly alternative for disinfecting drinking water without the harmful side effects of chlorine.
 - **Textile Industry:** Eco-friendly water treatment for dyeing, finishing, and wastewater management.
 - **Sewage Treatment Plants:** Advanced solutions for wastewater treatment and environmental protection.
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Target Audience/Beneficiaries

Government Bodies:

- **Ministry of Environment, Forest, and Climate Change:** Supports environmental initiatives by improving water quality, biodiversity, and ecosystem restoration.

- **MSME Ministry:** Helps small and medium enterprises in industries like dairy, textile, and farming reduce water usage and meet environmental standards with cost-effective water treatment solutions.

Private Businesses:

- **Fisheries & Farming:** Enhances water quality for aquaculture and agriculture, promoting healthier ecosystems and higher productivity.
- **Dairy, Textile, and Paper Industries:** Provides eco-friendly, efficient water treatment solutions that reduce costs and environmental impact.

Municipal Corporations & Sewage Treatment Plants (STPs):

Offers cost-effective and eco-friendly water treatment, improving water quality and reducing operational costs for urban areas and wastewater systems.

International Markets:

Scalable technology adaptable to global applications in water treatment and ecosystem restoration, beneficial for diverse markets worldwide.

Community Stakeholders:

- **Farmers & Local Residents:** Improves water quality for agriculture and enhances recreational spaces for communities, fostering a cleaner, healthier environment.
- **Environmental Groups:** Advocates for sustainable water management and ecosystem preservation through the use of ozone technology.