Ozone Nanobubble (O_3-NB) Treatment Dramatically Improves Highly Polluted Wastewater from Sustainable Waste Management Facility

Sustainable waste management facilities generate highly contaminated wastewater from composting, leachate, mortality processing, and organic waste streams. This results in extremely high BOD, VFAs, total carbon, suspended solids, metals, hydrogen sulphide (H_2S), and pathogens, causing severe odours, dark black colour, low dissolved oxygen, and major compliance challenges.

Nano Bubble Technologies (NBT) conducted controlled laboratory trials using Ozone Nanobubble (O_3-NB) technology on a sample from the facility's dam. The trials demonstrated the system's ability to oxidise organics, reduce odours, clarify water, and inactivate pathogens through powerful hydroxyl radical generation and nanobubble flotation.

Client: Australian Sustainable Waste Management Company
Unit Type: Single-Cell O_3-NB System
NB Installation: September 2025
Pond Size: 6 Megalitres

Key Benefits Achieved

- **BOD:** 6,470 → 1,030 mg/L (–84%)
- **Total Suspended Solids (TSS):** 4,500 → 870 mg/L (–81%)
- **Volatile Fatty Acids (VFAs):** 4,500 → 2,400 mg/L (–47%)
- **Total Carbon:** 7,500 → 4,300 mg/L (–43%)
- **Oil & Grease:** 25 → 10 mg/L (–60%)
- **Total Phosphorus:** 110 → 35 mg/L (–68%)
- **E. coli:** >1,600,000 → 3,500 cfu/100 mL (–99.78%)
- **Faecal Coliforms:** >1,600,000 → 5,400 cfu/100 mL (–99.66%)
- **Hydrogen Sulphide (H_2S):** 4.1 → 1.4 mg/L (–66% after initial release)
- **Key Metals (Total):** Aluminium –84%, Iron –78%, Zinc –80%, Lead –83%, Cadmium –79%
- **Oxidation-Reduction Potential (ORP):** –267 → –42 mV (significant shift to oxidising conditions)

Odour Reduction

Untreated: Score 5/5 (very strong, rotten egg + organic odour) full-face respirator mask required
After 7 hours: Score 0–1/5 (hardly noticeable), no mask required (Photos 2 & 3)

Colour Reduction

Before Treatment: Dark opaque black
After 7 hours: Muddy brown (clear visual improvement from oxidation of organics, metals, and suspended solids)

The O_3-NB treatment demonstrated time-dependent performance, with moderate improvement after 1 hour and strong overall effectiveness after 7 hours through advanced oxidation, flotation, and disinfection. The results confirm O_3-NB as a powerful, chemical-free solution for odour reduction, colour removal, and pollutant degradation in complex organic wastewaters. The system is scalable for commercial applications without the need for filtration, enabling cost-effective, low-maintenance operation.