

## Case Study

# Nanobubbles for Wastewater Drain Restoration



### Overview

Rapid urbanization in India has led to increasing stress on water resources, with urban drains carrying high pollutant loads into rivers and water bodies. Addressing this challenge requires innovative, scalable, and energy-efficient solutions that can be deployed in-situ without extensive infrastructure.

NICO Nanobubble India Pvt. Ltd. introduced an indigenous, nanobubble-based treatment system designed to deliver rapid, chemical-free, and reuse-ready water quality. The solution was successfully demonstrated at Mungeshpur Drain, Haryana, with validation from regulatory authorities. The deployment marked a transformative shift in drain remediation, enabling high-rate treatment with minimal footprint and operational cost.

### Project Details

- **Location:** Mungeshpur Drain, Haryana, India
- **Application:** In-situ Urban Drain Remediation
- **Technology:** NICO Nanobubble-Based Aeration, Oxidation, Filtration System
- **Validation:** Haryana Pollution Control Board



### Pre-Installation Challenges

Before deploying nanobubble technology, the drain exhibited typical characteristics of urban wastewater systems:

- High organic load (COD & BOD)
- Elevated ammonia and sulphide concentrations
- Very low dissolved oxygen (<1 mg/L)
- Presence of pathogens and odor-causing compounds
- Limited feasibility for large-scale civil infrastructure

These challenges restricted the ability to achieve fast, decentralized, and cost-effective remediation.

### NICO Nanobubble Solution

To address these challenges, NICO deployed a compact, in-situ treatment system integrating:

- **O<sub>2</sub> Nanobubbles** for enhanced biological oxidation
- **O<sub>3</sub> Nanobubbles** for advanced oxidation and disinfection
- **Filtration module** for polishing and solids removal



Nanobubbles, due to their ultra-fine size (<200 nm), high stability, and superior mass transfer efficiency, enabled:

- Deep penetration of oxygen and oxidants
- Accelerated biological and chemical reactions
- Uniform treatment across the flowing drain

This modular setup yields high-efficiency treatment without large reactors or chemical dosing.

### Performance Outcomes

Parameter	Unit	Conventional System	With *NNB ® Technology
COD	mg/L	280	< 50
BOD	mg/L	38	< 10
Ammonia	mg/L	4.5	0.05
TSS	mg/L	362	< 20
Dissolved Oxygen	mg/L	0.5	≥ 5.5
E. coli	-	Present	NIL
Sulphides	-	Present	NIL



\*NNB – NICO Nanobubble

### Impact Analysis

The implementation delivered multi-dimensional benefits:

- **High-Rate Treatment:** Rapid pollutant reduction within short contact time. The proposed process is suitable for continuous flow drains.
- **Chemical-Free Operation:** No external chemicals required and comparatively lesser sludge generation than conventional biological process.
- **Advanced Oxidation Efficiency:** Effective removal of ammonia, sulphides, and pathogens within **30 mins of hydraulic retention time.**
- **Energy & Cost Optimization:** **Lower OPEX (~₹6-7/kL)** due to reduced aeration requirements
- **Compact & Decentralized:** No need for large biological basins and ideal for urban and footprint constrain locations

### Conclusion

The successful deployment at Mungeshpur demonstrates that NICO's nanobubble technology is not just innovative, but truly deployment-ready. By enabling high-rate treatment, chemical-free operation, low energy consumption, and modular scalability, the system delivers a robust and efficient solution for real-world challenges. It offers a future-ready approach to urban drain remediation, supporting scalable and sustainable water management across India.

Nanobubbles are not just improving water treatment. They are redefining how urban water challenges are solved.