

Case Study

NICO Nanobubbles for Semiconductor Rinse Water Optimization



Overview

A leading semiconductor manufacturing company evaluated NICO Nanobubble O₂ Injection Technology for improving rinse water quality in a post-etch rinse module.

The 8-week trial focused on reducing TOC, microbial load, chemical consumption, and DI water use through a non-invasive side-stream retrofit.

Project Details

- **Client:** Leading semiconductor manufacturing company
- **Application:** Post-etch rinse module
- **Technology:** NICO Nanobubble O₂ Injection System
- **Trial Duration:** 8 weeks
- **Configuration:** Side-stream integration with existing rinse tank circulation loop
- **Objective:** Improve rinse water quality, reduce chemical and water use, and stabilize process performance

Pre-Implementation Challenges

The rinse module required improved control over TOC carryover, microbial growth, chemical usage, and DI water consumption. The client needed a solution that could enhance rinse performance without modifying the existing production process.

NICO Nanobubble Solution

NICO integrated the nanobubble generator in the existing side-stream loop:



This enabled continuous oxygen nanobubble recirculation, improved gas-liquid transfer, and better rinse water stability without process interruption.

Performance Outcomes

Across the trial window, the deployment demonstrated strong improvement in rinse loop stability, including a significant reduction in conductivity excursions, **rapid reduction of organic load indicators (>90% TOC reduction)** in the treated loop, and **robust microbial suppression relative to baseline operation (>95% algal contamination reduction)**.

The site also observed improvements in operational continuity, reflected in reduced need for cleaning interventions and improved stability of water quality across **operating hours (2x enhancement in reuse cycle)**. These outcomes support the role of nanobubbles as a practical, high-leverage tool for improving reuse confidence and reducing the operational friction typically associated with rinse water conservation strategies.

Impact Analysis

The trial showed that NICO Nanobubble Technology can improve semiconductor rinse water quality through a simple retrofit model. The system reduced TOC, controlled microbial contamination, lowered chemical and DI water demand, and improved process consistency without affecting the existing rinse operation.

Conclusion

NICO Nanobubble O3 Injection Technology demonstrated strong potential for semiconductor rinse water optimization, ultrapure water support, wet process stability, and sustainability improvement. The side-stream configuration makes it suitable for retrofit applications in advanced manufacturing facilities.