

# NANOBUBBLES IMPROVE PLANT RESILIENCE DURING DYNAMIC AND IMPULSE LOADING FOR CHEESE MANUFACTURING FACILITY



## Client Case Study: Cheese Facility

<b>Location:</b> Ohio, USA	<b>Unit Type:</b> Titan NBG 6 with Liquid Oxygen (LOX) as O <sub>2</sub> source	<b>Installation:</b> July 2022	<b>Installation Type:</b> Side stream on 60,000 gallon equalization (EQ) tank	<b>Gas Flow Rate:</b> Oxygen fed at 1 SCFM via a recycle pump operating at 1000 GPM	<b>Results:</b> <ul style="list-style-type: none"> <li>• Maintain targeted DO concentrations during slug-load conditions while keeping nitrification and biological ammonia removal</li> <li>• <i>Dramatically</i> decrease odors</li> <li>• Increase solids concentration in sludge from 12% to 17%</li> <li>• Significantly improve process recovery after dynamic and impulse loadings</li> </ul>
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Wastewater treatment efficiency was optimized at a cheese manufacturing facility through nanobubble injection prior to the aeration tank. By utilizing nanobubble pre-treatment, process dissolved oxygen (DO) levels remained constant during slug-loads of up to 20,000 mg/L of chemical oxygen demand (COD) which resulted in consistent nitrification, and better sludge settleability with the solids concentration increasing from 12% to 17%.

### Pre-Treatment with Nanobubbles

Moleaer's nanobubble technology installed as a pre-treatment for industrial wastewater can increase oxygen transfer efficiency and improve biological health by degrading compounds that inhibit oxygen transfer in the aeration process and can be toxic or inhibitory to process biology. Nanobubbles allow the existing aeration process to operate at peak efficiency while maintaining a healthier, more resilient biomass. This reduces recovery time after dynamic and impulse loadings that otherwise would cause huge demands on the system, creating a more resilient and sustainable wastewater system.

### Challenges with Slug Loading for Cheese Facility

An award-winning cheese facility's membrane bioreactor (MBR) process with jet aeration had issues with handling slug-loading and strong odors. When COD upsets occurred in the wastewater stream, the system lacked the capacity to handle these upsets and process the cheese waste, resulting in low-DO conditions and long recovery time.

Prior to nanobubble pre-treatment when slug-loads occurred the DO would fall to as little as 0.5 mg/L leading to lingering process challenges; however, within 36 hours of nanobubble pre-treatment, the DO held steady during slug-load conditions at 2 mg/L and above, with only one 15-minute increment where the DO fell to 1.6 mg/L when historically the system could take days to recover.

As with most industrial facilities, even when equalization and other best

practices are implemented, it can still be difficult or even impossible to predict dynamic loading events coming from a processing facility. Even when prepared for these demands, it's difficult to handle the loading events with limited process upsets.

The facility's contract manufacturer, Envirotec, sought a simple and sustainable solution that would minimize capital expenditure and provide additional resilience to the system. They selected Moleaer's patented nanobubble technology, a chemical-free solution that requires limited to no infrastructure changes or disruption to plant processes or operations.

### A Sustainable, Modular Solution

The Moleaer nanobubble generator (NBG) was installed on a side stream of the 60,000 gallon EQ tank using LOX for the oxygen source.

The nanobubble pre-treatment allowed the cheese manufacturer to:

- Eliminate the thick scum layer on the EQ tank
- Maintain their targeted DO concentrations during slug-load conditions while keeping nitrification and biological ammonia removal
- *Dramatically* decrease odors
- Increase solids concentration in sludge from 12% to 17%
- Significantly improve process recovery after dynamic and impulse loadings

Historically the site would need to over-aerate during typical operating conditions to ensure the system was prepared to handle slug loads when they occurred. After seeing the recovery of DO levels and the limited impact nanobubbles had on the biology during multiple slug events, Envirotec was able to reduce the DO set point for their positive displacement aeration blowers from 3.2 to 2.5 mg/L. They plan to continue to lower the DO set point and quantify the total power savings from nanobubble pre-treatment. This decreased blower speed also offset the power demand for the 40-horsepower nanobubble recycle pump needed to operate the system.

"The unique properties of nanobubbles to reduce and stabilize loading on primary and secondary treatment systems make the technology a great solution for any facility looking to stabilize their treatment process, increase treatment capacity and/or optimize their plant operations," stated Eric Phillips with Envirotec.

The cheese facility and their contract operator, Envirotec, have been able to achieve these benefits with Moleaer's easy-to-implement Titan™ nanobubble system while supporting the advancement of nanobubble technology and wastewater best practices. Today, the facility's system is showing increased resiliency along with plant process optimization and operating costs reduction.



**Learn more about how nanobubbles improve wastewater treatment processes:**

[www.moleaer.com/industries/wastewater](http://www.moleaer.com/industries/wastewater)

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