MOLEAER
ADVANCING NANOBUBBLE TECHNOLOGY

Fallbrook Public Utility District

MOLEAER'S NANOBUBBLES IMPROVE WASTEWATER TREATMENT PROCESS PERFORMANCE

Client Case Study: FALLBROOK PUBLIC UTILITY DISTRICT

Type:	Unit Type:	PERMITTED FLOW:	PROCESS IMPROVEMENTS
WASTEWATER TREATMENT PLANT	1800 GPM MOBILE TRAILER	2.7 MGD	60% MORE OXYGEN TRANSFERRED 45% POTENTIAL ENERGY SAVINGS

The Fallbrook Public Utility District (FPUD) Wastewater Treatment Plant (WWTP) #1 is located in Fallbrook, California and serves a residential population of around 25,000 people. Like many WWTPs, Fallbrook WWTP #1 faced challenges associated with the detrimental impacts of surfactants and other influent loading conditions on aeration system performance.

The treatment efficiency of the secondary treatment process is highly dependent on the transfer of oxygen to water, provided by the aeration system, to sustain the biomass necessary to remove contaminants from the wastewater. Approximately 40 to 60 percent of the energy required to dissolve oxygen into wastewater can be attributed to the detrimental impact of surfactants alone on oxygen transfer.

Moleaer's nanobubble pre-treatment can be applied at municipal and industrial scale.

The Fallbrook WWTP #1 uses mechanical bar screens and an aerated grit chamber followed by primary clarifiers to provide preliminary and primary wastewater treatment. The liquid stream from the primary clarifiers is further treated using a conventional activated sludge process including aerobic treatment followed by secondary clarifiers. After secondary treatment, the wastewater is disinfected in a chlorine contact basin prior to discharge. Sludge from the secondary clarifiers is thickened, aerobically digested, and dewatered via centrifuge prior to disposal.

Moleaer and FPUD conducted two 25-day pilot studies using one of Moleaer's 1800 GPM nanobubble generators. The nanobubbles were injected into a headworks basin upstream of the primary clarifiers to treat an average daily influent flow of 1.4 MGD. Data, including dissolved oxygen (DO), pH, oxidation reduction potential (ORP), oxygen uptake rates, nitrification rates, oxygen transfer efficiency, and other water quality and operating parameters, were measured throughout the pilot studies.

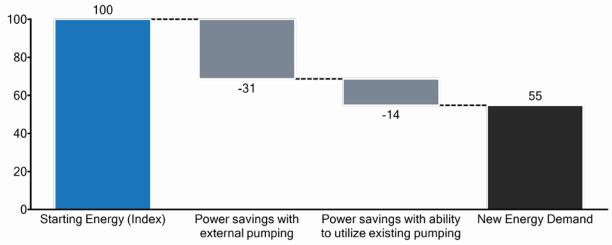
The pilot data in combination with the plant's energy usage before, during and after the pilot studies were used to assess the impact of nanobubble injection on overall wastewater treatment performance and efficiency. With nanobubble injection, Moleaer was able to reduce the organic and surfactant loads to the secondary process resulting in an aeration energy savings that averaged 30% of the plant's historical annual aeration operating expenditures (OPEX).

"The data collected by Moleaer showed how the adoption of the Moleaer nanobubble technology allowed to nearly double the energy efficiency of our existing fine-bubble aeration system, due to the ability of nanobubble to remove surfactants from the influent wastewater," said a FPUD representative, "Because surfactants suppress the ability of transferring oxygen in activated sludge systems, the integration of a Moleaer nanobubble technology in our headworks basin resulted in 60% more oxygen transferred to the process.

"More, the results showed how the removal of surfactants allowed a more efficient oxygen uptake from the activated sludge, thereby increasing the treatment capacity of the plant without the need for additional process volumes (i.e., for equal footprint)."

"We are very satisfied working with Moleaer and recommend other wastewater plants to consider this technology as a cost-effective solution to optimize plant operations, energy usage for treatment as well as to retrofit under-performing aeration systems."

The two 25-day pilots show that nanobubble injection provides a low-cost alternative for reducing aeration energy requirement, improving wastewater treatment process performance and increasing the treatment capacity of secondary treatment basins.



Energy savings are produced by improved plant efficiency after implementing Moleaer's nanobubble pre-treatment.

Rev. 101221