



Using Aquamonitrix® for real-time measurement of nitrate and nitrite in treated wastewater effluent

When the technologists at the biotech company Microvi wanted to demonstrate the effectiveness of their novel MicroNiche Engineering™ (MNE) process technology for nitrate removal at a sewage treatment site in the UK, they choose the Aquamonitrix® analyser to provide real-time monitoring of the nitrate and nitrite levels in wastewater entering and leaving the process.

Background

Most wastewater treatment facilities worldwide rely on bacteria-mediated reactions for the nitrogen removal. This typically involves the use of mixed microbial communities to convert ammonia, via nitrate and nitrite, to nitrogen gas. However, there are a number of limitations to these conventional biological processes – not least the fact that the bacteria become less effective as ambient temperatures drop.

To counter these problems, Microvi has combined material science and microbiology expertise to develop an innovative MicroNiche Engineering™ (MNE) biocatalytic composite that intensifies and extends the life of biological processes, while maintaining a controlled population of microorganisms at a much higher density than existing systems.

A major benefit of the MNE nitrate removal system is that it continues to deliver robust performance even at lower temperatures. The technology can be used for secondary treatment or retrofitted to existing plants for tertiary treatment, enabling compliance with discharge licence limits and/or superior environmental performance, with reduced risks of eutrophication and contamination of drinking water supplies.

Why Microvi Choose Aquamonitrix

A large regional UK water utility funded a trial of Microvi's MNE system for tertiary nitrate removal at one of its sewage treatment plants during the winter months of January through to March 2022.

During this period, an Aquamonitrix® analyser was used for automated, in-situ, real-time measurement of nitrate and nitrite levels in the wastewater entering and leaving the MNE tertiary treatment process.

One of the main reasons Microvi chose Aquamonitrix® was the ease of deployment at an existing wastewater treatment plant. "There aren't that many online nitrate analysers you can easily retrofit to an existing site," commented Ajay Nair, Director of Commercial and Technical Strategy at Microvi.

“With Aquamonitrix® we didn’t need any sampling or other infrastructure or site works. We literally just plugged it into the mains supply.”

The proprietary Datamonitrix platform, which trends nitrate and nitrite measurements from Aquamonitrix® in real-time via IoT, also made it very easy to track the system performance remotely via a PC.

“The other reason for choosing Aquamonitrix® was to analyse both nitrate and nitrite,” Ajay added. “While there are alternatives for nitrate, we aren’t aware of any other analyser that can simultaneously monitor nitrate and nitrite with a high degree of reliability for both measurements.

“While the goal was to reduce nitrate, we also wanted to be sure there wasn’t anything unusual happening with the nitrite levels.”

In fact, real-time monitoring revealed that the MNE nitrate removal technology also consistently reduced nitrite levels – an additional environmental benefit given the toxicity of nitrite to almost all aquatic creatures.

Results

During the trial, the Microvi nitrate-removal process handled incoming nitrogen levels as high as >100 mg/L nitrate (as NO₃⁻) and >2.5mg/L nitrite (as NO₂⁻). Even at temperatures below 8°C, the MNE process was consistently successful in reducing both the nitrate and nitrite content by several orders of magnitude.

The graphs below show a typical snapshot of the nitrate (and nitrite) removal performance over 72 hours between 28 February and 2 March 2022, with automated hourly sampling and analysis of the influent and effluent by the Aquamonitrix® Nitrate and Nitrite analyser.

The performance evaluation followed a successful demonstration of MNE technology for tertiary ammonia removal at the same site in 2021.

“The trials highlight our innovative solution for delivering total nitrogen reduction across a broad range of applications in the wastewater industry,” Ajay commented.

We are looking forward to using Aquamonitrix® for effluent monitoring in further applications as we continue to advance the state of nitrogen removal in the wastewater sector.”

