Simple control strategy for mitigating N2O emissions in phase isolated full-scale WWTPs -
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Nitrous oxide (N2O) is a strong greenhouse gas (GHG) and ozone depleter, with a warming potential 300 times higher than carbon dioxide (CO2). 1.2% of the total anthropogenic N2O emissions are believed to originate from the wastewater treatment (WWT) sector. Conventional biological nutrient removal processes relying on nitrification and denitrification are known to produce N2O. A one year long-term study of N2O production and emissions was performed at Lynetten, Denmark’s largest WWTP. Nitrification and denitrification takes place by alternating process conditions as well as influent and effluent flows in 20 pairs of interconnected and surface aerated reactors. The long-term data revealed that the N2O emissions contribute to as much as 30% of the total CO2 footprint from the WWTP. High ammonium concentrations and long aeration phases lead to high N2O production and emissions rates. Nitrification phases were identified to produce and emit most of the N2O. High production and emissions were also associated with the afternoon loading peaks at the WWTP. During denitrification phases N2O was produced initially but consumed consequently. An effective control strategy was implemented, whereby N2O emissions were reduced from 0.8% to 0.3% of the nitrogen load during the mitigation period.

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