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Max Weißbach, Paul Thiel, Jörg E. Drewes, Konrad Koch

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Max Weißbach, Paul Thiel, Jörg E. Drewes, and Konrad Koch*

Chair of Urban Water Systems Engineering, Technical University of Munich, Am Coulombwall 3, 85748 Garching, Germany.

*corresponding author: Konrad Koch, e-mail address: k.koch@tum.de, phone: +49.89.289.13706

Abstract

A Coupled Aerobic-anoxic Nitrous Decomposition Operation (CANDO) was performed over five months to investigate the performance and dynamics of nitrogen elimination and nitrous oxide production from digester reject water under real feed-stream conditions. A 93% conversion of ammonium to nitrite could be maintained for adapted seed sludge in the first stage (nitritation). The second stage (nitrous denitritation), inoculated with conventional activated sludge, achieved a conversion of 70% of nitrite to nitrous oxide after only 12 cycles of operation. The development of an alternative feeding strategy and the addition of a coagulant ($FeCl_3$) facilitated stable operation and process intensification. Under steady-state conditions, nitrite was reliably eliminated and different nitrous oxide harvesting strategies were assessed. Applying continuous removal increased N_2O yields by 16% compared to the application of a dedicated stripping phase. These results demonstrate the feasible application of the CANDO process for nitrogen removal and energy recovery from ammonia rich wastewater.