PROJECT PROFILE

Title	Use of deammonification for nitrogen elimination in the main stream of municipal wastewater treatment plants **(DEA-HS)**
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Project partner	Institute NOWUM-Energy at FH Aachen
Funding agency	The Ministry for Environment, Agriculture, Conservation and Consumer Protection of the State of North Rhine-Westphalia
Duration	01.10.2018 – 31.07.2020

The process of deammonification is an alternative method for nitrogen elimination. In contrast to conventional nitrogen elimination with nitrification and denitrification, deammonification requires considerably less aeration, so that its use promises remarkable energy savings. Due to the properties of the microorganisms used - the anammox bacteria - the process has so far only been successful in heavily loaded wastewater flows. In view of the high energy saving potential, the question therefore arises whether the process of deammonification could also be successfully integrated into the main stream of municipal wastewater treatment plants.

In the joint research project Dea-HS, the FH Aachen and the RWTH Aachen have therefore set themselves the goal of examining the application possibilities and limits of deammonification.

The procedure of deammonification consists of two steps. It is based on the partial nitritation of ammonium NH_4^+ to nitrite N_2^- and the subsequent anammox reaction to elemental nitrogen N_2. While the aerobic nitrite oxidizing bacteria require oxygen to convert ammonium, the anammox reaction takes place under anoxic conditions.

$$NH_4^+ + 1{,}5O_2 \longrightarrow NO_2^- + 2H^+ + H_2O$$

$$NH_4^+ + NO_2^- \longrightarrow N_2 + 2H_2O$$

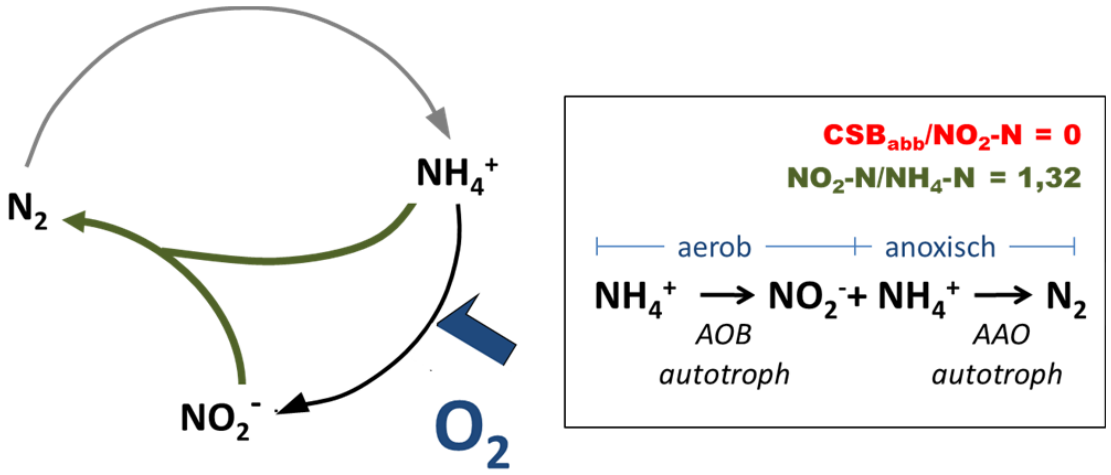
Since anammox bacteria are slow-growing organisms with unknown optimal living, the establishment of the process is not always without complications.

The first phase of the project contains the evaluation of the operating data of existing deammonification plants in NRW and laboratory tests to validate the operating limits and limitations of the process.

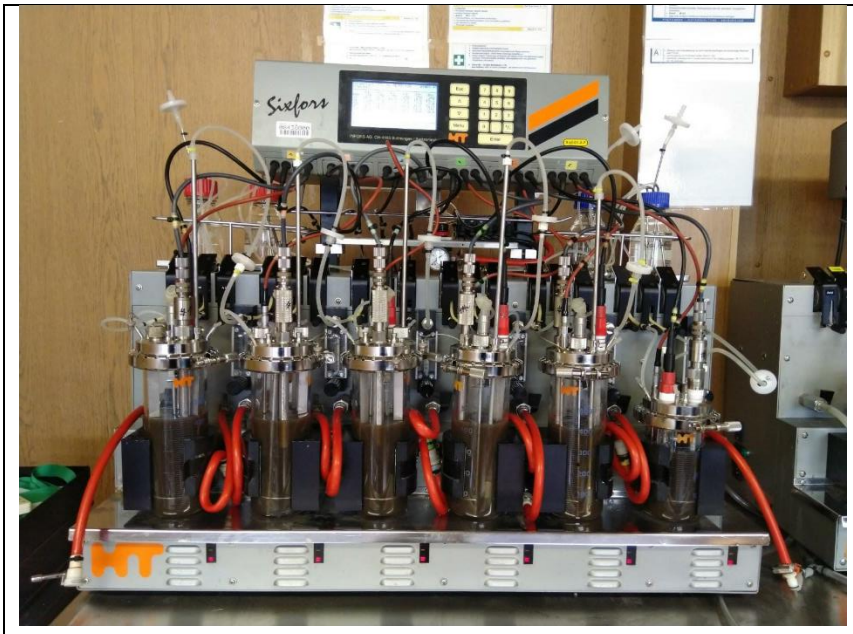
In the first step, we collect and evaluate the operating data of working plants, which are expected to have a stable deammonification operation. Here we consider different process designs in process water and landfill leachate treatment and collect the experience of the plant operators. In particular, the observation covers the influence of process parameters and control settings on operational stability.

In the second step, selected sludges from the previously examined plants are fed into a laboratory plant and the parameters influencing the process are investigated. In this context, we examine the inhibitory effects of various substances and the effects of a modified sludge composition.

The Institute NOWUM-Energy of the FH Aachen as applicant and its project partner, the Institute for Environmental Engineering of the RWTH Aachen University hope to be able to use the results of the investigation to enable a stable transfer of the deammonification process into the main stream of municipal wastewater treatment plants in a second project phase.



1 Process overview of deammonification (DWA-M 349 2019 after BEIER & SCHNEIDER 2015)



2 Laboratory plant of Infors AG (picture: NOWUM, 2019)