



High loaded MBR for improved energy recovery from Sewage

Motivation

Dutch water boards have expressed a strong incentive to improve the energy efficiency of their wastewater treatment plants. This incentive could be met if sewage organic matter is converted into the energy carrier methane. The aerobic sludge process has been the most common treatment technology for sewage during the last decades, mainly because it is robust and provides an effluent quality that meets the discharge demands. However, the activated sludge process can hardly be considered to be a sustainable technology: it largely destroys the potential energy of the organic compounds present in the sewage, while at the same time it consumes energy for aeration. Therefore a new process has to be developed to efficiently use the energy present in the sewage and convert it into an utilizable energy carrier.

Technological Challenge

Anaerobic treatment is common in practice, but limited to high-strength (typically >1000 mg/L of COD) and warm (typically >20 °C) industrial wastewaters. The technological challenge is to develop a treatment system for municipal wastewater which combines a high loaded aerobic bioflocculation MBR as a pre-concentration step with an anaerobic methane producing reactor to optimize the energy recovery from sewage and enable methane production also under moderate climate conditions.

High loaded Membrane Bioreactor

In the activated sludge process microorganisms metabolize the carbon organic matter present in the wastewater to produce more biomass. In a high loaded MBR a small fraction of the wastewater's soluble organic matter is utilized by fast growing microorganisms. These microorganisms produce exopolymers that flocculate the remaining colloidal and suspended organic matter which results in a concentrated stream. The concentrated stream is subsequently treated in an anaerobic reactor to produce the energy carrier methane.

Student project description

Fundamental studies are needed to understand the process of bioflocculation of sewage. The task of the student will be to identify the microbial population and species present in the high loaded MBR and compare them with the communities present in the conventional MBR.

Hypothesis:

Fats growing microorganisms build EPS to flocculate the colloidal and suspended organic matter. In order to find out which microorganisms are involved the microbial population in high loaded membrane bioreactors will be studied and single species will be identified. Methods used in this study will be:

- PCR-DGGE
- Clone library/Sequencing
- Phylogenetic studies

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