Counteracting ammonia inhibition during anaerobic digestion by recovery using submersible microbial desalination cell

Ammonia inhibition is one of the most frequent and serious problems in biogas plants. In this study, a novel hybrid system consisting of a submersible microbial desalination cell (SMDC) and a continuous stirred tank reactor (CSTR) was developed for counteracting ammonia inhibition during anaerobic digestion (AD) with simultaneous in situ ammonia recovery and electricity production. The SMDC was powered by acetate in a buffer solution, while synthetic ammonia-rich wastewater was used as the feeding of the CSTR. Under continuous operation, ammonia recovery rate of 86g-N/m²/day and current density of 4.33A/m² were achieved at steady-state condition. As a result, 112% extra biogas was produced due to ammonia recovery by the SMDC. High-throughput sequencing showed that ammonia recovery had an impact on the microbial community structures in the SMDC and CSTR. Considering the additional economic benefits of biogas enhancement and possible wastewater treatment, the SMDC may represent a cost-effective and environmentally friendly method for waste resources recovery and biomethanation of ammonia-rich residues. Biotechnol. Bioeng. 2015;9999: 1-5. © 2015 Wiley Periodicals, Inc.