



Effect of permeate flux in a membrane SBR (MSBR) treating the liquid fraction of manure

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ABSTRACT

In this study, a lab-scale membrane sequencing batch reactor (MSBR) was applied for the treatment of synthetic wastewater simulating the liquid fraction of manure. The MSBR was tested for three different hydraulic retention times (HRTs: 12.8, 10.4 and 9.2 h) to examine nutrient and organic matter removal. A submerged flat-type ultrafiltration membrane unit was applied as a polishing step in order to improve the characteristics of the sequencing batch reactor effluent. The membrane module operated at 16, 20 and 25 L/m² h flux during the three examined periods. The MSBR efficiency for organic content removal was demonstrated with a chemical oxygen demand (COD) treated effluent concentration ranging from 77 to 204 mg/L that is below the Turkish limits for discharge to the environment. Additionally, the integrated system effectively removed ammonium nitrogen (NH₄-N) achieving 99.8% nitrification and >86% denitrification at an HRT = 12.8 h with <1 mg/L NH₄-N concentration in the effluent. The decrease of the HRT in periods 2 and 3 reduced the NH₄-N removal efficiency to 93% and 81%, and the denitrification performance to 74% and 56%, respectively. However, the NH₄-N effluent concentration was always within the limits for discharge set by the Turkish legislation. The phosphates (PO₄-P) efficiency was 80%, 60% and 39% for periods 1, 2 and 3, respectively. The membranes enhanced nutrient and COD removal; the impact was higher in the case of PO₄-P with 10% of them being removed in the membrane chamber during period 1.

Keywords: Membrane sequencing batch reactor; Hydraulic retention time; Membrane flux; Liquid fraction of manure; Organic content; Nutrients

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