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Investigation of the sludge thickening potential of waste activated sludge using membranes

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ABSTRACT

Sludge thickening with membranes, especially external membranes, is recently emerging. In this study the feasibility of external membranes for thickening of waste activated sludge up to 30 g l^{-1} was studied using a test cell. In batch-wise thickening experiments, the characteristics of the filtration process under various operating conditions (w = 0.8–2 m s^{-1}, TMP = 1–1.8 bar) and with different membranes (four UF membranes, one MF membrane) were investigated. For the different membranes no considerable difference in the sludge thickening behaviour was observed, despite huge variations in membrane pore size and water permeability. By increasing the cross-flow velocity, significant improvements in permeability could be achieved, whereas an increase in TMP at constant cross-flow velocity slightly deteriorated the permeability during the sludge thickening. The obtained permeabilities of 15–20 l m^{-2} h^{-1} bar^{-1} at MLSS concentrations higher than 30 g l^{-1} are economical and, therefore this process is an alternative to conventional sludge thickening processes. In order to investigate the continuous operation of the sludge thickening process, filtration at constant MLSS concentration of approx. 30 g l^{-1} was investigated. During the constant MLSS operation, a slight decrease in permeability was observed. Long-term experiments indicate that batch-wise thickening of sludge is feasible with permeabilities of 10–15 l m^{-2} h^{-1} bar^{-1}.

Keywords: Sludge thickening; External membrane; Permeability; Test cell; Batch experiments

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