

Accepted Manuscript

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PII: S0960-8524(17)30661-2

DOI: <http://dx.doi.org/10.1016/j.biortech.2017.05.022>

Reference: BITE 18048

To appear in: *Bioresource Technology*

Received Date: 19 February 2017

Revised Date: 29 April 2017

Accepted Date: 3 May 2017

Please cite this article as: Zhang, Q., Singh, S., Stuckey, D.C., Fouling reduction using adsorbents/flocculants in a submerged anaerobic membrane bioreactor, *Bioresource Technology* (2017), doi: <http://dx.doi.org/10.1016/j.biortech.2017.05.022>

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Fouling reduction using adsorbents/flocculants in a submerged anaerobic membrane bioreactor

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Abstract

Using adsorbents/flocculants in anaerobic membrane bioreactors (AnMBRs) to reduce membrane fouling is comparatively rare. This study evaluated 8 additives: 3 powdered activated carbons, 2 granular activated carbons, 1 cationic polymer, and 2 metal salts to identify the best additive and dose to minimise membrane fouling. Small cross flow filtration tests showed 400 mg/L PAC SAE2, or 150 mg/L FeCl₃, reduced the transmembrane pressure (TMP) rise from 0.94 to 0.06 kPa/h, indicating excellent fouling reduction. The best filtration performance correlated with a significant reduction in supernatant supracolloidal particles, colloids and SMPs. FESEM-EDX showed that PAC SAE 2 and FeCl₃ reduced the thickness of the fouling layer dramatically, while FeCl₃ increased sludge floc size and particle size of the colloids, while decreasing the negative charge of colloids, and SMP size. Furthermore, Fe was not found in the supernatant or effluent, but precipitated with the solids, which is beneficial for its long-term use.

Key words: Anaerobic membrane bioreactor; membrane fouling; additives, fouling layer; soluble microbial products

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