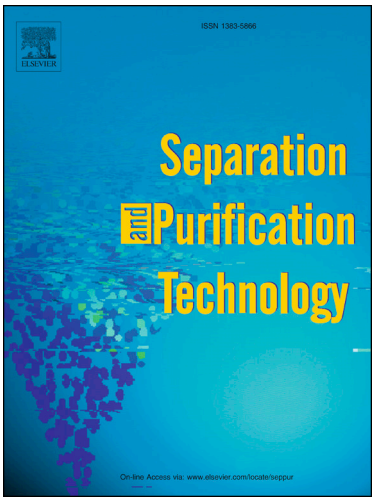

Dissolved gas separation for engineered anaerobic wastewater systems

S. Heile, C.A.L. Chernicharo, E.M.F. Brandt, E.J. McAdam

PII: S1383-5866(17)31590-3
DOI: http://dx.doi.org/10.1016/j.seppur.2017.08.021
Reference: SEPPUR 13963

To appear in: *Separation and Purification Technology*

Received Date: 19 May 2017
Revised Date: 8 August 2017
Accepted Date: 8 August 2017

Please cite this article as: S. Heile, C.A.L. Chernicharo, E.M.F. Brandt, E.J. McAdam, Dissolved gas separation for engineered anaerobic wastewater systems, *Separation and Purification Technology* (2017), doi: http://dx.doi.org/10.1016/j.seppur.2017.08.021

Dissolved gas separation for engineered anaerobic wastewater systems

S. Heile[1,2], C.A.L. Chernicharo[3], E.M.F. Brandt[4], E.J. McAdam[1,*]

[1]Cranfield Water Science Institute, Cranfield University, Bedfordshire, MK43 0AL, UK

[2]Fachhochschule, University of Applied Sciences Osnabrück, Albrechstr. 30, Osnabrück 49076, Germany

[3]Department of Sanitary and Environmental Engineering, Universidade Federal de Minas Gerais, Belo Horizonte – MG, Brazil

[4]Department of Sanitary and Environmental Engineering, Universidade Federal de Juiz de Fora, Juiz de Fora – MG, Brazil

*Corresponding author: e.mcadam@cranfield.ac.uk

Abstract

Dissolved gases produced within engineered anaerobic processes subsequently create a fugitive emission which can have financial, environmental and health and safety implications. Whilst desorption technology has been used to control dissolved gases in the drinking water sector, there is considerably less understanding of its deployment in wastewater for which there are numerous existing and emerging challenges. This review therefore focuses on existing and proposed technological approaches to gas desorption in engineered anaerobic wastewater processes, with specific emphasis on technology compatibility and downstream gas phase management. Simplified engineered solutions such as diffused aeration and multi-tray aerators appear robust solutions for implementation into wastewater. However, these processes are characterised by a low mass transfer coefficient and require high gas to liquid ratios (G/L) to achieve reasonable separation, which suggests their suitability is limited to small scale applications, in which gas recovery is not a priority. Packed columns and membrane contactors afford process intensification through increasing interfacial area which favours large scale applications; although both will require prefiltration technology to obviate media clogging. Vacuum or steam is the preferred driving force for separation when gas recovery is sought, while sweep-gas is energetically favoured. Sweep-gas has been used for gas recovery by operating at G/L toward the equilibrium value, which somewhat constrains mass transfer. Process selection must therefore be weighted on whole life cost, but will also be dependent upon process scale, financial (e.g. incentivisation) and non-financial (e.g. carbon) instruments, which are strongly influenced by regional policy.

Keywords: *stripping, degassing, degasification; desorption, effluent, leachate*