

Pilot scale electromethanogenic reactor treating brewery wastewater – progress to commercial implementation.

Kyle Bowman^{1,2}, George Fudge¹, William Gambier¹, Ben Jobling-Purser¹, Thomas Fudge¹, Izzet Kale³, Godfrey Kyazze².

¹WASE Ltd. - London, UK

²Water Research Group, School of Life Sciences - University of Westminster, UK.

³School of Computer Science and Engineering – University of Westminster, UK.

Corresponding author email: kyle.bowman@wase.co.uk

ABSTRACT

A pilot scale (4000L) continuous flow electromethanogenic reactor (MEC-AD) treating brewery wastewater was designed and installed at Hepworth's Brewery, UK. This investigation presents a 4-fold increase on the next largest pilot scale MEC-AD system presented in literature (Cusick et al., 2011), and will provide preliminary findings to inform the operation of a 24,000L MEC-AD system (currently under construction).

Housed in a 20ft shipping container, the system featured four 1000L reaction vessels arranged in series, each with a working volume of 900L. Each reaction vessel contained 64 electrode pairs in 8 modules. After acclimation and preliminary characterisation of system behaviour using simulated wastewaters, the system was installed at a brewery and will be subjected to increasing organic loading rates via the reduction of hydraulic retention time.

Retention times between 30 and 2.4 days will be investigated to align with commercial viability targets. Organic loading rate will be varied between 0.4 and 2.6 kgVS/m³/d. The system performance will be assessed for energy efficiency, wastewater treatment capacity, stability and to evaluate the efficacy of utilising generated current across a multistage reactor as a biosensor of organic matter concentration. Microbial community analysis will be carried out to observe the selection of key species over time and identify microbes occupying niche MEC-AD conditions.

Acknowledgements: The support of the Royal Commission for the Exhibition of 1851 in funding Kyle Bowman's doctoral studies through the Industrial Fellowship program is greatly appreciated.

References:

Cusick, R., Bryan, B., Parker, D., Merrill, M., Mehanna, M., Kiely, P., Liu, G. and Logan, B. (2011). Performance of a pilot-scale continuous flow microbial electrolysis cell fed winery wastewater. *Applied Microbiology and Biotechnology*, 89 (6), 2053-2063. Available from 10.1007/s00253-011-3130-9.