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PII: S1385-8947(14)01677-5
DOI: http://dx.doi.org/10.1016/j.cej.2014.12.063
Reference: CEJ 13064

To appear in: *Chemical Engineering Journal*

Received Date: 29 September 2014
Revised Date: 13 December 2014
Accepted Date: 15 December 2014

Please cite this article as: L. Doherty, Y. Zhao, X. Zhao, W. Wang, Nutrient and Organics Removal from Swine Slurry with Simultaneous Electricity Generation in an Alum Sludge-Based Constructed Wetland Incorporating Microbial Fuel Cell Technology, *Chemical Engineering Journal* (2014), doi: http://dx.doi.org/10.1016/j.cej.2014.12.063

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Abstract

This study investigates the ability of four alum sludge-based constructed wetlands, incorporating microbial fuel cell technology, to achieve high organic and nutrient removal from swine slurry while simultaneously producing electricity. As a cross-comparison the effects of electrode spacing and flow pattern are investigated. By providing a simultaneous upflow-downflow regime the maximum power density is boosted by 70% to 0.268 W/m^3 and an ammonium removal efficiency of 75% is achieved. However, the COD removal efficiency falls to 64% compared with 80, 79 and 81% achieved by operating with a continuous upflow regime in the other three systems of the study. The alum sludge wetland medium showed an enhanced capacity to immobilise phosphorous with total phosphorous and reactive phosphorous removal rates of 85-86% and 89-90%, respectively. Accordingly, multi-stage