Desalination and Water Treatment
www.deswater.com

doi: 10.1080/19443994.2014.940210

55 (2015) 3713–3724
September

Taylor & Francis
Taylor & Francis Group

Mathematical simulation to up-scale electrolysis for effective suppression of freshwater cyanobacteria

Gurminder Sardool[a,*], Yoshiteru Hamatani[b], Masafumi Goto[a,b], Megat Johari Megat Mohd Noor[a], Motoo Utsumi[b], Norio Sugiura[a,b], Zaini Ujang[c]

[a]*Malaysia-Japan International Institute of Technology, Universiti Teknologi Malaysia, Kuala Lumpur, Malaysia, Tel. +60 13 330 7402; emails: gkaur3@live.utm.my, gurminss@yahoo.com*
[b]*Graduate School of Life and Environmental Sciences, University of Tsukuba, Tsukuba, Japan*
[c]*Universiti Teknologi Malaysia, Kuala Lumpur, Malaysia*

Received 15 April 2014; Accepted 16 June 2014

ABSTRACT

Electrolysis, originally applied for removal of various pollutants from water and wastewater, has been recently found to be successful in the suppression and removal of cyanobacteria in freshwaters. Existing studies addressed crucial operational parameters based on batch laboratory studies; however, only very few studies have projected this information for continuous process to up-scale for industrial application. Oxygen Productive Electrode (OPE), a new type of electrolysis unit, is recommended as pre-treatment of freshwaters polluted by cyanobacterial blooms prior to conventional water treatment process. In this study, the data on suppression rate of *Aphanizomenon* sp., a filamentous cyanobacteria, from prior experimental work were used to mathematically evaluate the effects of configuration of OPEs as a pre-treatment stage of a water treatment plant. As it was found, the single-stage batch OPE was observed to be less effective on filamentous cyanobacteria than on coccus and unicellular cyanobacteria, thus an engineering consideration was made to improve system efficiency by estimating the overall system efficiency when multiple OPEs were implemented in series in continuous operation at steady state.

Keywords: Filamentous; Cyanobacteria; Electrolysis; Freshwaters; Industry; OPEs in series

*Corresponding author.

Presented at the Conference on Desalination for the Environment: Clean Water and Energy 11–15 May 2014, Limassol, Cyprus