

## 24 June 2021 (Thursday)

4.00pm-5.30pm (SGT) (GMT +8)

Session 3.5 – Membrane Bioreactor Processes

**Session Chair(s): Avner Adin, The Hebrew University of Jerusalem (Israel)**

### **MBRs: Academic Research vs Practitioner Needs**

S. Judd. Cranfield University (United Kingdom)

*Presenter is an invited speaker. No executive summary is available*

### **The Resource Efficient Integrated Membrane Bioreactor System**

G. Tao. PUB, Singapore's National Water Agency (Singapore)

Integrated Validation and Demonstration Plant (IVP Demo) was commissioned in 2017. The fully automated plant with a domestic used water treatment capacity of 12,500 m<sup>3</sup>/d (peak 18,750 m<sup>3</sup>/d) simulates the process selected for the future Tuas Water Reclamation Plant (initial domestic used water treatment capacity of 650,000 m<sup>3</sup>/d). IVP Demo consists of an enhanced primary treatment with biosorption, a compact lamella plate primary clarifier and a 5-pass step-feed low energy membrane bioreactor (MBR). The results from over two years of continuous operation and demonstration study indicate that the integrated system is reliable and energy and resource efficient. The MBR filtrate had a typical turbidity less than 0.1 NTU. Enhanced biological nitrogen and phosphorus removal was achieved without external carbon addition and without pH adjustment in tropical climate conditions. MBR energy consumption was less than 0.25 kWh/m<sup>3</sup> including membrane scouring energy of 0.04 kWh/m<sup>3</sup>, and the nett process energy consumption (process energy consumption - energy generation) was less than 0.05 kWh/m<sup>3</sup>. Using MBR filtrate as feed, the RO permeate had a low TOC of 24.1 to 31.3 ppb.

### **From Validation To Full-Scale Design: Dedicated Zoo Animal Wastewater Treatment And Reuse**

SH. Koh, S. Athreya. Binnies (Singapore)

Mandai Park Development (MPD) desires to construct two dedicated animal wastewater treatment plants (DAWTPs) in the newly integrated Mandai Precinct to treat animal wastewater. To align with the project's sustainability initiative, the DAWTPs will be designed to produce high-quality effluent suitable for non-potable applications, allowing controlled reuse purposes within the facilities. Considering the unique characteristics of the animal wastewater and concerns associated with the pathogens in the wastewater, a multiple-barrier approach was adopted in developing the treatment technologies including membrane bioreactor (MBR), ultra-violet (UV) and chlorine disinfection. Furthermore, an MBR pilot was constructed and operated for 3 months with challenge testing of indicator organisms conducted to validate the log reduction performance of the proposed MBR system. UV inactivation studies using collimated beam testing were also performed. The full paper will present the testing protocols, results, and lessons learnt from the pilot and the translation of the validation results into full-scale design.

## **Performance Of Newly Developed Intermittent Aerator For Flat-sheet Ceramic Membrane In Industrial MBR System**

H. Noguchi, SC. Lee, T. Xia, T. Niwa, W. Lay, SC. Chye, L. Yu, SL. Lim, MJ. Nassir, G. Tao, C. Gudipati, ST. Ooi, A. Dhalla. Meiden Singapore (Singapore)

An intermittent aerator was developed to supply large bubble at the bottom of flat-sheet membrane with a few second of interval. Performance tests for the intermittent aerator were conducted using a pilot system with two cassettes in a membrane tank of the 1-MGD DEMO plant at Jurong Water Reclamation Plant (JWRP). The present study has been undertaken to evaluate performance efficiency of the intermittent aerator by decreasing the membrane aeration flow rate required to sustain the flux. Stable operation with estimated 43 % potential reduction in the overall operating cost could be achieved with this improvement.