25 June 2021 (Friday)

4.00pm-5.30pm (SGT) (GMT +8)
Session 3.7 – Process Intensification: Integrated Approaches

Session Chair(s): Sock Hoon Koh, Binnies Singapore (Singapore)

Process Intensification Of Continuous Flow Bioreactors In Europe: Controlled-shift Of Microbiome Towards Densified Biomass Outstanding Performance Results Challenging Status-quo

S. Donnaz, C. Roche, B. Wett, S. Murthy. SUEZ International (France)

Alternatives for Brownfield retrofitting increasingly deserve to be considered in comparison with Greenfield expansion scenarios. Key advantage of valuing existing assets has led to the development of new biological process designs and technologies in the fields of continuous bioreactors. This paper deals with full-scale demonstrations implemented across Europe, through major WWTP in France, Spain and Poland. Outstanding performance results will be shared including detailed demonstration of the controlled-shift of microbiome implemented to achieve the new specific definition of densified biomass, together with key process results obtained with the densified biomass. Process configuration and methodology will be shared including how to assess, control and transform activated sludge to densified biomass. Operational performance results and rationale for site selection will be detailed over the trial periods for each site, such as carbon, nitrogen and phosphorus removal efficiencies, process operation parameters, Mixed Liquor Suspended Solids concentration, Sludge Volume Index (SVI), Initial settling Velocities, SVI30/SVI5, Aggregates > 200 Âµm...

The Application Of Computational Fluid Dynamics With Integrated Biokinetics To Accelerate Process Innovation In The Water Industry

W. Audenaert, U. Rehman, I. Nopens AM-TEAM (Belgium)

This abstract gives three different full-scale examples of the application of computational fluid dynamics (CFD) with integrated biokinetics. The examples relate to bioreactor aeration, scale-up of a novel MBR technology and enhanced biological phosphorus removal (EBPR). CFD-biokinetic modelling has led to novel applications of CFD models, whereby concentrations (e.g. ammonia, COD, nitrates, phosphorus) are simulated in 3D in bioreactors. Utilities and technology companies start embracing these models to (partially) replace or reduce physical trialing. The concept of 'virtual piloting' is rapidly emerging and can reduce the technology development cycle drastically and can lead to disruptive new designs. On the other hand, the models give new insights to be used for energy saving, effluent quality improvement and better reactor design.

Costs And Considerations When Implementing Process Intensification Technologies At A Wastewater Treatment Facility.

T. Koodie, T. Chan, Z. Bhumgara. Binnies (United Kingdom)

Rapid population growth and changing weather patterns are placing an increasing pressure on many existing wastewater treatment facilities globally while at the same time we strive to meet tighter environmental challenges. The scale of these future challenges for many of our major cities means process intensification (PI) technologies have come to the fore. While absolute costs are very much site specific, a unit cost analysis of various PI technologies is a useful guide. The aim of this presentation will be to compare unit costs for a variety of wastewater treatment technologies that offer the benefits of PI. In addition, the presentation will also highlight some of the critical factors that need to be considered before selecting a final treatment solution and propose a selection approach that can incorporate technical, commercial and strategic needs that match an organisations desired risk profile. Case studies will be presented to illustrate the impact of selection criteria when making investment decisions.

Performance Tracking Of RO Units In A Hybrid RO-EDR Configuration Treating Municipal Wastewater At 90% Recovery

K. Wee, G. Gunasheela, KK. Kee, B. Abolmaali. SUEZ Water Technologies & Solutions (Singapore)

SUEZ Water Technologies and Solutions (WTS) piloted a novel hybrid desalination process based on electrodialysis reversal (EDR) and reverse osmosis (RO) at a local water reclamation plant in Singapore. The pilot was run in two phases to demonstrate an overall recovery achieving 90% with the proposed process. During the first phase, RO1 and RO2 were operating at 75% and 65% recovery respectively, in tandem with the EDR which reduced the salt content such as total hardness (calcium, magnesium) in RO1 concentrate prior to entering RO2. Despite the elevated concentrations of silica and dissolved organics, RO2 continued to operate very stably. The operating data of both RO1 and RO2 were normalized using the MUNOS program (Eriksson, 2015) to track the change in RO performance in term of absolute numbers, i.e. water and salt permeabilities of RO membranes, and to estimate fouling allowance or safety factor in full scale RO design or simulation.