## 30 June 2021 (Wednesday)

**4.00pm-5.30pm (SGT) (GMT +8)**
**Session 3.13 – Industrial Wastewater Treatment and Reuse**

**Session Chair(s): Reddy Chirla Chandra Sekhara, Singapore Refining Company Private Limited (Singapore)**

### Development Of Potato Chip Process Water Treatment & Reuse Technology

A. Sathyagal, R. Verma, SK. Kota, S. Gupta, A. Anand. PepsiCo Inc. (United States)

Water stress in the Channo (India) snacks plant location necessitated a wastewater treatment and reuse solution to ensure business continuity. The objectives of this work were to design a treatment system that maximized treated water use in the plant while meeting Quality and Food Safety requirements for reuse water in process applications. A treat-in-place concept with a fit-for-purpose treatment was developed where process wastewater generated from a unit operation gets treated separately to the quality required for its reuse and then recycled back to the same unit operation. The designed system has been installed and operational since late 2018. It has reduced the plants' ground water usage by 30+% to date, with further reduction to 50% expected by late 2019. The treat-in-place concept reduced the capital cost by 30% and operational costs by 10% compared to a centralized system treating to potable quality water.

### Application Of Ultrafiltration Coupling Processes To Tackle Challenges In Industrial Wastewater Treatment

J. Liu. CITIC Envirotech Ltd (Singapore)

Application of innovative intensified technologies for wastewater treatment appears to be the future trend in water industry. This paper discusses two of such kind technologies both involving membrane filtration. One is the uprising Membrane Bioreactor ("MBR") where biomass is enriched in the bioreactor by ultrafiltration membrane. Another example is the novel combination of Fenton Oxidation and ultrafiltration process where iron catalyst (iron sludge) is well kept in the system. As a case study to demonstrate the remarkable performance of those technologies, a commercial operating industrial wastewater treatment plant was examined. It is the aim of this paper to provide insight to the process and explain the phenomenon observed.

### Evaluation Of Toxicity In Industrial Wastewater Treated By Electro-Fenton

R. Muzzi, H. Olvera-Vargas, O. García-Rodríguez, R. Marks, O. Lefebvre. National University of Singapore (Singapore)

Electrochemical advanced oxidation processes (EAOPs) offer an interesting possibility for industrial wastewater treatment, owing to their capacity to treat a wide range of chemicals at various concentrations. However, with the objective of integrating them within conventional biological treatment trains, the potential toxicity of the treatment must be considered. For this study, the effect of electrochemical degradation on the toxicity of a real wastewater, obtained from a Singapore membrane production facility, was investigated with a new methodology that makes use of three bioreporter bacterial strains, that bioluminesce specifically when exposed to DNA, protein and membrane damage. The observed effect is that, as the electrochemical treatment proceeds, the total organic carbon (TOC) decreases; however, the oxidation of the parent species gives rise to intermediate chemicals that increase then overall toxicity. The result suggest the need for a more prolonged treatment in order to get rid of this residual toxicity.

### Demonstrative-scale SIAM Technology Trials In Dairy And Slaughterhouse Factories

A. Silva-Teira, X. Bernat, J. Dominguez, L. Rodriguez-Hernandez, B. Saenz, J. Malige, JM. Garrido, A. Arias. Cetaqua - SUEZ Group (Spain)

Water reclamation and energy-efficient systems were the main drivers on SIAM (Spanish acronym of methanogenic Anaerobic reactor and Membrane bioreactor Integrated System) birth. Industrial wastewaters from different sectors were explored and prioritized by the physico-chemical characteristics and the water flows generated to be treated. Once selected the sectors, this technology has been demonstrated with dairy and slaughterhouse industrial wastewaters in two pilot-plants of 4 and 3 m3, respectively. Effluent characteristics complied: in-force discharge limits, the latest revision of the best available techniques (BAT) for food, drink and milk industries, reuse quality standards (excluding the productive process in which the reuse is forbidden), with competitive design parameters in both pilot trials. Environmental studies, life cycle analysis (LCA) and economic estimations indicated that this SIAM technology was more beneficial than the conventional activated sludge (CAS) systems.

### TERI Advanced Oxidation Technology (TADOX®) As An Integrated Approach To Treat Industrial Wastewater: Case Studies from India

N. Bahadur, N. Bhargava. The Energy and Resources Institute (TERI) (India)

In India, wastewater treatment suffers from two major limitations: (i) similar treatment of wastewater streams having different nature and constitution (ii) the effluent remains 'inadequately' treated, probably because of use of conventional, costlier and redundant approaches. As the result re-use, re-cycle and achieving ZLD is not possible in true sense. In this pursuit TERI has developed a novel and patented 'Advanced Oxidation Technology', which aims at complete end-to-end treatment of wastewater effluent streams having high color, COD, BOD, TOC, dissolved organics, non-biodegradable and persistent organic pollutants (POPs), generated from highly polluting industries and/or mixed streams having municipal sewage. The protocol involves innovative primary treatment, followed by Heterogenous Photocatalysis (HP) involving nano-TiO2/UV as secondary treatment and suitable filtration leading to treated water meeting process water quality enhancing water re-use efficiency and enable Zero Liquid Discharge (ZLD); These are discussed in the light of successful case studies developed at a pilot scale.