23 June 2021 (Wednesday)

4.00pm-5.30pm (SGT) (GMT +8)
Session 2.2 – Innovation in Desalination

Session Chair(s): Nikolay Voutchkov, Water Globe Consultants, LLC (USA), Miguel Angel Sanz, SUEZ (France)

Innovation in Desalination

B. Liberman. IDE Technologies (Israel)
Presenter is an invited speaker. No executive summary is available

Why Your RO Membrane Cleaning May Not Be Effective. The Benefits Of Reverse Cleaning

K. Andes, CR. Bartels, G. Hijo. Nitto Hydranautics (Australia)

Historically, RO (Reverse Osmosis) membrane cleanings have been performed in a forward direction, with the cleaning solution being introduced into the feed end of the pressure vessels. This results in the cleaning flow going through the RO membranes in the same direction as normal operation. This works well for many types of cleanings, but there are specific instances when the foulant is concentrated in the front end of the lead RO membranes. Some examples of this might be biofouling, colloidal fouling, or deposition of particulates. Cleaning in a forward direction can prove to have minimal effect at removing these front end foulants, and it actually can make matters worse by pushing foulant and/or debris further into the lead membranes. In these cases, it has been shown that reversing the direction of the cleaning flow can be beneficial in removing the foulant and returning the RO system to normal performance. Some of the major RO membrane manufacturers strongly discourage reverse cleaning due to concerns about telescoping the RO elements, since there is no support structure at the feed end of the pressure vessels. This paper will discuss the precautions that should be implemented to perform reverse cleaning safely, along with studies showing the effectiveness of reverse cleaning. This paper will look at some of the major desalination plants that have implemented the method, and we will look at how some of the larger desalination plants were able to convert their cleaning systems to be able to reverse clean simply. Finally, we will look at alternatives to reverse cleaning, such as reverse flushing, and rotations of lead and tail elements.

Evaluation Of Ceramic Adsorption Filter As Pretreatment For Seawater Reverse Osmosis Desalination

TH. Chong, J. Wang, LN. Sim, K. Nakano, Y. Kinoshita, K. Sekiguchi. Nanyang Technological University (Singapore)

Pre-treatment processes are important for seawater reverse osmosis desalination that serve as the first barrier to remove contaminants and protect the downstream reverse osmosis (RO) systems from severe fouling and scaling. The current study implemented an aluminium oxide (Alumina, Al2O3) coated ceramic filter, known as ceramic adsorption filter (CAF), as pre-treatment process for SWRO. The performances of two RO systems with two pre-treatment approaches were compared. One pre-treatment approach was UF filtration (denoted as UF-RO) and the other was UF followed by CAF (denoted as UF-CAF-RO). The presence of CAF treatment prior RO showed positive effect on the downstream RO filtration system, showing less fouling as compared to the system without CAF. The flux enhancement was promoted from 10% to 30% with more frequent CAF backwash, i.e., from weekly to daily. The autopsy analysis found that UF-CAF-RO membrane had less inorganic scaling, EPS content and bacteria accumulation compared to UF-RO.

Sustainable Water Desalination By Means Of A Solar PV-T Powered MED-MVC Technology

J. Cen. Desolenator (The Netherlands)

This paper presents specific solutions for a novel solar-powered multi-effect distillation with mechanical vapour compression (MED-MVC) hybrid technology which can operate 24/7 with simple hot water storage. The technology uses an optimized Photovoltaic-Thermal (PV-T) system to harvest solar electricity and solar thermal energy to drive the desalination process. The system has several unique solutions: * By cooling the PV-T panel with distilled water we increase the efficiency of solar electricity generation, while reducing the problem of scaling and fouling in the PV-T and piping system; * Aside from solar electricity, the system also harvests thermal energy that is stored in hot water; * The hot distillate is delivered by pipelines to the Multi-Effect Distillation (MED) unit and flashed to generate steam continuously in all effects; * The cooled distillate is pumped back to cool the PV-T system; * Solar electricity is used to drive a Mechanical Vapour Compressor (MVC) to increase output and efficiency of the MED unit; * Excess solar electricity is stored in safe, sustainable and fully recyclable NiFe Batteries to power the MED-MVC system during the night.