EDS WEBINAR

Membrane Scaling & Fouling – Part 2
Thursday 26. January 2023, 16:00-17:30 CET

Welcome Message: Ursula Annunziata, President EDS

Moderator: Felix Broens
CTO at Convergence BV
University of Twente - Master in Membrane Science and Technology

Bio

I studied chemical engineering at the University of Twente in The Netherlands. My specialization in membrane technology was done in the group of Prof. Matthias Wessling in 2008-2009.

After my studies I founded Convergence, a company that focuses on making automated pilot units for a wide range of membrane applications, including RO processes. I have the function as CTO in Convergence and will continue in this position for the coming years.

Since 2010 I have attended all EUROMED/EDS conferences, with the first one being the EUROMED # 5 in Tel Aviv. Since 2020 I have joined the EDS board.

Abstracts / Program

Nuria Adroer
R&D Director – Adiquimica S.A.
Barcelona, Spain

❖ **STRATEGIES FOR DESIGNING THE BEST ECONOMIC AND SUSTAINABLE SOLUTION FOR CLEANING REVERSE OSMOSIS MEMBRANES**

Almotasembellah ABUSHABAN
Reseacher/lecturer at the International Water Research Institute (IWRI)
Mohammed VI Polytechnic University, Benguerir, Morocco

❖ **Monitoring and assessing fouling potential along the pre-treatment of an SWRO desalination plant in the Middle East.**

Nuria Adroer
R&D Director – Adiquimica S.A.
Barcelona, Spain

Bio
Education:
PhD in Chemical Sciences by Universitat Autonoma de Barcelona . 1992
Chemistry by Universitat de Barcelona. 1984

I have more than 25 years experience in water treatment field. Joined ADIQUIMICA in 1996 as R&D director. I am a member of AEDyR, EDS and Aquaespaña. I presented several papers in IWA, IDA, EDS and AEDyR congresses. Author of studies published in research journals.

My research interests are focused on: Reverse osmosis antiscalants, Membrane cleaning products, Membrane integrated systems (MBR and RO/NF), Microbiological control in water applications, Control of Legionella in cooling systems, Scale and corrosion inhibitors for cooling systems.

Abstract:
STRATEGIES FOR DESIGNING THE BEST ECONOMIC AND SUSTAINABLE SOLUTION FOR CLEANING REVERSE OSMOSIS MEMBRANES

Membrane fouling is a persistent problem throughout reverse osmosis systems that reduces plant efficiency and economics. Both cleaners and cleaning procedures play a key role in restoring the membrane performance. Membrane autopsy is the best method and reliable technique to identify the nature of foulants and the cause of poor membrane performance.

In this presentation, a methodology based on membrane autopsies has been successfully applied to determine the most cost-effective and sustainable solution for cleaning reverse osmosis membranes. The methodology used to identify and characterize the composition of foulants deposited on a membrane surface consists in using a combination of several techniques. Membrane autopsies were performed on reverse osmosis elements derived from two different plants: a reverse osmosis seawater membrane and a reverse osmosis membrane used for leachate treatment. Both membranes surface, were covered by a thick gelatinous deposit layer.

After determining the fouling behavior and mechanisms involved in membrane fouling for each element, our study focused on selecting the best cleaning procedure and the most successful cleaners for restoring the membranes performance. Environmental and economic criteria were taken into consideration to design the cleaning membrane strategies. Comparative analyses of membranes before and after cleaning procedures were conducted using CLMS, ATR-FTIR and SEM-EDX techniques. The results demonstrated that powdered cleaners used in combination with non-oxidizing biocide restored both membranes performance to design specifications and removed bacteria and biofilm from membranes surface.

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Almotasembellah ABUSHABAN
Reseacher/lecturer at the International Water Research Institute (IWRI)
Mohammed VI Polytechnic University, Benguerir, Morocco

Bio
Dr. Abushaban is a Lecturer/Researcher in Water Desalination at the International Water Research Institute (IWRI) - Mohammed VI Polytechnic University, Morocco. Moreover, he is the Regional Coordinator of the Young Leader Program (YLP) for the Middle East and Africa at the International Desalination Association (IDA), USA. Abushaban has a PhD in Water Management from Delft University of Technology, The Netherlands and MSc in Municipal Water and Infrastructure from UNESCO-IHE, The Netherlands.

Abushaban's research interests lie broadly in water purification and desalination technologies, process optimization, water quality monitoring, controlling membrane fouling, pre-treatment, development of monitoring methods and tools, and wastewater reuse. He has carried out several research projects with industrial companies worldwide such as Suez in France, Promega in USA, Grundfos in Denmark, Evides in The Netherlands, Veolia in Australia, etc. His work included monitoring, assessing and optimizing numbers of seawater/brackish water desalination plants in Australia, Jordan, The Netherlands, Oman, and United Arab Emirates.

Dr. Abushaban has more than 12 publications in international journals (h-index 9) and 2 book chapters. He is currently co-supervising 4 PhD students and has supervised 7 MSc students and 5 BSc students internationally. Moreover, it has received several prestigious awards, including the Innovation Award of IDA at the International World Congress 2017.

Abstract:

Monitoring and assessing fouling potential along the pre-treatment of an SWRO desalination plant in the Middle East

In full-scale seawater reverse osmosis (SWRO) desalination plants, membrane fouling continues to be a major challenge which has often resulted in unforeseen operational costs and loss of production. The focus of many full-scale SWRO plants has been on maintaining low silt density index (SDI) values in the SWRO feed to control particulate fouling. However, organic and biological fouling are being occurred more frequent. To improve SWRO performance, strategies to control biological and organic fouling need to be developed. Recently, several methods to monitor organic and biological foulants have been developed such as assimilable organic carbon (AOC) and bacterial growth potential (BGP) methods.

In this presentation, the pre-treatment of an SWRO plant located in the Middle East is monitored in terms of turbidity, microbial ATP, particulate fouling potential (SDI, MFI-0.45), and biological/organic fouling potential (BGP, total organic carbon (TOC) and florescence excitation-emission (FEEM)). The pre-treatment processes of the SWRO plant includes dissolved air floatation (DAF) with addition of FeCl3 as coagulant, inline coagulation (1 mg FeCL3/L), two stages of dual media filtration (DMF) and cartridge filtration.

Overall, the monitored water quality parameters along the pre-treatment of the SWRO plant showed excellent removal of turbidity, particulate fouling indices, and microbial ATP. However, partial removal of organic fouling compound was observed.

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