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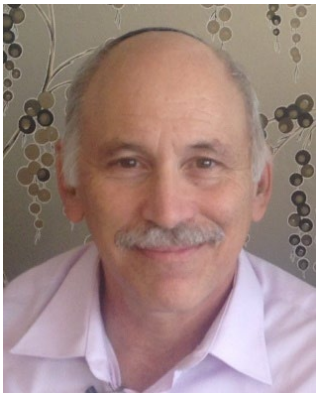
EDS WEBINAR

Small Scale Desalination – Part 2

Thursday 14. December 2023, 16:00-17:10 CET



Moderator: Prof Jack Gilron

DWT (Desalination and Water Treatment Department), Zuckerberg institute for Water Research, Blaustein Institutes for Desert Research, Ben Gurion University of the Negev.

Background

Jack Gilron DSc., Chem Eng., (Technion) began working in water treatment more than 40 years ago in industry in the U.S. and worked in water treatment industry more than 10 years before joining the academic staff at Ben Gurion University in 1997. He teaches at the Environmental Engineering unit and the AKIS international school of desert studies of BIDR of Ben Gurion University.

Abstracts / Program

- **Small scale desalination for irrigation during the volcanic eruption on the La Palma Island (Canary islands-Spain).**

  Luis Miguel Arauzo Alemany
  Chief Operating Officer at Cobra Infraestructuras Hidráulicas / TEDAGUA (Técnicas de Desalinización de Aguas).

- **Distributed Small Water Desalination and Purification Systems: Automation and Data-Driven Operational Models**

  Yoram Cohen
  Distinguished Research Professor of Chemical & Biomolecular Engineering (CBE) at the University of California, Los Angeles (UCLA),

Luis Miguel Arauzo Alemany
Chief Operating Officer at Cobra Infraestructuras Hidráulicas / TEDAGUA (Técnicas de Desalinización de Aguas)

Bio
Luis Miguel Arauzo is an Industrial Engineer from the Polytechnic University of Madrid and holds a Master's Degree in General Business Management from IESE.

He began his career in the water sector more than 23 years ago, holding various executive positions within DRACE and TEDAGUA, where he is currently the Commercial and Operating Director.

He has successfully led the awarding, development and management of some of the most relevant contracts worldwide in the water treatment, environment and hydraulic sector, including projects in more than 28 countries on the 5 continents and with budgets above € 500 million.

He has extensive experience in Nanofiltration and Reverse Osmosis technology, managing iconic desalination plants in places such as Algeria, Singapore or Chile, with a total production capacity of more than 2 million m3/day and in multipurpose mega-projects where treatment plants, distribution networks, hydroelectric and storage plants are combined.

Among the reuse projects to be highlighted, he led the Reuse Plants of Fuerteventura with Reversible Electro dialysis, the Benidorm Regeneration Station or the current waste water treatment plant of Palma de Mallorca II and international innovative facilities recognized as pioneers, such as the regeneration station of Campo Gaitán in Colombia or the tertiary treatment of Altona in Australia.

In addition, he is in charge of all the operations in the Canary Islands, including the services entrusted by BALTEN for the management of the operation of the reuse plants for more than 10 years, the most recent emergency portable desalination plants for La Palma after the volcano eruption and the Desalination Modular Business Unit in TEDAGUA.

Abstract:
Small scale desalination for irrigation during the volcanic eruption on the La Palma Island (Canary islands-Spain).

On September 19, 2021, a volcanic eruption took place on inhabited land on the island of La Palma (Canary Islands-Spain). The eruption lasted 85 days and devastated hundreds of homes and several hundred hectares of banana cultivation, numerous road infrastructures as well as electricity, telecommunications and water supplies. Faced with this unexpected situation, the Government of the Canary Islands acted urgently and hired the company TEDAGUA to install several portable seawater desalination plants, to supply water in record time for agriculture south of the volcano's lava flows. This presentation introduces the installation and operation work carried out that led to the success of the emergency initiative for the agricultural sector, giving rise to many lessons learned and the salvation of dozens of hectares of banana trees, which once the catastrophe was overcome, once again bear fruit.

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Yoram Cohen
Distinguished Professor
Chemical and Biomolecular Engineering Department
University of California, Los Angeles

Bio

Dr. Cohen is a Distinguished Research Professor of Chemical & Biomolecular Engineering (CBE) at the University of California, Los Angeles (UCLA), affiliate member of the Institute of the Environment and Sustainability (1981-present) and the California NanoSystems Institute, and Adjunct Faculty at Ben-Gurion University.

He is a co-founder of the UCLA Water Technology Research Center, and co-founder of the Center for Environmental Implications of Nanotechnology that received the 2012 California Governor's Award in Green Chemistry.

He received the Clarence (Larry) G. Gerhold Award (2019) and L.K. Cecil Award (2003) from the Separations and Environmental Divisions, respectively, of the American Institute of Chemical Engineers (AIChE). He was elected Fellow of both the AIChE (2009) and the North American Membrane Society (2022).

In 2008 he received the Ann C. Rosenfield Community Partnership Prize for his environmental research, a State of California Senate Certificate of Recognition, and a Certificate of Special Congressional Recognition (US) for his contribution to legislation to protect public health and dedicated service to the community.

He has authored/co-authored over 270 scholarly publications, delivered over 500 conference presentations and over 190 invited lectures, and he is Editor of five books that include two recent volumes on water desalination technologies. His research efforts includes environmental impact assessment and nanoinformatics, water treatment/purification and desalination, membrane separations, and machine learning approaches for process optimization and control and environmental impact assessment.

His research contributed to the development and deployment of high performance water desalination and purification systems, new membranes for water purification/desalination, monitoring technology of membrane fouling/scaling, and environmental impact assessment. He is also presently engaged in environmental protection efforts to promote water reuse, develop clean drinking water supplies for disadvantaged communities, and reduce risks from exposure to chemical contaminants.

Abstract:
Distributed Small Water Desalination and Purification Systems:
Automation and Data-Driven Operational Models

Distributed small water treatment and desalination (DSWTD) systems are suitable for deployment at various levels of capacity from small home-based systems to systems suitable for municipal, industrial and even agricultural water supplies. DSWTD systems are particularly suited for use in industrial facilities, produced water treatment, local upgrading of impaired groundwater and agricultural drainage water for crop irrigation, and for small community wellhead water treatment/desalination.

However, deployment of DWTD systems, particularly where 24/7 operator availability is infeasible, requires system design that enables remote monitoring and process operational strategies that autonomously respond to:

(i) fluctuations in water feed quality, (ii) variability of product water use patterns, and (iii) regulatory and/or process requirements (setpoints) concerning product water quality and residual stream generation. Self-adaptive operation requires real-time system performance monitoring which, along with a suitable decision support system, can be used to:

(i) forecast system performance, (ii) reduce energy utilization considering system physical and operational constraints; (ii) detect process performance degradation and sensor faults, (iii) mitigate membrane scaling and fouling, and (iv) remotely monitor system operation and management.

In this presentation, a discussion of the above challenges and solutions will be presented focusing on the utility of data-driven (machine-learning) models integrated with domain knowledge, and model-based control with practical considerations of the following practical operation of DSWTD systems:

(a) energy-optimal reverse osmosis (RO) desalination; (b) fault detection and isolation; (c) intermittent operation of water treatment/desalination system, linked to temporally variable community water usage; (d) membrane performance characterization with respect to solute passage; and (e) utility of transfer learning for accelerating system deployment and commissioning.

Examples of the above approaches will be presented, based on extensive field data derived from multiple DSWTD systems designed, constructed and deployed by the Water Technology Research Center team at the University of California, Los Angeles.

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