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EDS WEBINAR

Small Scale Desalination

Thursday 14. September 2023, 16:00-17:30 CET

Moderator: Prof Jack Gilron
Chem Eng., (Technion)
University of Twente - Master in Membrane Science and Technology

Bio

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

Prof Dr-Ing. Andrea Schäffer
Director, Institute for Advanced Membrane Technology (IAMT), Germany

- **Photovoltaic coupled nanofiltration and reverse osmosis for brackish water treatment: challenges for sustainable implementation and sustainable operation**

Guillermo Zaragoza, PhD.
Leader of the Working Group "Renewable Energy Desalination" of Water Europe.
Head of Solar Thermal Applications, Plataforma Solar de Almería, CIEMAT, Spain.

- **Solutions for a successful implementation of small-scale desalination**

Kevin Price
Middle East Desalination Research Center MEDRC, Senior S&T Advisor and the Principal Investigator for the Oman Humanitarian Desalination Prize and Pathway Research Grants to develop a low-cost handheld desalination device, Oman

- **Opportunities in Small-scale Desalination**

Prof Amos Winter
Massachusetts Institute of Technology, Associate Professor of Mechanical Engineering (with tenure)

- **Water from the sun with no batteries required: time-variant, photovoltaic-powered electrodialysis**

Prof Dr-Ing Adrea Schäffer
Director, Institute for Advanced Membrane Technology (IAMT), Germany

Bio

Andrea Schäfer is Professor of Water Process Engineering, Faculty of Chemical and Process Engineering and (founding) Director of the Institute for Advanced Membrane Technology (IAMT) at the Karlsruhe Institute of Technology (KIT).

Previously she was Professor at the Nelson Mandela African Institute of Science and Technology in Tanzania, East Africa. 2006 to 2013 she was the Chair of Environmental Engineering at the University of Edinburgh, Scotland, UK following 3 years as a senior lecturer at the University of Wollongong, Australia and 3 years as postdoc & lecturer at the University of New South Wales, Sydney Australia. She holds four engineering degrees from three countries (Germany, France (2) & Australia) including a PhD from the UNESCO Center for Membrane Science and Technology at the University of New South Wales in Chemical engineering and has worked in many countries.

Passionate about membrane process engineering she has experience with several membrane processes encompassing predominantly water treatment, desalination, water recycling, remote water supplies and international development. Her work spans from fundamental research, nanomembrane materials through to commercialisation projects, from water chemistry and engineering to socio-economic issues relevant to water.
Prof Schäfer has published extensively in high impact journals and authored or edited several books, including 'Nanofiltration: Principles, Applications and New Materials'. She collaborates extensively with colleagues in many leading academic institutions worldwide and works towards her long term vision 'I have a dream: safe water for all children'.

Abstract: Photovoltaic coupled nanofiltration and reverse osmosis for brackish water treatment: challenges for sustainable implementation and sustainable operation

Our academic work is about new knowledge generation, student learning and paradigm shifts. More than 20 years of research (in collaboration with Prof Bryce Richards as the renewable energy expert) into small scale brackish water desalination systems, directly coupled with renewable energy (wind & photovoltaics) has been a game changer. A conservative water industry and a water quantity focused aid sector has not welcomed the concept of decentralized, small-scale system using advanced technologies. The belief that what required advanced (well, just membrane) technology in the developed world should be possible with cheap clay pot in development has been irrational. Understanding that water prices in some African countries are multiples of those in the developed world (at fractions of per capita consumption) has highlighted the potential for decentralized systems, especially when considering the lack of water and electricity infrastructure in remote locations. Core challenges are neither the technology, nor the cost. Challenges are operating small systems in remote location and providing appropriate service contracts to ensure sustainable operation and guarantee water quality.

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Guillermo Zaragoza, PhD.
Leader of the Working Group "Renewable Energy Desalination" of Water Europe.
Head of Solar Thermal Applications, Plataforma Solar de Almería, CIEMAT, Spain.

Bio

Dr Guillermo Zaragoza is a senior researcher in CIEMAT (Centre for Energy, Environment and Technology Research), currently head of the Solar Thermal Applications R&D unit of Plataforma Solar de Almería (PSA), Spain. He is also co-leader of the "Desalination and Photosynthesis" R&D Unit of CIESOL (joint centre of University of Almería and CIEMAT).

His main research is focused on the application of solar energy to desalination in the water-energy-food nexus. In particular, his main expertise is membrane distillation, having worked during several years with solar-powered membrane distillation at pilot scale. He has coordinated CIEMAT's participation in 11 EU R&D&I projects, and participated in more than 20 international R&D&I projects and contracts with companies, leading the "Solar Desalination" research activities at PSA-CIEMAT.

Guillermo Zaragoza has a PhD in Physics, has held academic positions at the University of Oxford and the Spanish Research Council, as well as the greenhouse technology research facility of Cajamar Foundation. He has a long academic record (>100 papers, 5 books and 11 book chapters) and extensive experience in international R&D projects (>40), teaches in a master course on Solar Energy at the University of Almería, as well as in international courses on Solar Desalination organized by the European Desalination Society, of which he has been board director. He is ambassador of the Water Europe platform and leader of the Working Group on Renewable Energy Desalination.

Abstract: Solutions for a successful implementation of small-scale desalination

Small-scale desalination is often the only solution for decentralized water supply applications. However, its implementation has encountered some barriers. Energy supply is a critical element affecting feasibility. Solar energy is proposed as the most viable energy source, but its intermittency must be dealt with in a practical and affordable way. Brine management can be a decisive limitation, but solutions are available and again dependent on an efficient use of solar energy. Lessons learnt from previous applications identify the main technical aspects that affect the operation and maintenance of decentralized systems, but social aspects are also important. Engagement of users is essential for the successful uptake of decentralized solutions for small communities. Co-creation with users and other relevant stakeholders, using iterative feedback processes throughout a lifecycle approach of the innovation, must be considered as a means to guaranteeing the acceptability of the technologies and the sustainability of their implementation.

Kevin Price

Middle East Desalination Research Center MEDRC, Senior S&T Advisor and the Principal Investigator for the Oman Humanitarian Desalination Prize and Pathway Research Grants to develop a low-cost handheld desalination device, Oman

Bio

Eng. Price started his career with the U.S. Bureau of Reclamation over 40 years ago as a researcher studying, at the time, the world's largest membrane desalination facility in Yuma, AZ. He later managed water treatment engineering and research for the agency and was one of the two primary authors of the Desalination and Water Purification Technology Roadmap, managed Reclamation's Desalination and Water Purification Research and Development Program, the Title XVI water reuse research program, and was responsible for the design, construction, O&M, R&D, and policy for Reclamation's Brackish Groundwater National Desalination Research Facility in Alamogordo, NM. He retired as the Coordinator of the Advanced Water Treatment Research Program after 30 years of service.

He has been a strong advocate for research and innovation including service on the boards of the American Membrane Technology Association and the International Desalination Association, on the WateReuse Research Foundation's Research Advisory Committee, on the National Water Research Institute's Research Advisory Board, on the steering committee for the WHO Guidance Document on Desalination for a Safe Water Supply, a current member of National Alliance for Water Innovation's Industry Advisory Council and working with European, Middle Eastern, North African, and Asian countries. Over the years he has worked on issues involving desalination including water scarcity, water and peace, the values of water, the history of desalination, and advanced water treatment innovation through research and prizes. He is currently working for the Middle East Desalination Research Center as the Senior S&T Advisor and the Principal Investigator for the Oman Humanitarian Desalination Prize and Pathway Research Grants to develop a low-cost handheld desalination device. He graduated from the College of Idaho with a BS in Zoology, from Columbia University with an MS in Chemical Engineering, and from the University of Denver with an MBA in Finance.

Abstract: Opportunities in Small-scale Desalination

Most of the cost efficiencies we see today in desalination have come from increased economies of scale. It has meant that desalination is just as unaffordable as ever for those who need it most: remote poor communities relying on impaired water resources. Our research has dramatically increased energy efficiencies, but the capital costs for small systems remains very high. In this presentation, examples are used that model a starting strategy to increase the tools in our toolbox of water purification solutions, where the levelized cost of water is not the factor that is optimized. Also, why is downscaling of our current technologies not adequate and not sustained after the experts leave? Could it be as technologists, we need to strengthen how to integrate socio-technical processes in desalination applications? The development of new solutions is critical to sustain the future of unique cultures around the world as well as meeting the needs of the poor.assss

Prof. Amos Winter
Associate Professor of Mechanical Engineering (with tenure), Massachusetts Institute of Technology (MIT)

Bio
Amos Winter is a tenured Assistant Professor of Mechanical Engineering, and the Director of the Global Engineering and Research (GEAR) Laboratory, at the Massachusetts Institute of Technology (MIT). His group's research focuses on machine and product design for developing and emerging markets; with particular applications to solar-powered water purification and irrigation, assistive prosthetic devices, and hybrid-power systems.

Among numerous honors, Professor Winter was named one of MIT Technology Review's "35 Innovators Under 35" for 2013; and in 2015 he was co-winner of the McKinsey Award for the best article, "Engineering Reverse Innovations" in the Harvard Business Review that year. More recently, Professor Winter received an NSF CAREER award; as well as the MIT School of Engineering Junior Bose Award for Excellence in Teaching, and the MIT Edgerton Faculty Achievement Award, all in 2017.

Prof. Winter is also the principal inventor of the Leveraged Freedom Chair (LFC) developing world wheelchair, which was a winner of a 2010 R&D 100 award, was named one of the Wall Street Journal's top innovations in 2011, received a Patents for Humanity award from the U.S. Patent and Trademark Office in 2015, and was the subject of "Engineering Reverse Innovations", winner of the 2015 McKinsey Award for the best article of the year in Harvard Business Review.

EXPERIENCE
MIT Department of Mechanical Engineering Cambridge, MA
Ratan N. Tata Career Development Associate Professor
July 2017 - Present
Ratan N. Tata Career Development Assistant Professor
July 2012-June 2017
Director, Global Engineering and Research (GEAR) Lab July 2012-Present

Abstract: Opportunities in Small-scale Desalination