

Membrane Processes in Water and Wastewater Sectors: *Present Practice, Commercialization Landscape, and Emerging Trends*

Abstract: This presentation describes the commercialization landscape for membrane processes in the water/wastewater sector and summarizes innovations and emerging trends for conventional and non-conventional water sources, and brine management. Membrane processes driven by pressure, electrical, thermal, and osmotic gradients, playing roles ranging from wide to niche applications, are discussed. Innovations and emerging trends include computational chemistry in materials design, bioinspired membrane materials, enhanced selectivity membranes, 3-D printing of module components, AI/ML driven membrane operation, membrane-based ZLD processes, SWRO brine *mining*, renewable energy-driven processes, and reuse of end-of-life membranes.

Gary Amy Dean's Distinguished Professor Environmental Engineering Clemson University (USA)



Biography: Gary L. Amy presently holds the position of Dean's Distinguished Professor in the College of Engineering and Applied Science at Clemson University (USA). Until recently, he was a Visiting Professor in the Chemical and Biomolecular Engineering Department at the National University of Singapore (NUS), where he was instrumental in establishing the Singapore National Membrane Consortium (SG-MEM). He is also Emeritus Professor, and Former Director, in the Water Desalination and Reuse Center (WDRC) at the King Abdullah University of Science and Technology (KAUST) in Saudi Arabia. Prior to KAUST, he was Professor of Water Supply Engineering at the UNESCO-IHE Institute for Water Education in the Netherlands, where he held a joint appointment at the Technical University of Delft. Formerly, he was Professor of Environmental Engineering at the University of Colorado at Boulder (USA) and, earlier, at the University of Arizona (USA). Over a career of 45 years, Dr. Amy's main areas of expertise have been in drinking water quality and treatment, desalination, and wastewater reclamation/reuse, with specific expertise in membrane rejection and fouling, selective adsorption, natural organic matter characterization, disinfection by-product formation and control, and natural systems. Dr. Amy's present research focus is on emerging low-energy membrane-based desalination technologies, energy-harvesting wastewater treatment processes, and managed aquifer recharge for wastewater reuse. He has published over 500 articles in refereed publications and supervised more than 50 PhD students. Dr. Amy is the recipient of the 2017 A. P. Black Research Award from the American Water Works Association (AWWA).