



O₂ Technology Assessment Group (TAG)

Water Technology Expert

Dr. Mike Mickley

Dr. Mickley has over 45 years' experience in the field of desalination and process technology. Since 1990 most of Dr. Mickley's efforts have focused on addressing challenges of higher salinity water management, and as a consultant with the O₂ TAG

Dr. Mickley has collaborated with several engineering companies on projects evaluating saline water disposal alternatives. He has worked or is currently working as subcontractor to different engineering companies with several cities including Southern Nevada Water Authority, Thornton, Colorado, the City of Aurora, Colorado, the County of Maui, the City of San Antonio, City of Brighton, Colorado, and others (including projects in South Africa, Australia, and Oman in conjunction with Dr. Aro Arakel). These projects generally involve analysis of water quality and local regulatory policy to identify treatment/mitigation needs, evaluate treatment schemes, and evaluate wastewater management/disposal options.

Within the past 7 years most of the projects have involved a wide range of industries and locations (produced water, mining water, food processing water, municipal wastewater effluent) involving more complex water conditions than generally found in municipal potable water treatment situations. Need for analysis of complex chemistries and the many chemical reactions that can take place, over the broad range of salinities, temperatures and pressures encountered in industrial waters (such as produced water), has resulted in the proficient use of OLI software. This software has a database of thousands of chemical compounds enabling simulation of redox reactions over a wide composition and operating conditions.

Professional Engineer,
State of Colorado
#18485

EDUCATION

- Ph.D., University of Colorado, 1976 1966
- M.S., University of Colorado, 1970
- B.S., Illinois Institute of Technology, 1966. All in Chemical Engineering (B.S. included a minor in Gas Technology) 1970

PROFESSIONAL DEVELOPMENT

Dr. Mickley has over 45 years' experience in the field of desalination and process technology. Since 1990 most of Dr. Mickley's efforts have focused on addressing challenges of higher salinity water management. He has been principal investigator in several projects addressing water management issues that include:

- AwwaRF: Membrane Concentrate Disposal, 1993
- AwwaRF: Major Ion Toxicity in Membrane Concentrate, 2000
- Bureau of Reclamation: Membrane concentrate Disposal: Practices and Regulation, 1st edition 2001; 2nd edition 2006.
- Saint Johns River Water Management District: Demineralization Plant Database, 2002.
- Office of Naval Research: Pretreatment Capabilities and Benefits of Electrocoagulation, 2004
- WaterReuse Foundation: Survey of Zero Liquid Discharge and Volume Minimization for water Utilities, 2008

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- Office of Naval Research: *Field Tests for Pilot Electrocoagulation System*, 2008.
- Bureau of Reclamation: *Treatment of Concentrate*, 2009
- WateReuse Research Foundation: *Development of a Knowledge Base on Desalination Concentrate and Salt Management*, 2013.

Dr. Mickley was also a subcontractor in the following projects:

- WateReuse Foundation project: *Beneficial and Non-Traditional Uses of Concentrate where he authored the chapter on Salt Separation of Membrane Concentrate*; 2006
- Bureau of Reclamation: *The Southern California Regional Brine – Concentrate Management Study – Phase I, (as subcontractor to CH2M HILL)*; 2010.
- *AwwaRF: Guidelines for Implementation of Desalination Facilities, (as subcontractor to Stratus Consulting)*; 2011

Two current projects in which Dr. Mickley is a subcontractor involve addressing regulatory policy:

- WateReuse Research Foundation and Water Research Foundation project: *Desalination Concentrate Management Policy analysis for the Arid West; draft final report has been submitted.*
- WateReuse Research Foundation project: *Regulatory Workshop on Critical Issues of Desalination Permitting; final report has been submitted.*

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Dr. Mickley is recognized nationally and internationally as a leading expert in the issues of saline effluent management and in the past ten years has given invited presentations in France, England, Israel, Costa Rica, Cyprus, and across the U.S.

His most recent presentations include:

- (December, 2004) 'Costs of Concentrate Management,' 2004 Middle East Desalination Cost Modeling Workshop, Cyprus, December 6-7.
- (December, 2004) 'Separation of Salts,' 2004 National Salinity Management and Desalination Summit, December 13-14, Las Vegas.
- (July, 2006) "Zero Liquid Discharge". AMTA Biennial Conference & Exposition Pre-Conference Workshop: Concentrate Treatment Technologies
- (June, 2007) "High Recovery and Zero Liquid Discharge Processes," 11th Annual Water Reuse Research Conference, El Paso, TX
- (July, 2007) "Feasibility of High Recovery and ZLD Technologies," AMTA Conference and Exposition: AMTA / NWRI Pre-Conference Workshop: Inland Concentrate Management. Las Vegas.
- (January, 2009) "Economics and Energy Requirements for Various Water Treatment / Brine Management Options," Mountain States Salinity Council 2009 Annual Salinity Summit, Las Vegas.
- (January, 2009) "Options, Challenges, and Opportunities in concentrate Management for Inland Desalination Facilities," Ground Water Protection Council 2009 UIC Conference, San Antonio.
- (July, 2010) "Overview of Global Inland Desalination Concentrate Management - Situations, Challenges, and Technologies," AMTA Annual Conference and Exposition, San Diego.
- (May, 2010) "Brackish Water Concentrate Management," CHIWWA Concentrate Management Workshop

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- (March, 2012) "U.S. Municipal Desalination: Plant Statistics and Concentrate Management Practices and Issues," First Annual Joint Membrane Conference, AWWA/AMTA, Glendale, Arizona.

RECENT AND OTHER WRITINGS

- In October, 2005 State-of-the Science paper entitled "Membrane Concentrate Management" for the Joint Water Reuse and Desalination Task Force to be used as background for updating the National Desalination Roadmap
- Chapter 19 "RO Concentrate Management" in Mark Wilf's 'The Guidebook to Membrane Desalination Technology' published by Balaban Desalination Publications. 2007.
- Arakel, A. & M. Mickley (2007). Membrane concentrate treatment for byproducts recovery and waste minimization. Ozwater Conference, Sydney, March 4-8, 2007.
- (as a co-author with Dr. Arakel) White paper entitled "Inland Desalination Brine Management" prepared for National Center for Excellence in Desalination, National Desalination Research Roadmapping Workshop, Freemantle, Australia, October, 2009
- White paper entitled "Brackish Water Concentrate Management" prepared for New Mexico State University and El Paso Water Utility, 2010.
- U.S. Municipal Desalination Plants: Numbers, Types, Locations, Sizes, and Concentrate Management Practices, IDA Journal, 4,(1),2012).
- High Recovery Processing for Municipal Desalination: Approaches and Issues (submitted to Desalination and Water Treatment) - with co-author A. Arakel.

Dr. Mickley is on the editorial board and Desalination and Water Treatment. Additional information on Dr. Mickley and Mickley & Associates may be found at www.mickleyassoc.com.