European Desalination Society

MEMBRANE TECHNOLOGY, PROCESS AND SYSTEM DESIGN

A 3-day intensive course

Lecturer Mark Wilf, Ph.D.

March 14–16, 2016, Rome, Italy

The seminar topics include practical information about performance and operating conditions of reverse osmosis and nanofiltration technology for brackish and seawater desalting. The program includes introduction to membrane technology, description of commercial membrane elements, illustration of the membrane system design process and overview of systems operation. Calculations of the investment and operating cost of membrane plants, based on design cases will be illustrated. A section of the seminar is dedicated to the modern microfiltration and ultrafiltration technology applied for treatment of potable water and as a pretreatment of feed water for RO systems. Course material also includes information on process and equipment applied in membrane bioreactor (MBR) systems. An overview of commercial MF and UF membrane products will be provided. It will be followed by a description of the implementation process in large membrane treatment plants.The seminar is structured in the form of three seven hour a day sessions of frontal presentation combined with hands-on exercises of calculations of operating parameters and evaluation of process economics. It is expected that knowledge gained during the seminar will enable participants to conduct critical evaluation of feasibility and design parameters of water development projects based on membrane technology and estimation of capital and operating cost. The seminar is directed toward professionals who are familiar with membrane technology, with the objective of providing practical information on commercial products, the design process, operation conditions of membrane systems and economics of the membrane desalting and water treatment applications.

VENUE

University Campus Bio-Medico of Rome
Faculty of Engineering

Via Alvaro del Portillo 21, 00128 Rome, Italy

Rome is the capital of the Italian Republic. It is the most populous and largest municipality in Italy and is among Europe's major capitals in terms of the amount of terrain it covers.

It is the city with the highest concentration of historical and architectural riches in the world. Its historical centre, outlined by the enclosing Aurelian Walls, layering nearly three thousand years of antiquity, is an invaluable testimony to the European western world's cultural, artistic and historical legacy and in 1980 it was, together with the Holy See's property beyond the confines of the Vatican State as well as the Basilica of St. Paul outside the Walls, were added to UNESCO's World Heritage List .

Rome, the heart of Catholic Christianity, is the only city in the world to host an entire foreign state within its confines, the enclave of the Vatican City.

Over 16% of the world's cultural treasures are located in Rome (70% in all of Italy).

Lecturer

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Dr. Wilf has been involved in process development, system design, project execution, plant operation and maintenance of large, commercial desalination plants in US, Europe and Middle East since 1977.

Dr. Wilf has been involved in development of new desalination process and optimization of membrane technologies. Some of his inventions have resulted in patent applications and are being used in commercial desalination systems.

Dr. Wilf is a regular contributor to professional journals, wrote chapters on membrane technology processes and applications to a number of books. He edited and wrote with other coauthors T*he Guidebook to Membrane Desalination Technology* that has been published in 2006. The second book on membrane technology that he edited and contributed, *The Guidebook to Membrane Technology for Wastewater Reclamation*, has been published in 2010.

Dr. Wilf regularly presents and teaches desalination and membrane technology subjects to engineers and water professionals. His teaching activity includes teaching course on membrane technology and desalination for European Desalination Society in L'Aquila, Italy, another annual course in San Diego, CA and other courses industrial companies and engineering organizations.

COURSE OUTLINE

Fundamentals of membrane desalination processes

- RO process terms
- Concept of semipermeable membranes for water – salt separation
- Configuration of asymmetric and composite membranes
- Membrane types: microfiltration, ultrafiltration, softening, brackish, seawater
- Membrane elements configuration: spiral wound and hollow fibers
- Membrane elements manufacturing process
- Nominal performance and nominal test conditions
- Water transport and salt transport

Membrane performance

- Effect of feed water composition and process parameters on membrane performance
- Translation of nominal test data to element performance in filed conditions
- Effect of feed water composition and process parameters on membrane and system operation

Water chemistry of the desalination process

- Feed water types and representative water composition
- Analytical data required for the desalination process design
- Chemicals used in the pretreatment process
- The carbonate system, alkalinity calculations
- Calcium carbonate saturation indicators, methods of calculation. Saturation limits of other sparingly soluble salts. Scale inhibitors.

Post treatment

- Chemistry of post treatment process
- Stabilization of RO permeate

Energy usage in desalination systems

- Components of energy use
- Configuration of pumping systems including energy recovery devices
- Calculation of energy use and energy optimization

Pretreatment process configuration

- Feed water sources and feed water delivery alternatives
- Feed water quality indicators
- Pretreatment system configurations
  - Brackish desalination systems
  - Seawater desalination systems
    - Conventional pretreatment
    - Membrane pretreatment

Pretreatment process design

- Components of conventional pretreatment systems
  - Coagulation and flocculation
  - Medial filtration
  - Dissolved Air flotation
  - Chemicals dosing systems
- Sizing of conventional filtration systems

Operation of conventional pretreatment system
Determination of operating parameters and usage of chemicals

Membrane filtration technology

Fundamentals of membrane filtration technology
Membranes and membrane modules configuration
Membrane filtration system configurations
Sizing membrane filtration systems
Operation of membrane filtration systems

Membrane application for feed water pretreatment

Membrane filtration applied to wastewater reclamation
Membrane filtration applied to seawater desalination
Determination of operating parameters and usage of chemicals
Comparison of conventional and membrane pretreatment

RO system configuration

RO unit configuration: single stage and multistage concentrate processing, two pass permeate treatment configuration

Introduction to desalination system design

Project specifications
Process development
Calculation of membrane performance
Process and instrumentation diagram
Bill of materials
Major equipment components
System layout

Computer projections of RO system performance

Methods of RO membranes performance calculations
Algorithm of computer program for performance projection
Features of commercial computer programs
Examples of determination of process parameters and performance calculations
Optimization of system performance utilizing computer calculations

Boron reduction alternatives

Adjustment of feed water pH
Two pass systems
Ion exchange

Economics of membrane projects

Components of project cost
Components of operating cost
Optimization of project economics for “Turn key” and “Design Built Operate” project delivery methods

Advanced process design

“Split Partial” two pass permeate processing
Hybrid system configurations
Selected aspects of MBR technology

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REGISTRATION FORM

Surname _____ Name _____

Affiliation _____

Address _____

Country _____ Telephone _____

Fax _____ Email _____

Registration fee:

☐ EDS members	**€2,500**
☐ Non-members	**€2,700**

The fee includes 4 nights accommodation, lunches, coffee, dinners, course Workbook and CD, and *Guidebook on Membrane Desalination Technology* by Mark Wilf with chapters by Leon Awerbuch, Craig Bartels, Mike Mickley, Graeme Pearce and Nikolay Voutchkov.

Payment can be made by:

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