



**Dr. Mark
Wilf**



MEMBRANE TECHNOLOGY, PROCESS, SYSTEM DESIGN AND ECONOMICS

A 3 – Day Intensive Course

Lecturer Mark Wilf, Ph.D.

May 10 – May 12, San Diego, California

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The seminar topics include practical information about performance and operating conditions of reverse osmosis (RO) and nanofiltration (NF) technology for brackish and seawater desalting.

The program includes introduction to membrane technology, description of commercial membrane elements, illustration of membrane systems design process and overview of systems operation. Calculation of the investment and operating cost of membrane plants, based on design cases will be illustrated.

A section of the seminar will be dedicated to modern membrane filtration technology applied for treatment of potable water, as a pretreatment of feed for RO systems and its application in membrane bioreactors (MBR).



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Venue

Holiday Inn Express San Diego downtown
1430 Seventh Avenue, San Diego, ca 92101
Reservations: 888.465.4329 or www.hiexpandsandiego.com

The hotel is conveniently located in downtown San Diego. It provides easy access to all the major attractions and businesses in the area. The hotel is near Gas Lamp District, the San Diego Convention Center and Petco Park. The hotel provides shuttle from and to Lindberg Field Airport, San Diego.

Seminar attendees will receive a special rate of \$79.0 per night (plus state and local taxes) for reservations made prior to April 12 (pending room availability). Reservations have to be made individually, calling the hotel reservation.

Lecturer



Dr. Wilf has planned and will deliver the course. Recognized as a global expert for membrane applications, Dr. Wilf provides expertise to the engineering and scientific community worldwide. His expertise includes reverse osmosis, nanofiltration, ultrafiltration, microfiltration technologies applied for seawater and brackish water desalination, potable water treatment, and industrial and municipal wastewater reclamation.

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 new desalination processes 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 **The Guidebook to Membrane Desalination Technology** that has been published in 2006. The second book on membrane technology he edited and contributed to: **The Guidebook to Membrane Technology for Wastewater Reclamation** has been published in January 2010.

Membrane Technology, Process and System Design

Mark Wilf Ph. D.

Day 1 Commercial membranes and water chemistry

9:00 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

Membrane performance

Effect of feed water composition and process parameters on membrane performance

Translation of nominal test data to element performance in field conditions

Effect of feed water composition and process parameters on membrane and system operation

10:45 Coffee break

11:00 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.

13:00 Lunch

Post treatment

Chemistry of post treatment process

Stabilization of RO permeate

14:00 Energy usage in desalination systems

Components of energy use

Configuration of pumping systems including energy recovery devices

Calculation of energy use and energy optimization

16:00 Summary and discussion

Day 2 Feed water sources and pretreatment process

9:00 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

10:45 Coffee break

11:00 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

11:00 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

13:00 Lunch

14:00 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.

16:00 Summary and discussion

Day 3 Desalination system design and economics

9:00 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

10:45 Coffee break

11:00 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

13:00 Lunch

14:00 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

16:00 Summary and discussion