



SEAWATER REVERSE OSMOSIS SYSTEM DESIGN

This training program covers both theoretical and practical aspects of engineering and design of seawater reverse osmosis (SWRO) membrane systems. The course provides brief overview of RO system fundamentals and focuses on the practical aspects of selection and design of all key RO system components including: high pressure pumps, reverse osmosis membrane racks, energy recovery equipment and clean-in-place system. The course also discusses alternative RO membrane system configurations, key performance parameters of state-of-the art SWRO and BWRO elements, and instrumentation and control components of SWRO plants. A half day of the course is dedicated to the interactive demonstration of standard software for design of SWRO systems. The course is suitable for desalination plant designers and operators and includes examples of RO systems incorporated into large existing desalination plants worldwide.

3-DAY COURSE

Leading Lecturer:

Nikolay, VOUTCHKOV, PE, BCEE, Water Globe Consulting, USA

PROGRAM OUTLINE

Day 1: RO System Design Methodology

09.00 – 10.30 Reverse Osmosis System Design Fundamentals

- RO System Components
- Key Performance and Design Parameters
- Flux Distribution within Membrane Vessels and Membrane Fouling

- Effect of Salinity, Recovery, Temperature and Feed Pressure on Membrane Performance
- Key Steps of RO System Design

10.30 – 10.45 Coffee Break

10:45 – 12:00 Design Source and Product Water Quality Parameters

- Source Water Quality Factors
- Salt Content/Ionic Strength
- Source Water Fouling and Scaling Potential
- Chemical Compounds with Destructive Impact on RO Membranes
- Key Design Source Water Quality Parameters
- Design Product Water Quality Parameters

12.00 – 13.00 Lunch Break

13.00 – 14.30 1.3 Selection of RO System Configuration

- Overview of Alternative RO System Configurations
 - ✓ Single vs. Multiple Pass and Stage RO Systems
 - ✓ Individual Trains vs. Pressure Center Design
- Key Factors Impacting Selection of SWRO System Configuration
- Mass Flow Diagram – What Do We Need to Determine and How?

14.30 – 14.45 Coffee Break

14.45 – 16.00 RO System Design Software Packages

- Overview of Key RO System Design Software
 - ✓ TorayDS - Toray
 - ✓ IMSD System – Hydranautics
 - ✓ ROSA – Dow Filmtec
- Key Input and Output Parameters
- Alternative Uses of RO Design Packages

16.00 – 17.00 Questions & Answers

Day 2: Sizing of Key RO System Components

09.00 – 10.30 High Pressure Pumps

- Types and Configurations
- Key Design Parameters
- Selection of Number and Size of Pump Units
- Instrumentation and Controls

10.30 – 10.45 Coffee Break

10.45 – 12.00 Spiral-wound RO Elements and Pressure Vessels

- Sizes and Configurations
- Key Design Parameters
- Selection of Number and Size of RO Elements and Vessels

12.00 – 13.00 Lunch Break

13.00 – 14.45 RO Skids and Trains

- Sizes and Configurations
- Key Design Parameters
- Selection of Number and Configuration of RO Trains
- Design of RO Flushing and CIP Systems
- Instrumentation and Controls

14.45 – 15.00 Coffee Break

15.00 – 16.00 Energy Recovery Systems

- Types and Configurations
- Key Components and Design Parameters
- Selection of Number and Size of Energy Recovery Units
- Instrumentation and Controls
- RO System Energy Use

16.00 – 17.00 Questions & Discussions

Day 3 – Implementing RO System Design

09.00 – 10.15 RO System Installation and Commissioning

- Main Steps
- Key Issues Associated with RO System Commissioning

10.15 – 10.30 Coffee Break

10.30 – 12.00 Design of Example RO System

- Selection of RO System Configuration
- Sizing of Key RO System Components

12.00 – 13.00 Lunch Break

13.00– 14.45 Demonstration of RO Design Software

- Overview of Key Features
- Application for Sizing of Example RO System

14.45 – 15.00 Coffee Break

14.45 – 16.00 3.4 Interactive Application of RO Design Software

- Demonstration of Alternative RO Design Software Applications
- Interactive Use of RO Design Software for Development and Optimization of Alternative RO System Designs

16.00 – 17.00 Multiple Choice Test and Adjourn
