



PRETREATMENT FOR SEAWATER REVERSE OSMOSIS DESALINATION PLANTS

This training program provides practical understanding of key pretreatment processes widely used in reverse osmosis (RO) desalination plants worldwide and focuses on selection, operation, maintenance, monitoring, troubleshooting and optimization of conventional and membrane pretreatment technologies.

3-DAY COURSE

Leading Lecturer:

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PROGRAM OUTLINE

Day 1: Chemical Conditioning, Sedimentation and DAF Clarification

08:00 – 9:30 Reverse Osmosis and Pretreatment Process Fundamentals

- Pretreatment and Desalination Process Overview
- Chemical Conditioning of Source Water
- Sedimentation and Dissolved Air Flotation
- Granular Media Pressure Filtration
- UF and MF Membrane Filtration
- Cartridge Filtration

9:30 – 10:45 Source Water Quality Characterization

- Source Water Quality Factors
- Suspended Solids/Turbidity/SDI
- Type of Membrane Foulants
- Particulate Fouling – TSS, Turbidity and SDI
- Colloidal Fouling – THC, Fe, Mn
- Fouling from Natural Organic Matter (NOM)
- Biofouling
- Understanding the Process of Membrane Biofouling
- Algal Blooms and Biofouling
- Membrane Mineral Scaling
- Chemicals with Destructive Impact on RO Membranes

10:45 – 11:00 - Coffee Break

11:00 – 12:00 Source Water Screening

- Bar, Band and Drum Screens
- Microscreens
- Operation and Maintenance Considerations

12:00 – 13:00 - Lunch Break

13:00 – 14:30 Source Water Conditioning

- Pre-chlorination and Use of Biocides
- Coagulation and Flocculation
- Flocculation
- Type of Flocculation Chemicals and Feed Systems
- Scale Inhibitors
- Chemicals for Enhanced Boron Removal

14:30 – 14:45 – Coffee Break

14:45 – 15:30 Sedimentation and Dissolved Air Flotation

- Sedimentation Tanks
 - ✓ Function, Types and Configurations
 - ✓ Operation and Maintenance Considerations

- Dissolved Air Flotation Clarifiers
 - ✓ Function, Types and Configurations
 - ✓ Key Performance Parameters
 - ✓ Examples of Existing DAF Systems – Operation Challenges and Solutions

15:30 – 16:00 Questions and Discussions

Day 2: Pretreatment by Granular Media and Membrane Filtration

08:00 – 9:00 Granular Media Pretreatment Filters - Overview

- Filter Types and Configurations
- Filters Combined with DAF Clarifiers – O & M Considerations
- Gravity and Pressure Filters – Key Advantages and Disadvantages
- Handling of Spent Filter Backwash

9:00 – 10:30 Granular Media Filters - Performance Monitoring

- Key Performance Parameters
- Removal of Solids/Silt
- Removal of Organics and Microorganisms
- Routine Operations Tasks
- Performance Monitoring and Control

10:30 – 10:45 - Coffee Break

10:45 – 12:00 Case Studies of Full-scale SWRO Plant Pretreatment

- Fujairah SWRO Plant Pretreatment System, UAE
- Al Dur SWRO Plant, Bahrain
- Tampa Bay Desalination Plant, USA

12:00 – 13:00 - Lunch Break

13:00 – 14:00 Membrane Pretreatment Filters - Overview

- Filter Types and Configurations
- Filter Vessels and Modules – Materials and Configurations
- Membrane Filtration Media – Key Performance Parameters
- Comparison of Pressurized and Submerged Systems

14:00 – 14:15 - Coffee Break

14:15 – 15:30 Membrane Pretreatment Filters - Performance Monitoring

- Key Performance Parameters
- Removal of Solids/Silt
- Removal of Organics and Microorganisms
- Source Water Pretreatment Prior to Membrane Filtration
- Examples of Full-scale Membrane Pretreatment Systems

15:30 – 16:00 - Questions & Discussions

Day 3: Pretreatment Performance Optimization and Troubleshooting

08:00 – 9:45 Comparison of Granular Media and Membrane Pretreatment

- Effect of Source Water Quality on Performance
- Surface Area Requirements
- Quantity and Quality of Generated Residuals
- Chemical and Power Use
- Filtration Media Replacement Costs
- Commoditization;
- Water Production Costs;
- Guidelines for Selecting Pretreatment System

9:45 – 10:00 - Coffee Break

10:00 – 12:00 Optimization of Chemical Use for Pretreatment

- Minimizing Use of Intake Chlorination
- Use of Ferric Sulfate vs. Ferric Chloride
- Application of Other Source Water Conditioning Chemicals
- Biofouling Management
- Reduction of Antiscalant Use

12:00 – 13:00 - Lunch Break



13:00 – 13:45 Troubleshooting and Optimization of DAF Systems

- Potential Challenges
- Troubleshooting Practices

13:45– 14:00 - Coffee Break

14:00 – 15:00 Troubleshooting and Optimization of Pretreatment Filters

- Cartridge Filters
- Gravity Media Filters
- Membrane Pretreatment Filters

15:00 – 15:30 - Questions & Discussions

15:30 – 16:00 Written Multiple-choice Exam
