



Mechanical Engineering

## **Best Practices Operation & Troubleshooting of RO Plant Process**

## Course Introduction

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Since the development of the first practical cellulose acetate membranes in the early 1960's and the subsequent development of thin-film, composite membranes, the uses of reverse osmosis have expanded to include not only the traditional desalination process but also a wide variety of wastewater treatment applications. In addition, RO systems can replace or be used in conjunction with others treatment processes such as Oxidation, Adsorption, Stripping, or Biological Treatment (as well as many others) to produce a high quality product water that can be reused or discharged.

To understand how Reverse Osmosis works, it helps to understand the process of osmosis which is ubiquitous in nature. When two solutions having different dissolved mineral concentrations are separated by a semi-permeable membrane, water flows from the less concentrated solution to the more concentrated solution.

The course shall present a strategy to preserve RO Plant function, Predict RO Plant Performance and avoid the Failure of RO Plant Components, and ensure the highest Permeate Productivity with the best salt rejection. It shall assist attendees to understand and manage properly any RO Plant with best practice and most cost effective method. This should result in maximizing membranes and components life, reducing operating cost and maintaining productivity and quality.

## Target Audience

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This course is designed for Utility Engineers, Consulting Engineers, Highly Qualified Operators, and Chemists those working in Reverse Osmosis Desalination Plants.

## Learning Objectives

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- Understand and Specify Water Quality.
- Different Membrane Configurations used for Membrane Filtration (MF & UF) and RO

Applications.

- Understand Osmosis & Reverse Osmosis
- Understand RO Principles of Operations.
- RO Plant Configuration System.
- Control Scaling, Fouling and Chemical attack by using appropriate Pretreatment Technologies
- Start Up, Shutdown & Daily Operation Instructions
- Reverse Osmosis Preventive Maintenance
- Reverse Osmosis Membranes Cleaning

## Course Outline

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### • 01 DAY ONE

#### Module (01) Water Sources

- 1.1 Open Intake Sea Water
- 1.2 High, Medium, Low Brackish Water
- 1.3 Surface Water
- 1.4 Municipal Water

#### Module (02) Water Basics

- 2.1 Water Make up
- 2.2 Interpreting Water Analysis
- 2.3 Water Biology
- 2.4 Suspended Solids, Turbidity and SDI
- 2.5 Special Situations, Iron, Manganese and Aluminum

### • 02 DAY TWO

#### Module (03) Membranes Configurations

- 3.1 Difference between Cross flow & Depth Flow
- 3.2 Microfiltration
- 3.3 Ultrafiltration
- 3.4 Reverse Osmosis

- 3.5 Membranes Pore Size
- 3.6 Membranes Materials & Structure
- 3.7 Reverse Osmosis Definitions
- 3.8 Factors Affecting RO performance

#### **Module (04) RO Plant Configuration**

- 4.1 Pretreatment System Components
- 4.2 ROMAS (Reverse Osmosis Membrane Assembly)
- 4.3 Post Treatment System
- 4.4 Orientation to R.O Plant" RO Equipment's"
- 4.5 Instrumentation
- 4.6 Corrosion Control
- 4.7 Flush/ Cleaning System
- 4.8 Feed Water Specs
- 4.9 Alarms and Protections

#### **• 03 DAY THREE**

#### **Module (05) RO Plant Operation**

- 5.1 Start Up
- 5.2 RO Shutdown
- 5.3 Daily Operation Instructions
- 5.4 Chemicals Preparation
- 5.5 Back Wash Process
- 5.6 Cartridge Filters Replacement
- 5.7 Membrane Flow & Probe Test
- 5.8 Membrane Replacement
- 5.9 SDI Test

#### **Module (06) RO Plant Technical Techniques**

- 6.1 Unit's conversion
- 6.2 Net Driving Pressure NDP
- 6.3 HPP & ERT Efficiency Calculations
- 6.4 Recovery Calculations
- 6.5 Membranes Performance
- 6.6 Pump Selection" dozing, feed, etc"
- 6.7 Proper Installation of Flow Meters

## • 04 DAY FOUR

### **Module (07) RO Plant Maintenance**

- 7.1 Preventive Maintenance
- 7.2 Condition Monitoring for Equipment
- 7.3 High pressure Pump & Motor
- 7.4 Membranes
- 7.5 Pressure Vessels
- 7.6 Feed/ Sea Water Intake / Flushing Pumps
- 7.7 Pump /Motors Replacement & Alignment
- 7.8 Equipment's Lubrication

### **Module (08) RO Plant Administrative**

- 8.1 Daily Log Report
- 8.2 Weekly Trending
- 8.3 Monthly Monitoring
- 8.4 Performance Trends
- 8.5 Housekeeping

## • 05 DAY FIVE

### **Module (09) Troubleshooting RO & NF Systems**

- 9.1 Importance of Record Keeping
- 9.2 General Rule of Troubleshooting
- 9.3 Signs of Trouble
- 9.4 Causes and Corrective Measures
- 9.5 Taking the Total System Approach

### **Module (10) Cleaning RO and NF Membrane Elements**

- 10.1 Introductory Remarks
- 10.2 Defining a Foulant and Scalant
- 10.3 pH and Temperature Limits
- 10.4 FT30 Resistance to Cleaning Agents
- 10.5 Cleaning System
- 10.6 Chemical Attack
- 10.7 Permeate Back Pressure
- 10.8 The Cleaning Process
- 10.9 Permeate Back Pressure

## Confirmed Sessions

FROM	TO	DURATION	FEES	LOCATION
June 16, 2025	June 20, 2025	5 days	4250.00 \$	UAE - Abu Dhabi
Sept. 8, 2025	Sept. 12, 2025	5 days	4950.00 \$	Turkey - Istanbul
Dec. 22, 2025	Dec. 26, 2025	5 days	4250.00 \$	UAE - Dubai