

## Professional Engineering Services

### Advanced RO Training Course

**Course Duration**

**3 Days**

**Who should attend?**

Plant & technical support managers, O & M supervisors, senior mechanical and electrical engineers , senior chemists, environmental and consulting engineers for reverse osmosis plants..

**Course Objectives**

After successful completion of the course delegates will have an excellent knowledge RO plant O & M, troubleshooting, design and components' selection, chemical cleaning and RO economics.

**Course outcome**

You will gain valuable know-how related to reverse osmosis plants on:

- ✓ Membrane types, application and configurations.
- ✓ Understand Osmosis & Reverse Osmosis principles.
- ✓ RO Plant Configuration and passes.
- ✓ How to operate smoothly RO plant
- ✓ Monitor RO plant performance and take necessary corrective action
- ✓ Control scaling, fouling and chemical attack by using appropriate pretreatment technologies.
- ✓ Reverse Osmosis membranes cleaning.
- ✓ Understand RO design.
- ✓ RO components selection
- ✓ RO economics
- ✓ RO Maintenance Management.
- ✓ RO performance parameters monitoring and control
- ✓ RO process normalization

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### **Course Contents**

#### **Part I: Membrane Modules Configuration:**

- Difference between Cross flow & Depth Flow.
- Microfiltration, Ultra-filtration , RO
- Membranes Materials & Structure.

#### **Part II: RO System Configuration and Design Parameters**

- Parameters Affecting Membrane Performance.
- Pretreatment System Components.
- ROMAS (Reverse Osmosis Membrane Assembly).
- Post Treatment System.
- Orientation to R.O Plant system
- Instrumentation.
- Flush/ Cleaning System.
- Feed Water Specs.
- Alarms and Protections.

#### **Part III: Reverse Osmosis System Operation and Maintenance**

- RO System Startup and Operation.
- Daily Operation Instructions.
- Chemicals doses calculation and preparation.
- Back Wash Process.
- Cartridge Filters Replacement.
- Membrane Flow & Probe Test.
- Membrane replacement.
- SDI Test.

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### **Part IV: RO Engineering Design Process**

- Computer Projections of RO System Performance.
- Acceptance Test and Monitoring System.
- Select the Flow Configuration and Number of Passes.
- Calculate the Number of Elements & Number of Stages.
- Performance Normalization
- Introduction to Piping System
  - Pipe types
  - Pipes schedule, pressure ratings, materials, etc

### **Part V: Corrosion Introduction**

- Corrosion definition
- Corrosion types and control
- Introduction to stainless steel material types and grades

### **Part VI: Technical**

- Units conversion.
- Net Driving Pressure NDP.
- HPP & ERT Efficiency calculations.
- Recovery calculations.
- Pumping Systems
  - Design of pumps and motors.
  - Pump construction
  - Types of pumps
  - Pump selection " dozing, feed, etc".
- Mechanical shaft seal
  - The mechanical shaft advantages.
  - Types of mechanical shaft seals.
- Electric Motors.
  - Some Basic Motor Concepts
  - Operating Principles.

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- Stator.
- Rotor.
- Proper installation of flow meters.

### **Part VII: Maintenance**

- Types of maintenance
  - PM
  - CM
- Maintenance & repair of :
  - High pressure pump & motor
  - ERT
  - MMFs & CF
  - Pressure vessels
  - Membranes
  - Feed/ sea water intake / flushing pumps
- ERT inspection, maintenance, repair
- Pump /motors
- Equipments Lubrication
- PVC repair & installation.

### **Part VIII: Administrative**

- How to maintain a proper & accurate daily log report?
- Housekeeping

### **Part IX: Safety**

- Hazards & Fire Fighting
- Safety of :
  - Pressure vessels
  - HPP
  - Electric motor
  - ERT

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### **Part X: Troubleshooting Spiral Wound RO & NF Systems**

- Importance of record keeping.
- General rule of troubleshooting.
- Signs of trouble.
- Causes and corrective measures.
- Taking the total system approach.

### **Part XI: Cleaning RO and NF Membrane Elements**

- When to Clean
- Defining a Foulant and Scalant
- pH and Temperature Limits
- FT30 Resistance to Cleaning Agents
- Cleaning Carbonate Scaling
- Cleaning Sulfate Scaling
- Cleaning Organic Fouling
- Cleaning Biological Fouling
- Cleaning Iron Fouling
- Cleaning Silt Fouling
- Cleaning Carbon Fouling
- Chemical Attack
- Permeate Back Pressure
- The Cleaning Process
- Safety
- Questions & Answers.

### **SUMMARY AND CLOSING**