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# Reverse Osmosis Plant Health Management: Fouling Diagnosis and Cleaning Planning Course

13 – 17 June 2027  
Manama





## Reverse Osmosis Plant Health Management: Fouling Diagnosis and Cleaning Planning Course

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### Programme Summary

Reverse osmosis plant health management is the subject of this one-week training course for plant, utilities and operations managers, ending in a plant health review and cleaning plan for one membrane system. Membrane plants lose output quietly, and decisions on cleaning or repair are often taken late or on weak data. The programme moves from performance principles through diagnosis to the design of control rules, and then to application on a real data set. Mars Training Centre UK delivers this programme on reverse osmosis plant health management for leaders from industrial and municipal organisations.

### The Business Case

Desalination and process water systems supply products, utilities and communities that cannot easily do without them. A membrane system that drifts unnoticed uses more energy and chemicals, shortens membrane life and risks unplanned outages. Managers who can read trends, separate causes and set clear cleaning and escalation rules protect supply and keep spending proportionate to the actual fault.

- Energy and Chemical Use: Falls as drift is caught early and cleaning is triggered by data rather than habit.
- Membrane Life: Extends as fouling and scaling are treated before damage becomes permanent.
- Supply Continuity: Improves as faults are diagnosed quickly and escalated with evidence.

### Principles and Evidence Base

- ASTM D4516 practice for standardising reverse osmosis performance data: It supplies the normalisation method applied to flow, salt passage and pressure in Sessions 1 and 5.
- ASTM D4189 silt density index: It frames the feed quality readings reviewed in Session 2.
- Membrane performance monitoring methods described in American Membrane Technology Association literature: They shape the trend reading and data discipline used throughout.

### Intended Participants

- Plant managers accountable for the output and cost of a membrane system.
- Utilities and operations leaders who approve cleaning, repair and replacement spending.
- Technical and reliability managers who review plant data and challenge diagnoses.
- Heads of water services who report plant condition to executives.

Typical participants come from desalination, power generation, petrochemical and municipal water operations.



## Learning Outcomes

1. Participants will be able to evaluate membrane performance by normalising flow, salt passage and pressure data.
2. Participants will be able to interpret feed quality and pretreatment signals that warn of fouling.
3. Participants will be able to diagnose fouling, scaling and membrane damage from stage-by-stage data.
4. Participants will be able to construct cleaning triggers and escalation rules for a membrane system.
5. Participants will be able to justify a decision to clean, repair or replace membranes.
6. Participants will be able to prioritise corrective actions in a plant health review.

## Programme Structure

### Day 1: Reverse Osmosis Performance Principles and Normalised Data

How is the health of a membrane system measured against its own baseline?

- Normalised Permeate Flow and Salt Passage
- ASTM D4516 Normalisation Practice
- Differential Pressure Trend Reading
- Baseline Commissioning Data Record
- Plant Health Indicator Dashboard

### Day 2: Feed Quality, Pretreatment and Early Warning Signals

Which feed and pretreatment signals warn of fouling before output falls?

- Silt Density Index Reading to ASTM D4189
- Feed Water Analysis Review Sheet
- Antiscalant Dosing Control Check
- Biofouling Early Indicator Log
- Cartridge Filter and Pretreatment Walk-Through

### Day 3: Diagnosing Fouling, Scaling and Membrane Damage

How does a manager tell fouling, scaling and membrane damage apart from the data?

- Stage-by-Stage Pressure Drop Pattern Map
- Fouling Type Decision Tree
- Scaling Risk Calculation Review
- Permeate Probing and Vessel Profiling Plan
- Instrument Error and Calibration Check



## Day 4: Designing Cleaning Triggers and Escalation Rules

When should a membrane system be cleaned, repaired or reported upward?

- Cleaning-in-Place Trigger Rule Set
- Cleaning Chemical and Sequence Selection Matrix
- Cleaning Result Verification Sheet
- Membrane Replacement Timing Case
- Escalation and Reporting Protocol

## Day 5: Applying the Plant Health Review to One Membrane System

Is the review and cleaning plan ready to hand to the plant team?

- Applying Session 1 Normalisation to the Chosen Plant Data
- Testing Session 2 Warning Signals Against Past Events
- Using the Session 3 Decision Tree on One Fault
- Applying the Session 4 Trigger Rules to the System
- Completing the Plant Health Review and Cleaning Plan

## Methodology

The programme uses a data workshop method built on anonymised plant records from desalination and industrial water systems. Participants normalise data, read trends and test diagnoses in small groups, then defend their conclusions to peers who play the roles of plant owner and technical reviewer. Facilitator feedback is given on every work product before it enters the final review.

- Suggested activity: Normalising two years of anonymised pressure and flow records and marking the point where drift began.
- Suggested activity: Sorting a set of fault symptoms into fouling, scaling or damage using the decision tree.
- Suggested activity: Writing a cleaning trigger rule and testing it against a historical event.

## Capstone Output

Each participant completes a plant health review and cleaning plan for one membrane system. It holds a normalised performance trend, a feed quality and pretreatment assessment, a diagnosis with its supporting data, a cleaning trigger rule set and an escalation protocol. The plan is used at work to brief the plant team, justify cleaning or repair spending and track results after intervention.



## Frequently Asked Questions

### **Is reverse osmosis plant health management suitable for managers who are not membrane specialists?**

Yes. Reverse osmosis plant health management is taught from first principles and assumes responsibility for a plant or its budget, not a chemistry or process engineering degree.

### **Which standards does reverse osmosis plant health management rest on in this programme?**

Reverse osmosis plant health management here rests on ASTM D4516 for standardising performance data and ASTM D4189 for the silt density index, with American Membrane Technology Association monitoring literature.

### **How is the plant health review from reverse osmosis plant health management used at work?**

You use the plant health review to brief the plant team, justify cleaning or repair spending and set the triggers that start the next cleaning.

### **How does reverse osmosis plant health management differ from a programme on water treatment operation?**

Reverse osmosis plant health management centres on reading performance data and deciding on cleaning and repair, while water treatment operation centres on running the equipment shift by shift.