

EXPERT TROUBLESHOOTING OF SEAWATER RO SYSTEMS



CONTENT

Page 1

[Who Should Attend](#)

[Why You Should Attend](#)

[What You'll Receive](#)

[Instructors](#)

Page 2

[Overview of Topics](#)

[What You'll Learn](#)

[Certificate of Completion](#)

[What Others Say About DHP Training Seminars](#)

Page 3

[Detailed Agendum](#)

REGISTER AT

www.dhpseminars.com



Courtesy Photos: Perth Desalination Plant, RAWEC, Tampa Bay Water, Siemens

Who Should Attend

This course is a must for anyone wanting to learn the proven, effective troubleshooting techniques used by DHP when consulting at seawater reverse osmosis facilities. You receive dozens of expert tips and techniques. This seminar will catapult your troubleshooting abilities to a new level.

Why You Should Attend

Nearly every SWRO system experiences performance problems sometime during its operating life. If you've never seen a particular problem before, however, you may not respond quickly enough to solve the problem at an early, reversible stage. DHP has provided troubleshooting services to over a hundred clients. DHP has seen many, many different problems. Participating in this seminar provides you with the experience and knowledge of consultants that have been troubleshooting RO system problems for many years. You'll learn DHP's proven, effective practical tips and techniques for uncovering even the most complex and multi-faceted problems.

What You'll Receive

- 8 hours of interesting, easy-to-understand expert troubleshooting training
- 8 hours of the latest in multimedia training including 3-D animations
- A highly illustrated workbook
- Break refreshments

Instructors



David Paul is the author of over 150 published articles on membrane water treatment, has developed and administers a 4,000 page correspondence training program on advanced water treatment, and has created and administers on-campus Associate Degree in Advanced Water Treatment programs at four different locations in the United States. David is the President of David H. Paul, Inc. (DHP), an advanced water treatment training and consulting firm located in the USA. DHP has trained over 16,000 water treatment professionals worldwide since 1988.



Bill Dees provides water treatment training and consulting services for David H. Paul, Inc. (DHP). He has over 18 years of design, installation, operation, maintenance, troubleshooting, training and consulting experience of water treatment systems including membrane, ion exchange, pretreatment and post-treatment equipment. Bill is also the Technical Services Manager for DHP, responsible for membrane module autopsies and consulting. Bill holds an Associate of Applied Science Degree in Industrial Water Treatment from San Juan College, DHP's first on-campus, college degree program.

EXPERT TROUBLESHOOTING OF SEAWATER RO SYSTEMS

Overview of Topics

- Process Flow Diagrams: Pretreatment & RO Unit
- Troubleshooting Tools
- Problems
- Troubleshooting High Permeate Conductivity
- Troubleshooting High Feed Pressure
- Troubleshooting High Pressure Drop(s)
- Troubleshooting the Requirement for Too Frequent Cleaning
- Troubleshooting the Decreasing Effectiveness of Chemical Cleanings

What You'll Learn

- How to use over 20 troubleshooting tools
- Expert troubleshooting of:
 - 9 problems causing high permeate conductivity
 - 9 problems causing high feed pressure
 - 4 problems causing high pressure drop(s)
- Expert troubleshooting of (Cont'd):
 - 5 problems causing the requirement for too frequent cleaning
 - 8 problems causing decreasing effectiveness of chemical cleanings
 - 3 problems causing high element replacement rate

Certificate of Completion

Each attendee will receive a DHP certificate of completion following the course.

What Others Say About DHP Training Seminars

DHP has trained over 16,000 water treatment professionals worldwide since 1988. Trainees include industrial, governmental and drinking water clients. The average rating given by attendees for all DHP seminars, including this one, is over 9 (on a scale of 1-10, with 1 being a terrible rating and 10 being an outstanding rating).

The following are typical comments from attendees of DHP Seminars:

**“Your lectures help a lot in the operation of the RO system.
We can apply all the knowledge we learned from you!”**

Luisito Agua - Plant Shift Leader
RAWEC - Saudi Arabia

“The workshop’s are excellent, they actually make you think. You also cover things very thoroughly.”

Cory Wirth - Technical Service
Osmoflo - Australia

“After 15 years in the industry, this class filled many holes gained from being self taught.”

Scott Risser - Senior Chemical Engineer
Tucson Electric Power - Springerville, AZ

“Excellent Training!”

Daniel Barge - Municipal Water Treatment
Brazos River Authority - Granbury, TX

“Great Class!”

Martin Rocks - Maintenance Technician
Tropicana Products

EXPERT TROUBLESHOOTING OF SEAWATER RO SYSTEMS

7:45 Refreshments (Provided)

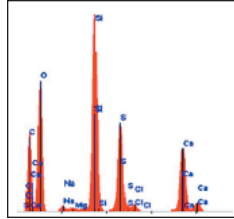
8:00 Introductions

Process Flows: Pretreatment & RO Unit

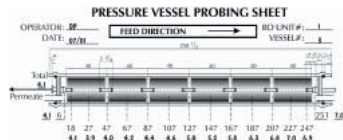
Workshop 1: Pretreatment & RO Unit

Troubleshooting Tools

- Specific ion analysis
- Concentration factor determination
- Mass balance calculations
- Water flux calculations
- Salt flux calculations
- Crossflow evaluation
- Operating data
- Performance trends
- Design software
- Element autopsy
- Electron Dispersive X-Ray (EDX)
- Fourier Transform Infrared (FTIR)
- Scanning Electron Microscopy (SEM)
- Silt Density Index (SDI)
- Chemical Cleaning
- pH, conductivity, oxidation-reduction potential (ORP), temperature, sulfite, chlorine
- Profiling data
- Probing data
- Water analyses
- More



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Problems

- High permeate conductivity
- High feed pressure
- High pressure drop(s)
- Requirement for too frequent cleaning
- Decreasing effectiveness of chemical cleanings
- High element replacement rate



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Troubleshooting High Permeate Conductivity

- Single-stage unit
 - O-ring leak(s)
 - Chemical attack

9:00 Break (Refreshments Provided)

9:15 Troubleshooting High Permeate Conductivity

- Single-stage unit
 - Mechanical damage
 - Brine seal problem
 - Membrane damage
 1. Abrasion
 2. Pressure
 3. Pressure drop
 4. Chemical attack
 - Manufacturing defects

10:15 Break (Refreshments Provided)

10:30 Troubleshooting High Permeate Conductivity

- Two-stage unit
 - Scaling (in addition to First Stage list)

Workshop 2: Troubleshooting High Permeate Conductivity

11:30 Lunch (Not Provided)

12:30 Troubleshooting High Feed Pressure

- Fouling
 - Organic
 - Bacteria
 - Non-living particles



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- Scaling
- Other

Troubleshooting High Pressure Drop(s)

- Fouling
- Scaling
- Other

1:45 Break (Refreshments Provided)

2:00 Troubleshooting the Requirement for Too Frequent Cleaning

- Fouling, scaling, chemical bonding, other
- Chemical cleaning

Troubleshooting the Decreasing Effectiveness of Chemical Cleanings

- Cleaning chemicals
- Cleaning procedures

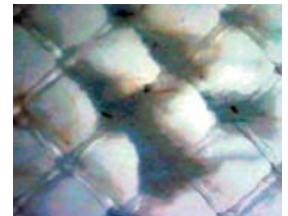
Workshop 3: Expert Troubleshooting of RO Problems

3:15 Break (Refreshments Provided)

3:30 Workshop 4: Troubleshooting Attendees' RO Problems

**4:45 Summary & Conclusions
Final Questions & Answers
Seminar Evaluation**

5:00 End



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