

REVERSE OSMOSIS MECHANICAL TROUBLESHOOTING HANDS ON



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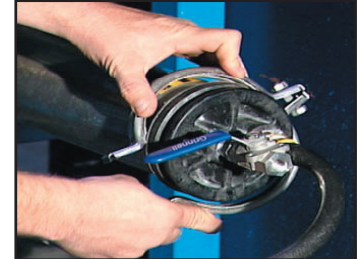
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Photos: David H. Paul, Inc.

Who Should Attend

Operators and technicians currently working with RO/NF systems need to be able to effectively address and correct system performance problems. Mechanical troubleshooting is a necessary skill that will save your facility time and money. Management, engineering personnel and anyone else who wants to understand advanced hands-on troubleshooting will also find this seminar tremendously valuable.

Why You Should Attend

Learn the most effective ways to keep your RO/NF units running at peak performance. Learn how to recognize and isolate a multitude of problems immediately and effectively. Why be dependant on an outside company or a few individuals when problems arise?

Overview of Topics

- Determining replacement parts and fittings
- Element loading and unloading
- Element Inspection and placement
- Probing and profiling techniques
- Shimming pressure vessel internals
- Diagnosis and repair
- GFD/Flux per pressure vessel determination
- RO/NF unit lay-up procedures

What You'll Learn

- How to determine the correct replacement parts and fittings for your units
- Tips and techniques for loading and unloading elements
- How much you can learn from a visual inspection and the importance of element placement
- How to isolate problems to a stage then to a specific pressure vessel.
- How to determine exactly where and what the problem is within the pressure vessel without disassembly.
- How to get the most life out of your o-rings and fittings
- How to diagnose and repair common RO problems
- How to determine the actual flux rates for each pressure vessel and stage of an RO unit
- How to properly leave a membrane unit out of operation with minimal effects on performance

What You'll Receive

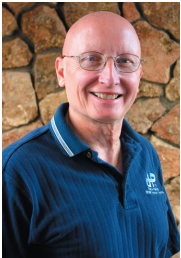
- 8 hours of interesting, easy-to-understand hands-on RO/NF training
- A comprehensive workbook packed with procedures, datasheets and techniques
- Personal attention! DHP hands-on seminars are limited to a maximum of 6 attendees
- Break refreshments and lunch



Photo: David H. Paul, Inc.

REVERSE OSMOSIS MECHANICAL TROUBLESHOOTING HANDS ON

Instructors



David Paul has provided consulting services at several SWRO plants around the world including at the Tampa Bay Desal Plant in the United States. He 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 administered 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.



Travis Caveney is an Advanced Water Treatment classroom and lab instructor for David H. Paul Inc. He is a graduate of DHP Inc.'s Water Technologies Training Institute where he became certified as a Reverse Osmosis Water Treatment Specialist, High Purity

Water Treatment Specialist and Water Treatment Plant Operator I, II. Travis' industrial water treatment experience and knowledge includes: maintenance, operation, and troubleshooting of pretreatment, filtration, membranes, ion exchange and post-treatment systems and equipment.

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:

"I enjoyed the class very much and would highly recommend it to anyone in the industry."

Janet Drozda, Operator, Intel

"Outstanding course. Best training program that I have attended in the water treatment industry!"

George James, Reaction Engineering, Inc.

"Excellent... got what I was interested in and more, especially in the inner workings of UF."

Eric Lozano - Austin Energy

"Instructor was very knowledgeable and thorough. Course will have large impact on our cleaning procedure."

John Paul Robb, Plant Engineer, Trigen Colorado Energy

"Excellent Course! The hands on portion served very well in firming up the concepts and increasing retention. Level of instruction was good balance of theory and practical...well presented."

Finley Jones, Sr. Account Manager, Nalco

"Probably the best hands-on course I've had in my 10 years as a technician."

Andy Gutierrez, Technician, Amgen

"I thought I knew a good amount about RO systems. After taking this course I realized how little I actually did know."

Chris Corsetti, Facilities Engineering Supervisor, Genzyme Corp.

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Detailed Agendum

7:45 Refreshments (Provided)

8:00 Introductions

- Safety in the hands-on areas
- RO mechanical troubleshooting pre-test

Preparing the units for operation (4" and 8")

- 4" and 8" RO unit walk down
- Fill and ready feed tanks

9:00 Break (Refreshments Provided)

9:15 Preparing the units for operation (Continued)

- Hand-held conductivity meter calibration
- Pretreatment skid start-up
- Chlorine removal and verification



9:50 Determining replacement parts and fittings

10:15 Break (Refreshments Provided)

10:30 Start up 4" and 8" RO units

- Readings and data collection
- Shutdown

11:05 Element unloading on 4" and 8" RO units

- Visual, external inspection
- Element placement and management
- Determining proper probing reference points
- Reload elements



12:00 Lunch

1:00 Probing and profiling on 4" and 8" RO units

- Pressure vessel purging
- Probing rod preparations
- Profile
- Probing

2:00 Break (Refreshments Provided)

2:15 Determining excess play within a pressure vessel

- Shim thickness determination
- Shim installation

2:35 Bucket test

- Perform a bucket test on an RO unit

3:15 Break (Refreshments Provided)

3:30 Troubleshooting

- Troubleshoot both RO units with various problems

4:10 RO unit lay-up procedures

- Perform a system lay-up on an RO unit

4:30 Discussion, questions and answers

- RO Unit mechanical troubleshooting post-test

5:00 End

