

# Reverse Osmosis Monitoring & Troubleshooting



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Courtesy: Orange County



Tampa Bay Water

## WHERE & WHEN

For a list of where and when this seminar is being presented, click [here](#).  
This seminar can also be presented at your facility.

## DAILY SCHEDULE

8:00 a.m. - 11:30 a.m.

Lunch Break

12:30 p.m. - 5:00 p.m.

## WHO SHOULD ATTEND

Anyone desiring to know the latest, **UNBIASED** information on reverse osmosis (RO) and nanofiltration (NF) water treatment monitoring and troubleshooting.  
DHP is a training company, NOT an equipment vendor.

## WHY YOU SHOULD ATTEND

What you don't know CAN hurt the efficient, least-cost operation of your RO/NF water treatment system. This seminar teaches you the monitoring and troubleshooting activities you must perform to catch problems at an early stage when hopefully they're relatively easily reversible. Thorough understanding of required monitoring activities and thorough understanding of performance trends and interpretation of data are stressed.



Courtesy: City of Chandler

This course provides the technical information that's typically missing from startup training and O & M manuals. All information is applicable to NF units as well.

## WHAT YOU'LL RECEIVE

- 8 hours of interesting, easy-to-understand reverse osmosis water treatment training
- 8 hours of the latest in multimedia training including 3-D animations
- A highly illustrated workbook
- Break refreshments (lunch not included)

## INSTRUCTORS



**Bill Dees** is an Instructor with David H. Paul, Inc. (DHP). Prior to becoming a DHP Instructor, Bill had over 10 years of design, installation, operation, maintenance and troubleshooting experience of water treatment systems including membrane, ion exchange, pretreatment and post-treatment equipment. Bill has 8 years of training experience as a DHP Seminar Instructor and as a Lead Instructor at one of DHP's on-campus, college-based Advanced Water Treatment Programs. Bill holds an Associate of Applied Science Degree in Industrial Water Treatment from San Juan College, DHP's first on-campus program.



**David Paul** was an operator for 2.5 years, first-level supervisor for 1 year and manager for 8 years of one of the most advanced water treatment systems in the world. He then began David H. Paul, Inc. (DHP) and has trained and consulted since 1988. David is the author of over 130 published articles on advanced 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 three different colleges in the United States. David is the President of DHP, an advanced water treatment training and consulting firm located in Farmington, New Mexico, USA. DHP has trained over 13,000 water treatment professionals worldwide since 1988.

## OVERVIEW OF TOPICS

- On-stream instruments needed for proper monitoring
- Hand-held/bench instruments needed for proper monitoring
- Daily Monitoring
- Weekly Monitoring & Trending
- How to Use Free Monitoring Software for weekly trending
- Monthly Monitoring
- Performance Changes With Scaling, Fouling & Chemical attack
- Pretreatment Monitoring
- Chemical Cleaning Monitoring



Courtesy: City of Scottsdale

## WHAT YOU'LL LEARN

- Advanced understanding of RO/NF problems
- Advanced monitoring skills
- Advanced troubleshooting skills
- Advanced trend interpretation
- Advanced actions required to correct problems
- Advanced proficiency with the RO/NF technology



Courtesy: City of Robinson, TX



Siemens



US Army

# DETAILED AGENDA

7:45 Refreshments (Provided)

8:00 Introductions

On-stream instruments needed for proper monitoring

- Single stage RO units
- Multi-stage RO units
- Double pass RO units
- Conductivity
- pH
- Pressure
- Flow
- Temperature
- ORP (for some)
- SDI (for some)



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Hand-held/bench instruments needed for proper monitoring

- pH
- Conductivity
- Chlorine
- Sulfite
- SDI
- Silica (for some)
- ORP (for some)



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Daily Monitoring

- Pressures
- Flows
- Conductivities
- pH
- Temperature
- Silt Density Index (SDI)

9:00 Break (Refreshments Provided)

9:15 Daily Monitoring

- Free & Total Chlorine
- Sulfite
- Pressure drops
- Recovery rate

Weekly Trending

- Normalized Permeate Flow (NPF)
- Normalized Salt Passage (NSP)
- Normalized Pressure Drop (Normalized Differential Pressure)
- Changes seen with scaling, fouling & chemical attack



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10:15 Break (Refreshments Provided)

10:30 How to Use Free Monitoring Software for weekly trending

- Startup data
- Daily data
- Performance trends

Workshop 1: Monitoring & Performance Trends

11:30 Lunch (Not Provided)

12:30 Monthly Monitoring

- Profiling
  - Performance changes with scaling, fouling & chemical attack

Startup & Intermittent Monitoring

- Probing
  - Problems causing probing changes

Workshop 2: Evaluating Profiling & Probing Data

1:45 Break (Refreshments Provided)

2:00 Performance Changes With Scaling, Fouling & Chemical attack

- NPF
- NSP
- NPD
- Gauge changes
- Profiling
- Probing

3:15 Break (Refreshments Provided)

3:30 Pretreatment Monitoring

- Free & total chlorine
- SDI
- pH
- Total Hardness (softener)
- Scale inhibitor injection

Chemical Cleaning Monitoring

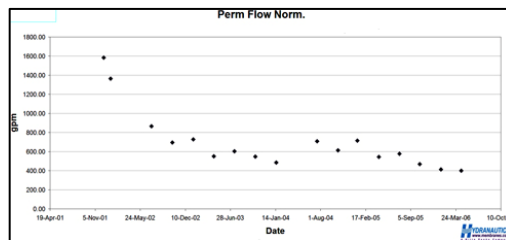
Workshop 3: Evaluating Performance Data

4:45 Summary & Conclusions

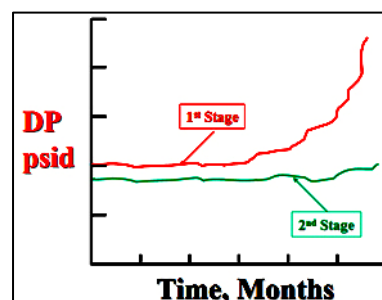
Final Questions & Answers

Seminar Evaluation

5:00 End



Source: Hydranautics RO Data Program



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## CERTIFICATE OF COMPLETION

Each attendee will receive a DHP *Certificate of Completion* following the seminar.

### WHAT ATTENDEES SAY ABOUT DHP TRAINING SEMINARS

DHP has trained over 13,000 water treatment professionals worldwide since 1988. Trainees include industrial, governmental and drinking water clients. The average rating given by attendees for all DHP seminars 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:

“Learned so much my brain hurt.”

Harold (Budji) McDill, System Operator, Monterey Bay Aquarium

“Excellent course material/presentation-lays a solid foundation to build upon. Very high emphasis on students understanding the volume of information given.”

Robert Markle, Boiler Area Leader, Proctor& Gamble

“Course should be required prior to installing & operating RO systems.”

Kim Price, Sr. Plant Engineer, Lucent Technologies

“Excellent info and presentation.”

W.R. Schulz, Manager of Product Development, Isco Industries

“Very good course, even if you have some background in RO.”

Kevin Simmons, Mechanical Project Engineer, US Filter (Siemens)

“Excellent! Very helpful.”

Stan Brooks, President, MoBetta Water Inc.

“Great! Workshops really helped on my troubleshooting skills.”

Gerald Lands, Operator, Duke Energy

“Great seminar! Came in knowing very little about reverse osmosis, left with a good understanding of RO and RO units.”

Chris Greer, Technical Sales Rep., Ashland Specialty Chemical

“This class was extremely enlightening even for someone with RO experience.”

Lionel Fontes, Chemist, SRP

“Great course- I would recommend this course to everyone in this field of work.”

Mike Wilkey, UPW/IWS Tech., Intel-Colorado Springs

“The flow and concentration of information was excellent.”

Joe Turner, Plant Utility Operator, Amgen-Longmont

“Very informative, very in depth, and very helpful.”

Martin Wix, Instrument Tech., BOC Gases