

# Advanced Water Treatment

## Drinking Water to Ultra-pure Water



Bureau of Reclamation

City of Chandler

Ionpure

Sumitomo

### 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 needing to know the latest, **UNBIASED** information on advanced water treatment technologies and treatment schemes.  
(DHP is a training company, **NOT** an equipment vendor)

### WHY YOU SHOULD ATTEND

Most water treatment professionals have received little, if any, high school and/or college training in advanced water treatment...and water treatment is getting more high tech every year. From under-the-kitchen sink reverse osmosis and pretreatment systems to the largest industrial and drinking water systems in the world, the more you know about advanced water treatment, the more value you are to your family, your employer and your customers.

By the end of this course you'll know what every piece of equipment in a high purity water treatment plant does and doesn't do. You'll know which contaminants are removed by which piece of equipment. You'll thoroughly understand your water treatment system(s) and every other attendee's water treatment system(s).

Technologies covered include: city water treatment (which also can affect an industrial system), multimedia filtration, softening, activated carbon, acid injection, scale inhibitor injection, sulfite injection, cartridge filtration, ultraviolet irradiation, reverse osmosis, single-bed and mixed bed ion exchange, EDI, degasification, final filtration and ozonation.

### WHAT YOU'LL RECEIVE

16 hours of interesting, easy-to-understand high purity water treatment training  
16 hours of the latest in multimedia training including 3-D animations  
A highly illustrated workbook  
Break refreshments

# INSTRUCTOR

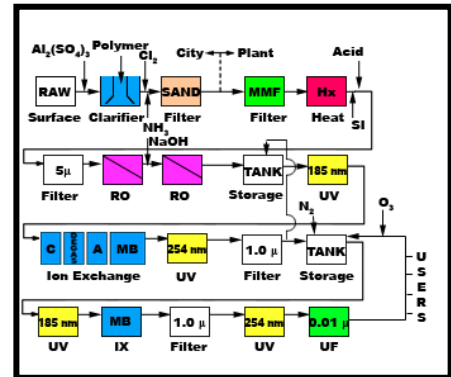


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Barring unforeseen circumstances, David Paul will instruct this training program. David was an operator for 2.5 years, first-level supervisor for 1 year and manager for 8 years of one of the most advanced water treatment systems in the world. He then 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

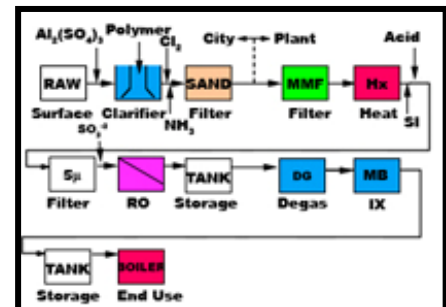
- Drinking water treatment
- Industrial water treatment
- Water Contaminants Overview
- Conventional Pretreatment (Brackish Water & Seawater)
- Advanced Pretreatment
- Reverse Osmosis
- High Purity Water
- Ultra-Pure Water
- Water Treatment Examples
- Attendees' Process Flows



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## WHAT YOU'LL LEARN

- How city water treatment can affect an industrial system
- How each water treatment technology works
- You'll have a thorough understanding of the mechanisms of treatment and the limitations of most common treatment steps
- You'll be able to look at any Process Flow Diagram (PFD) of any plant and understand the purpose of each piece of equipment and what it can and can't do
- You'll understand when to "raise the alarm" when certain performance issues arise



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# DETAILED AGENDA

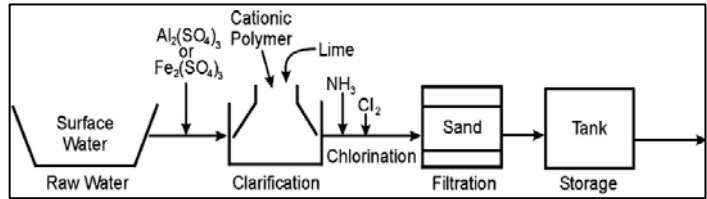
## DAY 1

7:45 Refreshments (Provided)

8:00 Introductions

### Water Treatment Examples

- Drinking water treatment
  - Point of Use (POU)
  - Conventional
  - Membrane
    - Microfiltration (MF)
    - Ultrafiltration (UF)
    - Nanofiltration (NF)
    - Reverse Osmosis (RO)
      - Brackish water
      - Seawater
- Industrial water treatment
  - Pharmaceutical/Biotech
  - Beverage
  - Power Generation
  - Semiconductor



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### Workshop 1: Attendees' water treatment system process flows

9:00 Break (Refreshments Provided)

9:15 Conventional Pretreatment (Brackish Water & Seawater)

- Alum injection
- Ferric injection
- Polymer injection
- Lime injection
- Clarification

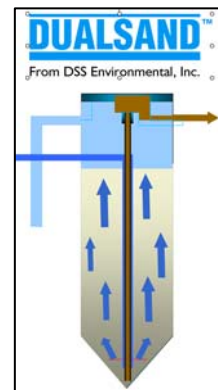
10:15 Break (Refreshments Provided)

10:30 Conventional Pretreatment (Brackish Water & Seawater)

- Filtration
  - Sand
  - Dual
  - Upflow
  - Filter aid injection
- Chlorine injection
- Ammonia injection

### Workshop 2: Conventional Pretreatment

11:30 Lunch (Not Provided)



Courtesy: Dual Sand

12:30 Advanced Pretreatment

- RO fouling control
  - Multimedia filtration
  - Cartridge filtration
  - JelClear™
  - MF
  - UF
  - Other

1:45 Break (Refreshment Provided)

2:00 Advanced Pretreatment

- RO pressure control (heat exchange)
  - Pressure effects
  - Chemical effects
  - Biological effects
- RO scaling control
  - Scale inhibitor injection
  - Acid injection
  - Softening
- RO chemical attack control
  - Sulfite injection
  - Activated carbon
  - Ultraviolet (UV) irradiation



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3:15 Break (Refreshments Provided)

3:30 Reverse Osmosis

- RO permeate quality versus:
  - pH
  - Softener pretreatment with & without caustic injection
  - Single pass RO
  - Double pass RO with & without caustic injection



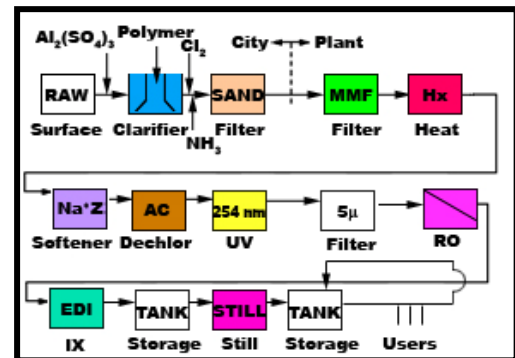
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Workshop 3: Advanced Pretreatment & RO

4:45 Summary & Conclusions

Final Questions & Answers

5:00 End



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## DAY 2

7:45 Refreshments (Provided)

8:00 Workshop 4: Day 1 Review

High Purity Water

- Mixed-bed (MB) ion exchange
  - Strong Acid Cation (SAC) Resin
  - Strong Base Anion (SBA) Resin
  - MB effluent quality versus:
    - RO performance
    - RO pretreatment performance

9:00 Break (Refreshments Provided)

9:15 High Purity Water

- Electrodeionization (EDI)
  - Cation exchange membranes
  - Anion exchange membranes
  - EDI effluent quality versus:
    - RO performance
    - RO pretreatment performance
- Degasification
  - Forced draft
  - Vacuum
  - Membrane

10:15 Break (Refreshments Provided)

10:30 Ultra-Pure Water

- Ultraviolet (UV) irradiation
  - TOC destruct
    - Ozone enhanced
  - Bacterial inactivation
  - Ozone destruct
- Nitrogen blankets
- Polishing MB
  - Boron breakthrough

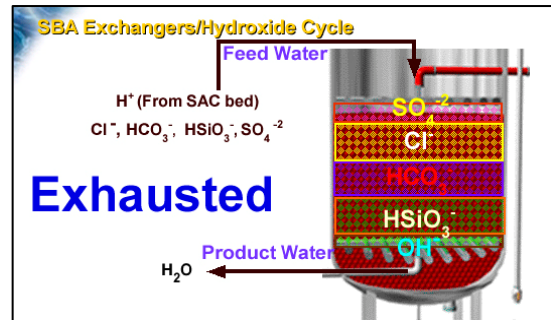
11:30 Lunch (Not Provided)

12:30 Ultra-Pure Water

- Final filtration
  - Non-membrane
  - Membrane
- Maintaining Purity
  - Loop
  - Ozone
  - Membrane degas

Workshop 5: Ultra-Pure Water

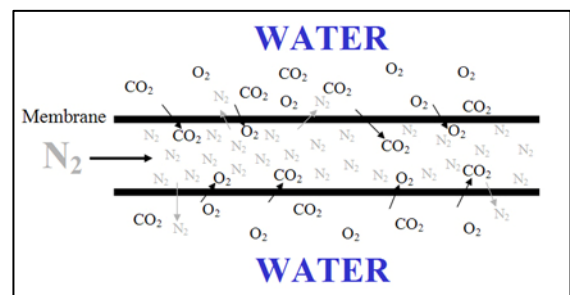
1:45 Break (Refreshments Provided)



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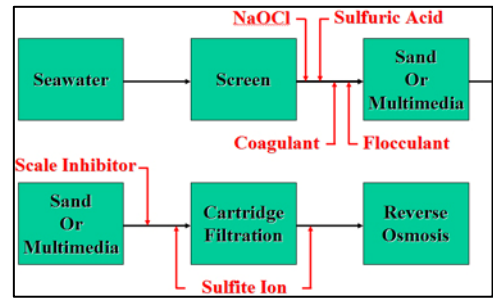
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2:00 Water Treatment Examples

- Drinking water treatment
  - Point of Use (POU)
  - Conventional
  - Membrane
    - Microfiltration (MF)
    - Ultrafiltration (UF)
    - Nanofiltration (NF)
    - Reverse Osmosis (RO)
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3:15 Break (Refreshments Provided)

3:30 Workshop 6: Attendees' Process Flows

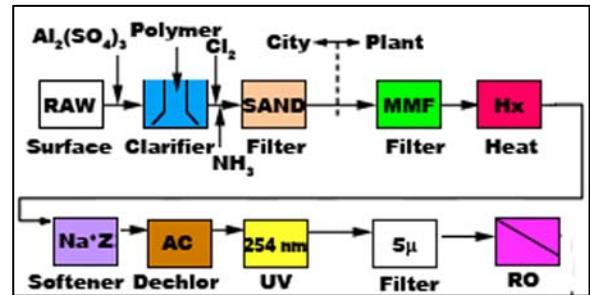
Workshop 7: Advanced Water Treatment

4:45 Summary & Conclusions

Final Questions & Answers

Seminar Evaluation

5:00 End



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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