

# HIGH PURITY WATER TREATMENT



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Courtesy: Bureau of Reclamation



City of Chandler



Ionpure



Sumitomo

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

## Who Should Attend

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

## 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

## 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

# HIGH PURITY WATER TREATMENT

## What You'll Receive

- 3 8-hour days with interesting, step-by-step, easy-to-understand, practical RO Training
- A highly illustrated workbook
- Break refreshments and lunch

## 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 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.

## 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:

**“Great Course! Well worth the time.”**

Bob Castle - Water Quality Manager, Marin Municipal Water District

**“Excellent training materials and presentation.”**

Gary Trent - Abbott Laboratories

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

Eric Lozano - Austin Energy

**“Well presented and well worth the investment.”**

John Countz - Operations Manager, Consolidated Water Co.

**“Excellent! More than I expected.”**

Mark Hall - Texas Water Development Board

**“It was great!”**

Trent Hughes - Civil Engineer, Black & Veatch

**“Great Course.”**

Joe Gonzales - Xcel Energy

**“Most Excellent!”**

Mike Milner - Alternative H2O Solution

# HIGH PURITY WATER TREATMENT

## Detailed Agendum

### Day One

**7:45 Refreshments**

**8:00 Introductions**

Membrane Water Treatment  
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

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

**9:00 Break**

**9:15 Water Contaminants Overview**

- Ions
- Gases
- Organics (including colloidal)
- Silica (including colloidal)
- Inorganic particles (including colloidal)
- Living particles

**Conventional Pretreatment (Brackish Water & Seawater)**

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

**10:15 Break**

**10:30 Conventional Pretreatment (Brackish Water & Seawater)**

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

**Workshop 2: Conventional Pretreatment**

**11:30 Lunch Break**

**12:30 Advanced Pretreatment**

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

**1:45 Break**

**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

**3:15 Break**

**3:30 Reverse Osmosis**

- Reverse Osmosis
  - pH
  - Softener pretreatment with & without caustic injection
  - Single pass RO
  - Double pass RO with & without caustic injection

**Workshop 3: Advanced Pretreatment & RO**

**4:20 Summary & Conclusions**

- Final Questions & Answers

**5:00 End Day One**

# HIGH PURITY WATER TREATMENT

## Day Two

### 7:45 Refreshments

### 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

### 9:15 Good Design Means Low Fouling

- 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

### 10:30 Ultra-Pure Water

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

### 11:30 Lunch

### 12:30 Ultra-Pure Water

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

### Workshop 5: Ultra-Pure Water

### 1:45 Break

### 2:00 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

### 3:15 Break

### 3:30 Workshop 6: Attendees' Process Flows Workshop 7: Advanced Water Treatment

### 4:30 Summary & Conclusions

- Final Questions & Answers
- Seminar Evaluation

### 5:00 End Day Two