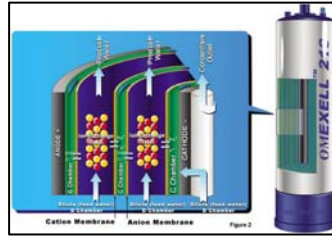


Electrodeionization Water Treatment (EWT)



Courtesy: Electropure™

GE

Omexell

Siemens

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 electrodeionization (EDI) water treatment! (DHP is a training company, **NOT** an equipment vendor)

WHY YOU SHOULD ATTEND

You'll want to know the latest details of EDI if you:

- Have a high purity water treatment system with reverse osmosis and mixed-bed ion exchange units in your treatment scheme
- Are investigating a system upgrade or a new high purity water treatment system
- You currently operate EDI units

EDI is an electrically regenerated ion exchange technology. No regeneration chemicals are required. In some cases this eliminates the need to store/handle hazardous regeneration chemicals. There is a great reduction, or even elimination, of regeneration wastes requiring neutralization and disposal. There are a lot of intricacies to operating EDI units that you don't get from salespeople, installers and even an O & M Manual.

WHAT YOU'LL RECEIVE

16 hrs of enjoyable, interesting, easy-to-understand EDI water treatment training

16 hrs of the latest in multimedia training including 3-D animations

A highly illustrated workbook

Break refreshments

INSTRUCTOR

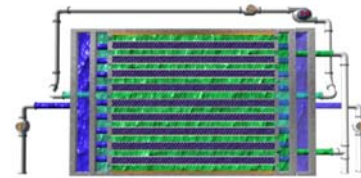


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Barring unforeseen circumstances, David Paul will instruct this training program. David was an operator for 2.5 years, first-level supervisor for 1 year and manager for 8 years of one of the most advanced water treatment systems in the world. He then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

- Contaminant Removal
- Ion Exchange
- Pretreatment Requirements
- EDI System Designs
- Problems to avoid
- Monitoring Requirements
- Maintenance Requirements
- Troubleshooting



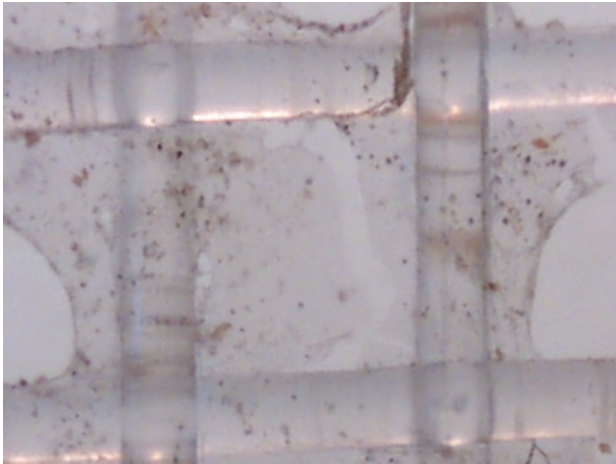
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WHAT YOU'LL LEARN

- All of the fundamental knowledge needed to thoroughly understand the EDI technology, including:
 - Contaminant characteristics
 - Principles of ion exchange
 - EDI pretreatment requirements
 - Different types of EDI units
- All the details needed to understand your proposed or actual EDI unit(s), including:
 - Thin cell or thick cell,
 - Plate & frame or spiral wound,
 - Homogeneous or heterogeneous membrane,
 - Brine injection/brine recirculation or not
- How to operate an EDI unit most effectively, including:
 - Pretreatment, Pretreatment, Pretreatment!
 - Current efficiency
 - Monitoring requirements
 - Troubleshooting

- How to maintain and chemically clean EDI units most effectively
- What must be monitored and maintained on essential pretreatment equipment, including:
 - Reverse osmosis units
 - Control of organic compounds
 - Control of scaling ions
- The details of operating EDI units

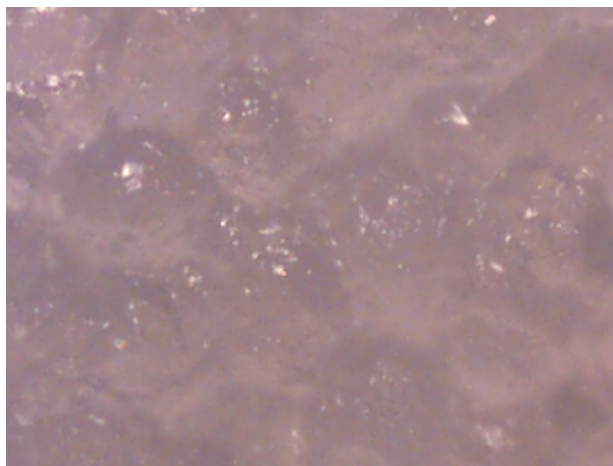
Biofouling of Concentrate Spacer



Scaling of Concentrate Compartments



Oxidation of Resin Beads



Photos Courtesy of Ionpure

DETAILED AGENDA

DAY 1

7:45 Refreshments (Provided)

8:00 Introductions

Workshop 1: Process Flow Diagrams

Ionic Contaminants

- Cations
- Anions
- pH

9:00 Break (Refreshments Provided)

9:15 Ionic Contaminants (continued)

- Hardness, alkalinity, conductivity
- Charged & uncharged organics
- Charged & uncharged silica
- CO₂ & scaling

10:15 Break (Refreshments Provided)

10:30 Fundamentals of Ion Exchange

- Electrical neutrality
- Ion exchange
- Ion exchange resins: beads & sheets
- Strong acids & strong bases
- SAC & SBA resins
- Selectivity

Workshop 2: Ion Exchange

11:30 Lunch (Not Provided)

12:30 Strong Acid Cation & Strong Base Anion Resin Beads & Resin Sheets

Transitions from Dual-Bed Ion Exchange to Reverse Osmosis-EDI

1:45 Break (Refreshments Provided)

2:00 Electrical Potential Driven Membrane Water Treatment

- Electrodialysis (ED) & Electrodialysis Reversal (EDR)
Predecessors to EDI

Electrodeionization (EDI) Fundamentals

- Module Components
- Deionization Process
- Voltage, Current, Resistivity
- Dilute filled, all filled
- Brine injection, brine recirculation

3:15 Break (Refreshments Provided)

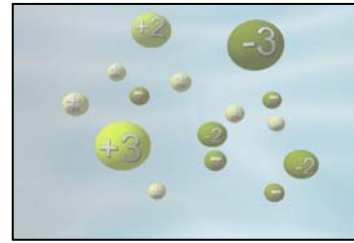
3:30 EDI Fundamentals (continued)

- Module features
- Module dynamics

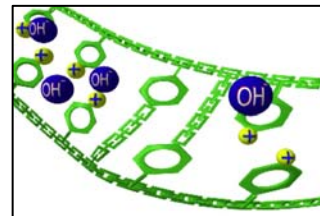
Workshop 3: EDI Fundamentals

4:45 Question & Answers

5:00 End



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Courtesy: GE Ionics

DAY 2

- 7:45 Refreshments (Provided)
- 8:00 Workshop 4: Day 1 Review
Overview of Different EDI Units
- Electropure
 - GE
 - Ionpure
 - Omexell
 - Tenergy-Christ
- 9:00 Break (Refreshments Provided)
- 9:15 EDI Potential Problems
- Scaling
 - Fouling
 - Chemical Attack
 - Leaks
 - Overheating
 - Shorting
- Pretreatment to Minimize EDI Problems
- RO membrane performance
 - Single pass
 - Double pass
- 10:15 Break (Refreshments Provided)
- 10:30 Pretreatment to Minimize EDI Problems (continued)
- Scaling control
 - Fouling control
 - Chemical attack control
- Workshop 5: EDI Pretreatment
- 11:30 Lunch (Not Provided)
- 12:30 EDI System Monitoring Requirements
- Instrumentation required
 - Performance data collection (daily, weekly, etc)
- Troubleshooting
- Performance data analysis
 - Catching problems at an early stage
- 1:45 Break (Refreshments Provided)
- 2:00 Chemical Cleaning
- Cleaning procedures
 - Heat Sanitization
- Module autopsy to identify where problems show up
- 3:15 Break (Refreshments Provided)
- 3:30 Workshop 6: EDI
- 4:00 Summary & Conclusions
- Final Questions & Answers
 - Seminar evaluation
- 5:00 End



Courtesy: Electropure™



Courtesy: Texas Independent Energy

CERTIFICATE OF COMPLETION

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

WHAT OTHERS SAY ABOUT THIS TRAINING SEMINAR

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 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 some comments from 2006 attendees of this seminar:

“Fantastic course. I've learned a lot and look forward to getting back to the plant with a new perspective on our equipment.”

Rob O'Connell, O&M Tech, Athens Generating

“Very good course. David is a great instructor and very knowledgeable.”

Lloyd Joppie, Senior Chemist, Austin Energy

“Until this course the E in E-CELL was for Enigma, because it was hard to understand.”

Wally Smith, Outside Operator, Clark Public Utilities

“The course was well organized and easy to follow. Thank you!”

Jim Brown, Utility Operator, Genentech

“Great Course - Excellent overview of EDI process and troubleshooting.”

John O'Donnell, Chemical Engineer, Intel

“This is one heck of a course-Excellent! DHP is an excellent teacher and well versed in the material. I've learned the most I ever have about EDI and now believe I understand all about EDI ! Thanks!

Very good interactive participation.”

Jerry Cunningham, Area Supervisor, Lower Colorado River Authority

“Complete explanation of EDI, good coverage of the basics for those new to EDI.”

Julie Hannah, Water Resources Engineer, West Basin Municipal Water Water District