

# Good Housekeeping in the Portable Exchange Regeneration Plant

As a portable exchange business grows, new accounts may include users of ultrapure water. (Ultrapure water generally refers to water with a resistivity greater than 15 megohm.) These users may require documentation and procedures that the dealer may not be accustomed to providing. This article will describe some of the requirements that many high tech customers may ask their supplier of ultrapure water to provide.

The portable exchange business is growing because end users want to have a reliable supply of pure water without having to deal with chemicals, regeneration waste, power demands and all the other requirements of an in-house system. A portable exchange deionization (PEDI) dealer can deliver deionized water to the end user, freeing the customer of the need to deal with chemicals, regenerations, wastewater disposal and regulatory compliance. Those liabilities now are transferred to the dealer.

Accountability and the ability to trace the components, chemicals and procedures of portable exchange regenerations require careful documentation and good housekeeping. In these days of computerization, it should not present too great a burden to the PEDI dealer.

The need for this accountability can be explained by the requirement to be able to find and correct past mistakes as well as establish liabilities during upset conditions. A sobering example of this might be the production of off-spec water at a hemodialysis clinic that leads to patient deaths or illnesses. What happened to cause this? Where did the contaminants come from, the raw water or from the PEDI tanks? Did the upset stem from a material source or from a procedural error?

Another example could be PEDI tanks used for pharmaceutical water production. USP specifications do not allow "added

substances," and should these added substances (dissolved solids, organics or particles) appear in the water, it is paramount to find where they came from, who is responsible for their presence and how this episode can best be prevented in the future.

A portable exchange regeneration plant can be a heavily regulated business. There are federal, state and local regulations to stay in compliance with. There will be additional rules to adhere to if the dealer is providing regeneration services to tanks that are used for hemodialysis (USFDA), pharmaceutical (USP) or electroplating operations (EPA).

### Ion Exchange Resins

The PEDI operation may have segregated batches of resin. If this is the case, it is relatively easy to keep track of new or old batches, what tanks they end up in before being sent out to service, when they are regenerated and what the quality history is. Record the purchase dates, the type of resin that was purchased and include the proper documentation listed below.

The PEDI plant must keep on hand Material Safety Data Sheets (MSDS) of all the chemical components used in the plant including ion exchange resins. If the plant is regenerating resins that are used for medical or pharmaceutical applications, it also is important to have on hand Certificates of Analysis (C/A) of each batch of resin that is provided by the resin manufacturer.

The C/A is provided free or for a nominal fee from the resin manufacturer depending on the degree of complexity required. Basically, it states that the resin provided has been tested and meets the published specifications of the resin. Most often, a standard C/A that lists the items in the sidebar to the left is sufficient.

### Activated Carbon

It is recommended to have granular activated carbon tanks placed in front of the PEDI tanks when in service to remove chlorine or chloramines and, in general, to protect the ion exchange resin from oxidation and organics. The carbon can be purchased as standard or acid-washed grades depending on the ultimate service requirement.

Granular activated carbon used for high purity customers also may need to be supplied with C/A from the manufacturer. The C/A for carbon typically lists the following.

- Lot number.
- Percentage of moisture.
- Iodine number.
- Abrasion number.
- Uniformity coefficient.
- Screen size distribution (percentage on standard U.S. mesh size screens).

Premium medical grades of acid-washed activated carbon are available from select manufacturers. These carbons have been treated for the ultimate in purity and are suitable for use in treating water for hemodialysis and pharmaceutical processes. These carbons undergo additional certification that can include an ash analysis to determine that any metals present are below the acceptable limits. These metals usually are reported as mg/kg of carbon.

- Aluminum
- Arsenic
- Barium
- Silver
- Chromium
- Copper
- Lead
- Mercury
- Zinc

### Chemicals

PEDI plants use hydrochloric acid or sulfuric acid to regenerate the cation resin, sodium hydroxide to regenerate the anion resin and sodium chloride to regenerate softeners or assist in the separation of the mixed-bed components. Safety regulations require that an MSDS be kept on file for any chemical used in the plant. The dealer also should request C/A from the chemical supplier for any chemicals that come in contact with the resin.

- **Hydrochloric Acid**  
C/A should list
  - Percentage of HCl.
  - Iron in ppm.
  - Color, APHA.
- **Sulfuric Acid**  
C/A should list
  - Percentage of H<sub>2</sub>SO<sub>4</sub>.
  - Iron in ppm.
  - Manganese in ppm.
  - Color, APHA.
  - Nickel in ppm.
- **Sodium Hydroxide**  
C/A should list
  - Total alkalinity percentage as Na<sub>2</sub>O.

## Standard C/A List

### Cation Resin

- Lot number.
- Total capacity in meq/mL.
- Percent of moisture retention.
- Ionic form.
- Bead count (percentage of whole perfect, cracked and broken).

### Anion Resin

- All of the above.
- Salt splitting capacity in meq/mL.

### Regenerated Resins (If a cation or anion resin is supplied in the hydrogen or hydroxide form, the C/A also may include)

- Site composition.
- Hydrogen form (percentage for cation resin).
- Hydroxide form (percentage for anion resin).

### Mixed-Bed Resins

- Lot number.
- Anion component.
  - Ionic form. (OH)
  - Volume percent of mix.
  - Site composition. Percent of hydroxides, percent of sulfates and chlorides

## Useful Websites for PEDI Dealers

Microelectronic / Semiconductor  
[www.semi.org](http://www.semi.org)  
 Pharmaceutical

- Total alkalinity percentage as NaOH.
- NaCl in ppm.
- Iron in ppm.

### • Sodium Chloride

C/A should list

- Percentage of sodium chloride.
- Percentage of calcium and magnesium.
- Percentage of moisture (for rock salt).
- Percentage of water insolubles.
- Percentage of iron.
- Appearance (visual description).
- Screen analysis on U.S. mesh (for rock salt).

### Regeneration Information

The performance of the PEDI tanks in the field are influenced by many factors, but the most important one to keep in mind is that the better the regeneration performed on the resin, the better quality water produced in the field. The success of the regeneration procedure itself depends on many controllable factors in the regeneration plant.

The operator of the PEDI plant should be striving for excellent, repeatable results. Therefore, standard procedures must be developed, fine-tuned and committed to record as an easy-to-follow written procedure.

This procedure should be in the form of a checklist for the operator to follow.

Regeneration information should be maintained and recorded into a log. (See the sample log on this page.)

All of the procedures and documentation mentioned here should be kept in a book (or books) that can be made available for any visiting inspectors. The procedure book can include more details than just the raw data and should explain which precautions are in place, which quality control methods are used and what the course of action is in the event of an unsuccessful regeneration. Committing this information to writing and maintaining an up-to-date regeneration procedure book will greatly assist the PEDI dealer in getting the plant approved by the regulatory authorities.

It may be a good idea for PEDI dealers to invite the regulating entities (EPA, county sewer utility, FDA, etc.) to inspect the regeneration plant to see that the proper procedures and laws are being followed. This gesture of cooperation can go a long way to establishing a mutually beneficial relationship between the PEDI plant and the watchdog agencies. It is particularly timely to get the advice of the regulatory

## Regeneration Log

- Date \_\_\_\_\_
- Person performing regeneration \_\_\_\_\_
- Lot number or type of resin \_\_\_\_\_
- Location of last use (for segregated batches of resin) \_\_\_\_\_
- Flowrate and duration of backwash \_\_\_\_\_
- Percent chemical applied to the resin
  - Percentage of HCl or H<sub>2</sub>SO<sub>4</sub> applied to the cation resin \_\_\_\_\_
  - Percentage of NaOH applied to the anion \_\_\_\_\_
- Amount of chemical used
  - Gallons or pounds of acid for the cation \_\_\_\_\_
  - Gallons or pounds of caustic for the anion \_\_\_\_\_

agencies when entering a new market such as medical or hemodialysis.

The ion exchange resin is the heart of the PEDI operation. Good record keeping will enable a trained operator to see the initial effects of resin fouling or substandard regenerations. Test the resin regularly, annually at the minimum. Contact your resin supplier to receive a regeneration plant audit.

### About the Author

Frank DeSilva is the national sales manager for ResinTech, Inc., West Berlin, N.J. He has been in the water treatment industry for more than 20 years. ResinTech manufactures a broad range of ion exchange resins for water and wastewater treatment and also activated carbon and inorganic selective exchangers.

For more information on this subject, write in 1012 on the reader service card.



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