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Episode 15 Show Notes – DI Resin

DI is an acronym for “deionized”. When water passes through DI resin it is considered deionized water. Different levels of water purity can be attained using DI resin. This podcast is about “mixed bed resin” aka “di resin”. The DI Tank business is profitable but requires experience. You will need to lean on the appropriate vendors to assist with the learning process.

Discussion

Mixed bed resins are a combination of cation in the hydrogen (H) form and anion in the hydroxide form (OH). This is very different from the cation used in softeners, sodium form (Na) and anion used for nitrate, sulfate, tannin reduction, chloride (Cl) form.

- The cation portion of mixed bed is regenerated with Hydrochloric Acid (very low pH).
- The anion portion is regenerated with rayon grade Sodium Hydroxide also known as Caustic (very high pH).
- The regeneration cannot be performed at a customer’s site unless they have the proper equipment installed, commonly known as a mixed bed demineralizer or deionizer. The terms demineralizer and deionizer are interchangeable.
- We do not recommend regeneration of the mixed bed resin by dealers without the proper regeneration equipment and waste treatment. Regeneration can be subcontracted to a third-party regenerator.

DI water is “hungry water”. In its purest form it is a solvent anxious to grab minerals and salts. For this reason, we don’t recommend the use of DI water in a residence. It will eat the metal pipes, fixtures, and appliances. We recommend RO, reverse osmosis, drinking water vs. DI water.

Like distilled water, deionized water, can be used in steamers and irons.

Applications

- Spot free rinse – car washes
- Window washing,
- Anti-freeze
- EDM Machines
- Microchip manufacture
- Water for injection
- Sodium-free drinks
- Dialysis
- Pharmaceuticals
- Power generation
- Vehicle Batteries



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Each application requires a different level of water purity. The deionization process/design can be complicated. Design is based on the desired endpoint/outcome for each application. The cost and type of mixed bed resin is different for these various applications. For instance, you wouldn't use an expensive, high purity grade mixed bed for spot free rinse or window washing.

Basic Design

At the very least TDS (total dissolved solids) of the water is required to design/supply a simple system for window washing or spot free rinse. For high purity applications a full cation/anion water analysis is needed. The more critical the process, the more analysis needed.

TDS meters can run anywhere from \$49 to \$4900.

Equipment

- Tall fiberglass tank
- Distributor
- DI head with a threaded connection, preferably no O-ring; polypropylene if high purity
- Hose & Connectors
 - Use union connections but reverse them so you'll never get the inlet and outlet connections mixed up.
 - Inlet could be a union, male adapter and outlet could be a male adapter by union.
- Inlet screen to prevent drilling or channeling of resin bed.
- Downflow only – if you upflow the resin will separate; water quality will drop.
- NO SUBFILL
- Pretreatment
 - Carbon tank – to remove chlorine – use acid washed coconut carbon, rinse before installation.
 - Coal based carbons tend to have more ash than coconut. Using any carbon that is not acid washed and rinsed down prior to use may result in loss of DI resin capacity.

Configuration

- Application dependent.

Monitoring

- For simple applications use a conductivity light. These are available in various ranges from 10,000 megohm through 2 megohm.
- High purity applications will generally have a conductivity probe that can measure up to 18 megohm. A wide range of products is available.



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- DI water which is not circulating may read higher conductivity. High purity applications will circulate the water for this reason. If the tanks have been sitting be sure to rinse before testing the water quality.
- Caution – overrunning a mixed bed tank may result in very low pH water. Mixed bed resin capacity is governed by the anion. *If you run out of anion capacity the pH of the water will be depressed.* Remember – the anion is caustic or high pH; the cation is acidic or low pH. When they combine the pH should be neutral. When you run out of anion capacity the water will have low pH. This may create problems if you are washing and rinsing automobiles or any items sensitive to pH.

Sizing

- As a rule of thumb, we use a capacity of 7,500 grains. This is a conservative number.
 - Example calculation:
 - TDS is 200 ppm.
 - Convert 200 ppm into grains as calcium carbonate (same as a water softener).
 - $200 \div 17.1 = 11.7$ grains
 - Capacity of $7,500 \div 11.7$ grains = 641 gallons treated water.

Regeneration

When the tanks are exhausted the resin will need to be regenerated at a regeneration facility. Be sure the facility obeys all municipal, state, and federal waste treatment rules. Regeneration of dialysis and water for injection applications are governed by 501K rules and regulations

Finally, we recommend getting as much information as possible about a customer's application prior to quoting. Applications such as plating and wire EDM will recirculate water through the tanks. Mixed bed resin will pick up metals. This resin should not be mixed in or regenerated with resin used for potable water treatment. It must be kept separate and sent to certified regeneration facilities that don't put the waste regenerant into the municipal waste system.

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Connect with Mike on [LinkedIn](#)

Connect with Denise on [LinkedIn](#)

PO Box 434
Lima PA 19037-0434
610-365-7818