Ion Exchange for Industrial Applications
Ion Exchange Technologies

Ion exchange equipment – the ion exchange process is an exchange of one ion for another, using a synthetic resin to perform the transfer of ions. These technologies are widely used for the removal of inorganic dissolved solid impurities from the feed water to steam-generating boilers or other process equipment to prevent scaling and oxidation damage.

Purpose

- To remove hardness (scale forming calcium and magnesium ions) and replace with soluble sodium ions
- Hardness can easily damage plumbing, valves and downstream equipment
- Hardness can foul RO membranes
- Hardness is harmful to boilers and can cause scaling and thermal efficiency loss

Softening

Construction

Vessels: Carbon steel, stainless steel or FRP (fiber reinforced plastic), ASME coded/stamped options
Design Pressure: As required
Internals: Stainless steel or schedule 80 PVC
Media: Synthetic strong acid cation resin (sodium form), coarse gravel
Regeneration Method: Sodium chloride brine
Face Plumbing: Carbon steel, stainless steel or schedule 80 PVC
Valve Operation: Pneumatic, water, electric or manual actuated
Skid Mounted Option: Carbon steel or stainless steel
Controls: PLC, stager/timer, metered or manual

Advantages

- Provides effective continuous removal of water hardness and low levels of dissolved iron
- Can be automatically regenerated based on manual, time or metered flow demand initiated
- Inlet/outlet pressure gauges
- Efficient internal designs provide a typical 10 PSI pressure drop across tank when clean
- Self adjusting backwash flow control
- Safety air release valve for pressure fluctuations
- Minimum energy and maintenance requirements
- Stand alone tanks or modular skid mounted (pre-piped & pre-wired) options
- Clear backwash drain line for visual inspection (PVC plumbing only)

Principle of Operation

Feed water enters the vessel and is evenly distributed over a bed of cation exchange resin. The water then flows down through the bed where the resin continues to exchange ions of sodium for calcium and magnesium. The softened water enters the distributor system at the bottom of the vessel and travels upward via the center riser tube where it is then piped out of the vessel. When throughput capacity of the system is exhausted, the unit must be taken off line and regenerated. There are four distinct phases: backwash, salt brine addition, slow rinse and fast rinse. This process is designed to restructure the resin bed to its original form and capacity. The total regeneration process takes approximately 90 minutes after which the vessel is then switched back into normal operation.
Condensate Polishing (Sodium or Amine Cycle)

**Construction**
- **Vessels:** Carbon steel, stainless steel, ASME coded/stamped options
- **Vessel Lining:** Optional epoxy coating
- **Design Pressure:** As required
- **Internals:** Stainless steel
- **Media:** Synthetic high temperature rated strong acid cation resin (sodium form)
- **Regeneration Method:** Sodium chloride brine or user preferred amine
- **Face Plumbing:** Stainless steel
- **Valve Operation:** Pneumatic, water, electric or manual actuated
- **Skid Mounted Option:** Carbon steel or stainless steel
- **Controls:** PLC, Semi or fully automatic

**Advantages**
- Provides effective removal of water hardness in boiler condensate
- Provides effective removal of iron/ copper oxides in boiler condensate
- Can be automatically regenerated based on manual, time or metered flow demand initiated
- Inlet/outlet pressure gauges
- Efficient internal designs provide a typical 10 PSI pressure drop across tank when clean
- Minimum energy and maintenance requirements
- Stand alone tanks or modular skid mounted (pre-piped & pre-wired) options

**Purpose**
- To remove hardness (scale forming calcium and magnesium ions) and replace with soluble sodium ions
- To remove iron/copper oxides and replace with soluble sodium ions
- Hardness and iron/ copper oxides in boiler condensate can easily damage plumbing, valves and downstream equipment
- Hardness and iron/copper oxides in boiler condensate are harmful to boilers and can cause scaling and thermal efficiency loss

**Principle of Operation**
Feed water enters the vessel and is evenly distributed over a bed of high temperature strong acid cation resin media. The water then flows down through the bed where the resin continues to exchange ions of sodium for calcium, magnesium and iron/copper oxides. The water enters the distributor system at the bottom of the vessel and is piped out of the vessel.

When pressure loss of the system exceeds a preset value, the unit must be taken off line and cleaned/ regenerated. There are four distinct phases: backwash, salt brine addition, slow rinse and fast rinse. This process is designed to restore the resin bed to its original form and capacity. The total regeneration process takes approximately 90 minutes after which the vessel is then switched back out of the vessel. When throughput capacity of the system is exhausted, the unit must be taken off line and regenerated.

Dealkalizing

**Construction**
- **Vessels:** Carbon steel, stainless steel or FRP (fiber reinforced plastic), ASME coded/stamped options
- **Vessel Lining (steel only):** Optional epoxy coating
- **Design Pressure:** As required
- **Internals:** Stainless steel or schedule 80 PVC
- **Media:** Synthetic strong base anion resin (sodium chloride form), coarse gravel
- **Regeneration Method:** Sodium chloride brine, caustic
- **Face Plumbing:** Carbon steel, stainless steel or schedule 80 PVC
- **Valve Operation:** Pneumatic, water, electric or manual actuated
- **Skid Mounted Option:** Carbon steel or stainless steel
- **Controls:** PLC, stager/timer, metered or manual

**Advantages**
- Provides effective, continuous alkalinity removal
- Can be automatically regenerated based on manual, time or metered flow demand initiated
- Inlet/outlet pressure gauges
- Efficient internal designs provide a typical 10 PSI pressure drop across tank when clean
- Self adjusting backwash flow control
- Safety air release valve for pressure fluctuations
- Minimum energy and maintenance requirements
- Stand alone tanks or modular skid mounted (pre-piped & pre-wired) options
- Clear backwash drain line for visual inspection (PVC plumbing only)

**Purpose**
- To remove 90% alkalinity
- Increases boiler system efficiency by increasing concentration cycles and thus reducing energy wasting blowdown
- Inhibits the release of corrosion damaging CO2 caused by the boiler breakdown of bicarbonate alkalinity.

**Principle of Operation**
Softened feed water enters the vessel through an inlet valve and is sprayed out over a bed of strong base anion resin media. The water then flows down through the bed where the resin continues to exchange ions of chloride for bicarbonate, carbonate, nitrate, phosphate and sulfate. The dealkalized water enters the distributor system at the bottom of the vessel and travels upward via the center riser tube where it is then piped out of the vessel. When throughput capacity of the system is exhausted, the unit must be taken off line and regenerated.

There are four distinct phases: backwash, salt brine addition, slow rinse and fast rinse. This process is designed to restructure the resin bed to its original form and capacity. The total regeneration process takes approximately 90 minutes after which the vessel is then switched back into normal operation. A slight amount of caustic soda addition during the salt brine phase is required to obtain 90% alkalinity removal.
solids with very close to neutral pH. The purified water enters the distributor system at the bottom of the vessel and it is then piped out of the vessel. When throughput capacity of the system is exhausted, or conductivity rises above a target value, the vessel is then piped out of the vessel. When throughput capacity of the system is exhausted, the unit must be taken off line and regenerated.

The purified water enters the distributor system at the bottom of the vessel and it is then piped out of the vessel. When throughput capacity of the system is exhausted, or conductivity rises above a target value, the units must be taken off line and regenerated. There are four distinct phases: backwash, acid addition for the cation unit and caustic addition for the anion unit along with slow rinse and fast rinse. This process is designed to restore the resin beds to their original form and capacity. The total regeneration process takes approximately 240 minutes after which the vessels are then switched back into normal operation.

The individual resin components are separated by backwashing. The density difference between the two resins allows the strong acid cation resin to remain on the bottom while the strong based anion resin remains on the top. Using the respective regenerate, acid and caustic, each resin is then regenerated separately. After regeneration the resins are remixed using air. This process is designed to restructure the resin bed to its original form and capacity. The total regeneration process takes approximately 240 minutes after which the vessel is then switched back into normal operation.

Principle of Operation

A mixed bed demineralizer contains two resins, strong acid cation and strong base anion, which are homogeneously mixed in one vessel. Feed water enters the vessel and is distributed over the media. The water then flows down through the bed where the resin continues to exchange ions of hydrogen (H+) for cations and caustic (OH-) for anions simultaneously. The result is a highly efficient system that removes all dissolved solids with very close to neutral pH. The purified water enters the distributor system at the bottom of the vessel and travels upward via the center riser tube where it is then piped out of the vessel. When throughput capacity of the system is exhausted, the unit must be taken off line and regenerated.

The twin components, plumbed in series, of this type of demineralizer (depending on feed water quality) are a strong or weak acid unit that removes nearly all cations (hydrogen form) resin, strong or weak based anion (hydroxide form) resin, coarse gravel

Regeneration Method: Hydrochloric or sulfuric acid, caustic soda

Face Plumbing: Carbon steel, stainless steel or schedule 80 PVC

Valve Operation: Pneumatic, water, electric or manual actuated

Skid Mounted Option: Carbon steel or stainless steel

Controls: PLC, stage/timer, metered or manual

Advantages
• Provides very low total dissolved solids
• Can be automatically regenerated based on manual, time, metered flow or conductivity
• Inlet/outlet pressure gauges
• Efficient internal designs provide a typical 10 PSI pressure drop across tank when clean
• Minimum energy and maintenance requirements
• Stand alone tanks or modular skid mounted (pre-piped & pre-wired) options

Construction
Vessels: Carbon steel, stainless steel or FRP (fiber reinforced plastic), ASME coded/stamped options
Vessel Lining (steel only): Rubber
Design Pressure: As required
Internals: Stainless steel or schedule 80 PVC
Media: Strong or weak acid cation (hydrogen form) resin, strong or weak based anion (hydroxide form) resin
Regeneration Method: Hydrochloric or sulfuric acid, caustic soda
Face Plumbing: Carbon steel, stainless steel or schedule 80 PVC
Valve Operation: Pneumatic, water, electric or manual actuated
Skid Mounted Option: Carbon steel or stainless steel
Controls: PLC, stage/timer, metered or manual

Advantages
• Provides extremely low total dissolved solids
• Effluent service water is near neutral pH
• Can be automatically regenerated based on manual, time, metered flow or conductivity
• Inlet/outlet pressure gauges
• Efficient internal designs provide a low pressure drop across tank when clean
• Minimum energy and maintenance requirements
• Stand alone tanks or modular skid mounted (pre-piped & pre-wired) options

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Vessel Lining (steel only): Rubber
Design Pressure: As required
Internals: Stainless steel or schedule 80 PVC
Media: Strong acid cation (hydrogen form) resin, strong based anion (hydroxide form) resin
Regeneration Method: Hydrochloric or sulfuric acid, caustic soda
Face Plumbing: Carbon steel, stainless steel or schedule 80 PVC
Valve Operation: Pneumatic, water, electric or manual actuated
Skid Mounted Option: Carbon steel or stainless steel
Controls: PLC, stage/timer, metered or manual

Advantages
• To remove all cations and anions
• Total dissolved solids are considered contaminates in some industrial processes
• Total dissolved solids will scale and foul boiler tubes inhibiting heat transfer

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Design Pressure: As required
Internals: Stainless steel or schedule 80 PVC
Media: Strong acid cation (hydrogen form) resin, strong based anion (hydroxide form) resin
Regeneration Method: Hydrochloric or sulfuric acid, caustic soda
Face Plumbing: Carbon steel, stainless steel or schedule 80 PVC
Valve Operation: Pneumatic, water, electric or manual actuated
Skid Mounted Option: Carbon steel or stainless steel
Controls: PLC, stage/timer, metered or manual

Advantages
• To remove cations and anions to a very low level
• Total dissolved solids cause scaling and under scale corrosion in industrial processes
• Total dissolved solids will scale and foul boiler tubes inhibiting heat transfer
About newterra

A Global Water Technology Leader

newterra is recognized as a leader in the development of modular treatment solutions for water, sewage, wastewater and groundwater remediation for industrial, municipal, land development, commercial & residential markets. Our heritage of innovation in providing clean water solutions dates all the way back to 1863. Over that time, newterra has grown to over 200 people and we’ve installed thousands of treatment systems – some of which operate in the most extreme conditions on the planet.

Full Control from Start to Finish

At newterra, we take full control of virtually every aspect of the treatment systems we build – from process design and engineering to manufacturing, installation, operations and ongoing parts & service support. That also includes manufacturing our own MicroClear® UF membranes in newterra’s ISO 9001:2008 certified facility. This award-winning approach ensures newterra treatment systems meet our high standards for quality and on-time delivery.

200+ Employees

40+ Professional Engineers

10,000+ Installations Worldwide

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Engineering & Sales Office

Brockville, ON
Head Office & Manufacturing Facility

Calgary, AB
Sales Office & Service Center

Trooper, PA
Engineering & Sales Office

Macon, GA
Manufacturing Facility

Venice, FL
Sales Office, Manufacturing Facility & Service Center

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