Membrane Technologies

Systems engineered and built to maximize uptime and minimize process water maintenance requirements of industrial applications.

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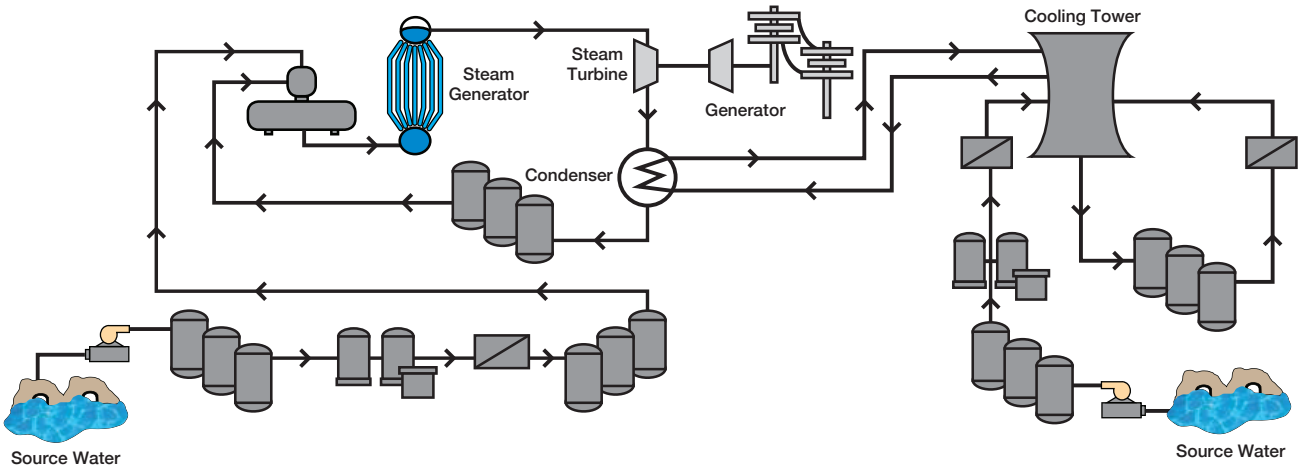
Membrane Technologies

Membrane Equipment – technologies that are widely used for the removal of various impurities and contaminants from the feed water to steam-generating boilers or other process equipment. Typical impurities are suspended solids, dissolved solids, and organics, which can cause fouling, scaling and oxidation damage.



1. **Boiler Make-up Water – Filtration**
   - Multimedia Filtration
   - Screen Filtration
   - Activated Carbon Filtration
   - Iron Filtration
   - Microfiltration/Ultrafiltration
2. **Boiler Make-up Water – Softening**
   - Sodium Zeolite Softening
   - Lime Softening
   - Nanofiltration
3. **Boiler Make-up Water – Dissolved Solids Reduction**
   - Nanofiltration
   - Reverse Osmosis
4. **Boiler Make-up Water – Polishing**
   - Demineralization
   - Electro-deionization
5. **Deaeration**
   - Counterflow Deaeration – Spray/Tray
   - Parallel Downflow Deaeration – Spray/Tray
   - Atomizing Deaeration – Spray
   - Vacuum Deaeration
6. **Condensate Recovery – Condensate Treatment**
   - Mix Bed Condensate Polishing
   - Deep Bed Condensate Polishing
7. **Cooling Tower Make-up Water – Filtration**
   - Multimedia Filtration
   - Screen Filtration
   - Iron Filtration
   - Microfiltration/Ultrafiltration
8. **Cooling Tower Make-up Water Softening**
   - Sodium Zeolite Softening
   - Nanofiltration
9. **Cooling Tower Make-up**
   - Water Filtration
   - Nanofiltration
   - Reverse Osmosis
10. **Cooling Tower Water – Blowdown Recovery and Recycle**
    - Multimedia Filtration
    - Screen Filtration
    - Activated Carbon Filtration
    - Microfiltration/Ultrafiltration
    - Reverse Osmosis

Microfiltration/Ultrafiltration

Construction

Frame: Painted carbon steel or stainless steel

Membranes: Hollow fiber, tubular and flat sheet

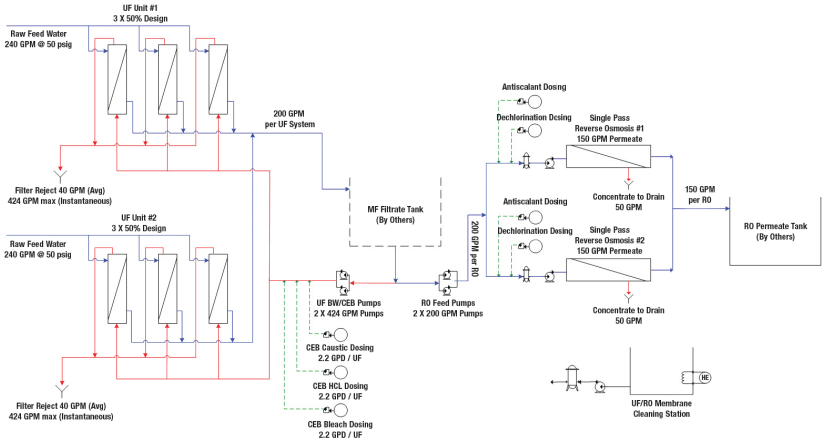
Controls: Customized for the end user

Piping: PVC, 304 SS or 316 SS

Instrumentation: Customized for the end user

Cleaning System: Integral to the skid or stand alone

Controls: Customized PLC controls



Advantages

- Provides effective suspended solids filtration to 0.01 microns
- Very consistent permeate quality
- Can accommodate a wide range of feed water qualities
- Recoveries up to 98%
- Automatic cleaning cycles
- Permeate flow rate controlled by VFD
- Small footprint
- Modular – can have several units together to account for variations in flow rates
- Skid mounted for easy installation
- Automatic Control – minimizes operator labor

Purpose

- To remove suspended solids, TSS, turbidity, SDI, dirt, sand, and sediment
- Suspended solids are abrasive and can easily damage plumbing, valves and downstream equipment
- Suspended solids will plug filters and foul RO membranes
- Suspended solids are harmful to boilers and can cause fouling and thermal efficiency loss

Principle of Operation

Feed water is pumped or drawn via vacuum into the membrane skid. The water moves through the hollow fiber membranes. The suspended solids are retained by the membrane as the water passes through the membrane. The suspended solids build up on the surface of the membrane and need to be periodically cleaned from the surface of the membrane.

The removal of the residual suspended solids is accomplished by brief back pulsing, brief chemical cleanings and thorough chemical cleanings depending on the increase in the trans membrane pressure. These cleanings are automatic and are initiated in the control panel of the water treatment system. Permeate is sent to a storage tank when it exits the membrane skid.

Reverse Osmosis

Construction

Frame: Painted carbon steel or stainless steel

Membranes: Thin film composite

Membrane Housings: FRP or stainless steel

Controls: Customized for the end user

Piping: PVC, 304 SS, 316 SS, Duplex SS or Superduplex SS

Instrumentation: Customized for the end user

Cleaning System: Integral to the skid or stand alone

Controls: Customized PLC controls

Advantages

- Provides effective, continuous dissolved solids removal
- Very consistent permeate quality
- Can accommodate a wide range of feed water qualities
- Recoveries up to 80%+
- Permeate flow rate controlled by VFD
- Small footprint
- Modular – can have several units together to account for variations in flow rates
- Skid mounted for easy installation
- Automatic Control – minimizes operator labor

Purpose

- Remove dissolved solids
- Dissolved solids increase boiler blow down
- Dissolved solids can cause scaling
- Dissolved solids can contaminate processes

Principle of Operation

Feed water is pumped into the membrane skid. The filtered and pressurized water flows through the membrane array rejecting the majority (99%+) of the dissolved solids. The dissolved solids build up in the concentrate stream of the membrane skid.

The concentrate is disposed of as it leaves the membrane skid. Permeate is sent to a storage tank when it exits the skid. A second pass of reverse osmosis can be applied to the permeate to further improve the water quality to meet process requirements.

Nanofiltration

Construction

Frame: Painted carbon steel or stainless steel

Membranes: Thin film composite

Membrane Housings: FRP or stainless steel

Controls: Customized for the end user

Piping: PVC, 304 SS, 316 SS, Duplex SS or Superduplex SS

Instrumentation: Customized for the end user

Cleaning System: Integral to the skid or stand alone

Controls: Customized PLC controls

Advantages

- Provides effective, continuous dissolved solids removal
- Very consistent permeate quality
- Can accommodate a wide range of feed water qualities
- Recoveries up to 80%+
- Permeate flow rate controlled by VFD
- Small footprint
- Modular – can have several units together to account for variations in flow rates
- Skid mounted for easy installation
- Automatic Control – minimizes operator labor

Purpose

- Remove dissolved solids, specifically hardness
- Dissolved solids increase boiler blow down
- Dissolved solids can cause scaling
- Dissolved solids can contaminate processes
- Hardness reduction

Principle of Operation

Specifically targeting multivalent ions, the feed water is pumped into the membrane skid. The filtered and pressurized water flows through the membrane array rejecting the majority of the multivalent dissolved solids allowing a portion of the monovalent ions to pass.

The rejected dissolved solids build up in the concentrate stream of the membrane skid. The concentrate is disposed of as it leaves the membrane skid. Permeate is sent to a storage tank when it exits the skid.

Sea Water Reverse Osmosis

Construction

Frame: Painted carbon steel or stainless steel

Membranes: Thin film composite

Membrane Housings: FRP

Controls: Customized for the end user

Piping: PVC, Duplex SS or Super Duplex SS

Instrumentation: Customized for the end user

Cleaning System: Integral to the skid or stand alone

Controls: Customized PLC controls

Advantages

- Provides effective, continuous dissolved solids reduction
- Very consistent permeate quality
- Can accommodate a wide range of feed water qualities
- Recoveries up to 50%+
- Permeate flow rate controlled by VFD
- Small footprint
- Modular – can have several units together to account for variations in flow rates
- Skid mounted for easy installation
- Automatic Control – minimizes operator labor
- Energy recovery systems reduce electrical costs

Purpose

- Remove dissolved solids
- Dissolved solids increase boiler blow down
- Dissolved solids can cause scaling
- Dissolved solids can contaminate processes

Principle of Operation

Feed water is pumped into the membrane skid. The filtered and high pressure seawater flows through the membrane array rejecting the majority of the dissolved solids. The dissolved solids build up in the concentrate stream of the membrane skid.

The concentrate is disposed of as it leaves the membrane skid. Permeate is sent to a storage tank when it exits the skid. Due to the high pressures required to overcome the osmotic pressure of the seawater, energy recovery devices are frequently applied to reduce the operating costs of the equipment.

Electrodeionization (EDI)

Construction

Cells: Modular cell stack in plate and frame, cylindrical, spiral configurations

Membranes: Cation and anion membranes, spacers, mixed bed resin, electrodes

Plumbing: Schedule 80 PVC, 316 SS

Skid: Two coat epoxy carbon steel

Controls: Customized PLC controls

Advantages

- Provides extremely low total dissolved solids
- Effluent service water is near neutral pH
- Continuous operation with no regeneration or hazardous chemicals required
- Modular units that can be combined for larger flow rates
- Inlet/outlet pressure gauges
- Minimum energy and maintenance requirements
- Smaller footprint compared to mixed bed demineralization
- Stand alone modular skid mounted (pre-piped & pre-wired)

Purpose

- To polish RO product water to remove nearly 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

Principle of Operation

Electrodeionization (EDI) is a continuous electrically driven membrane and resin ion separation technology used to polish RO product water to extremely low levels of dissolved solids. EDI systems offer an alternative to mixed bed demineralization without the need for regeneration chemicals and waste neutralization. RO product water enters the EDI module through an inlet valve and then enters stack of cells with cation and anion membranes separated by spacers.

On opposite ends of the stack is a cathode and anode respectively providing an electrical potential to drive the cations and anions through the respective one way membranes to a waste channel.

The product and waste channels contain a thin layer of mixed bed resin to provide a conductive path to facilitate the process. The result is a highly efficient system that removes all dissolved solids with very close to neutral pH. The purified water is then piped out of the stack. Modules of different flow rates can be plumbed together to provide higher flow rate capacities.

About Newterra

Newterra designs, engineers, manufactures, and services environmental, water and wastewater treatment solutions that assure great performance, superb reliability, and the highest value to renew precious ecosystems. Newterra offers a broad portfolio of reliable, trouble-free technologies and outsourcing support for global municipal and industrial customers across diverse applications, including drinking water, industrial process water, wastewater, stormwater and remediation.

From the first interaction, you'll experience passionate experts who tailor solutions based on intimacy, knowledge and partnership to meet your operational, regulatory and safety goals. These experienced water experts uniquely question, listen, advise then deliver solutions and schedules – on time and on budget.

With 150 years in water treatment and tens of thousands of installations across every continent, you'll enjoy security and peace of mind from a trusted partner for life.

Now, what can we do for you?

40+ Professional Engineers

200+ Employees Worldwide

THOUSANDS of Installations Worldwide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