

# Separate Bed

Ion Exchange

DT 24072

## Application

Separate Bed Ion Exchangers consist of sequential vessels containing cation and anion resins. These units reduce the ionic impurities in a process stream by exchanging positively charged ions for hydrogen ions in the cation vessel, and negatively charged ions for hydroxyl ions in the anion vessel. The released hydrogen and hydroxyl ions combine to form pure water. Separate bed exchangers are typically capable of producing water quality between 20,000 and 500,000 Ohm-cm, depending on feedwater quality and resin selection.

Each resin vessel has a finite capacity for removing positively or negatively charged ions. After each processed batch, the cation vessel of the separate bed exchanger is regenerated using an acid solution, while the anion vessel is regenerated using a caustic solution.

## Quality by Design

Res-Kem's DT24072 Separate Bed Ion Exchanger is designed to provide reliable service and long operation life. During the development of this product, strict attention was paid to ease of use and serviceability. Our successful integration of these design philosophies enables Res-Kem to offer a product series with excellent value, while helping our customers to reduce installation, commissioning and operating costs.

Hydrostatic and factory testing of each unit prior to shipment permits quality performance when placed in operation. Units are delivered pre-assembled and ready for resin loading.

## Standard Units

The DT24072 Ion Exchanger is designed with ionically balanced cation and anion volumes. Standard units are supplied with Strong Acid Cation and Strong Base Type II or Weak Base Anion.

*Option:* Units with Strong Base Type I Anion are also available as a standard option. Custom units can be supplied with various resin types.

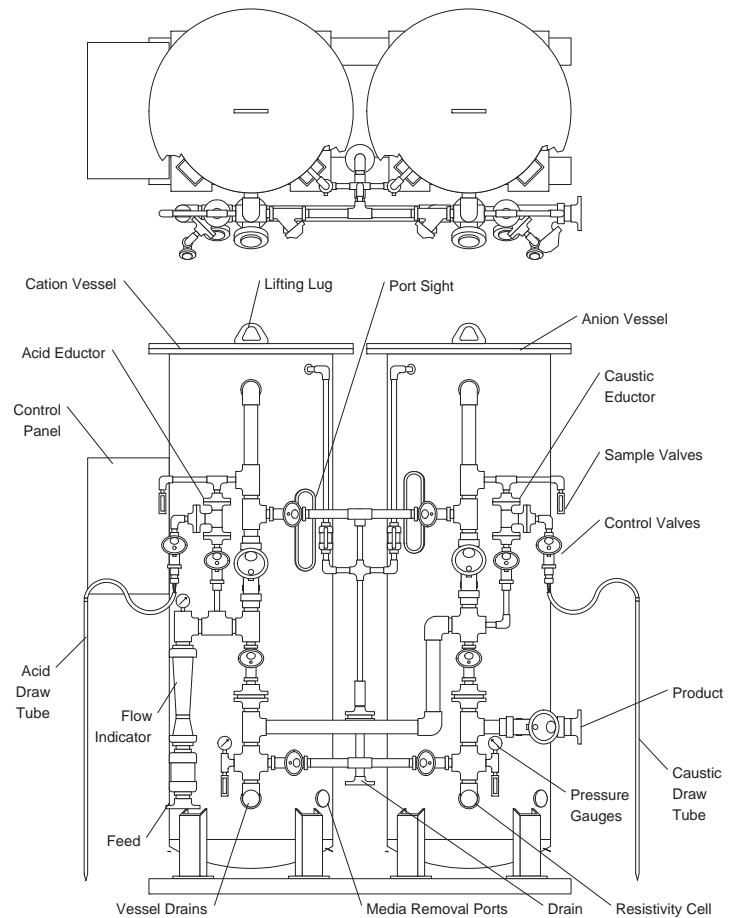
## Vessels

Vessels are constructed of carbon steel and are rated for 100 psig. Each is designed with structural steel channel legs and bolt-down footpads. These rugged construction features assure long product life and make Res-Kem's Ion Exchangers suitable for Seismic Zone IV applications. To simplify installation all vessels in the series are designed with lifting lugs.

DT24072 Units are supplied with full size flanged and gasketed top manways to allow complete access to vessel interiors for the purpose of applying and inspecting internal coatings. Vessels come standard with a media removal port to simplify resin replacement and a sight glass to permit checking resin level and condition. Both vessels are mounted on a rugged unitized base.

*Option:* ASME code stamped vessels are available as an option.

## Diagram



## Distribution and Collection

Vessel internal distribution and collection systems are designed to efficiently regenerate the entire resin volume. Units employ V-slot screen laterals arrayed from a central hub radial design for both top distribution and bottom collection. All distributors, headers and laterals are constructed of PVC for corrosion resistance. Custom materials are available.

## Linings / Coatings

PVC is sprayed and baked onto carbon steel surfaces of the ion exchange vessels. Internal linings are applied at 60-80 mil thick, while external coatings are 10-20 mil. This material has proven to be superior in its resistance to corrosion and mechanical damage compared with other commonly used materials.

**We warrant our PVC linings  
against corrosion failure  
for five years!**

*Option:* Standard DT Series Separate Ion Exchange Units are also available with rubber-lined interiors and epoxy coated exteriors.

## Piping, Valves & Instrumentation

All piping is schedule 80 PVC. Automatic valves are air-close, piston diaphragm style. For ease of service, valves are supplied with union connections. Each ion exchange unit is outfitted with feed and product, liquid-filled, stainless steel pressure gauges. Sample valves are provided for regenerant chemicals, and the outlets of the cation and anion piping. An inlet rate of flow indicator is also provided to monitor all water flow conditions.

*Option:* Weir type, fail-close diaphragm valves are available as an option.

## Regeneration Cycle

Standard DT Separate Bed Ion Exchange units are designed to accomplish cation regeneration using a 30% Hydrochloric Acid (HCl) solution. Anion regeneration is accomplished using a 50% Sodium Hydroxide (NaOH) solution. DT units are supplied complete with eductors and flexible draw - up tube assemblies for each regenerant chemical.

*Option:* Units can be designed to regenerate with alternate chemicals (i.e. Sulfuric Acid) and concentrations.

Operators can elect to initiate regeneration automatically based on resistivity, or manually via an external control signal. When the manual or external initiation option is selected, a system alarm will indicate that product quality has fallen below the product resistivity setpoint.

*Option:* DT Series Ion Exchange units are available with a combination "low flow - rinse recirculation" pump option that protects the unit against the low service flow rates that might otherwise "channel" through the beds. Reducing "channeling" maximizes the volume of water processed between regenerations. This option also reduces the amount of water directed to the drain during the "final rinse" step of the regeneration cycle.

## Controls

Standard DT Separate Ion Exchange units are provided with NEMA 12 control panels. A programmable logic controller (PLC) is supplied to provide system control. Effluent water quality is monitored by a resistivity monitor. System modes, alarms and control interface are accomplished through a digital display. The panel also includes an alarm horn to alert the operator to potential system alarm conditions.

Model	DT 24072	
Type Anion Resin	Strong Base II	Weak Base
<b>Service Flow Rates (GPM)</b>		
Minimum	6	6
Normal	25	25
Maximum	40	40
<b>Ion Exchange Data</b>		
Cation resin/ft <sup>3</sup>	10	12
Anion resin / ft <sup>3</sup>	12	11
Nominal <small>total capacity in KGR based on Anion</small>	240	275
<b>Regenerant Chemicals</b>		
Cation resin, lbs 100% HCl	60	72
approx. gals 30% HCl	20	24
Anion resin, lbs 100% NaOH	96	44
approx. gals 50% NaOH	15.1	6.9
<b>Dimensions (in.)</b>		
Column Diameter	24	24
Straight Side	72	72
Overall Height	87	87
Overall Width	78	78
Overall Depth	43	43
<b>Connection/Access Sizes (in.)</b>		
Inlet Flange	1.5	1.5
Outlet Flange	1.5	1.5
Drain Flange	1	1
Top Access Flange	24	24
Media Removal	2 NPT	2 NPT
<b>Weights</b>		
Dry without Resin, lbs (calc)	1,450	1,450
Operating, lbs (calc)	4,350	4,350
Electrical Requirements 115V/60HZ/1PH		
Air Requirements: 2 SCFM at 15 psi above max available water pressure		

Regeneration Cycle Steps	Regeneration Volumes									
	Strong Base Type II					Weak Base				
	FLOW RATES		Total Flow GPM	Total Time Min.	Total Gallons Each Phase	FLOW RATES		Total Flow GPM	Total Time Min.	Total Gallons Each Phase
Influent GPM	Chemical GPM	Influent GPM				Chemical GPM				
Model: DT 24072										
Backwash Anion	7.5		7.5	5	37.5	5.1		5.1	5	25.5
Backwash Cation	10.2		10.2	10	102	18		18	10	180
Caustic Introduction	4.5	0.5	5	30	150	2.8	0.2	3	30	90
Slow Rinse Anion	4.5		4.5	10	45	2.8		2.8	10	28
Acid Introduction	2.8	1	3.8	20	76	4.5	1.2	5.7	20	114
Slow Rinse Cation	2.8		2.8	10	28	4.5		4.5	10	45
Fast Rinse Cation	20		20	20	400	24		24	20	480
Fast Rinse Anion	24		24	30	720	22		22	30	660
Sub Totals				135	1558.5				135	1622.5
*Final Rinse Totals	24		24	30	720	22		22	30	660

\*1. Total final rinse gallonage is affected by the quality and temperature of the water supply, and the effluent water purity required for use. Due to these variables, total time and gallons for final rinse can only be determined during actual operation.

\*2. Sub totals equal final totals when rinse recirculation is employed.

## Other Products & Integrated Systems

Res-Kem has a broad array of standard water treatment equipment products including: multimedia filters, carbon filters, water softeners, reverse osmosis units, electrodeionization systems and many others. In addition to our standard products, we have extensive experience and capabilities that allow us to apply a wide variety of water treatment technologies. Our core strength is working with our customers to integrate these products and technologies into systems that provide exceptional value from an installation, commissioning and operational standpoint.

## Custom Constructions Available

Features described in this bulletin relate to Res-Kem's DT Series Ion Exchange Units and standard options. At Res-Kem, we pride ourselves on our ability to economically construct customized equipment. Please feel free to contact us to develop systems to meet your specific needs.