DOWEX HCR Softening Resin

An 8% cross-linked, high-capacity resin for softening

Description

DOWEX* HCR resin is a high-capacity, gel-type, strong acid cation exchange resin with a polydispersed (normal) particle size distribution.
It is based on a styrenedivinylbenzene (DVB) copolymer matrix with sulfonate functional groups. The degree of cross-linkage (approximately 8% DVB content) is chosen to yield a high-capacity, efficiently regenerable resin with good physical and oxidative stability for operation in typical nonaggressive softeners. For more highly oxidative systems, such as those containing 1 ppm CI_2, gel resins with higher levels of cross-linkage are recommended.

The polydispersed particle size distribution of DOWEX HCR resin (ranging between 16 and 50 mesh) provides pressure drop that is sufficient to permit good distribution of flow across the resin bed. Backwash expansion characteristics allow for cleanup by bed fluidization.

Product	Type	Matrix	Functional group
DOWEX* HCR	Strong acid cation	Styrene-DVB gel	Sulfonic acid

Guaranteed Sales Specifications		Na^+ form
Total exchange capacity, min.	eq/l	2.0
	kgr/ft^3 as $CaCO_3$	43.5
Bead size distribution range† (U.S. standard sieves)		
% on 16 mesh, max.	%	5
% through 40 mesh, max.	%	6
% through 50 mesh, max.	%	1
Whole uncracked beads, min.	%	90
Color throw, as packaged, max.	APHA	20
Acidity range	pH	7.0 - 9.5

Typical Physical and Chemical Properties		Na^+ form
Physical form		Hard, golden-colored, spherical beads
Water content	%	44 - 48
Shipping weight	g/l	820
	lbs/ft^3	51

Recommended Operating Conditions	
Maximum operating temperature	120°C (250°F)
pH range	0-14
Bed depth, min.	800 mm (2.6 ft)
Flow rates:	
Service/fast rinse	5-50 m/h (2-20 gpm/ft^2)
Backwash	See figure 5
Co-current regeneration/displacement rinse	1-10 m/h (0.4-4 gpm/ft^2)
Total rinse requirement	3-6 Bed volumes
Regenerant	8-12% NaCl

†For additional particle size information, please refer to the Particle Size Distribution Cross Reference Chart (Form No. 177-01775/CH 171-476-E)

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Applications

DOWEX HCR resin is used in commercial and home water softening. It can operate effectively over the entire pH range, under high flow rate conditions, and at high temperatures.

DOWEX HCR-S resin is recommended for use in municipal and industrial water softening (see DOWEX HCR-S Bulletin for details). Its combined physical and chemical stability makes it suitable for virtually any but the most aggressive softening applications.

DOWEX HCR and DOWEX HCR-S cation resins meet the requirements of FDA Food Additive Regulations Title 21, Subpart A, 173.25, when standard pretreatment practices are applied.

Properties and Operating Information

Operating Capacity and Leakage

Capacity and hardness leakage data for DOWEX HCR resin use in water softening applications are presented in Figures 1 to 3.

More complete computer-generated capacity and leakage ratings, particular to your operating conditions, can be obtained from your Dow Sales or Technical Service Representative.

Hydraulic Characteristics

The particle size distribution of DOWEX HCR resin is a carefully selected range to give hydraulic properties appropriate to the needs of a standard softener design. The properties of prime concern are pressure drop across the bed and backwash expansion during resin cleanup.

Figure 1. Hardness Leakage in Co-flow Operation for DOWEX HCR Resin

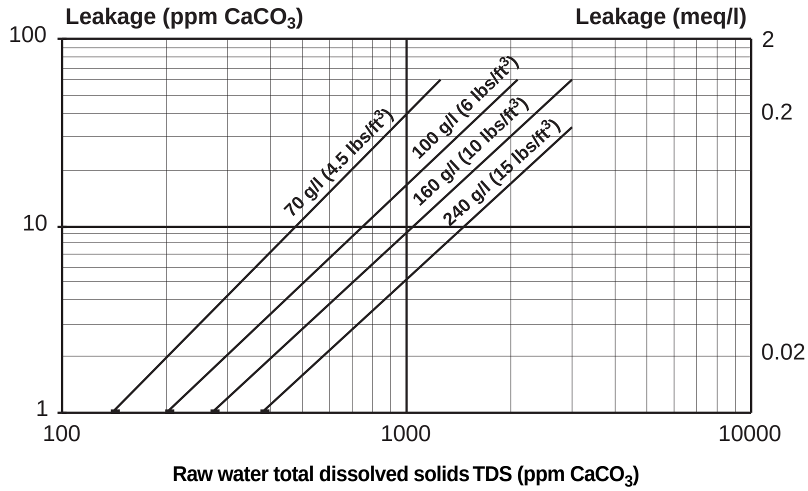


Figure 2. Operating Capacity of DOWEX HCR Resin for Water Softening

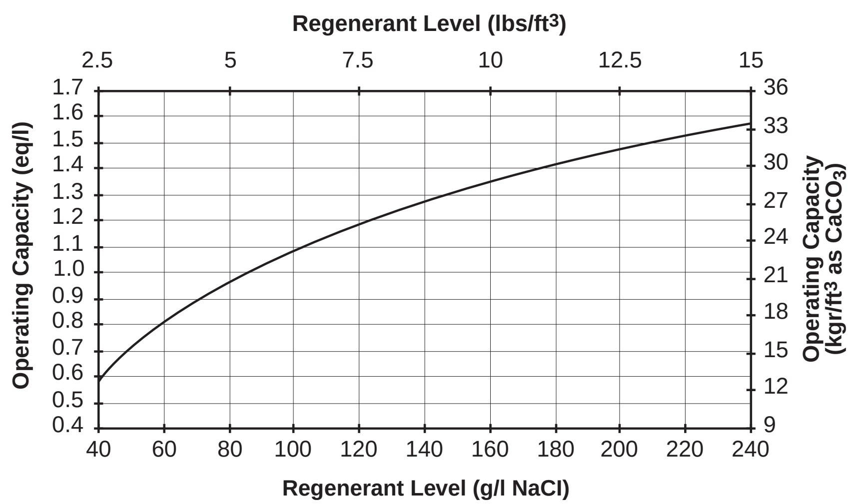
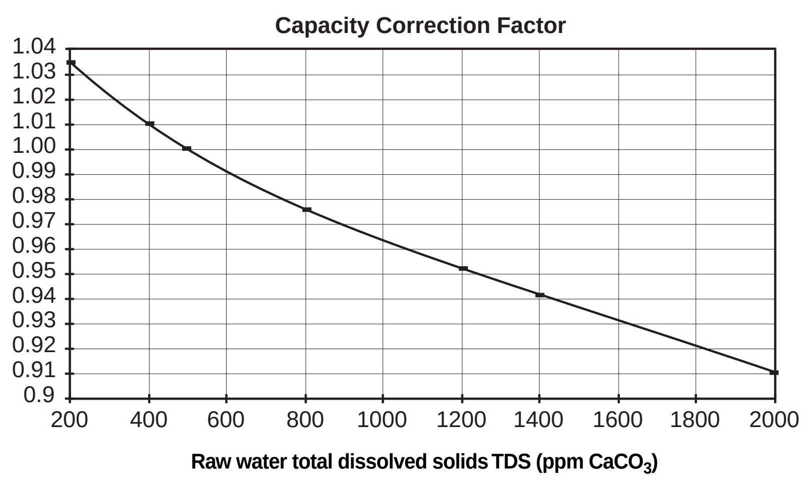


Figure 3. Correction of Operating Capacity for Feed TDS



Pressure Drop

The pressure drop across a resin bed can vary with bead size, flow, temperature, and the interstitial space in the packed bed. The interstitial space can vary from the classified to the mixed resin state in resins with a polydispersed distribution. When resins are mixed, the small beads tend to fill the spaces between the larger beads, thus, the pressure drop is greater than across a classified bed. Resins are operated following a backwash step. Thus, the data presented in Figure 4 is for single-resin beds in the classified condition. Normally, the pressure drop across a resin bed in softening service is quite low because of the low flow rates involved.

Figure 4 shows the variation of pressure drop with flow rate for the exhausted form of the resin. The formula allows the effect of temperature on the pressure drop across a resin bed to be calculated. As water viscosity decreases with increasing temperature, so does the pressure drop. This effect is most apparent when seasonal changes significantly modify the influent water temperature.

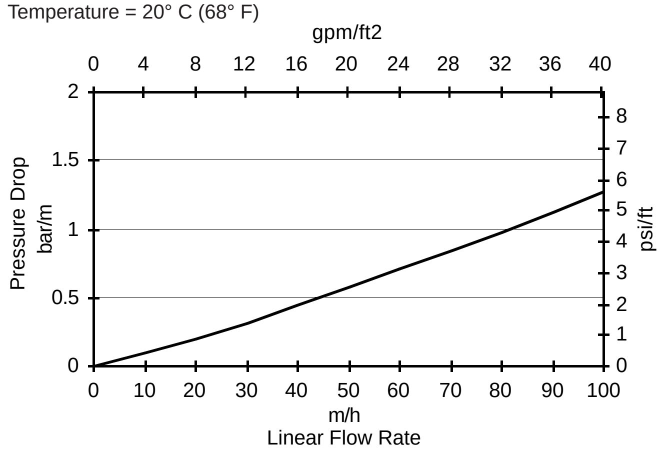
Backwash Expansion

The ability to keep the resin bed clean is of the utmost concern in the operation of a softener. The standard method for bed cleanup is removal of particulate materials and reclassification of the resin bed by backwash expansion. Fluidization of the resin is affected by the bead size, bead density, water flow rate, and water temperature. Figure 5 shows the relationship of the backwash expansion characteristics to flow rate.

Because the backwash operation is most often done with the resin in the exhausted state, data presented are for the calcium form. Also included is the sodium form used in softeners. The flow rate needed to expand the resin bed to a given percentage above the settled volume can be estimated. An expansion of approximately 50% for a period of at least 20 minutes is normally suggested to achieve a flow rate sufficient to remove the particulate matter from the resin bed.

Figure 4. Pressure Drop Data

Temperature = 20° C (68° F)



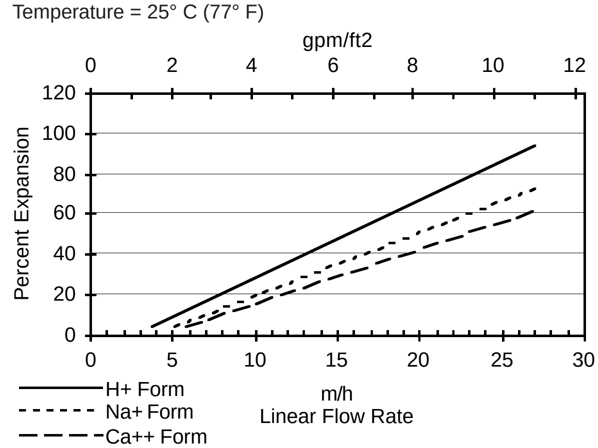
For other temperatures use:

$P_T = P_{20°C} / (0.026\ T_{°C} + 0.48)$, where P ≡ bar/m

$P_T = P_{68°F} / (0.014\ T_{°F} + 0.05)$, where P ≡ psi/ft

Figure 5. Backwash Expansion Data

Temperature = 25° C (77° F)



For other temperatures use:

$F_T = F_{77°F}\ [1 + 0.008\ (T_{°F} - 77)]$, where F ≡ gpm/ft^2

$F_T = F_{25°C}\ [1 + 0.008\ (1.8T_{°C} - 45)]$, where F ≡ m/h

DOWEX
Ion Exchange Resins

For more information about DOWEX resins,
call Dow Liquid Separations:

North America 1-800-447-4369
Latin America . . . .(+55) 11-5188-9277
Europe . . . .(+31) 20-691-6268
Japan . . . .(+81) 3-5460-2100
Australia . . . .(+61) 2-9776-3226
http://www.dow.com/liquidseps

Warning: Oxidizing agents such as nitric acid attack organic ion exchange resins under certain conditions. This could lead to anything from slight resin degradation to a violent exothermic reaction (explosion). Before using strong oxidizing agents, consult sources knowledgeable in handling such materials.

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