

Technical Data

Section VI.

PRODUCT DESCRIPTION

Purolite S-950 is a macroporous aminophosphonic acid chelating resin, designed for the removal of cations of toxic metals such as lead, copper and zinc from industrial effluents at low pH. At somewhat higher pH values, calcium, magnesium and barium, as well as the toxic metals cadmium, nickel, and cobalt are strongly complexed and may be separated from quite high concentrations of univalent cations.

Unlike **Purolite S-930**, the well known iminodiacetic acid resin, which is selective

for heavy metal ions, but not for common divalent ions (calcium and magnesium), **Purolite S-950** is more highly selective (under the appropriate conditions) for a range of both heavy metal and common divalent ions. Hence its use may be recommended where it is necessary to remove calcium or magnesium in order to avoid possible precipitation, or where its selectivity for a particular range of metals offers advantages.

Typical Chemical & Physical Characteristics

Polymer Matrix Structure	Macroporous Styrene-divinylbenzene
Physical Form & Appearance	Opaque light brown spheres
Whole Bead Count	>95%
Functional Groups	RCH ₂ N HCH ₂ PO ₃
ionic Form (as shipped)	Na ⁺
Shipping Weight g/l	710 - 745 g/l (44.5 - 46.5(lb./ft ³))
Screen Size Range: British Standard Screen	14-52 mesh, wet
U.S. Standard Screen	16-50 mesh wet
Particle Size Range	+1.2mm <5%, -0.3mm <1%
Moisture Retention, Na ⁺ Form	60-68%
Reversible Swelling, (H ⁺ → Na ⁺) Max.	45%
Specific Gravity, Moist Na ⁺ Form	1.13
Total Exchange Capacity, Na ⁺ Form (wet, volumetric)	2.0 meq./ml., min.
(dry weight).....	5.5 meq./g., min.
Exchange Capacity (Na ⁺ Form)	24 g. Ca ⁺⁺ /l (1.51b/ft ³)min at pH 9.5
Max, Operating Temperature, Ca ⁺⁺ Form	90°C (195°F)
pH Range (operating), H ⁺ Form	2-6
Na ⁺ Form	6-11

STANDARD OPERATING CONDITIONS

Operation	Rate	Solution	Minutes	Amount
Service	8- 16BV/h 1-2gpm/ft ³	For treatment		
Backwash	5-7m/h 2-3gpm/ft ²	Raw Water	5-20	1.5-6BV 10-35 gal/ft ³
Regeneration	3-4BV/h 0.4-0.5gpm/ft ³	Mineral Acids (2N-3N)	30-60	120-200g/l HC1 7.5-1 2.51b/ft ³ 200-300g/l H ₂ SO ₄ 12.5-20 lb/ft ³
Slow rinse	3-4BV/h 0.4-0.5gpm/ft ³	Raw Water	30-40	2-3BV 15-20gal/ft ³
Conversion to sodium form-as required:				
	3-4BV/h 0.4-0.5 gpm/ft ³	N NaOH (Upflow)*	30-60	60-120g/l 3.75-7.5 lb/ft ³
Rinse (slow)	3-4BV/h 0.4-0.5gpm/ft ³	Soft Water	20-40	2-4BV 15-30gal/ft ³

Backwash expansion 75% (optimum)

Design rising space 100%

Minimum bed depth 1000mm

"gallons" refer to U.S. gallons = 3.785 Litres.

*The aim is to achieve the same pH as that of the incoming solution.

CHEMICAL STABILITY

Purolite S -950 is insoluble in acids, alkalis and all common solvents at normally encountered temperatures (although oxidizing agents like concentrated nitric and perchloric acid at elevated temperatures will destroy its structure and solubilise the resin. Care should be taken when using strong nitric acid, as explosive

hazards have been reported on poly(styrene)-based anion exchange resins with this reagent). However exposure, even at ambient temperatures, to certain other strong oxidizing agents such as chlorine causes **irreversible damage to** this resin and must be kept to the **absolute minimum**.

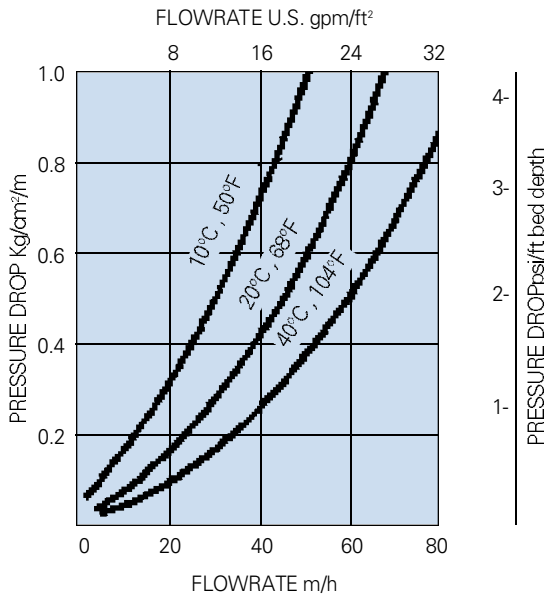
HYDRAULIC CHARACTERISTICS

The pressure drop (or headloss) across a properly classified bed of ion-exchange resin depends on the particle size distribution, bed depth, and voids volume of the exchange material, and on the flowrate and viscosity (and hence on the temperature) of the influent solution. Anything affecting any of these parameters, for example the presence of particulate matter filtered out by the bed, abnormal compaction of the resin bed, or the

incomplete classification of the resin spheres will have an adverse effect, and result in an increased headloss.

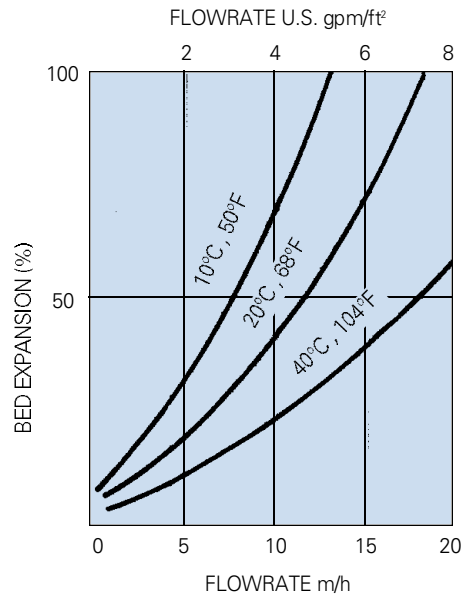
Service flow rates from 8-16 bed volumes per hour, depending on the application, may be regarded as the normal range used on this resin, Typical pressure drop figures to be expected for ordinary aqueous solutions, are given in Fig. 1.

Fig. 1. PRESSURE DROP VS FLOW RATE



During upflow backwash, the resin bed should be expanded in volume by between 50 and 75%, in order to free it from any particulate matter from the influent solution, to clear the bed of bubbles and voids, and to reclassify the resin particles as much as possible, ensuring minimum resistance to

Fig. 2. BACKWASH EXPANSION (exhausted form)



flow. Bed expansion increases with flow rate and decreases with temperature, as shown in Fig. 2. for a typical exhausted form of the resin. Care should always be taken to avoid resin loss by over-expansion of the bed.

CONVERSION OF UNITS

1 m/h (cubic metres per square metre per hour)	= 0.341 gpm./ft².
	= 0.409 U.S. gpm./ft².
1Kg/cm² /m (Kilograms per square cm. per metre of bed)	= 4.33 psi/ft.
	= 1.03 atm./m/
	= 10 ft. H ₂ O/ft

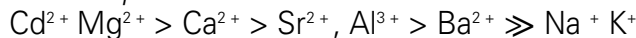
AFFINITY ORDER FOR TYPICAL CATIONS.

Like the **S-940**, the **S-950** affinity order varies as a function of solution pH.

Acidic pH:



Alkaline pH:



It should be noted that **Purolite S-950** is capable of operating under acidic, neutral, or alkaline conditions; its operating capacity for any of the chelated ions is a function of

pH, and consequently there are minimum values of pH below which removal of a given cation from the influent solution is not feasible. Relevant figures are given below:

CATION SPECIES

CU ²⁺ + Pb ²⁺ +	2
Zn ²⁺ +	2.5
Cd ²⁺ , Ca ²⁺	3
Mg ²⁺ , Ni ²⁺ Co ²⁺	4.5

CATION SPECIES

2
2.5
3
4.5

APPLICATIONS

- a) Extracting heavy metal ions from leach liquors, tailings runoff, or from industrial effluents. For example, lead may be removed from oil refinery waste liquors, solvents and aqueous wastes from the manufacture of paints and printing inks, or battery factory wastes.
- b) Recovery of zinc from cooling-tower

waters, etc. where it is used as a corrosion inhibitor.

- c) Refining of metal salt solutions by selective removal of individual ions.

- d) "Polishing" of aqueous organic and inorganic solutions for the removal of trace metals.

OPERATING PERFORMANCE

Before attempting to use **Puolite S- 950** for any industrial application, it is strongly recommended that laboratory column tests are carried out on the solution which is to be treated, so as to determine the operating performance in terms of both treated solution quantity and quality once the chosen equilibrium cycle conditions have been established. This may take several cycles.

The curves for copper and nickel for **Puolite S -950** given in fig. 3 may serve as a guide to the maximum exchange capacity obtainable from a feed of 2g/l metal as a function of pH. In practice, lower capacities will usually be obtained, depending, depending upon regeneration level chosen, having regard to the leakage of metal acceptable .

Fig. 3. RESIN CAPACITY

