PUROLITE SERVICE BULLETIN

THE STORAGE & TRANSPORTATION OF ION EXCHANGE RESINS

PUROLITE

INDEX

General Guidelines

Purolite Ion Exchange Resins are generally supplied in fully swollen moist bead form. Provided that transportation and storage guidelines are followed, resins may be stored successfully for extended periods without significant deterioration. For certain special products supply is made in a dry or part-dried condition. In such instances, instructions for use should be carefully followed. Such resins may expand considerably on rewetting, hence adequate space should be made available in the vessel to accommodate the increase in volume.

Storage & Transportation Requirements

1. Packaging

Various types of containers, as listed towards the end of this bulletin, are used to pack Purolite resins. All types are designed to ensure that the ion exchange resins are kept sealed to prevent either the loss or uptake of moisture. If containers are damaged or left open, so that resins are exposed to the atmosphere for lengthy periods, a risk exists that resins can deteriorate both physically and/or chemically.

Dehydration

One of the major risks is that resins dry out. Unless rewetting is carried out carefully beads can crack or break on rewetting. Damage can be minimised by following the recommended procedure for rewetting the resins. A brine of 20-30% is slowly introduced and left for at least 1h to equilibrate. Brine displacement is carried out, reducing brine concentration by 5% on consecutive treatment. A contact of 30 min. is used for successive displacements. The final 5% brine is then displaced and rinsed out with water. In cases where resin is very dry it is recommended that the process is optimised in the laboratory by altering the starting concentration of brine, temperature, rates of addition and contact times, prior to plant treatment.

It should be noted that resins in the hydrogen form will generate acid and resin in the hydroxide form, caustic soda. In each case cation resin will be converted to the sodium form and anion resin to the chloride form.

Contamination

Certain resins are supplied in specially purified ionic forms. If such resins are left exposed to the atmosphere, they can become carbonated from contact with carbon dioxide or contaminated with chemicals present in the air or rainwater. Hence once resin containers are opened, resins should be used as soon as possible, and any unused resin adequately resealed in suitable containers.

2. Warehousing

Exposure to high temperature and sunlight

It is recommended that Purolite Resins are stored indoors or under cover. All containers, and especially bags should be stored away from direct sunlight. This is to maintain the temperature below 40°C, (104°F), and to ensure stray UV light (which can promote oxidation, and increase growth of algae and bacteria) does not fall upon any exposed resin. It also follows

that resin should not be stored near a radiator, or any other heating appliance, or in a warm boiler house.

Exposure to low temperature and frost.

Although it has been found that Purolite Resins will withstand temperatures as low as -40°C, (-40°F), successive thawing and freezing may damage the product, and/or the packaging. Hence it is recommended that the resins are stored above 0°C, (32°F).

If for any reason resin becomes frozen it should be left to thaw out gradually. No attempt should ever be made to free frozen resin mechanically.

If it is anticipated that it will be necessary to handle resin at sub-zero temperatures, the resin may be conditioned with saturated brine prior to storage.

3. Transportation

During transportation of resins precautions should be taken to avoid the extremes of temperatures as outlined previously.

If product becomes frozen during transportation, thawing should take place gradually, without any physical interference.

Requirements for resin storage during plant shut-down

It is recommended that some simple precautions are taken where an ion-exchange plant is to be shut down for an extended period.

These will avoid the problems associated with the following :-

- Dehydration
- Freezing
- Growth of bacteria, algae and moulds
- Chemical Stability
- Precipitation and corrosion

■ Dehydration

It is recommended that the unit is filled with water. If draining is necessary, the vessel should be sealed to prevent the resin from dehydrating.

■ Freezing

The vessel should be filled with brine or ethylene glycol mixtures.

■ Growth of bacteria, algae and moulds

Where conditions are favourable, microorganisms such as algae and bacteria can proliferate in ion exchange plants which are shut down for extended periods. For example nitrate forms provide nutrient for bacterial growth and are less stable. If such growth is allowed to continue unhindered, irreversible fouling of the resin and plugging of the resin bed can occur.

In order to ensure that the ion exchange plant remains in good working order the following precautions should be taken prior to shut-down.

The resins should be backwashed to remove any suspended material which may have been collected during service.

Anion Resins

Anion resins should be treated with alkaline brine (10% NaCL+2% NaOH) by passing 1.5 bed volumes, allowing to stand for several hours and passing a further 1.5 bed volumes and rinsing out. The bed may be left immersed in the sodium chloride solution for the period of shut-down, and, if necessary rinsed with an acceptable sterilising solution prior to re-use, 0.2% of a recommended grade (low H_2O_2) of peracetic acid solution is suitable. Alternatively, the sodium chloride is rinsed out, and the resin vessels and associated pipework filled with a 0.1% solution of a quaternary ammonium salt which acts as a

very effective biocide which does not harm the resin or the equipment : 2 bed volumes are generally sufficient.

Cation resins

The cation resin bed, vessel and pipework etc. can be filled with 0.5% formaldehyde solution. If the bed is to be left for extended periods it is advisable to top up the formaldehyde concentration if it falls below 0.2%. Alternatively, the resin may be left immersed in 10% NaCl solution and given a formaldehyde or peracetic rinse prior to use.

Where softeners are subject to shut-down, the use of Purolite C-100E Ag which has bacteriostatic properties, is recommended.

■ Chemical Stability

Purolite strong base anion resins are quite stable in the chloride and sulphate forms, They are generally supplied in the chloride form and may be kept under suitable storage conditions for 2-3 years. The hydroxide form and to a lesser extent carbonate and bicarbonate forms slowly degrade even at room temperature to produce a higher proportion of weak base functionality at the expense of the strong base groups plus a small (almost insignificant) loss of total capacity. The degradation processes are accelerated at higher operating and regenerant temperatures and the loss of total capacity becomes significant when operating close to or above the maximum recommended operating temperatures for the given resin type. Hence it is important to convert the resin to the exhausted or chloride forms prior to shut-down or storage. This also avoids the spread of amine odour which develops when hydroxide form anion resin is stored.

Purolite weak base anion resins are more stable and can be stored in both free base or chloride form. For reasons of maintenance of disinfection the chloride form, immersed in brine, may be preferred for storage of used resin.

Purolite strong and weak acid cation resins are quite stable in terms of ion exchange capacity. However, the hydrogen form of strong acid resins, after relatively short storage times, produces a colour throw as a result of trace leachables which diffuse from the resin matrix. A regeneration and rinse is recommended prior to use. The sodium form is more stable. However, where the treated water is intended for potable use, suitable pretreatment as specified by authorities such as the Food and Drugs Administration of the United States of America, should be used.

Cautionary Note

If cation or anion resins are left to dry out in the presence of excess nitric acid at elevated temperatures there is a risk of explosion. Before storage of resins in the nitrate form is contemplated a knowledgeable source should be consulted. For full details on safe handling of ion exchange resins or copolymers please consult the relevant Purolite safety data sheet.

■ Precipitation and corrosion

Care should always be taken to choose an ionic form of resin to be stored which avoids the possibility of corrosion and or precipitation. For example resins with a high content of hardness should not be left in water high in bicarbonates. Calcium carbonate could be formed which can block collector systems, foul the resin, and cause deposits which can set up corrosion on metallic parts. Such problems may occur when contaminant ions are oxidised or become insoluble as a result of changes in temperature.

Food Industry

The use of formaldehyde or quaternary ammonium salts may not be acceptable where the treated water is for potable use. A variety of alternatives is available. Use of peracetic acid is recommended. Details can be obtained from your local sales office on request.

Where resins are being used for the treatment of sugars, fruit juices and other beverages for human consumption, the beds should be sweetened off, regenerated and brine treated prior to treatment with the recommended sterilising treatment.

Types of Packaging

Purolite Ion Exchange Resins are available in :

- 25 litres and 1cu.ft. (USA) bags shrink-wrapped in polythene and palletised.
- Polythene lined plastic drums of 50 litres and 1cu.ft. fibre board kegs (USA).
- Lined fibreboard drums of $5ft^3$ (USA) and 150 litres capacity; also steel drums of 150 litres.
- $1m^3$ octabin cardboard containers, palletised.
  $1m^3$ polypropylene bags palletised.
- Alternative special packaging is also used for certain products such as pharmaceutical. Other specific style packaging will be considered on request.

CAUTION: Palletised bags should preferably be single stacked. However if space is limited double stacking can be employed but we would advise separation with pallet boards.

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The Purolite Company and Purolite International Limited have one of the most complete ranges of ion exchange resins worldwide. For further information please contact your local Purolite office.

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