

Macroporous Resins

Macroporous resins are manufactured with discrete holes in the polymer. These holes act in a physical manner to provide stress relief. The advantage of macroporous resin beads is physical toughness. The disadvantage is the relatively lower capacity of the macroporous resin, up to 15 to 20 percent of gel resins.

Macroporous resins generally have higher crosslink levels in the polymer which provides greater oxidation resistance. This type of resin is useful in strong oxidizing environments, such as in the electroplating industry, where it is used for the treatment or rectification of chrome plating baths.

The macroporous structure lends a higher surface area to the bead which can be useful in some applications like organic scavenging. The porosity of the gel phase of the bead is also important.

When the resin is used in high flowrate condensate polishers where it is serving as an ion exchange resin and filter for particulate matter, it undergoes physical and thermal stresses simultaneously. While these “stresses” acting by themselves may not hurt the resin beads, acting together they have been known to cause resin failure in as little time as a single cycle.

During operation, pressure drops can reach 100 pounds per square inch (seven atmospheres) causing physical stresses. When the resin is in service and polishing condensate, temperatures can go up to 140°F. In condensate polishing, most mixed bed resins are regenerated externally by using a water line to sluice the exhausted resins from the service vessel to a centrally located regenerating station. In the winter the water used to sluice the resin can be as low as 35°F. Therefore the resins undergo physical stress during sluicing and temperature induced stress when the temperature changes suddenly from 140°F to 35°F. Any of these stresses alone, generally, will not hurt a resin. These stresses in combination, however, will have a far greater impact on the resin’s physical integrity.

Making a higher crosslink gel resin does not always work out because of the increased osmotic forces that are also created by having a higher crosslinking level. That’s where the benefit of a macroporous structure comes in (stress relief).

