REV 0421

Nitrate Removal

The EPA limit on nitrates in potable water supplies is 10 ppm as N, or 44.3 ppm as NO_3, or 35.7 ppm as $CaCO_3$.

ResinTech SBG2, a Type 2 anion resin, ResinTech SBG1, a Type 1 anion resin, or ResinTech SIR-100, a nitrate selective resin, can be used in the chloride form to remove nitrates. The resin is regenerated with dilute brine, usually at 10 pounds per cubic foot. When operated in the chloride cycle (sodium chloride regeneration), the resin will not exchange for CO_2 or silica. Recommended service flow rate is 3-5 gpm/cu.ft.

STANDARD RESINS - RESINTECH SBG2 AND SBG1

Although highly selective for nitrates, ResinTech SBG2 and SBG1 are more selective for sulfates than for nitrates. These resins can also exchange chloride for bicarbonates and are routinely used to do this in dealkalizers.

Initially, all anions are replaced by chlorides. The effluent sulfates will be very low throughout the run. Bicarbonates will be exchanged for chlorides in the first part of the run, then pushed off the resin in the latter part of run. Nitrates will be low throughout the run unless the unit is run past its nitrate capacity. In normal drinking water concentrations, sulfate has a higher affinity for SBG1 or SBG2 than nitrate. Because of this, the sulfate occupies the top portion of the bed, and the nitrate, which has the second highest affinity for the resin, take the next position. On OVER EXHAUSTION the sulfate will displace the nitrate, so that the nitrate concentration will rise quite sharply to a level IN EXCESS OF THE NITRATE LEVEL IN THE RAW WATER. This phenomena is called dumping.

pH will be reduced during the first part of the run due to the removal of alkalinity and increased above the influent pH once bicarbonates, (alkalinity) begin to leak. Chlorides will be equal to the sum of SO_4, Cl, HCO_3 and NO_3 during first part of run and equal to SO_4, Cl, and NO_3 during the latter part of the run.

Since the anion unit is salt regenerated, materials of construction may be the same as for a water softener. Also, since no caustic is used for regeneration, the influent to the unit does not need to be softened.

SELECTIVE RESINS - RESINTECH SIR-100

ResinTech SIR-100 has a much lower affinity for sulfate, so much so that it avoids nitrate dumping which can happen when a regular resin such as SBG1 or SBG2 is run past the exhaustion point.

ResinTech SIR-100 is commonly called a nitrate selective resin. The term nitrate selective resin is actually a misnomer. In fact, all of the commonly referred to nitrate selective resins are non-selective for sulfates and other polyvalent ions. This leaves nitrates as having the greatest affinity for the resin. Sulfate and chlorides have about the same affinity for ResinTech SIR-100.

ResinTech SIR-100 has larger molecular groups at the exchange sites and a greater level of porosity to enhance kinetics. Because of this, it has a lower total capacity than standard resins like ResinTech SBG1 and SBG2.

On exhaustion, the nitrate concentration climbs gradually until it reaches the same level as the raw water. Nitrates will not exceed their influent levels. Sulfates, however, break before nitrates and will rise to levels higher than the inlet sulfate levels due to dumping. The sulfate levels can achieve a level equal to the sum of the nitrates and sulfates before coming back to the same level as the sulfate concentration in the raw water.

NOTE: Nitrate values are usually reported either as the Nitrogen Atom, the Nitrate Ion, or as the Calcium Carbonate equivalent. The calcium carbonate value is the one used for most ion exchange calculations in North America. To convert from values reported as "N" to their calcium carbonate equivalent, multiply them x 3.57, i.e. (N X 3.57 = as $CaCO_3$.) Likewise to convert values reported as nitrates (NO_3) to $CaCO_3$, multiply them by 0.80645, i.e. (NO_3 x 0.80645 = as $CaCO_3$.)

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INNOVATIONS IN ION EXCHANGE

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