RESINTECH INC
INNOVATIONS IN ION EXCHANGE

TECHNICAL DATA SHEET

DEALKALIZATION BY ANION EXCHANGE

Dealkalization by chloride-anion exchange is a process that treats softened water with a chloride form anion resin, removing anions such as bicarbonates, carbonates, sulfates, and nitrates. These anions are exchanged for chloride ions.

The anion dealkalizers are primarily used to remove alkalinity from boiler feedwaters. This prevents the formation of insoluble carbonate precipitates in the boiler tubes and stops corrosion due to the presence of carbonic acid.

The resin of choice for this system is a Type 2 strong base anion resin, ResinTech SBG2. When regenerated by salt alone (typically at a dosage rate of 5 lbs/cf), the anion dealkalizer will remove 90-95% of the carbonate (CO_3) and bicarbonate (HCO_3) alkalinity as well as 99% of the sulfates (SO_4) and nitrates (NO_3). The dealkalizer will give substantially higher capacity when regenerated with both salt and caustic soda (5 lbs/cf NaCl plus 0.25 lbs/cf NaOH).

Removal of alkalinity and CO_2 is enhanced by this addition of caustic because these ions exchange more efficiently with hydroxide ions than with chloride ions. It also results in a higher effluent pH.

The leakage of alkalinity from the resin bed depends on the regeneration efficiency. Bicarbonate ions are pushed down through the bed during regeneration and some of these ions remain near the bottom of the bed and are the first ions to come off the resin, appearing as leakage, during the service run. The amount of bicarbonate leakage that appears is directly related to the total dissolved solids (TDS) and the percent alkalinity in the influent.

This method of alkalinity removal is generally economical for boiler plants where the treated water requirements are not too stringent and where the (TDS) content of the water is low to moderate. An important consideration here is the elimination of any acid handling in the process.

PRETREATMENT REQUIREMENTS

When salt and sodium hydroxide are both used as regenerants, soft water must be used for regeneration, and a softener must be used in front of the dealkalizer. When salt only regeneration is used, soft water is required during regeneration when carbonates or hydroxides are present in the raw water. A sodium cycle softener should be placed before the anion dealkalizer to prevent any possible precipitation of calcium carbonate or magnesium hydroxide in the anion bed.

The water softener should be selected based on water usage, flow rate, etc. When selecting the water softener, make sure to consider the amount of water that will be used for the regeneration of the dealkalizer. This additional water usage through the softener is typically a 10-25% increase in water usage.

CAPACITY CALCULATIONS – ResinTech SBG2

1. Salt regeneration - 5 lbs/cu. ft. NaCl

$$175{,}000 \times \frac{\text{Percent Alkalinity}}{\text{sppm Alkalinity as } CaCO_3} = \text{Gallons / cu. ft.}$$

2. Salt and Caustic regeneration – 5 lbs./cu. ft. NaCl plus 0.25 lbs./cu. ft. NaOH

$$230{,}000 \times \frac{\text{Percent Alkalinity}}{\text{ppm Alkalinity as } CaCO_3} = \text{Gallons / cu. ft.}$$

Calculations assume 2.5 ft. minimum bed depth, service flow rate of 2 gpm/cu. ft., and 10% alkalinity endpoint.

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