

Cation Polishing

ACHIEVING HIGH PURITY WATER WITH THE USE OF CATION POLISHING

In a normal operating two bed demineralizer, the effluent quality is primarily indicated by the amount of sodium leaking off of the cation unit. The cation bed is operated in the hydrogen form. The anion bed is operated in the hydroxide form.

After exiting the cation unit, the sodium ion remains as a salt and when it subsequently passes through the strong base anion unit it becomes NaOH. The presence of this NaOH is what causes a slightly elevated effluent pH and is the primary contributor to conductivity. The table below shows the water quality expected at different effluent sodium levels.

To improve the effluent quality from a two bed demineralizer system, a mixed bed ion exchange polisher may be installed. This will remove the residual ions that leak from the two bed system, such as sodium ions from the cation unit and silica ions from the strong

base unit. The net result is an ultrapure water effluent with very low levels of ions, high resistivity, and neutral pH. (Note – it is difficult to measure the pH of ultrapure water unless it is monitored with an inline pH probe.)

Another method that can be used to improve the effluent quality of a two bed system is to install a polishing cation unit. This third column can use strong acid or weak acid cation resin, and is smaller than the primary cation. It removes any residual sodium hydroxide present in the anion effluent, thereby decreasing conductivity and bringing the pH down to neutral. It offers the benefit of being very simple to operate and regenerate, and may not require any additional acid, since the acid regenerant can be passed through the cation polisher and then put through the first cation unit to regenerate it.

The cation polisher is a simple, cost-effective method to produce high purity water that is neutral in pH, very low in sodium, and close to the theoretical minimum conductivity.

SODIUM LEAKAGE FROM THE PRIMARY CATION UNIT <i>Na, ppm as CaCO₃</i>	STRONG BASE ANION EXCHANGE RESIN EFFLUENT		
	pH	Conductivity <i>micromhos</i>	Resistance (<i>leakage as NaOH</i>) (<i>ohm-cm</i>)
0.02	7.5	0.1	10,000,000
0.14	8.4	0.7	1,400,000
0.4	9.0	2	500,000
0.8	9.5	4	250,000
4.0	10.0	20	50,000

