

Heavy Metals Removal

Ion exchange is an efficient tool for removing objectionable materials from dilute industrial waste waters, especially heavy metals. However, these “dilute wastes” usually contain other materials that do not pose a problem but can interfere with the efficiency of the ion exchange process.

These interfering substances can often be eliminated by softening or deionizing the water before it is used in the process. Recirculating rinse waters through an ion exchange bed back to the rinse process can further enhance efficiency. This prevents interfering substances from entering the waste stream; especially calcium, magnesium, and sodium ions which are present to varying degrees in ordinary tap water. This allows the ion exchange waste treatment step to operate in a more efficient manner, usually with a less expensive resin such as ResinTech CG8. This approach can provide substantial savings over the long term in reduced regenerant and makeup resin expenses.

When it is not practical to change the quality of the water provided for rinsing or washing, and interfering substances such as calcium and magnesium can not be eliminated, then special types of ion exchange resins are used. These selective ion exchange resins have specialized functional groups that form complexes with specific substances. There are several different kinds of these resins. Each type of selective resin offers unique characteristics for, at best, only a few ions, therefore it may sometimes be necessary that more than one kind of resin be used for complete removal of all objectionable substances. The table below is a generalized guide for the most efficient ResinTech product for specific ion removal based on the application and type of feedwater.

METAL	HARD WATER DEIONIZED WATER	HARD WATER SOFTENED WATER	WITH pH ABOVE 6.5	WITH pH LESS THAN 6.5
Mercury*	WBMP	WBMP	WBMP	WBMP
Zinc	CG8	CG8	WACMP	SIR-300
Cadmium	CG8	CG8	WACMP	SIR-300
Lead	CG8	CG8	CG8	SIR-300
Copper	CG8	CG8	WACMP/SBMP1	SIR-300
Nickel	CG8	CG8	CG8 or WACMP	SIR-300
Chromium	CG8	CG8	CG8 or WACMP	SIR-300
Cobalt	CG8	CG8	CG8 or WACMP	SIR-300
Silver**	SBG1	SBG1	SBG1	SIR-400

*Mercury can form anionic complexes in the presence of chlorides.

**In photo finishing waste, silver is removed as the thiosulfate complex.

The pH plays an important role in deciding between the various kinds of selective resins. All of these resins to varying degrees have very high affinities for the hydrogen ion. In most cases the selection between weakly acidic cation resins and chelating types is entirely based on the effect the pH plays in the operating capacity of these resins. The chelating types can operate in a lower pH range than the weakly acidic types, however, the weakly acidic types have a higher operating capacity and are less expensive. Both weakly acidic and chelating resins are able to select most of the heavy metal ions preferentially over the common ions found in water like calcium, magnesium and sodium. Standard strong acid cation resins like ResinTech CG8 can select most heavy metals over sodium but cannot select them over calcium or magnesium. This resin is usually limited to use on waste waters where the raw water going into the process was either softened or demineralized.

