Which Class of **Mixed Bed Resin** is Best for You?

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Summary: *Many users of mixed bed ion exchange resin are not aware that the industry offers several classes of resin products. How do you know if you're using the correct resin for your application? What's the difference between nuclear and various grades of semiconductor or electronics resins? What about general purpose, industrial grade resins? This article describes in general terms the various classes of mixed bed resins available on the market, and is meant as a guide to selecting the proper product for your application.*

Sometimes manufacturers "muddy the water" of mixed bed resin selection by constantly refining product lines. In most instances, however, manufacturers truly try to listen to what customers are saying and develop resin products to meet their needs. The result in the ion exchange marketplace is an abun-dance of products developed to meet specific customer needs.

By understanding your options and selecting the proper resin for your application, you can improve the profitability of your business. It's wasteful to use a resin system designed for the highest semiconductor quality requirements made when your application is standard commercial use, such as dilution water for personal care products or parts washing. On the other hand, it can be painful—if not impossible—to achieve the highest water quality when using a standard resin.

Typical water specification

Most users of deionized (DI) water have water quality specifications for their application. These specifications frequently include water resistivity or conductivity, hardness, alkalinity, pH and total dissolved solids (TDS)

Additionally, application specifications include limits on the maximum concentration of contaminants such as: chlorides, silica, total organic carbon (TOC), heavy metals, particles and bacteria.

These specifications don't directly define the type or class of resin needed to produce the desired water quality. There are several industry-wide waterquality standards developed for spe-cific markets (see Tables 1-3).

Historical review of resins

The commercial manufacture of synthetic zeolites (ion exchange resins) began about 60 years ago. The first synthetic cation resins were manufac-

Table 1.
ASME recommended feedwater quality water tube boilers—301-to-600 psi

Water purity	1.0 ppm TDS maximum
Total hardness	< 0.30 ppm as $CaCO_3$
Total iron	< 0.05 ppm as Fe
Total copper	< 0.03 ppm as Cu
Total Organic Carbon	< 1.0 ppm as C
Oil and grease	< 1.0 ppm
Dissolved oxygen	< 0.007 ppm as O_2
pH range	8.3-to-10.5

Table 2.
ASTM Standard for E-1 electronics grade water

Resistivity, minimum @ 25°C	18 MegOhm cm
Silica (SiO_2), total	5 ppb
Sodium	500 ppt
Potassium	2 ppb
Chloride	1 ppb
Nitrate	1 ppb
Phosphate	1 ppb
Sulfate	1 ppb
Copper	1 ppb
Zinc	500 ppt
Nickel	100 ppt
Total Organic Carbon (TOC)	25 ppb

Table 3.
SEMI Guidelines 1992—acceptable levels

Resistivity at 25°C	18.2 MegOhm cm
Silica (SiO_2), total	3 ppb
Sodium	50 ppt
Potassium	100 ppt
Chloride	100 ppt
Nitrate	100 ppt
Phosphate	100 ppt
Sulfate	100 ppt
Copper	50 ppt
Zinc	60 ppt
Nickel	50 ppt
Total Organic Carbon (TOC)	2 ppb