

# Chromium Compliance



By Scott Rogers & Mike Waite

Achieving compliance  
with California's  
hexavalent chromium  
MCL with ion exchange

In 2014, the California Department of Public Health set a new maximum contaminant level (MCL) for hexavalent chromium (chromium-6) in drinking water. Chromium-6 levels in the aquifer beneath the Coachella Valley exceed the state's new standard, so the Indio Water Authority, like others in the Coachella Valley and across the state, took steps to comply with the new limit.

## Early Mobilization

Indio mobilized quickly to achieve compliance. Anticipating the new MCL, water officials in the Coachella Valley town of nearly 90,000 people began exploring possible treatment options.

Traditional ion exchange systems were considered the best available technology for Indio. While the process is proven and reliable, it is also costly and inefficient because of the substantial waste generated.

Ionex SG's ion exchange technique was shown to Indio in early 2015. Through the company's IXP pilot program, the technique demonstrated applied chemistry and fluid dynamics process improvements. The innovations helped reduce equipment costs to one-tenth of the cost of traditional ion exchange systems.

Compelled by these advantages and further assured by observing another chromium-6 installation at Soquel Creek Water District in Soquel, Calif., Indio selected Ionex to treat its water.

## Built From the Ground Up

The Ionex system is engineered to improve resin bed performance efficiency. It achieves this by focusing on two key steps: loading, which captures the chromium-6, and regeneration, which removes it.

The system optimizes the loading process with custom-designed, high-efficiency water distributors. Water is evenly delivered across the entire resin bed for uniform saturation and maximum bead loading. This is combined with taking process control to new levels, thereby ensuring the best possible utilization of the resin beads. This enables higher water flow and reduced resin bed volume.

As water flows downward, chromium-6 and other anions such as nitrate, sulfate and bicarbonate exchange for chloride ions on the resin beads, fully loading the bed to its maximum capacity. The resin has a number of specific chromium-6-selective sites, which continue to remove chromium-6 from the water after the resin's ability to remove more common anions has been exhausted. Normally, an ion exchange resin would require regeneration once a day, but by applying its selective regeneration method, Ionex scientists have shown that regeneration is necessary only every two to six weeks, which reduces the amount of chemicals needed to run the plant.

Once loaded, the resin requires regeneration to remove the chromium-6 and enable the resin to be reused.

With the selective regeneration process, the sulfates and bicarbonates are removed first via a super-dilute brine rinse, which then is returned to the treatment plant. This process reduces waste volumes by as much as 80%.

Having removed the sulfate and bicarbonate first, the chromium-6 can be removed in a small volume by increasing the strength of the brine solution. Without first removing the sulfate and bicarbonate, the volume of waste produced is six to 12 times greater. The small waste volume of super-concentrate brine produced is suitable for safe disposal or reuse.

Finally, the ion exchange column is rinsed with softened water to remove the last traces of brine from the resin bed, at which point the column is ready to continue treating water. Ionex recovers all of this rinse water and reuses it on the next regeneration.

The process is scalable, able to meet community flow requirements from 50 to 5,000 gal per minute.

## Waste Finds Safe Passage

With the exchange cycle complete, the waste is ready for safe disposal. For this critical part of the process, Ionex partners with a hydrometallurgical recycler.

The firm brings its expertise in waste recovery, basic chemicals and end-use chemical processes to responsibly dispose of Indio's waste. The collaboration adds a layer to Ionex's service offering, and relieves Indio of the transportation burden associated with waste disposal.

The recycling firm collects waste material from the installation and, using its fully equipped and permitted private transportation system, carefully carries it to its waste treatment facility, where the chromium-6 is converted to a non-toxic form.

## A Complete Treatment Solution

By collaborating throughout the research, design, build and operation phases, the Indio installation was completed on schedule. The system continues to improve its performance and efficiency, and is generating less waste than typical ion exchange systems. Most importantly, by investing in a system with lower lifecycle costs, Indio quickly and efficiently achieved compliance with the new chromium-6 MCL without raising water rates. Moreover, the community is assured that waste from the site is being handled with care and deference to its environmental priorities. **w&wd**

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