Sorbster

Ecologically Effective Contaminants Adsorption

Sorbster® Selenium Removal System

The Sorbster® Selenium Removal System treats selenium contamination in industrial process, ground and wastewater systems. The system combines Sorbster® Se-1, a highly effective adsorbent media for selenite and selenate removal with selected pretreatments to maximize selenium removal. Pretreatments utilizing a silica removal media, Sorbster® Si-1, and low inlet water pH are especially effective in maximizing selenate removal rates by Sorbster® Se-1 and maintaining selenium removal capacities in higher ionic strength waters. The Sorbster® system is recommended for all waters requiring selenium removal that contain 2 or greater mg/L of soluble silica.

Process Description:

| pH reduction tank | → | Sorbster® Si-1 Media for Silica Removal | → | Sorbster® Se-1 Media for Selenium Removal | Treated Water → |
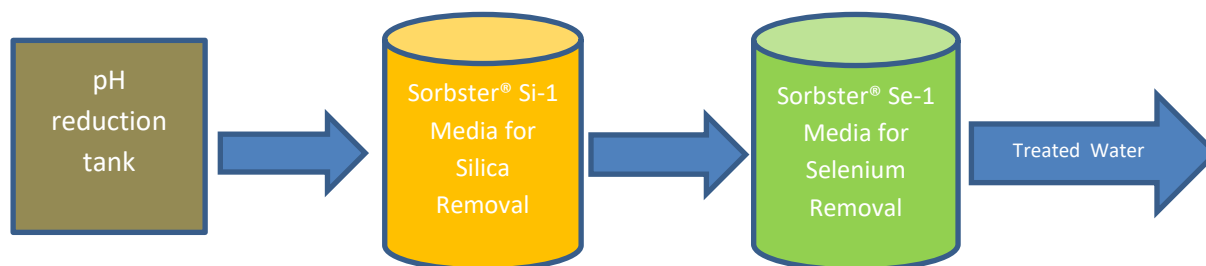
pH/alkalinity reduction pretreatment is a benefit in selenium treatment utilizing Sorbster® media. A pH adjustment with acid minimizes any competing anion effects of bicarbonate alkalinity to selenate removal sites. Ideally, reduction to pH 3 provides the maximum selenium removal but pH reductions to 6 typically provide a boost in selenium removal. Hydrochloric acid is the preferred acid over sulfuric because it does not introduce additional sulfate competing anions to the system. Organic formic acid can also be utilized because as a natural reducing agent, formic acid provides the additional benefit of selenate reduction to less oxidized forms of selenium that can be easier to remove.
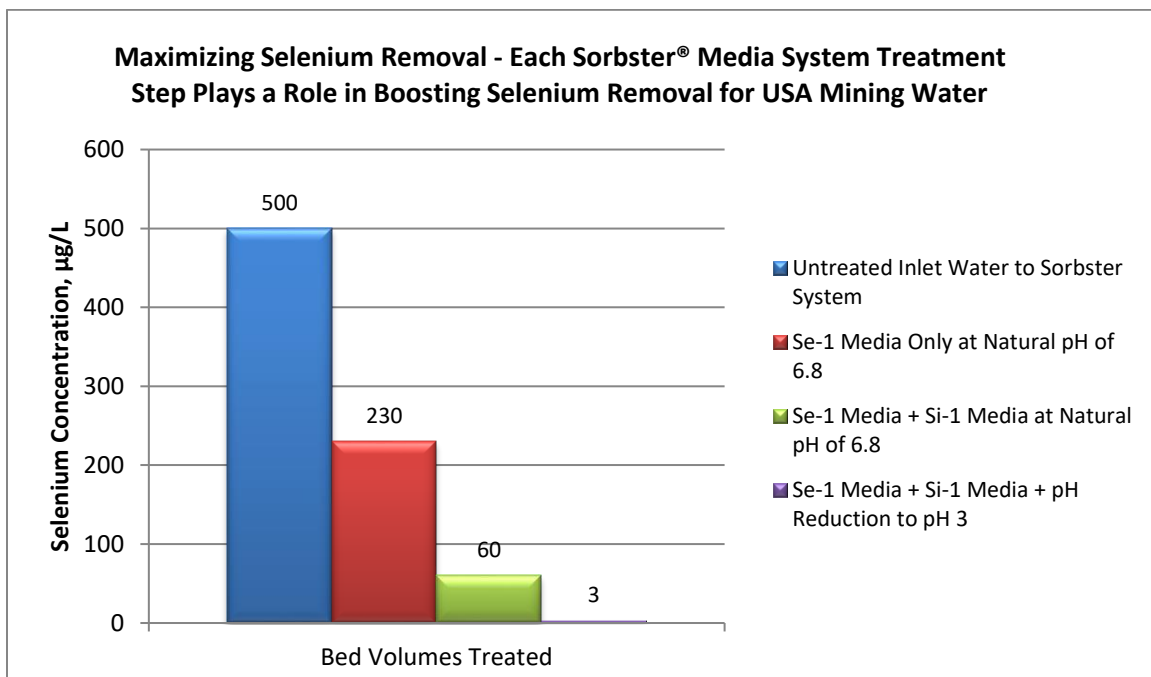
The Sorbster® Si-1 pretreatment media prior to the selenium removal media in the system conditions the water for selenate removal by removing the silica competing anion. Soluble silica reacts readily with the activated alumina composition of this high macroporosity media and is removed at levels of >90%. Silica removal in this leg of the system ensures that the maximum number of active sites for trace selenate remain available throughout the Se-1 media for utilization by selenate and not silica. The silica removal media also has the capacity to remove fluoride at mg/L levels, another competing anion to selenate, that often is present in FGD and mining waters. The silica media does not remove selenium but conditions the water for selenium removal by the Se-1 media and should always be used ahead of the Se-1 selenium removal media.

The Sorbster® Se-1 media for selenium removal is a specially manufactured functionalized activated alumina that contains specific active sites that complex rapidly with both selenite and selenate anions to bond them tightly throughout its high surface area. These two selenium anions prefer different active sites on the media with the result that both are removed simultaneously to provide significant reductions in total selenium levels.

Maximized Performance

A USA mining water containing 500 µg/L of selenium contamination as selenate, 65 mg/L of soluble silica, 530 mg/L total alkalinity as CaCO3 and 550 mg/L sulfate was treated by the Sorbster® System to achieve selenium discharge levels of < 5 µg/L selenium for the mine site.

- The Sorbster® Se-1 media used alone for this water reduced the selenium by 54%.
- Removal was boosted when the silica pretreatment media Si-1 was added ahead of the Se-1 media – the silica pretreatment media reduced the silica from 65 mg/L to 1.7 mg/L and the selenium removal jumped to 88%.
- When a pH reduction with hydrochloric acid pretreatment step was implemented prior to water flow through the two medias, the selenium removal jumped further to 99%. The pH reduction step reduced the total alkalinity from 530 mg/L to 10 mg/L.
- The system controlled silica and alkalinity anions to provide a high level of selenium removal

Maximizing Selenium Removal - Each Sorbster® Media System Treatment Step Plays a Role in Boosting Selenium Removal for USA Mining Water

Sorbster® Media Selenium Removal System Benefits

- Excellent water quality
- High efficiency and capacity
- Simple design and application – fixed bed adsorption process
- Customizable to each water stream
- Insensitive to water quality fluctuations