

## Fluoride Removal by Sorbster® Media

### Fluoride in Industrial Water

Fluoride pollution persists in selected industrial waters and is a regulated contaminant. Historically, activated alumina is known to adsorb fluoride from water and is optimally applied at a pH of 5 to 6. Sorbster® media combines the fluoride removal properties of an activated alumina substrate with additional proprietary active chemistry adsorbent sites to provide a superior product capable of providing high capacity fluoride removal across a broad range of operating conditions. At both high and low levels of fluoride, Sorbster® media has demonstrated sustained removal of the fluoride anion in refinery, FGD and general industrial wastewaters.

### Refinery Tank Clean Out Application with Sorbster® Media

Three million gallons of wastewater containing 70 mg/L of fluoride stored in a refinery tank were processed through Sorbster® F-1 media to enable quick turnaround of the tank during refinery process changes. In 35 days, all three million gallons were treated through 80,000 lbs. of Sorbster® F-1 at an average water flow rate of 60 gpm. Occasionally, the rate was as high as 200 to 600 gpm. The Sorbster® media treated water measured a removal rate of 98% and attained a fluoride level of < 1 mg/L. In all, 1,750 lbs. of fluoride were removed and only 2.2 weight % capacity of the media was used. Following the treatment, the media had the option of retention for use in other tank clean outs or because it passed an EPA TCLP leaching test, the refinery had the option of disposal in a non-hazardous landfill.

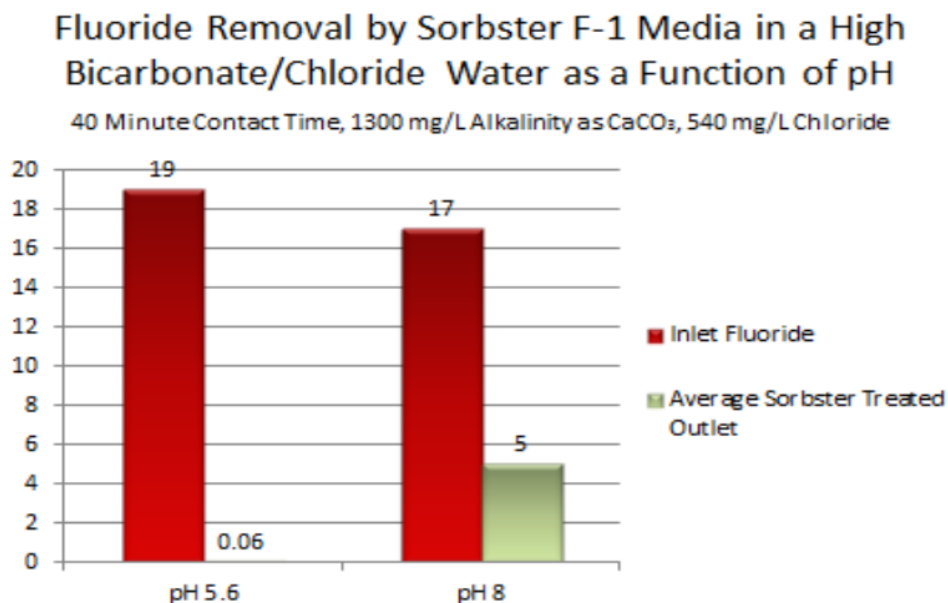
- 3,000,000 gallons of 70 ppm fluoride water processed in 35 days – tank back in service quickly
- Discharged at < 1 mg/L fluoride – 1750 lbs. fluoride removed
- Media placed in rented frac tank fitted with simple distribution piping – quick into operation
- Significant time and cost savings over barge storage, dilution, additional tank construction

### Results for Other Waters

Water Type	pH	Column Inlet, ppm Fluoride	Column Outlet, ppm Fluoride	% Fluoride Removed
Mining Tailings Pond	8.0	0.66	Not detected, <0.05 ppm	>90%
Refinery Rinse Out Water	6.2	30	1.7	94%
Refinery Effluent Wastewater	7.2	1.2	0.1	92%

### Technical Application Guidelines

Fluoride removal is influenced by two operating parameters, the pH of the water and the amount of time that the water and media are in contact. Removal can be enhanced by maintaining the pH between 5 and 6 and by maximizing the water-to-media contact time. Both of these factors have a positive correlation with an increased removal rate. In the example below, strong removal is evident across the pH range of 5.5 to 8 but the highest level of removal is obtained at the lower pH, where the fluoride was reduced from 17 mg/L (ppm levels) to 60  $\mu$ g/L (ppb levels) at a 40 minute contact time.



The recommended application guidelines for use of Sorbster® media for fluoride removal include keeping the water pH as close to neutral (pH 7) as possible and maintaining an empty bed contact time of at least 20 minutes. The presence of other water constituents typically do not impact the media's ability to remove fluoride, although high levels of competing anions such as sulfate over 1000 mg/L may have a minor negative effect. Sorbster® media's primary mechanism of removal is by chemisorption of soluble fluoride at sites throughout its pore structure. It is sized for maximum contact and water flow through its surface and porosity.