

MAR Systems' Sorbster™ Media

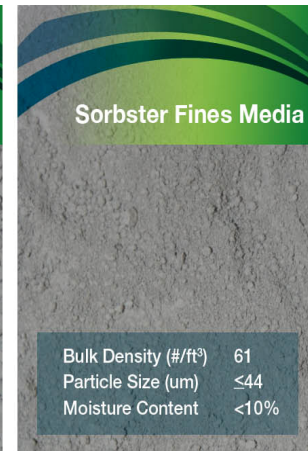
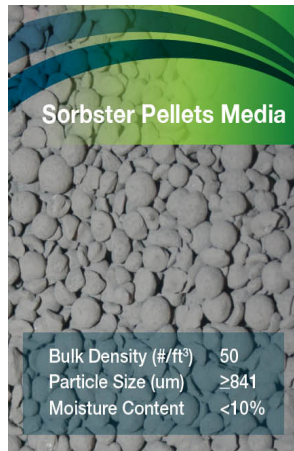
A FASTER, CHEAPER, GREENER Mercury Removal Solution

MAR Systems offers customers an economical and environmentally safe solution for removing metal contaminants such as mercury from water.

MAR Systems' core technology is its Sorbster brand of products, a media that provides clients the opportunity to cost-effectively reduce industrial discharges to the environment and clean up legacy contamination issues, thereby mitigating the conflict that has historically occurred between industry and the environment.

Through MAR Systems' ongoing R&D efforts, the company has developed an innovative, proprietary process that reduces mercury concentration in water streams to below detectable limits.

The same technology has shown reductions in a variety of other heavy metals.



Sorbster media is effective at all mercury concentrations across a wide range of water quality and temperatures. Applications of Sorbster represent a variety of industrial water conditions and mercury levels. Meeting new mercury discharge limits at part per trillion targets is achievable with Sorbster media, as it readily attains very low ppt mercury levels.

Sorbster media has a capacity for mercury removal up to 75 weight percent mercury to media, and Sorbster media can be applied in standard vessels designed for water flow through. Once capacity is attained, Sorbster media passes EPA TCLP leaching tests that enables disposal of mercury laden Sorbster into non-hazardous landfills.

CONTAMINANTS REMOVED:

Mercury Selenium Arsenic
Hexavalent Chromium Vanadium Molybdenum

SORBSTER MEDIA FEATURES/BENEFITS:

- Removal of metals to meet/exceed permit regulations
- Less frequent replacement required due to high adsorbent capacity
- Works effectively with high flow rates
- Passes TCLP test, creating non-hazardous disposal option
- Performs across a broad pH range of 3-12

APPLICATIONS:

- Commercial and industrial treatment units with contaminated water
- Process streams
- Municipal water treatment
- Flue gas desulfurization
- Wastewater treatment
- Mining
- Oil field produced waters



MAR SYSTEMS

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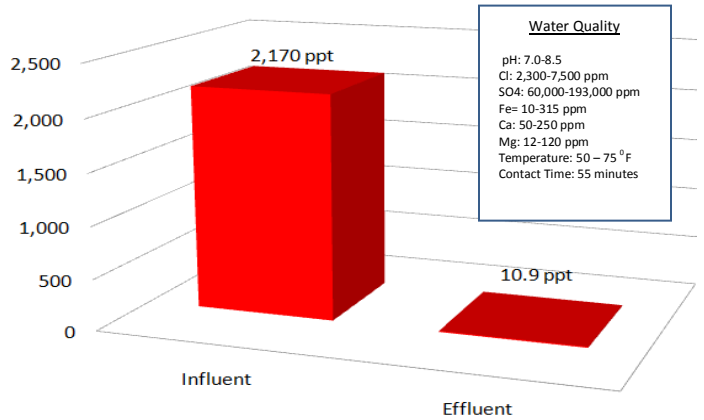
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Case Studies:

At a chemical manufacturing plant, mercury present in raw materials carries into the discharge effluent. Much of the mercury is insoluble and during a wastewater pH neutralization step, calcium, iron and any soluble mercury precipitate as carbonate and sulfate salts to form a turbid water.

Understanding and characterizing the water was important for designing the Sorbster process. In this case, the mercury required oxidation pretreatment and the wastewater pH adjustment was minimized to reduce turbidity. With oxidation pretreatment, the mercury was successfully removed from 2170 ppt dissolved mercury by Sorbster media to 10.9 ppt, well below the 20 ppt target of the plant.

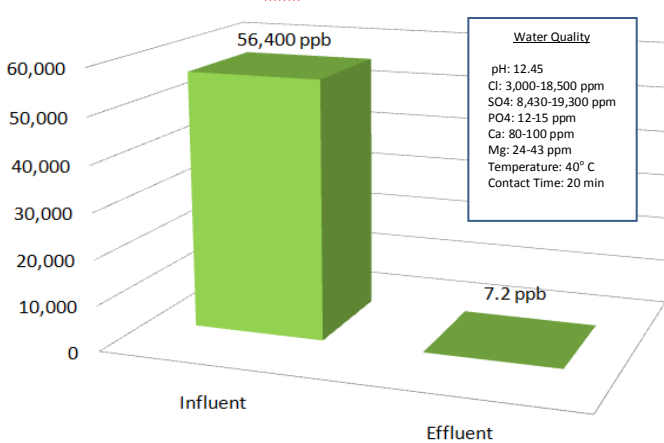
Mercury Removal to Very Low ppt Levels in a Chemical Plant Wastewater Field Trial with Sorbster Media Following Oxidation Pretreatment



A chlor-alkali plant had high levels of mercury in its wastewater following mercury cell caustic manufacturing operations. This water was classified as hazardous as it contains 56,400 ppb (or 56.4 mg/L Hg.) Sorbster media was evaluated in lab studies as a primary treatment to reduce the mercury level. With a water stream contact time of 20 minutes through a Sorbster media packed bed, the mercury was reduced from ppm 56,400 ppb to 7.2 ppb.

This water had unusual characteristics of very high anions and pH, which did not interfere with metals removal performance. Mercury removal was done in the presence of up to 18,000 mg/L chloride and 19,000 mg/L sulfate at a pH of 12.45. Sorbster media performance in this 20 minute pass through the media outperformed the sodium sulfide precipitation process for primary mercury removal currently in use at this plant by achieving single digit ppb mercury levels.

Sorbster Media Removal of Mercury from Chlor-Alkali Plant Raw Wastewater Containing ppm Levels of Mercury



In an application where Sorbster media was applied to polish the water for further mercury removal following a sulfide precipitation mercury removal process, **the sulfide precipitation process effluent contained nucleated and growing mercuric sulfide colloidal particles**. Since mercuric sulfide has a solubility of less than 1.0 mg/L in water, little dissolved mercury was present. To successfully treat this water for further mercury removal, it was oxidized prior to passage through the Sorbster media bed.

Oxidation converted the mercury from insoluble mercuric sulfide to 27,100 ppt as dissolved Hg. This 27,100 ppt of dissolved mercury was then successfully removed by Sorbster to a level of 3.64 ppt, well below the 50 ppt target at this plant. The calcium, phosphate, chloride and sulfate were high in this pH 3 application but none of these variables interfered with metals removal performance.

Sorbster Media Removal of Mercury from Chlor-Alkali Secondary Treatment Wastewater

