



## USDA-CSREES 2006 National Water Quality Conference

### Arsenic Removal from Waters Containing Varying Alkalinity and Silicate Levels using Arsenil™.

USEPA adopted an As Mean Contaminated Level (MCL) of 10 ppb from 50 ppb and the affected communities have to comply with the new regulation. Studies have shown that most adsorptive media perform poorly under one or more of the following water chemistries: 1) high pH, 2) high  $\text{Ca}^{2+}$  and alkalinity, and 3) high silicate, phosphate or fluoride level. The Arsenil™ medium, a natural zeolite coated nanophase Mn-substituted Fe oxide, has high surface reactivity and good water flow property. Also, it is capable of removing As(III) without the use of a pre-oxidation stage. The objective of the study was to test Arsenil™ performance in varying pH,  $\text{Ca}^{2+}$  and alkalinity, and silicate containing waters.

Both, bench scale and pilot scale studies were conducted. The bench scale study showed: 1) the removal of As(III) and As(V) but the percent removal of the latter was higher, and 2) the As sorption was not affected by the presence of either sulfate or silicate ions.

The column studies were performed using Dallas, TX municipal water containing pH 8.2, low alkalinity (76 mg  $\text{CaCO}_3$  per L), and low  $\text{Ca}^{2+}$  and Si levels of 40 ppm and 3 ppm, respectively. The influent water spiked with 38 ppb As with Empty Bed Contact Time (EBCT) of 5 min, and that spiked with 118 ppb As with EBCT of 10 min passed 10,138 and 5,242 bed volumes; respectively, before breakthrough ( $>10$  ppb As) was observed. For the influent water with 17 ppb As and EBCT of 3 min passed 11,900 bed volume with effluent As level still below the detection limit. In case of the column studies with influent water spiked with 25 ppm Si and maintained at pH 7; the column with influent As level of 25 ppb and EBCT of 10 min passed 19,500 bed volumes and the column with 50 ppb influent and EBCT of 15 min passed 10,133 bed volumes before observing breakthrough. The influent water spiked with 50 ppm Si and 25 ppb As and pH maintained at 7; the column passed 5,000 bed columns and effluent As is still below detection limits. No silicate or Ca adsorption was observed by the medium in the Si spiked columns, and in all the studies little to no backwashing was performed. The use of dual serial columns or roughing and polishing columns will significantly improve the As removal efficiency and EBCT.

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