

# Arsenic Removal System for Point-of-Use/Point-of-Entry Drinking Water Systems

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## Environmental Problem

Arsenic contamination in groundwater poses a severe health risk to populations throughout the world. In the United States, the problem is most pronounced in the West, parts of the Midwest, and the Northeast. In response, EPA announced a tougher drinking water standard for arsenic, lowering the standard from 50 ppb to 10 ppb. This change is expected to impact 10% of the nation's community drinking water systems. Although several technologies are readily amenable to incorporation in large water treatment processes, fewer options are available for small water systems, particularly those serving fewer than 500 users.

## SBIR Technology Solution

With support from EPA's SBIR Program, ADA Technologies, Inc., developed and commercialized a complete arsenic removal system for point-of-use/point-of-entry (POU/POE) drinking water systems. The unit combines a highly effective arsenic sorbent with an automatic shutoff feature that prevents overuse of the sorbent media. The unit features ADA Technologies' new Amended Silicate™

sorbent, a material that exhibits high capacity and the ability to remove both arsenite and arsenate, the forms of arsenic that commonly are found in well water. Tested in cooperation with Kinetico Incorporated, the system provides easy-to-maintain hardware for individual home use or deployment in small, centrally managed water systems.

ADA Technologies has continued to improve the performance of the Amended Silicate™ sorbent by modifying the formulation process. Amended Silicate™ recipes were compared to commercial granular ferric hydroxide (GFH). Small-scale column tests compared the performance of V8 (an Amended Silicate™ formulation) with GFH, with and without pretreatment processing. Columns were filled with equal volumes of the two sorbents, but because of the differences in bulk density, roughly four times more GFH was used by weight. Column life ranged from 3,500 to more than 5,000 bed volumes when tested with the arsenic challenge water at pH 8.5. Several electrochemical pretreatment options were tested. An electrocoagulation (EC) process removed arsenic to less than 10 ppb by itself but provided little benefit to the downstream sorbent columns, while use of acidic electrolyzed water pretreatment extended column life by approximately 30%.

## Commercialization Information

Amended Silicate™ cost is estimated at \$0.50 to \$2.00/lb, depending on formulation and production volume. GFH costs are approximately \$3.00 to \$4.00/lb. ADA Technologies and CH2M Hill

(Denver, Colorado) formed a joint venture company, Amended Silicates, LLC, to promote, produce, and market Amended Silicate™ sorbents. The initial focus of the joint venture is commercialization of a mercury-specific form of Amended Silicates™ for mercury control from coal-fired power plants.

Isotherm tests have shown that the Amended Silicate™ can achieve seven-fold higher capacity versus commercial GFH on a mass basis (150% of the capacity on a volume basis) when tested in the arsenic challenge water. This, coupled with the lower estimated cost of the Amended Silicate™, indicates a clear economic advantage for the new sorbent. Electrochemical pretreatment can enhance the performance of arsenic sorbents, but the



ADA developed and commercialized an arsenic removal POU/POE drinking water system using Amended Silicate™ sorbents (pictured above with a dime to indicate scale).

economic value will depend strongly on incoming water quality. EC treatment may be suitable as a primary treatment process for arsenic removal and can be configured to remove silica from drinking water.

ADA Technologies also has secured follow-on funding through a U.S. Air Force SBIR award to field test Amended Silicate™ for use in small municipal systems. The company recently completed assembly of two pilot plants in collaboration with Kinetico, Incorporated.

### Company History

ADA Technologies, a Littleton, Colorado-based firm, was founded in 1985 and has established a solid foundation of proprietary technologies to address a range of commercial opportunities. In October 2000, new ownership implemented a renewed focus on commercialization of technology through licensing, sale, joint ventures, and business manufacturing. ADA Technologies is establishing itself as a preeminent technology commercialization company through the development and implementation of processes to guide the entire technology commercialization cycle.

Amended Silicates, LLC, is a joint venture established between ADA Technologies and CH2M Hill to commercialize the sorbent technology. It represents a significant investment by both parties to take this SBIR technology forward into the marketplace. In addition to ADA Technologies' relationship with CH2M Hill on Amended

Silicate™ production, the company has teamed with Kinetico Incorporated (Newbury, Ohio), a major POU/POE hardware supplier, to address the issue of column design and aid with sensor integration activities. Partnering with an established hard-

ware provider is the most efficient method of introducing the technology into the marketplace.

### SBIR Impact

- Arsenic contamination of drinking water poses a severe health risk to populations throughout the world.
- ADA Technologies developed and commercialized a complete arsenic removal drinking water system that features Amended Silicate™ sorbents.
- ADA Technologies' Amended Silicate™ sorbents can be produced at low cost from common starting materials, making them suitable for domestic and international applications where simple, inexpensive arsenic control is required.
- Isotherm tests demonstrated that ADA's Amended Silicate™ achieves arsenic removal that is seven times better than a leading competitor.