



CALGON CARBON CORPORATION



Arsenic Removal Technologies



Making Water and Air Safer and Cleaner

Calgon Carbon's Commitment to You

For more than 40 years, Calgon Carbon Corporation has been a leader in the municipal drinking water market. From the use of activated carbon technology for taste, odor, color, and VOC removal, to our innovations in UV technology for disinfection, to our development of ion exchange technologies for perchlorate and nitrate removal, Calgon Carbon has been at the forefront of drinking water treatment. Our scientific research and innovative, yet practical, technologies are being used every minute of every day, helping provide safe, clean drinking water to millions of people worldwide.

Our CalSolutions™ technologies offer a total package of media, equipment, and services targeting numerous groundwater remediation and drinking water treatment applications. Using both new and proven technologies, the CalSolutions™ program includes CalMedia™ adsorbents, CalRes™ ion exchange resins, and CalOx™ advanced oxidation technology to meet and exceed the latest water treatment challenges, including:

- Perchlorate
- Nitrate
- Iron and Manganese
- MTBE and TBA
- 1,4 Dioxane
- NDMA

Now, we are applying the CalSolutions™ program to a new problem in water treatment – arsenic removal.

The Challenge of Arsenic in Drinking Water

As the compliance deadline approaches to lower the maximum contaminant level (MCL) for arsenic from 50 ppb to 10 ppb, impacted municipalities are faced with numerous treatment options: adsorption, reverse osmosis, coagulation/filtration, lime softening, and ion exchange. Although all of these technologies can be used for arsenic removal, the adsorption processes offer several advantages to the small or large municipality.

Ease of Operation

Adsorption processes often require little or no maintenance (other than periodic backwashing of the media beds); thereby, freeing an operator's valuable time for other responsibilities.

Efficiency

Through proper system design, adsorption media can easily meet the treatment objective of 10 ppb or less of arsenic to comply with the strictest treatment standards.

Minimal Waste

Adsorptive media are often used on a one-pass basis (the techniques that generate liquid or brine wastes are not used with most adsorptive media). The spent media passes TCLP testing in nearly all circumstances and can be landfilled as a non-hazardous waste.

Minimal or No Chemical Injection Required

At some sites, a simple pH adjustment step may be needed to optimize performance; at other sites, no upstream chemical injection is required to operate adsorption systems.

Multiple Contaminant Removal Possible

In many cases, the adsorptive media used for arsenic removal can also remove other contaminants including chromium, uranium, lead, copper, and radium, allowing for a one-step customized media solution for multiple treatment problems.



CalSolutions™: A Five Step Solution to Arsenic Removal Challenges

Calgon Carbon's CalSolutions™ technology includes several adsorption-based processes which allow for the economic removal of arsenic to below treatment standards with safe, reliable performance. The CalSolutions™ program consists of five steps:

Step 1: Media Options

There are many arsenic removal media commercially available today and many more in development. Choosing which media is best depends on the chemistry of the inlet water, the online timing requirement, operational ease, treatment cost, and the water supplier's location relative to the contaminant plume.

Calgon Carbon can help you determine which arsenic removal treatment system is the right one for your specific needs. We have developed a portfolio of CalMedia™ adsorbents, allowing for economic solutions for even the toughest inlet waters. Our CalMedia™ WTA line of arsenic removal adsorbents includes:

- WTA 200 series: standard and surface-modified activated aluminas
- WTA 300 series: titanium-based adsorbents
- WTA 400 series: modified resin adsorbents
- WTA 500 series: iron-based adsorbents

To date, we have evaluated over a dozen types of arsenic removal media and we continue to work with various media suppliers to develop new adsorptive processes for arsenic removal. As these new technologies approach commercialization, they will be added to the CalMedia™ portfolio, driving down the cost of arsenic treatment.

Step 2: Technical Evaluation/Piloting

Calgon Carbon offers a full staff of Research & Development and Process Engineering professionals to help answer your questions about choosing the optimal adsorptive media.

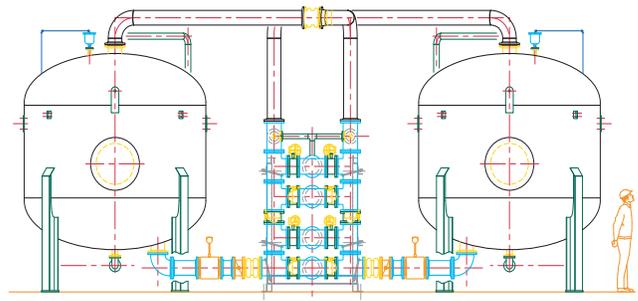
At each step in your evaluation, we can help you choose the best solution for your arsenic treatment problems by applying our technical expertise including support services for dynamic testing in the laboratory, the supply and operation of pilot columns and pilots using our fleet of service adsorbents, and full scale treatment systems.

Step 3: Equipment Selection

Our modular systems feature:

- Quick assembly and shipment with complete package delivery of vessels, piping, instrumentation, and media within six weeks of order
- Simple installation that often requires just placing the equipment on a level surface such as a concrete pad or railroad ties
- Few moving parts requiring less operator intervention and expertise
- The convenience of media exchange by the supplier rather than regeneration

Model 12 CM Adsorption System



Standard designs are available in multiple size ranges. Custom designs to meet specific customer needs are also available.

Modular Systems for CalMedia™ WTA Adsorbents

System Designation	Vessel Diameter, ft.	Flow Rate, gpm (max)	Pipe Size, in.
Model 3 CM	3	50	2
Model 4 CM	4	90	3
Model 6 CM	6	225	4
Model 8 CM	8	400	6
Model 9 CM	9	500	8
Model 10 CM	10	600	8
Model 11 CM	11	700	8
Model 12 CM	12	1,000	10
Model 14 CM	14	1,200	10

Step 4: Ongoing Customer and Technical Service

At Calgon Carbon, we realize the job is not over when the initial system is installed. Customers at thousands of installations across the globe have trusted Calgon Carbon's extensive network of skilled service technicians to provide the support they need every day.

Our site service personnel have the equipment and experience needed to make your on-site media exchange quick, clean, safe, and cost-effective. Once spent media is removed from your site, it is disposed of using methods that are environmentally friendly and in full regulatory compliance. Monthly service fee programs can be set up to cover a variety of services, including:

- Analytical testing of treated systems for regulatory compliance
- Chemical supply management
- Regular equipment inspections and periodic maintenance
- Replacement of spare parts
- System optimization recommendations
- Emergency services

Step 5: Financing Options

For many municipalities, the financial burden of an arsenic treatment system can be challenging. Fortunately, Calgon Carbon can help with flexible financing programs to meet any budget. We can provide both equipment and media on a sale or lease basis, and we offer monthly fee or treatment cost basis programs to provide you with the financial flexibility you need.



The Calgon Carbon CalSolutions™ approach to arsenic removal problems - media selection, media evaluation, equipment systems, and ongoing services - is a proven model to help you deal with the challenge of meeting the upcoming regulations for arsenic in drinking water. Contact your local Technical Sales Representative today to get started.

Company Overview

Calgon Carbon Corporation (NYSE: CCC) has been a global leader in services and solutions for making water and air safer and cleaner and for purifying food, beverage, and industrial process streams. Headquartered in Pittsburgh, Pennsylvania, Calgon Carbon employs more than 1,200 people at 18 carbon manufacturing, reactivation, and equipment fabrication facilities and 27 sales and service centers. Calgon Carbon is known as Chemviron Carbon in Europe, the Middle East, and Africa. Calgon Carbon serves more than 4,000 customers around the world. In 2003, the company's sales totaled \$278 million.

Calgon Carbon's expertise spans many fields, including activated carbon, UV technology, continuous ion exchange, and chromatography. For any application from drinking water purification to pharmaceutical manufacturing, Calgon Carbon technologies are designed to enhance production efficiencies, minimize waste, and remove pollutants - in short, making the world a cleaner, safer place.

www.calgoncarbon.com



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