

A large, dynamic splash of clear water forms a circular ring around the central text. The water is captured in mid-air, with many small droplets and bubbles scattered around the main ring, creating a sense of movement and freshness.

GRANULAR ACTIVATED CARBON  
**REMOVES PFOA FROM  
DRINKING WATER**

*Upstate New York Case Study*

# Granular Activated Carbon Removes PFOA from Drinking Water

## Background

### Upstate New York

In the fall of 2015, a small village on the border of Vermont in New York State, tested positive for Perfluorinated Compounds (PFCs), specifically Perfluorooctanoic Acid (PFOA), in the town's municipal drinking water. The influent levels of PFOA in the water were above 600 ng/L, and thus considered harmful to village residents. Realizing that PFOA was on the U.S. EPA Contaminant Candidate List, the Village solicited the services of engineering firm CT Male Associates to investigate treatment options and provide a treatment system.

In late 2015, CT Male Associates inquired about Calgon Carbon's granular activated carbon (GAC) filtration systems and the ability to remove PFOA from drinking water. Calgon Carbon has been providing a successful treatment solution for PFCs for 15 years. After the EPA issued a "Do Not Drink" notice to the Village, a temporary Calgon Carbon Model 10 two-vessel pressurized carbon system, designed to contain a total of 40,000 lbs of GAC, was rapidly deployed. Upon start up, the Village drinking water was declared safe for public consumption.

## The Solution: Granular Activated Carbon

## The Importance of Testing

### Accelerated Column Test (ACT)

After the temporary system was deployed, an Accelerated Column Test (ACT) was performed to ensure that the proposed permanent system would be adequately sized to meet the PFC treatment objectives. The Accelerated Column Test (ACT) procedure uses a miniature carbon-filled column to simulate the adsorption breakthrough curve that would be obtained by treating an aqueous stream in a large adsorption system. This technique, developed by Calgon Carbon's Research and Development team, has been shown to be accurate in simulating the carbon treatment of a wide range of waters and wastewaters under various conditions.

The column test was designed to simulate the permanent system; the 12 ft diameter vessel containing 40,000 lbs of GAC, operating at 700 gallons per minute, and providing 13.2 minutes of Empty Bed Contact Time (EBCT). The column test was conducted using Filtrasorb 400 12x40 GAC to determine the bed life for removal of PFCs as well as Total Organic Carbon (TOC). The water sample contained average concentrations of 330 ppt (ng/L) perfluorooctanoic acid (PFOA), 8.8 ppt (perfluoroheptanoic acid (PFHpA), and 7.4 ppt perfluorohexanoic acid (PFHxA). The column test consumed the entire source water sample, simulating 620 days of treatment, and 595 million gallons treated. The graph shows the PFC data on the primary axis and the TOC data on the secondary axis versus simulated days of operation.

### What are Emerging Contaminants?

Emerging contaminants are chemicals or materials that have been found in global drinking water supplies and are perceived as real or potential threats to human health. While these contaminants may have always been present in drinking water, advances in technology have only recently made it possible to detect them.

Contaminants are classified as "emerging" if a new source or direct pathway to humans has been determined. Perfluorinated compounds, such as Perfluorooctane Sulfonate (PFOS) and Perfluorooctanoic Acid (PFOA), have been identified as both persistent and mobile in the atmosphere and in aqueous environments, and are therefore considered emerging contaminants of concern.

### What are perfluorinated compounds (PFCs)?

Perfluorinated compounds, or PFCs, are manmade fully fluorinated compounds which are not naturally found in the environment and are used in a range of products such as fire fighting foams and coating additives. PFOS and PFOA are the most commonly produced PFCs.

## Results and Conclusions:

### PFC:

- PFCs in the column effluent were non-detectable for the three PFC compounds detected in the feed. The detection limits for PFHpA, PFHxA, and PFOA in the effluent were 3 ppt.
- With no breakthrough data, the carbon use rate is based on the maximum run time of 620 days. Based on the influent concentrations, the carbon use rate is a maximum of 0.07 lb of GAC per 1000 gallons treated, which corresponds to 620 days or 595 million gallons treated.

### TOC:

- TOC achieved 50% breakthrough after ~340 simulated days and ~320 million simulated gallons treated, which equates to a carbon use rate of 0.13 lbs / 1000 gallons treated.
- The column effluent achieved initial breakthrough above detection limit for TOC at 195 simulated days and ~178 million simulated gallons treated, which equates to a carbon use rate of 0.22 lbs / 1000 gallons treated.

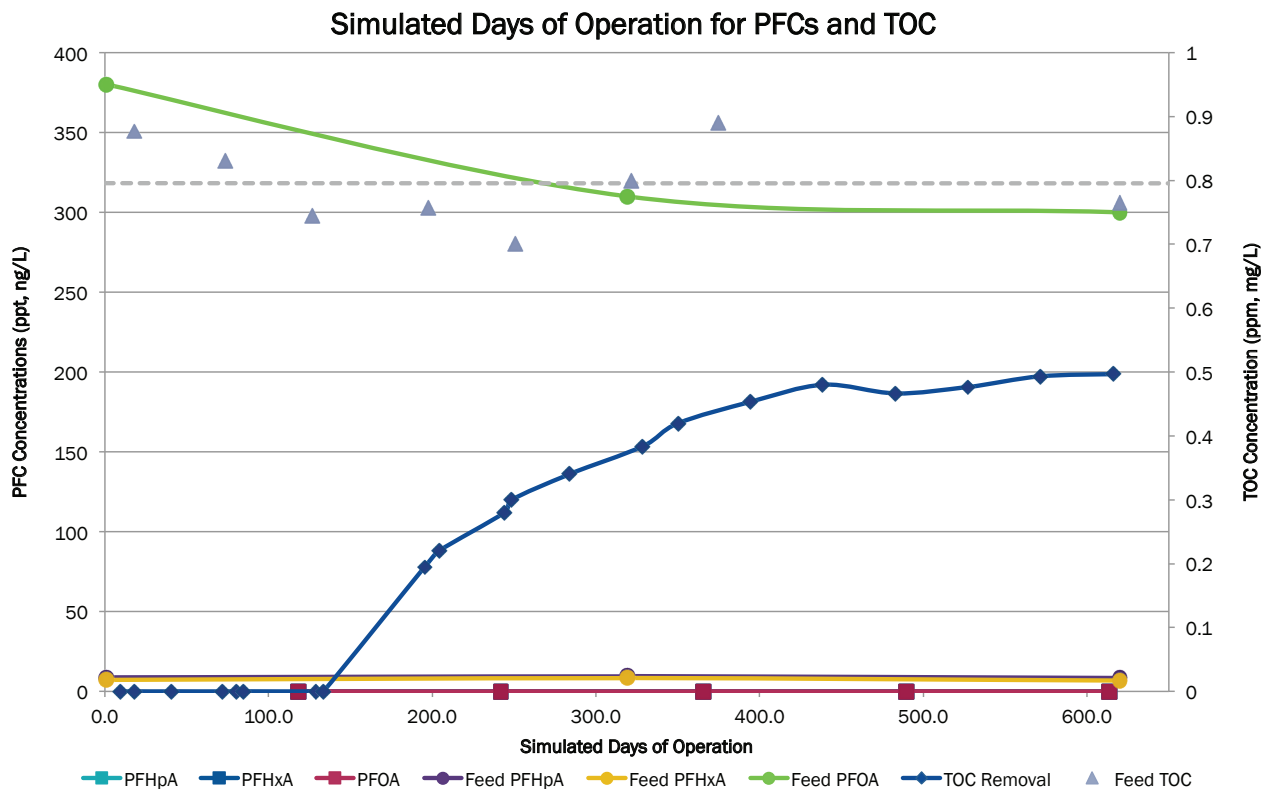
## Results

Based off the above results, a Calgon Carbon Model 12-40 vessel was recommended to achieve the treatment objective.

### Point of Entry Treatment Systems

In addition to those receiving water from the municipal supplier, more than 500 residents use private well water systems for supply to their home. The Village committed up to \$10 million to install point of entry treatment systems (POETS) to both public and private wells to ensure clean drinking water for those without access to the public system.

The New York DEC partnered with Calgon Carbon to ensure GAC systems were properly started up and functional.



## Looking Ahead

The Village's drinking water is, and will remain, safe for consumption as long as a functional GAC filtration system remains online. The permanent system was delivered in late 2016.

## U.S. EPA Health Advisory

On May 19, 2016, the U.S. EPA established Health Advisories for both PFOA and PFOS based on the agency's assessment of the latest peer-reviewed science. The Advisory was created to provide drinking water system operators, as well as state, tribal, and local officials who have the primary responsibility for overseeing these systems, with information on the health risks of these chemicals. To provide U.S. citizens with a margin of protection from a lifetime of exposure to PFOA and PFOS from drinking water, the U.S. EPA has established the Health Advisory levels at 70 parts per trillion.

## GAC: Why it Works

The adsorption capacity of GAC makes it ideal for removing a variety of contaminants from water, air, liquids and gases. GAC is a hybrid mixture of a wide variety of graphite platelets that are interconnected by non-graphitic carbon bonding.

GAC has shown to be an effective adsorption media for removing contaminants in drinking water, and has the added benefit of removing taste and odor compounds while simultaneously acting as a physical filtration medium.



## About Calgon Carbon

Calgon Carbon Corporation (NYSE:CCC) is a global leader in innovative solutions, high quality products and reliable services designed to protect human health and the environment from harmful contaminants in water and air. As a leading manufacturer of activated carbon, with broad capabilities in ultraviolet light disinfection, the Company provides purification solutions for drinking water, wastewater, pollution abatement, and a variety of industrial and commercial manufacturing processes.

Calgon Carbon is the world's largest producer of granular activated carbon and supplies more than 100 types of activated carbon products – in granular, powdered, pelletized and cloth form – for more than 700 distinct applications. Headquartered in Pittsburgh, Pennsylvania, Calgon Carbon Corporation employs more than 1,100 people at 15 manufacturing, reactivation, and equipment fabrication facilities in the U.S., Asia, and in Europe, where Calgon Carbon is known as Chemviron Carbon. The company also has more than 27 sales and service centers throughout the world.

For more information about Calgon Carbon's leading activated carbon and ultraviolet technology solutions for municipalities and industries, visit [www.calgoncarbon.com](http://www.calgoncarbon.com).