

Application Bulletin

DEEP BED FILTRATION WITH LARGE MESH CARBON

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The Connecticut Water Co., serving 31 communities in the state, in part has responded to federal and state water quality regulations covering color, turbidity, and odor by using deep-bed filters filled with large-mesh granular activated carbon (GAC).*

The GAC filters further reduce the turbidity from the plants' clarifiers to meet the requirements (<0.5 NTU) of the Surface Water Treatment Rule while improving water quality by removing any dissolved odor compounds.

The utility's five water plants equipped with GAC have a total filter volume of 18,000 cubic feet (500,000 pounds) and 17-MGD treatment capacity.

The GAC gravity filter beds range in depth from 3.5 to 5.0 feet, and operate at 1.7- to 4.0 GPM/sq ft filtration rates. The activated carbon has a larger mesh size than is typical for systems using GAC for adsorption only. The 8 by 16 mesh size, by providing deep-bed filtration, completely replaces and and/or anthracite coal.

Operation of the GAC filters is monitored and controlled by traditional process parameters (loss of head, filter run time, filtration rates, backwash rates, and duration) and analytical control methods (turbidity, threshold odor number, color, TOC).

On a regular basis, the filters are backwashed with finished and chlorinated water. First, the filters are partially drained and air-scoured to: clean the GAC media, facilitate removal of accumulated solids, and prevent mud ball formation. Air scour rates range between 3.9 to 5.1 cubic feet per minutes per square foot. Then a sequence of low-high-low backwashings (at 5- to 10-, 10- to 15-, 5- to 10 - GPM/sq ft rates respectively) is used to remove the solids from the GAC bed. The backwash frequency varies from 24 to 120 hours of filter-run time, depending on seasonal influences, raw-water quality, and the particular plant design. A backwash sequence typically takes 20 to 60 minutes. The spent back wash water is collected and recycled to the head of the plant at three of the five plants or sent to a lagoon at the other two plants.

Carbon core samples from the GAC filters are analyzed routinely for iodine number and apparent destiny as indicators of remaining carbon adsorption capacity. The carbon filters are usually changed out every 1.5 to 3 years, depending upon the particular plant design. The spent activated carbon is hydraulically removed as a carbon/water slurry using an eductor and hose assembly.+ The spent carbon is transported by truck to one of the material supplier's reactivation facilities. During the reactivation process, adsorbed organic contaminants and particulates are thermally destroyed, and the reactivated GAC can be recycled. This provides an environmentally safe and cost effective outlet for spent GAC.

Table 1

Specifications for the GAC* used by The Connecticut Water Co

Property	Value
U.S.Std Series Sieve Size	
Larger than No. 8, %, max	15
Smaller than No. 16, %, max	5
Iodine number, min	900
Abrasion number, min+	75
Moisture, %, max	2.0
Effective size, mm	1.3-1.5
Uniformity coefficient, max.	1.4

* The product has CODEX and ANSI/NSF Standard 61 certification.

+ Important for withstanding the abrasion of repeated backwashing.



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This feature was contributed by Kevin T. Walsh, The Connecticut Water Co., Clinton, CT, and Stephanie L. Carr, Calgon Carbon Corp., Bridgewater, NJ.

* Calgon Carbon's Filtrasorb 816; see table 1 for product specifications.

+ The educator and hose assembly as well as other equipment, supervision, and technical and analytical support for the safe and efficient replacement of the GAC may be available from the carbon supplier.

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Calgon Carbon Corporation
P.O. Box 717
Pittsburgh, Pa 15230

Chemviron Carbon
Zoning Industriel C
B-7181 Feluy, Belgium

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