

# A Guide to

# Carbon Certification

By Eric Yeggy

Assessing activated carbon requires a rigorous review

The application of activated carbon to drinking water dates all the way back to 450 B.C., when Phoenician trading ships stored drinking water in charred wooden barrels. This practice was widely in use on long sea voyages by the 18<sup>th</sup> century. Even today, brewers use charred wooden barrels to remove impurities during the aging process.

Activated carbon filtration is currently one of the most common technologies employed for drinking water purification. The Water Quality Assn. (WQA) has certified activated carbon systems for a wide variety of reduction claims, including metals, organics and cysts.

WQA also certifies the activated carbon itself to either NSF/ANSI Standard 42 for point-of-use (POU) applications or NSF/ANSI Standard 61 for point-of-entry (POE) and municipal applications. Both of these standards test for any impurities that might leach from the carbon into drinking water and create a public health concern.

A typical carbon certification project might include the following steps:

1. Application;
2. Toxicology review (also known as formulation review);
3. Material safety testing (also known as extraction testing);
4. Labeling/packaging review;

Table 1. Material Safety Testing of Activated Carbon

	POU Carbon	POE Carbon	Municipal GAC Mesh > 0.25 mm (~60 mesh or courser)	Municipal GAC Mesh < 0.25 mm (Finer than ~60 mesh)	Municipal - Powdered Activated Carbon
Conditioning	Condition according to manufacturer's instructions	Condition according to manufacturer's instructions	1. Wet for 16 hours 2. Backflush for 30 minutes	1. Wet for 16 hours 2. Condition according to manufacturer's instructions	1. Wet for 1 hour 2. No conditioning unless the manufacturer's use instructions stipulate a specific conditioning protocol
Exposure Water pH	6.75	5	5	5	5
Dose (amount exposed)	Dose according to manufacturer's recommended maximum use ratio, or worst-case surface-area-to-volume ratio (SAV)	Dose according to manufacturer's recommended maximum use ratio, or worst-case SAV	Dose is 25 g/L	Dose is 25 g/L	Dose is 25 g/L
Exposure Protocol	1. 24-hour exposure 2. Collect sample 3. Repeat conditioning 4. 24-hour exposure 5. Collect sample 6. Repeat conditioning 7. 24-hour exposure 8. Collect sample 9. Composite	1. 24-hour exposure 2. Dump 3. Flush with five bed volumes 4. 24-hour exposure 5. Dump 6. Flush with five bed volumes 7. 24-hour exposure 8. Collect sample	1. 1-hour exposure 2. Dump 3. 1-hour exposure 4. Dump 5. 1-hour exposure 6. Filter 7. Collect sample	1. 1-hour exposure with stirring 2. Filter 3. Collect sample	1. 1-hour exposure with stirring 2. Filter 3. Collect sample
Limit	Compare to the levels in NSF/ANSI 42	Compare to total allowable concentration	Compare to the single product allowable concentration (SPAC)	Compare to the SPAC	Compare to the SPAC

5. Facility assessment; and
6. Attestation.

### Application

During the application stage, the carbon manufacturer is asked for information that defines the scope of the certification project. It is important to have accurate and complete information up front in order to avoid problems later on

in the certification process. Information that is critical to a carbon certification project includes:

- Intended use (POU, POE and/or municipal);
- Source (coal, coconut shell, wood, etc.);
- Formulation;
- Production location (activation and cleaning);

- Packaging location;
- Mesh size;
- Virgin media versus regenerated media; and
- Recommended conditioning steps.

The information manufacturers provide during the application process impacts the structure of the certification project and the protocols that will be used throughout the process.

### Toxicology Review

Prior to testing the carbon, the certification body performs an initial toxicology review. A toxicologist examines the source and formulation of the carbon to determine what impurities might be present. The toxicologist then establishes the “test battery,” the list of chemicals that could potentially leach into drinking water and create a public health concern. The laboratory tests for the presence of each chemical included in the test battery during the material safety test.

### Material Safety Testing

The protocol used for the material safety test varies based on the intended use and specifications of the carbon, as shown in Table 1. This demonstrates the importance of providing accurate information up front in order to avoid complications down the road.

Upon completion of the material safety testing, a final review is performed against established limits, which are defined by the standard. In some cases, the laboratory might find compounds for which no limit has been set. These situations may require additional review by a toxicologist.

Regeneration is becoming increasingly popular as a more sustainable solution to meet the growing demand for activated carbon. Regenerated carbon has special requirements under NSF/ANSI 61. It must be clearly identified on the packaging. When a mixture of spent carbons from different sources is regenerated, the product must be identified as both commingled and regenerated media. When spent carbon is commingled in this way for the purpose of regeneration, the source products must be of comparable type and function.

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The equipment used to handle carbon during commingling or regeneration must be either potable or food-grade equipment. Transportation equipment that comes in contact with the carbon has to be cleaned and protected from sources of contamination. Washout tickets must be kept to document that the equipment has been cleaned.

The manufacturer must keep additional records to document the source of the regenerated media, how it was used, specifications and many other details. WQA has certified several types of regenerated media, and can assist manufacturers in understanding all of the certification and record-keeping requirements.

### Labeling & Packaging Review

Another step in the certification process is a labeling and packaging review. During this stage, the certification body evaluates the labeling and packaging to ensure that all of the requirements in the standard have been met. This includes basic information like the manufacturer's name and address, product identifier, net weight and lot number.

It also ties back to information that the manufacturer provided prior to testing. For example, if the manufacturer provided a specific maximum use ratio for the purpose of testing, the certification body ensures that the maximum use ratio is disclosed on the literature provided with the product. If the manufacturer provided specific conditioning instructions for the purpose of testing, these instructions also must be disclosed on the supporting literature.

### Facility Assessment

The certification body also perform a facility assessment. The scope and focus of the initial assessment may vary, but typically includes things like a review of the quality systems at the production facility.

Facility assessments also are used for ongoing annual surveillance of certified products. Annual surveillance audits might focus on checking suppliers and literature to ensure that nothing has changed. The certification body may collect samples for testing during the facility assessment. The frequency of testing is up to the certification body. WQA requires testing every five years.

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### Carbon Goes Green

Another important new development that could impact the carbon industry is the WQA Sustainability Certification program. This effort began in 2011 when WQA partnered with PE Intl. & Five Winds Strategic Consulting to develop a sustainability program for the water treatment industry. The scope of the program currently includes POU water filters that use activated carbon, and the activated carbon itself. As a result of this initiative, carbon manufacturers will soon be able to apply for an eco-label on activated carbon by having their product evaluated against WQA S802, the new sustainability standard for activated carbon. Eventually, all types of drinking water treatment devices will be included in the scope of the sustainability program.

The WQA sustainability program focuses on the three pillars of sustainability: environmental, social and economic. These are multi-attribute standards based on a life-cycle analysis. Manufacturers that successfully meet the program's criteria will be able to display a new eco-label certification mark on qualifying products.

### Attestation

The final step in any certification project is attestation. During attestation, the certification body documents its final decision on granting certification. When WQA grants certification, the certified product is listed on WQA's public website, and the manufacturer is granted the right to use WQA's registered Gold Seal certification mark.

The process of certification can be complex and confusing, but a good certifier will be able to provide guidance toward the least expensive path to product certification. *wqp*

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