

# POU Carbon Filters: Special Tests for Special Products

**D**uring my near decade of association with the drinking water treatment industry, many different types of water treatment products have passed through the Water Quality Association's Laboratory. It has been very interesting to see how products have changed and advanced over the years with manufacturing improvements in an effort to try to meet consumer needs.

Whenever consumers and regulators demand higher quality, eco-friendly products, the water treatment industry has always been there with products that meet their demands. As the residential water softener—the 'backbone' of our industry—remains in the crosshairs of regulators, what the future holds remains in question.

Regardless of what happens, the industry will survive and water softeners will still be looked upon to reduce hardness in drinking water. People need water and are becoming more and more aware of the various contaminants that could be in their water supply.

However, with a stalled economy, consumers are looking for ways to cut spending and save money. One of the areas that will help our industry supply treated water to consumers during this tough time is POU water filters.

### **POU systems**

Many consumers are turning away from purchasing bottled water and investing in POU drinking water filters. In fact, the largest growing area of drinking treatment products that we have tested and certified over the past decade is that of POU water filters.

Filters come in different sizes, shapes and can be used in many different applications. Despite all these differences, a common component is activated carbon.

All POU water filters are tested and certified according to *NSF/ANSI 42* for aesthetic (taste and odor) reduction claims and *NSF/ANSI 53* for health-related reduction claims. But filters with activated carbon media have a few special requirements within these standards.

Materials extraction testing determines whether or not the materials of such water filters, which contact drinking water, are safe and do not leach harmful contaminants back into the drinking water. The materials extraction test protocol for POU water filters is identical in both *NSF/ANSI 42* and *53*.

One of the interesting requirements of these *NSF/ANSI* standards is that materials extraction testing must be performed both with and without adsorptive and absorptive media. Therefore, any POU filter that contains activated carbon would be tested both with and without activated carbon for the materials safety test. The product must pass both portions of this test to meet the requirements of the *NSF/ANSI Drinking Water Treatment Unit (DWTU)* standards.

### **Safety and health**

Extraction testing a product with and without carbon may

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seem excessive, but the intent is to ensure that public health and safety are upheld.

To most manufacturers, testing a complete system for materials extraction makes the most sense because a complete system is what will most likely be used in the field.

One issue with complete system extraction is that activated carbon will reduce or remove volatile and semi-volatile organics from the water it contacts. If a material within a product extracts an organic contaminant, the carbon media will likely remove it, but it is not clear whether the non-carbon materials are really safe for contact with drinking water.

The need for a materials extraction test without carbon media may not be as obvious, but it allows product certifiers to have confidence in the safety of all wetted materials used by a product. This test ensures that even if a carbon filter is not present, the system will not add anything harmful to the drinking water.

Manufacturers of filtration systems purchased through retail stores rely on consumers to properly install and service their product. A consumer may decide to not use the supplied carbon filter cartridge, not install the filter cartridge at all, or even use the filter beyond its rated capacity.

These examples not only apply to the retail channel, but to dealer channels as well. A homeowner can easily modify a system that has been professionally installed by a dealer.

### **Testing procedures**

The extraction testing issue without media is further magnified on systems that make health reduction claims of organic chemicals. If components of POU filters or systems contribute organic chemicals to the unfiltered water, the rated capacity of the system adsorption would be compromised due to carbon media reducing or removing these contaminants instead of the desired contaminants.

Typically, only carbon media is removed for the 'without-media' portion of the extraction test. The standard does allow for removal of any non-media materials or ingredients that cannot be easily separated from the media or materials that would be released into the system effluent if the media were not present.

For example, the binder used to produce carbon blocks would also be removed for a without-media test. The standard also allows for normalization or adjustment for changes in wetted surface area from the normal configuration when this testing occurs.

When tested without a carbon block attached, end caps of a cartridge will have more wetted surface area exposed. An appropriate adjustment for end caps included in the extraction test is applied to the final data for end caps.

POU carbon filters also require testing to ensure carbon media does not migrate into treated water during normal filter use. This test is called the filter media test and is required for systems making mechanical-reduction claims (such as cyst, turbidity and particulate) as well as systems making chemical-reduction claims (taste/odor or health-related claims).

*NSF/ANSI 42* and *53* allow for filter media tests to be conducted in conjunction with a mechanical (or chemical) reduction

test and also allow the test to be performed individually. In either case, product water samples are observed during performance testing for visible evidence of media migration (or media in the product water). Visible evidence is defined as media visually observed as retained when product water is passed through a 100-mesh sieve.

### **Agents and additives**

Another requirement found in the NSF/ANSI DWTU standards for testing POU water filters is active agent and additive testing. This test does not apply to all POU filters, but must be performed when active agents or additives are used within a product.

An active agent is defined as a substance or medium that is added to or involved in the treatment process that requires direct

or sacrificial release of the agent or degraded product to reduce specific contaminants in the water. An additive is defined as a substance directly or indirectly added to water during a drinking water treatment process.

Carbon filters that contain copper/zinc media or silver-impregnated carbon are two examples of active agents used in POU carbon filters. When present within POU water filters, active agents and additives must be monitored in product water to ensure that these substances (or their degradation products) are not present at concentrations of toxicological significance (levels given by US EPA, Health Canada or other US Federal regulatory agencies) over the life of the filter.

Active agent and additive sampling is typically performed during a contaminant reduction test that represents the highest potential extraction of active agents or additives. Sampling occurs at the same frequency as the contaminant reduction test until rated capacity is reached, but at least one sample must be taken immediately following a rest period (minimum of eight hours).

The contaminant reduction test chosen does not have to be a claim chosen by the manufacturer, so the testing laboratory must consider the type of challenge water and duration of rest periods used during the test to select the worst case. The NSF standard does list the NSF/ANSI 42 chlorine reduction test as the active agent test for copper/zinc media and NSF/ANSI 42 bacteriostasis test for silver-impregnated carbon.

Active agent and additive monitoring must be performed in addition to materials extraction testing, since the presence of active agents or additives may actually increase as the rated capacity of the system is achieved. While these special requirements and additional tests for POU water filters may seem excessive, one must remember that our industry is responsible for upholding public health and safety.

Consumers are looking for ways to save money and also to make sure the products they buy for their families are safe. However, the larger the POU water filter market continues to grow, the harder it becomes to stand out in the crowd. Certifying POU water filters is a way to rise above competitors. It also shows that the products manufactured or sold are safe.

### **About the author and organization**

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