Small Spaces, **High Filtration**

The future of carbon block technology

By Frank A. Brigano, Thomas A. Burke, Andrew Lombardo & Richard Kendrick

Figure 1. Extruded carbon blocks of various widths, lengths, wall thicknesses and formulations

Those involved in the drinking water industry may be familiar with extruded carbon block technology, which fast became an industry standard when it was introduced as an adsorbent technology for drinking water applications.

Extruded carbon block filters (Figure 1) have the following physical characteristics:

- Highly porous, extremely uniform;
- Low pressure drop;
- Bonds small particles to larger particles;
- Low binder content;
- No channeling, fluidizing or bypass
- Low fines to service;
- Zeolites and catalytic additives; and
- Various block wall thicknesses.

The unique properties afforded to extruded carbon block by these physical characteristics, combined with proprietary manufacturing processes, drives future development in this technology.

Particle Immobilization

Extruded carbon block technology is essentially the technology of particle immobilization. Carbon and other specialty materials are combined in a proprietary process in which they are captured and immobilized—set in place—such that they are allowed to work uniformly and consistently throughout the extruded block. Because the block is a rigid, nonmobile structure, there is no way the specialty materials can gravitate to one place in the filter or be pushed aside as water finds a channel past the material.

In this fashion, performance claims attributed to extruded carbon block are not able to be thwarted as may happen in nonrigid media where water works to find the least resistant path through the filter—perhaps through a channel, bypassing the carbon media's filtration effects.

In addition to immobilization, the extrusion process allows for an almost infinite number of extruded solutions. Various inner and outer diameters can be extruded in almost any conceivable length, giving customers a number of solutions to fit their unique applications.

This variety of shapes and sizes has allowed product designers flexibility to put carbon block filters in large and small appliances and within plumbing fixtures—practically anywhere water can be directed, an extruded carbon block filter can be added.

Performance Claims

Extruded carbon block filters can offer a wide range of performance claims, depending on the materials used and the method of construction. Standard performance claims often certified to NSF/ANSI standards may include:

- Chlorine taste and odor reduction;
- Particulate reduction;
- Lead reduction;
- Volatile organic compound reduction; and
- Arsenic reduction.

Enhanced performance claims including bacteria, virus and cyst reduction can be made with this technology by specially modifying microporous activated carbon. An extruded carbon block can be manufactured containing a microbiologically high-molecular-weight polycationic interception agent and a cationic silver halide complex. Cyst reduction occurs via mechanical filtration.

These microbiological-reduction products undergo rigorous product testing and certification processes. The products must meet the performance and material safety requirements of NSF/ANSI standards 42 and 53.

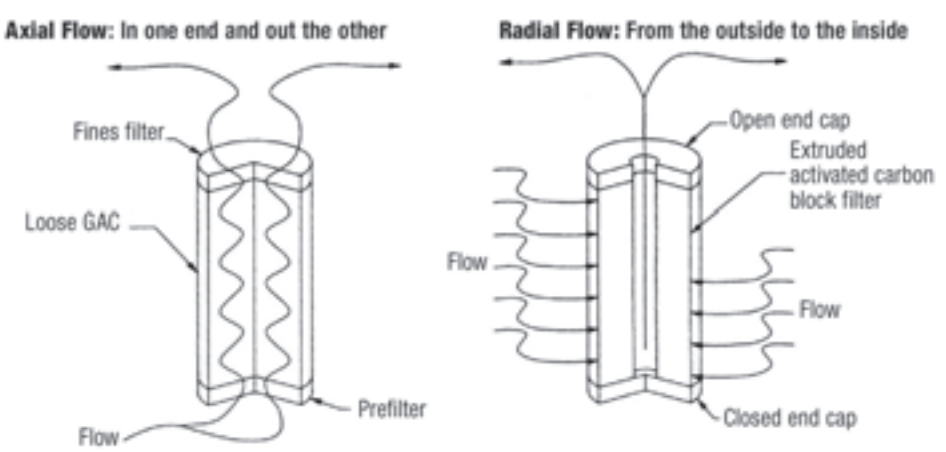
Microbial cyst reduction claims can be certified using NSF/ANSI Standard 53; bacterial, cyst and virus reduction for the microbiological interception product is verified using protocols adapted from the U.S. Environmental Protection Agency's purifier guide protocol.

Ergonomics

Extruded carbon block filters operate on a radial flow basis—water flows from the outside to the inside, not downward through one end of the filter to the other end (Figure 2). As such, radial flow filters have nearly 15 times the external surface area of axial flow filters, providing improved dirt-holding capacity and performance. This construction also allows for these filters to be placed in virtually any configuration—vertical or horizontal—in order to best utilize increasingly limited space within a customer's product design.

With space being a primary concern to many dealers—who in turn are reacting to changing market dynamics that could see a resurgence in smaller homes and apartment utilization as people return to urban living—extruded carbon block solutions provide the greatest

Figure 2. Axial Flow versus Radial Flow Filter Performance



flexibility for performance given the nearly unlimited range of product placements including major appliances, counter-top units, under-sink units, end-of-tap filters, shower filters and water coolers.

Smaller-sized products enhance the consumer's experience during product installation and filter changeouts by making the process more simple and easy.

Filtration products placed at the point of use, such as within a major appliance, are designed to be easily replaced with an operation as simple as pushing a button. Point-of-entry products must be sized larger in order to handle higher pressures and flows coming into a residence; as such, they often require specialized tools to remove filter housings, requiring some effort—not an easy push-button filter change.

It might be surmised in the drinking water filtration industry that consumers can be confused by a myriad of product performance claims and are unable to determine how to choose the best filtration solution to meet their specific needs. What several consumer product manufacturers have learned and are responding to is consumer interest in and demand for well-designed, aesthetically pleasing high-performance products that enhance living space and are easy to use—not just easy to install but easy to operate over the lifetime of the product, including changing filters as required.

Future Developments

Enhancing extruded carbon block with specialty materials allows for greater performance within the same or even smaller product footprints. Coinciding with the benefits provided by utilizing extruded carbon block filters—everything from filtration efficiency to placement flexibility within a customer's product design—performance and flexibility prove it to be a valuable technology for drinking water filtration.

The future of extruded carbon block technology resides in its ability to provide increasingly higher levels of filtration performance in smaller spaces. *wqp*

Frank A. Brigano, Ph.D., is vice president, technology for KX Technologies, LLC. Brigano is a member of *Water Quality Products'* editorial advisory board. He can be reached at 203.799.9000 or by e-mail at fbrigano@kxtech.com. Thomas A. Burke is marketing manager for KX Technologies, LLC, and can be reached at tburke@kxtech.com. Andrew Lombardo is manager, nanotechnology for KX Technologies, LLC, and can be reached at alombardo@kxtech.com. Richard Kendrick is senior media development engineer for KX Technologies, LLC, and can be reached at rkendrick@kxtech.com.

LearnMore! For more information related to this article, visit the web at www.wqpmag.com/lm.cfm/wq100803

For more information on this subject, write in 1013 on the reader service card.