The Quest for the Holy Grail: Microbiological Carbon Block Filters

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Summary: *As the water treatment industry tackles the threat of microbiological contamination, companies are continually searching for better and more effective means to address the issue. One company has discovered encouraging results through carbon block filtration.*

In recent years, consumer demand has driven development of several point-of-use/point-of-entry (POU/ POE) technologies that can provide broad microbiological reduction in potable water. For example, there has been significant growth in the sale of reverse osmosis (RO), ultraviolet (UV) light and ozone systems. These systems, however, are expensive, complex and may require regular maintenance and replacement of key components, which also may be expensive.

What if, though, you could offer a low-cost, highly effective microbial reduction device that was as simple as, say, an ordinary carbon block filter? Assume this new carbon block wasn't only rated for cyst reduction, but also had the capability to provide 99.99 to 99.9999 percent (or 4 to 6 log) reduction of both virus and bacteria, respectively. Such performance would represent a full microbiological capability, not just bacteriostatic (controlling the proliferation of bacteria) performance. If an ordinary carbon block could achieve these results without a significant pressure drop penalty or a significant reduction in its chemical reduction performance, it would represent the Holy Grail of water purifiers.

A recent technological advancement not only provides microbiological interception (capture) but, at the same time, retains the standard chemical reduction capabilities normally associated with carbon block filtration. This technology is highly adaptable to existing systems, affordable and exhibits no significant impact on flow resistance through the carbon block. The technology involves the combined use of an appropriate carbon block pore structure and a chemical surface treatment process. Although the exact kill mechanism hasn't been systematically confirmed, it appears that this surface treatment enhances the interception and/or inactivation of bacterial or visral particles. This enhancement is the result of a synergistic interaction between two chemicals that, when combined into an organized surface-coating complex, provides broad-spectrum reduction of microbiological targets on contact. The only limitation is the rate of diffusion of the organism to the treated surface.

This diffusion and interception/kill process are governed by the time spent by the organism within the biocidal structure, pore size of the structure, physical size of the organism and number of "bumps" against the surface that the organism can withstand. Remarkably, performance of the surface treatment can be accurately predicted from these four parameters. The two chemicals used to form the treatment have little effect when used separately. They have essentially no mammalian toxicity and, once bonded to the carbon, don't elute back into the water.

Current test methods

There are currently no official standards within the water treatment industry to assess the effectiveness of microbiological water treatment technologies on a comparative basis. While NSF International is currently in the process of developing a "Microbial Water Treatment" standard, specific test protocols are still in development, and haven't yet been presented to the joint committee for approval as an ANSI/NSF standard No date has been set for a new standard.

The U.S. Environmental Protectic Agency (USEPA) Guide Standard and Protocol for Testing Microbiological Water Purifiers has long been the standard utilized within the industry to assess the performance of microbiological watt "purifiers." While this has been an industry benchmark, it should be under: stood that this document was original! prepared as only a guidance document for the development of a water purification standard. Table 1 provides a de