Technical paper #3

Carbon versus KDF

At Rainshow'r, we offer our customers the highest quality and latest technology in our shower, bath, and garden dechlorinating products. Because of this, we use only KDF as a dechlorinating media and refuse to use less expensive and less effective activated carbon in our products.

Activated carbon filters contain particles of carbon that have been treated to increase their surface area and increase their ability to adsorb a wide range of contaminants. Coconut shell carbon and bituminous (coal) carbon are the most common sources of carbon in activated carbon filters. The raw carbon source is slowly heated in the absence of air to produce a high carbon material. Passing oxidizing gases through the material at extremely high temperatures activates the carbon. As the water passes over the positively charged carbon surface, the negative ions of the contaminants are drawn to the surface of the carbon granules. This is known as ADSORPTION [to adhere] and can be closely compared in principle to magnetism. As a general rule the adsorption ability of Activated Carbon depends largely on a number of factors. They are as follows:

TURBIDITY: How clean is the water from fine particulate matter. The cleaner the incoming water, the greater is the ability to adsorb.

FLOW RATE: Gushing water is not filtered as well as water flowing at slower speeds. Example, if you were to throw a nail past the head of a magnet the odds of it *adhering* would be slight. Carbon is primarily used in drinking water filters which have a lower flow rate of ½ to 1 GPM (Gallons per minute) Water entering a shower filter is usually at a higher flow rate of approximately 2.5 GPM.(5 time faster than through a water filter), far too fast for proper adsorption. Even using cold water, a minimum of ***5 times*** the amount of carbon would be necessary to filter the shower water.

CONTACT TIME: Water must be in contact with the activated carbon for a sufficient period of time to allow the activated carbon to effectively adsorb the contaminants. With a cartridge size of approximately 2.5 to 3 inches, shower filters containing carbon do not contain sufficient media to adsorb at the above mentioned 2.5 GPM flow rate. Most drinking filters produce .5-1 GPM but shower usage ranges from 2 - 2.5 GPM. (***2 - 5 times greater***).

TEMPERATURE: Carbon is a cold water media. It is most effective at temperature ranges of 50° - 80°(F). At higher temperatures, carbon becomes ineffective. Tap water, where carbon works best, has temperatures ranges from 60°- 75° (F). Showering temperatures typically range from 85° - 105° (F). ***Hot water should NEVER be run through a carbon filter***, because hot water will tend to release, or "off-load", trapped contaminants into the water flow potentially making the water leaving the filter more contaminated than the water going in.

Bacterial Concerns with Carbon Shower filters

The major problem associated with carbon in any form is bacterial contamination. Wet activated carbon, richly infused with trapped organic matter, provides an ideal breeding ground for bacteria. High bacterial levels occur when the carbon is fully saturated and then let to stand [e.g., overnight]. As the water temperature inside the carbon cartridge rises, as with warm shower water, bacteria breeding escalates. Activated Carbon cannot hold onto bacteria, so when water flow is reintroduced a contaminated sample can be output. Bacteria gets into the activated carbon filter in the first place because disinfection at the water treatment plant does not guarantee the destruction of all bacteria.

KDF	Activated Carbon
Works best in hot, shower water	Works best in cold, tap water
Effective at high flow rates (2.5 GPM)	Needs slower rate, ½ GPM, for effective contact time
Non-Organic (inhibits bacterial growth bacteriostatic)	Organic (bacteria growth possible)