Carbon Filter Guide

Activated Carbon for Water Filtration

Activated carbon has proven to be ideally suited to filter tastes, odors and contaminants from water.

Activated carbon is a form of carbon that has been processed to increase the porosity of the individual granules, resulting in a large surface area available for adsorption.

Activated carbon is utilized in water filtration in two basic forms: Granular Activated Carbon (GAC) and carbon block.

Why Carbon Block is a Better Choice than Granule Active Carbon

Carbon block is mainly comprised of activated carbon granules and a binding agent that allows the carbon granules to maintain a static position relative to each other. Carbon block immobilizes carbon particles, stopping water from channeling, achieving a higher effectiveness in contaminant reduction.

The smaller particle size and uniform pore structure of carbon block provides a high level of effectiveness in a much smaller size than a GAC at the same flow rate.

Carbon block produces minimal carbon fines at start up, thereby minimizing the need for backwashing or flushing. This also virtually eliminates carbon fines during the ongoing operation of the filter.

A further advantage of carbon block over GAC is that the pore size of the block can be controlled to a small enough size as to virtually eliminate bacteria growth inside the filter. A loose bed of carbon can provide ample room for bacteria colonization.

How Carbon Blocks Filter Water

Carbon block water filters employ three processes to remove or reduce contaminants from drinking water. 1. **mechanical filtration**. Carbon blocks can mechanically filter particles as small as one-half micron (submicron).

2. **electrokinetic adsorption.** This process works as water passes through one outer wrap, which causes the material in the wrap to acquire a positive molecular charge that attracts negative ions of certain pollutants. 3. **physical adsorption**. The carbon itself attracts pollutants. Specially formulated binders used in compressed carbon blocks can avoid masking the surface of the carbon, thereby optimizing its ability to reduce levels of pollutants.

Compressed vs. Extruded Carbon Block Manufacturing Processes

Carbon block is manufactured using one of two processes: extrusion or compression molding. Extruded carbon blocks are manufactured using a mixture of carbon, binder and other media that is forced through a die to form a continuous block. The block is then trimmed to size. Compressed carbon blocks are manufactured individually in a mold under great pressure and high heat. Compression molding utilizes a more labor intensive manufacturing process with a lower production rate. However, compression molding also provides a final product with more consistent filtration properties, due somewhat to needing less binder material to manufacture a cohesive carbon block. Another advantage of compression molding is the broader array of binding materials from which to choose. Due to the greater temperatures and pressures employed in the compression molding process, specially formulated binders that are more porous may be used to prevent the binder from masking the carbon's inherent porosity. This results in superior performance and increased capacity when comparing same sized blocks.

Carbon Filter Design Parameters — Raw Material Selection

There are a variety of raw materials used to make carbon block filters. Some of the most common sources of carbon are bituminous coal, wood, and nutshells.

Bituminous based coal is plentiful and inexpensive. However, coal-based carbons can be contaminated with high levels of pollutants that can leach into water.

Wood-based carbons can have an affinity for reducing specific contaminants. It is readily available and comes from a renewable resource; however the timeframe for a tree to mature can be years. Nutshells, and specifically coconut shells, are an ideal source for the raw carbon used in drinking water filtration. Coconut shell carbon has a substantially higher micropore volume than other carbons, which provides a greater surface area and higher porosity.

Activated coconut shell carbon provides about 50% more micropores than bituminous coal based activated carbon. Coconut shell carbon is purer than other carbon sources because of its lower inorganic ash content. This results in carbon that is more consistent and can provide better quality control. Also aiding in manufacturing is the higher density of coconut shell carbon resulting in less dust and carbon fines. Finally, this carbon source is highly renewable and can be considered a **"green" product**.