

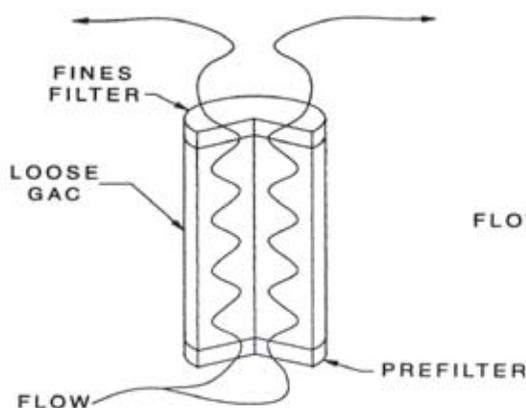
The Features and Benefits of Extruded Carbon Filters: Axial versus Radial Flow

WHAT IS EXTRUDED CARBON BLOCK?

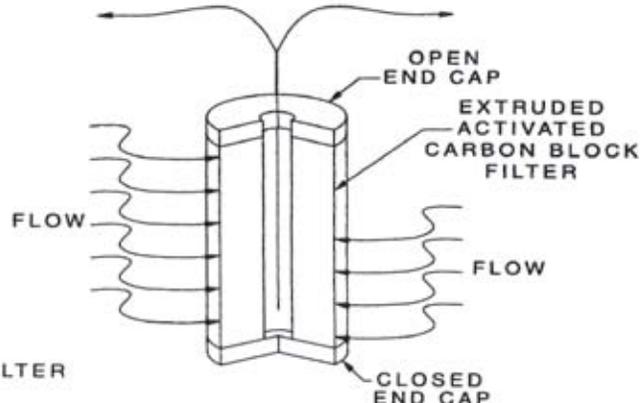
Extruded activated carbon filters consist of virgin activated carbon powder, a thermoplastic binder, and specialty adsorbents such as zeolites or oxidizing filtration media. The filters are manufactured as continuous lengths of rod, tube, or as other complex shapes using a proprietary solid-state extrusion process. The resulting products are highly porous and extremely uniform, providing high-performance adsorption and particulate reduction at low flow resistance when fabricated into finished filter elements. Standard consumer and commercial filters manufactured by continuous solid-state extrusion cost approximately the same as conventional filters manufactured using loose granular activated carbon, but provide an enormous spectrum of performance advantages.

Extruded activated carbon filters meet exacting performance requirements and/or claims, and specific models are registered as meeting the requirements of NSF/ANSI Drinking Water Treatment Unit Standards for VOCs and THMs reduction, particulate, cyst, turbidity, lead, chlorine taste and odor reduction, and other requirements relating to purity and safety of their materials of construction.

• Axial Flow: in one end and out the other



• Radial Flow: from the outside to the inside



*** Radial Flow Filters have nearly 15 times the external surface area of Axial Flow Filters, providing improved dirt holding capacity and performance.**

*** Radial Flow Filters can be manufactured from powdered, versus granular, activated carbon (GAC) without experiencing a pressure drop penalty...thereby delivering greatly improved performance.**

• Features and Benefits

1) No release of carbon fines:

Extruded filter elements do not release activated carbon particles ("gray water") during startup or operation. Extensive flushing or "activation" of extruded filter elements are not required. Some GAC carbon filters will release carbon fines even after the filter elements have been in service for an extended period of time, resulting in contaminated sumps and plumbing and a non-sanitary condition.

2) No channeling, fluidizing, or bypassing:

Extruded filter elements cannot channel, bypass, or fluidize because extruded carbon is a rigid structure that prevents movement of the adsorbent particles or the formation of channels and defects in the adsorbent structure. GAC filters consist of loose beds of particles that are often loosely packed into a non-rigid plastic tube (you can often hear the particles move when GAC filters are shaken). At sufficient flow, the entire bed will fluidize and the integrity of the adsorbent bed will be lost.

3) Low pressure drop:

Water flows through an extruded filter element in the "radial" direction (from the outside of the filter element to the inside). As a result, the entire exterior surface of the filter is presented to the incoming fluid, not just off one edge of the filter as in most GAC filters. This results in nearly fifteen times more prefiltration surface area and a much lower flow "density". In a GAC filter, a fluid flows at high velocity through the entire length of the filter, often about eight (8) inches of carbon. In an extruded filter element, the fluid flows slowly through only the thickness of the filter's wall; often less than an inch. While the contact time between the fluid and carbon are basically identical in both cases, the extruded element displays almost ten times less pressure drop when the adsorbent particles are the same size.

Together, these two effects result in a total reduction of pressure drop of almost 100-200 fold. An extruded carbon filter manufactured with fine powdered carbon will display essentially the same pressure drop at a given fluid flow as a GAC filter filled with coarse particles of activated carbon. The ability to use powdered activated carbon significantly enhances the performance of the extruded carbon in comparison to that of the GAC filter--without the anticipated pressure drop penalty.

4) Compared to Molded Block Technology:

- Consistency across the extruded carbon block is technically balanced based upon the technology of the extruded carbon rod—the first carbon block is the same as the last carbon block cut from the extruded carbon rod.
- Extruded carbon blocks can be manufactured in much longer lengths and larger diameters with easier customization of sizes compared to molded carbon block.
- Molded carbon blocks must be tapered due to the molding technique, whereas extruded carbon blocks have consistent diameter for the entire length of the block.
- During the loading of the mold particle segregation can occur, as compared to the extrusion die where there is no particle segregation and there is a consistent flow of carbon formulation to the die.

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5) Low binder content and high dirt capacity:

One of the challenges of producing high-quality solid activated carbon block is to produce a material of great physical strength, that is entirely free of attrition and media migration; that retains nearly the full capacity of the original activated carbon; and displays the best possible dirt holding capacity and low pressure drop. Today, extruded carbon stands alone in providing all of these desirable features. This is made possible because only a small amount of thermoplastic binder is used in the extrusion process--about one-half of what is used in a typical molded carbon block.

A low binder content results in low carbon fouling (essentially negligible). In addition, the reduction in the amount of binder maximizes the porosity of the extrusion, resulting in the lowest possible flow resistance and the greatest dirt holding capacity. KXT may provide a layer of prefiltration media to achieve a "graded pore density" exterior surface. Any layer(s) are constructed to provide the best possible prefiltration of the incoming fluid.

6) "Blowout" of GAC is eliminated with extruded carbon filter elements:

Extruded activated carbon filter elements are structurally rigid and of great strength. If the filter element is clogged by particulate contamination, the carbon cannot be released to the downstream water. Extruded filters can withstand higher levels of pressure than most GAC filters. In some cases, clogged GAC filters can "blowout" and release activated carbon into the product water.

7) Extruded carbon's cost/performance ratio "the best in the industry":

MATRIKX® extruded filter elements will outperform conventional GAC filters in almost every application because of the higher adsorbent capacity and contaminant reduction, low pressure drop, high dirt capacity, elimination of carbon fines, higher integrity and strength, and overall ability to produce the highest possible effluent quality. All of these high-quality attributes are achieved by a process that is more automated and productive than any other solid carbon manufacturing process.

8) Composite particles - the secret to great performance:

One of the unique features of the extrusion process is its ability to bond one or more layers of small particles onto a larger surface. For example, 80x325 mesh particles of one activated carbon can be bonded to the surface of 20x50 mesh particles of a second activated carbon. This is a major breakthrough and benefit, allowing KXT to manufacture filter elements that are capable of performing in entirely new ways.

The ability to form complex composite mixtures of particles and extrude these into stable solid adsorbent forms provides a virtually limitless potential for the development of high performance water and air filtration products. Such process flexibility is unique to the extrusion process that has been developed by KX Technologies LLC.

The performance and technical benefits of extruded carbon are made possible by the fundamental ability of the extrusion process to produce an incredibly uniform, reproducible, and reliable adsorbent structure. To produce the highest quality finished filter element, additional assembly technology is required. KXT operates a modern fully-automated filter assembly plant utilizing automatic systems for the flexible manufacture of complete filters. These assembly systems are developed and supported by in-house automation and design engineers to specific requirements.

KX Technologies LLC is a high technology firm that provides its customers extensive testing and development support. Production is supported by comprehensive on-line quality and statistical process control methods. Quality Assurance laboratories provide electronic dimensional analysis of finished product and perform routine tests such as:

- * California Proposition 65 Compliant
- * Latex Microsphere - 3-micron Particle Reduction Testing
- * Moisture Analysis: Activated Carbon and Lead Adsorbents
- * Water ΔP versus Flow
- * R2T versus Flow
- * Flexural Strength: Mechanical
- * pH of Activated Carbon
- * BET Surface Area
- * Multi-Point BET Surface Area
- * Sieve Analysis: Roto-Tap
- * Sieve Analysis: Ultrasonic Micro-Particle
- * Material Extractions
- * Particle Size-Wet/Dry Laser-(Malvern)
- * X-Ray Diffraction
- * PMI Porometer: Flat Sheet
- * Media Fines Release
- * Binder Melt Index
- * Chlorine Taste & Odor Reduction
- * Soluble Lead Reduction: Long-Term
- * Single-Point Lead Adsorption Isotherm Assay
- * Carbon Block Porometry
- * Perkin-Elmer ICP-MS with Reaction Cell for Trace Metals
- * Zeta Potential
- * Volatile Organics: Purge and Trap GCMS

All components used in filter assembly are manufactured from FDA-compliant material and are NSF/ANSI components.

Quality extends beyond the product to include the entire range of service and support provided by KXT. We are not aware of any manufacturer who provides its customers with more responsive product development, technical support, product testing, troubleshooting, and order processing integration. Shipments are usually scheduled to the day and sometimes to the hour. KXT is focused upon providing a narrow, highly specialized filter product and service, and that degree of focus allows it to provide absolutely the best product, support, and service within the industry. KXT is a reliable and non-competitive partner to OEMs and does not sell or distribute its products direct to retail under the MATRIKX® brand.

KX Technologies LLC is your activated carbon filter supplier and the quality of this single product defines the strength of our company.