GENERAL INFORMATION FOR GRANULAR ACTIVATED CARBON (GAC) SYSTEMS

Granular Activated Carbon (GAC):
In this type of filter, water flows through a bed of loose activated carbon granules which trap some particulate matter and remove some chlorine, organic contaminants, and undesirable tastes and odors. The three main problems associated with GAC filters are: **channeling**, **dumping**, and an inherently **large pore size**. Most of the disadvantages discussed below are not the fault of the activated carbon filtration media, rather, the problem is the design of the filters and the use of loose granules of activated carbon.

The advantages of GAC filters include:
Simple GAC filters are primarily used for aesthetic water treatment, since they can reduce chlorine and particulate matter as well as improve the taste and odor of the water.
Loose granules of carbon do not restrict the water flow to the extent of Solid Block Activated Carbon (SBAC) filters. This enables them to be used in situations, like whole house filters, where maintaining a good water flow rate and pressure is important.
Simple, economical maintenance. Typically an inexpensive filter cartridge needs to be changed every few months to a year, depending on water use and the manufacturer's recommendation.
GAC filters do not require electricity, nor do they waste water.
Many dissolved minerals are not removed by activated carbon. In the case of calcium, magnesium, potassium, and other beneficial minerals, the taste of the water can be improved and some (usually small) nutrient value can be gained from the water.
The bottom line is that GAC filters are effective and valuable water treatment devices, but their limitations always need to be considered. A uniform flow rate, not to exceed the manufacture's specifications, needs to be maintained for optimal performance, and the filter cartridge must be changed after treating the number of gallons the filter is rated for.

Granulated Activated Carbon (GAC)

Activated carbon canisters are widely used devices for determining the radon in air by virtue of the fact that radon can be adsorbed onto and held in the pores of the activated charcoal. Similarly, when water containing high concentrations of radon is passed through a bed of activated carbon the radon is dsorbed onto the carbon, thereby affecting a separation of radon from water.

Once the radon has been collected onto the carbon, it is held there long enough for the radon to continue through its normal decay chain. In essence, the radon is trapped in the carbon bed and its decay products are also firmly held in place. Carbon style filters, when used for removal of other organic contaminants, exhibits what is referred to as "breakthrough" (when the bed becomes fully loaded with the contaminant and it can be no longer removed). Because the radon on the bed is constantly breaking down, this loading or breakthrough does not occur. This allows carbon units to operate until they become plugged with contaminants, rather then becoming saturated with radon.

A significant advantage of this technique is that the carbon beds are within pressure tanks that allow for easy insertion into the water supply to the house, without the need for a pump or pressure tank to deliver the water to the point of use. The major disadvantage is the amount of gamma radiation that emanates from the tank due to the radon decay products that have been trapped in the bed from the decaying radon.

Activated carbon's enormous surface area is a critical factor in its effectiveness to adsorb various contaminants. The surface area typically is about 1,000 square meters per gram. As an example, a piece of carbon the size of a pea has an area the size of half a football field. The structure and distribution of pores in activated carbon are key factors for adsorption because they determine the size of molecules that can be adsorbed. Adsorption can only occur when molecules enter activated carbon's pores. As a result, the size and porosity of activated carbon determines the rate at which contaminants are adsorbed.

THE CHEMICALS & ELEMENTS THAT THE GAC SYSTEM REMOVES

GAC - Granular Activated Carbon is one of the most powerful and efficient methods for improving drinking water quality. The table shows many of the problems that are addressed by GAC. Keep in mind that with municipally treated water it is highly unlikely that the majority of these contaminants will ever be present. Chlorine (and its derivatives), is the primary concern. THM's & PCB's may also be a concern. As shown, GAC is excellent at treating these problems.

0 - Not an application for GAC
1 - POOR not recommended use
2 - FAIR limited application
3 - GOOD very acceptable results
4 - VERY GOOD a proven application
5 - EXCELLENT a proven application

Acetaldehde 4, Acetic Acid 3, Acetone 4, Alcohols 4 ,Alkalinity 1, Amines 3, Ammonia 1,, Amyl Acetate 5, Amyl Alcohol 5, Antifreeze 4, Arsenic 1,

Benzene 5, Bleach 5, Boron 1, Butyl Alcohol 5, Butyl Acetate 5,

Calcium Hypochlorite 5, Carbon Dioxide 0, Chloral 5, Chloramine 4, Chloroform 5 ,Chlorine 5, Chlorobenzene 5, Chlorophenol 5, Chlorophyll 4, Citric Acid 4,
Cresol 5,

Defoliants 5, Detergents 3, Diesel Fuel 5, Dyes 5,

Emulsions 2, Ethyl Acetate 5, Ethyl Acrylate 5, Ethyl Alcohol 4, Ethyl Amine 4 Ethyl Chloride 4 ,Etyl Ether 4
Fertilizers 1, Flourides 2, Formaldehyde 2

Gasoline 5, Glycols 5,
Hardness 0, Heavy Metals 3, Herbicides 5, Hydrogen Bromide 2, Hydrogen Chloride 1, Hydrogen Flouride 1, Hydrogen Iodide 2,

Hydrogen Peroxide 5, Hydrogen Selenide 3, Hydrogen Sulfide 3, Hypochlorous Acid 5

Inorganic Acids 1, Inorganic Chemicals 1, Insecticides 5, Iodine 5, Isopropyl Acetate 5, Isopropyl Alcohol 5,

Ketones 5,

Lactic Acid 4, Lead 3, Lime 0,

Mercaptans 4, Metal Salts 1, Methyl Acetate 4, Methyl Alcohol 4, Methyl Bromide 5, Methyl Chloride 4, Methyl Ethyl Ketone 5,

Naptha 5, Nitrates 0, Nitric Acid 3, Nitrobenzene 5, Nitroluene 5,

Odors (general) 5, Oil - dissolved 5, Oil - Suspended 2, Organic Acids 4, Organic Esters 5, Organic Salts 4, Oxalic Acid 5, Oxygen 5, Ozone 4,

PCB's 5, Pesticides 5, Phenol 5, Phosphates 0, Plastic Taste 5, Plating Wastes 3, Potassium Permanganate 4, Precipitated Iron 2, Precipitated Sulfur 2,
Propioc Acid 4, Propionaldehyde 3, Propyl Acetate 4, Propyl Alcohol 4, Propyl Chloride 4

Radon 4, Rubber Hose Taste 5,

Sea Water 1, Sediment 2, Soap 3, Sodium Hypochlorite 5, Soluble Iron 2, Solvents 4, Sulferic Acid 1, Sulphonated Oils 4, Suspended Matter 2,

Tannins 4, Tar Emulsion 4, Tartaric Acid 4, Taste (DI Water) 4, Taste (From Organics) 4, THM's 5 Toluene 5, Toluidine 5, Trichlorethylene 5 ,Turpentine 5,

Urine 2,

Vinegar 3,

Xanthophyll 4,

Xylene 5,