Aquafacts No. 3

A KINETICO AquaTaste drinking water filter

Improving the quality of drinking water; the products available & what they will & will not do

In recent years there has been criticism of our drinking water. This has led to a proliferation of products designed to improve the potability of water. These are known in the trade as 'point of use' (POU) devices as the majority are used at, or connected close to, the kitchen sink. Many consumers are confused by what these filters and purifiers will do. This fact sheet, will, hopefully explain the differences and make clear some of the terms used in the industry. It may prove helpful to use this information in conjunction with the 'Aquafacts 4' sheet, which puts the products explained below into a comparison chart format.

'Point of Use' Products The in-home water quality market has a large number of POU products available. Some of these are referred to as counter top units, which can be attached or used indirectly with the cold-water tap. The majority however are in-line systems, which can be simply fitted under the kitchen sink linked to a separate drinking tap.

The simplest device is a sediment filter. There are also activated carbon filters. These normally fall into three categories, jug filters, in-line filter cartridge units and the finer ceramic filters. These can be linked to an ultra violet steriliser to remove bacteria. Higher purity levels are attainable by using KDF™ media, reverse osmosis and distillation.

Jug filters ADVANTAGES These units are exceedingly popular. A jug filter is filled with cold water which is then filtered. Initially they seem a cheap way of improving water quality. Their main constituent is activated carbon to remove chlorine and improve taste. Many jug filters contain a media mix including activated carbon to reduce other contaminants. They are easy to use and replacement cartridges / capsules are readily available from many high street outlets. As long as they are used within the constraints listed below they produce pleasing results. Some jug filters include a water hardness removal resin. In hard water areas these filters can make an enormous difference to the water. Scale will not deposit in kettles and beverages, such as tea, can taste far better. Scum staining in teacups and mugs will no longer occur.

DISADVANTAGES In the long-term jug filters are expensive to use especially as the amount of water they will treat is small. Most cartridges will last about three weeks before a new filter is needed. The actual media content in this type of filter is limited simply by the size and way in which it must be used. This also affects the overall removal capability. Jug filters should never be used longer than is recommended and as bacterial contamination can also occur, it is advisable to keep the filter in the fridge when not in use.

Sediment and GAC filters ADVANTAGES These types of filters have been successfully used for many years. Sediment filters, at various micron ratings, remove dirt, rust and other particulate matter. They have little effect on taste but are an ideal 'cleaning' filter. They are normally only used on mains water with high particulate contamination and as a pre filter for equipment on private water supplies.

Activated carbon filters (GAC), on the other hand, use granular activated carbon in the same way as a jug filter and effectively filter the water as well as giving it a fresher and cleaner taste. The actual filter is housed, as a cartridge, within a filter unit or, supplied as a disposable module. The latter is becoming the most popular of the in-line filters now available. Most are rated between one and fifty microns.

Carbon is a remarkable material and has the property of being able to remove tastes, odours and any discolouration in water. It gives it a sparkling optical clarity. The finely pitted porous surface of the carbon enables it to remove chlorine, pesticides, herbicides and other chloro-organic 'nasties'. Carbon granules the size of a penny have an enormous surface area equivalent to three quarters of a square mile. They work by adsorption rather than by absorption. Some carbon filters can remove water hardness.

DISADVANTAGES Filters in this category cannot remove inorganic material and heavy metals such as lead and substances such as nitrates. They also cannot reduce or remove bacteria or viruses. Activated carbon can harbor bacterial contamination This is not considered harmful as long as the cartridge is regularly changed in line with manufacturer's instructions. Some filters use a silver impregnated carbon as a bactericide. Most cartridges will last between six and twelve months. Some of the latest filters incorporate an automatic shut off device when the cartridge becomes exhausted.

Ceramic and combination filters ADVANTAGES The biggest advantage of a ceramic filter is the lower micron rating. This gives a greater removal capability. Ceramic units are made of a special clay and are available as candles, cartridges or blocks dependent on the type of housing used. They are usually rated one or half micron absolute. The pores are so fine that even bacteria can be filtered out with any particulate matter. Ceramic units are also available impregnated with activated carbon giving many of the advantages of an ordinary carbon filter.

Multi media / combination filters are usually used on suspect private water supplies. These systems, in addition to the above, use selective resins and bone charcoal to remove heavy metals, nitrates etc. Cartridge life will vary considerably dependent on size and type of the system.

DISADVANTAGES As ceramic filtration is so fine cartridges can quickly clog. Dependent upon the amount of suspended solids in the water, the filter may need to be cleaned at regular intervals — every three to four weeks. This can be done by removing the cartridge and scrubbing with nailbrush under running water. Care in handling is necessary as the clay composite is often fragile. (Note: normal sediment and GAC cartridges cannot be cleaned in this way). Like other filters they cannot remove water hardness.

KDF™ Filters ADVANTAGES KDF™ is a filter media combining zinc and copper metals. The interaction between these metals creates an energy field in which electrons are exchanged with contaminants. Some become harmless components and others bond to the KDF™ media. The electrolytic field created kills

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most micro-organisms while inorganics are reduced by oxidation/reduction (redox). KDF™ stands for *Kinetic Degradation Fluction*.

Most KDF™ filters incorporate activated carbon and the combination provides a highly versatile filter able to reduce copper, lead, fluoride, chlorine and nitrate (see Fact Sheet 4). Some will also bring down levels of iron and aluminium. The overall constituents of water will determine how effective the KDF™ media will be. One of the positive effects of KDF™ is to keep bacteria contamination to a minimum during the working life of the filter. Cartridges only need changing annually.

DISADVANTAGES There are very few disadvantages with KDF™ filter systems. The taste of drinking water is the same as with most other activated carbon filters. They are not designed to remove all water borne bacteria or produce a high level of purity. For this, a much more sophisticated type of equipment is required. Any effect on reducing water hardness is minimal.

Reverse Osmosis Systems ADVANTAGES The technology behind reverse osmosis (RO) is comparatively young. It was only in the late 60's, with the coming of the space age, that RO evolved as an ideal way of producing almost pure water without resorting to traditional filtration techniques.

Scientists took a cue from nature during the years of RO development. Osmosis is the means by which water and nutrients are supplied to living cells. Cell walls are natural semi-permeable membranes. These are very selective allowing only certain materials to pass through. The natural flow is from the dilute solution to the concentrated solution. In an RO drinking water system this process is reversed utilising water pressure to push water through and along a membrane containing millions of micro pores. As water molecules are so small they pass through the pores while the impurities cannot.

The Eco-315 RO System

An RO is classified as a purifier rather than a filter. One of the major advantages is the membrane's ability to continually self clean by washing any impurities away to drain. The membrane is therefore capable of performing at a very high level for long periods of time. The system will consistently remove 99% of bacteria. It will also remove giarda cysts and the majority of viruses, together with 90% of simple organics and 99% of larger organic material. On average 95% to 98% of most inorganic material, including water hardness and heavy metals, will be rejected by the membrane (see Fact Sheet 2 and 4).

An RO system consists of filters, a membrane module and a storage tank for the purified water. It can be easily accommodated under a kitchen sink. It is easy to install and requires very little user attention. Reverse Osmosis is so reliable that it is now recommended for tackling most problems associated with private water supplies. The taste of RO water is highly commendable. It is very enjoyable and is known to enhance aromas and give rich flavours.

Reverse osmosis systems have been become very sophisticated and one of the market leaders, KINETICO, have taken the concept to new heights with their 'Water Station' concept. This gives water at exceptional levels of purity and has available several different cartridges that can provide up to 8 water options. The technology is currently the most advanced available.

DISADVANTAGES As a drinking water purifier RO has little competition. As the membrane is constantly cleaning itself an RO system will use more water flushing to drain than it produces as product water. This can be said to be wasteful, although for the average family it is less than 2 toilet flushes a day. As the production of water is slow the system incorporates a separate storage tank enabling volume use. Good water pressure is important for optimum performance. This is not normally a problem in most homes.

A KINETICO Drinking Water Station

Ultra Violet Sterilisation ADVANTAGES Although not popular as a POU device ultra violet sterilisation has been around for some years. It is usually employed on private well water and bore hole supplies. UV light is an excellent 'bug killer' and will eliminate bacteria, mould, algae and virus contamination. The units are available in several sizes and are relatively compact. They are usually used in conjunction with sediment and carbon filters. A typical unit provides high intensity UV light rays which eradiate the water as it passes through an illuminated chamber. One of the biggest advantages of UV sterilisation is its ability to treat large volumes of water relatively cheaply and is therefore used more as a 'point of entry' (POE) product.

DISADVANTAGES UV sterilisation units need to be illuminated constantly 24 hours a day. They require regular cleaning. They should be used in conjunction with other water treatment systems as they are only designed for removing 'bug' contamination. To do this well, flow and contact time are critical. The water can become warm. In recent years smaller and more efficient units requiring less power and prolonging lamp life have become available.

Distillation Equipment In brief, distillation is one of the oldest methods of purifying water. It can however be largely discounted for drinking purposes as the water can taste 'flat'. The equipment is bulky, consumes a lot of electric power and creates heat. They are expensive to buy, operate and maintain and cannot be recommended.

Conclusion Most of the current market demand is for the cheaper jug type filters, which give good results but are expensive for the volume of water they provide. The majority of the in-line filter systems (supplied as DIY kits) cost between £70 and £150. Multi media filters prices vary enormously due to the mix of versions available. Many are recommended for private supply use. KDF™ filters offer considerable value for the all round performance they give. They are priced around £140.00. Ongoing running costs for the most common in-line filters are less than a jug filter. Of the more advanced products RO has proved particularly popular due to the marvelous taste of the water. The water quality, rejection characteristics, reliability and performance make this drinking water system the purifier to aspire to. Costs start at around £340.00.

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