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How to choose a water filter/purifier

Tjin

- Gear reviews and tests - Bivouac -



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A article about the features to look for when buying a waterfilter/purifier

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How to choose a water filter.

There are many different kinds and brand of water filters out there. This article is a basic guide to what features to look for. I will keep as much brand names and models, away so you can make your own decision. I personally do not think there is an ultimate filter out there, each filter has there advantages and disadvantages. You should look a filter that suits your needs and your personal preferences.

This article is only about filters and purifiers, not desalination devices. Filters and purifiers will not remove salt. You will need a reverse osmoses pump to do that.

Filter or purifier The terms filter and purifiers are quite often misused. There is a difference between these two words. A filter is system that uses a material with very small pores, to stop things that are larger than those pores. These pores can be smaller than bacteria, but no filter can filter out viruses. A purifier uses a chemical (usually iodine) to kill the bacteria and viruses, making the water virtually free of any living organism. The chemical used is usually iodine resin. This iodine resin means it will add an unpleasant taste and health hazard for certain people. In addition, this chemical needs time to work. Therefore, you have to wait before you start to drink your purified water.



The First Need purifier (this is the old model)

There is an exception on the market: The First Need purifiers. They use a permanent electric charge in the filter canister to let viruses stick to the filter. There is however debate about its effectiveness, because some people warn that there are both positively and negatively charged viruses in the real world. The First Need is however, EPA certified as purifier.

The actual danger of viruses in North America and Europe is relatively low. Although this does not mean you cannot get sick from viruses in these locations, the chance is not high. Risks spots are water with human waste and high temperatures.

Beware that some purifiers are able to deal with bacteria and viruses, but some will not remove or kill *Guardia* and *cryptosporidium*.

Carbon element A carbon element is mend to absorb chemicals from water. Carbon has an enormous surface area, allowing it to trap tiny parts of chemicals. Size matters, when it comes down on how much it will absorb. Bigger is

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better. These carbon elements can be integrated in a filter, as a separate stage or in some cases; the carbon element is the filter.

Silver Some filters has tiny amounts of silver out in to there filter to prevent bacteria from growing. Silver is not strong enough to kill bacteria, so it is certainly NOT a purifying chemical. It prevents bacteria from growing inside the filter. Unlike other filters, without silver, you do not have to use a chlorine solution to clean your filter before storage.

Iodine resin Unlike silver, iodine is strong enough to kill bacteria and viruses. Therefore, some filters include iodine resin to kill bacteria and viruses, although that means you have to wait a little bit after filtering to let the iodine do its job. When this iodine resin is included, these filters are usually called purifiers, because they eliminate both viruses and bacteria. The iodine will leave some tastes behind in the water. Beware of health risks for certain people.

Pore size When choosing a water filter you should first ask you self what it should filter out of the water. Most modern water filters have pores of 2 micron, 0.3 micron or 0.2 micron. Smaller pores means, more particles being filtered out.

2-micron 2-micron filters will filter out larger organism like *Guardia* and *cryptosporidium*, but not bacteria or viruses. These 2-micron filters are usually combined with a carbon element. Some also include iodine resin to kill bacteria and viruses (purifiers). These filters are usually cheaper to buy, but you are not able to clean them. When they clog, there really is not much you can do about it.

0.3 micron 0.3 micron is a pore size, which is not very often used. It will filter out bacteria, *Guardia* and *cryptosporidium*. These are usually Glass-fibre based filters. Most know model is the katadyn (used to be PUR) hiker filter. These Glass-fibre based filters are pleated too increase the surface area of the filter. Which means these filters are usually quicker than there 0.2 micron counterparts, which generally have less surface area. It has one of the same disadvantages of the 2-micron filter. When they clog, you have a problem. Although Glass-fibre filters can be rinsed, this method is not very effective in clearing a clog.



A ceramic 0.2 micron filter element. This particular one has silver in it, to prevent bacteria from growing.

0.2-micron 0.2-micron filters are usually based on a ceramic filter. It will filter out bacteria, *Guardia* and *cryptosporidium*. These ceramic filters usually have something combined in them. Manufacture like MSR has there ceramic filters combined with carbon, to absorb chemicals. The manufacture Katadyn has there ceramic filters combined with silver; this prevents bacteria from growing inside the filter. These 0.2 ceramic filters are cleanable, you are able to remove a thin layer of the ceramic it self, to expose a new surface. This means a ceramic filter in

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generally would have a much higher capacity on a filter element. Unfortunately, it also means these filters are not pleated, to increase the surface. (A pleated filter is almost impossible to clean.) This means slower filtration. Ceramic is a material that is sensitive to shock and temperatures changes.

Gravity, pumps or squeeze. To get water flowing in your filter or purifier there has to be something providing force. This can be done with the help of gravity, a pump or by squeezing.

Gravity filters Gravity filters come in different sizes. Most have a waterproof bag with a filter attached inside the bag and are suspended in trees or something similar. These filters are great for filtering lots of water, for little effort. They do take a bit of afford to suspend, best done with a small group of people. They are also very slow, bit like a leaky tap. Therefore, it is best to hang them up before you go to sleep and let it does it job overnight. These filters do have a problem, when you scoop water with the bag, dirty water will be on the outside as well. Just like the clean filtered water, this dirty water will be pulled by gravity downwards, following the clean water tubing. If the tube is not connected to a container with a nipple, than the dirty water can drip in to you clean water container. Therefore, it is important to take caution, to dry the outside of the bag or have a connection with the water container that can prevent this.

There are also other kinds of gravity filters; some use a rigid container to hold the dirty water and have different filtration speeds. These are usually for individual users or the opposite, very large, to large to carry on a hike.

Pump filters There are about three pump types used in portable water filters, these are the single action pumps, dual action pumps and the leverage pumps. Each has there advantages and disadvantages.



A single action pump Note the long and thin design of the pump rod; this makes it easier to pump than a "fat" pump rod.

single action pump The single action pump is a very simple and reliable pump. It is usually made of a tube, a valve and a pump lever with a gasket. Due to its simplicity, they are easy to clean and maintain in the field and very reliable. You can use your body weight during pumping. They have no mechanical parts for leverage or other system to make pumping easier. The tube is however usually thin and long, making it easier to pump.

Dual action pumps Dual action pumps looks a lot like single action pumps on the outside, but they use a more complex valve system to pump and suck at the same time. This makes them pumps faster. You can use your body weight during pumping, but only when you are pushing the pump lever downwards. However, these pumps are more complicated and thus harder to dismantle, maintain and clean.

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leverage pump A leverage pump is usually just a single action pump with a leverage arm mounted to make pumping easier. They usually have short and fat pump shafts, so the force needed to pump is not much different from other kinds of pumps. Many people like these pumps, because they think these pumps are more comfortable to use, due to the different movement of pump. It is hard to use you body weight during pumping.

Squeeze Squeeze filters are really only mend for a single person, drinking sips at the time. They are not suitable to filter large amounts of water. You scoop up dirty water inside the bottle and squeeze the bottle to force water through the filter. Water is filtered at the moment you squeeze them, that is usually the moment when you drink it. It is the simplest "pump" out there; there really is not much that can brake. The remaining water inside the bottle influences the output rate of the filter, they works best fully filled with water.

Contamination hazard The design of purifier/filter can have serious effect on the (cross) contamination chances of the filtered clean water. With proper care, you can prevent contamination with all filters. However, some design features makes it easier to do so. The biggest hazard of cross contamination is the intake and output hoses. It is very important to keep them separate and mark them clearly. Using the intake tubing as an output tube is asking for trouble. Although the float and screen on the input hoses should indicate it pretty clearly, what kind of tube it is. The best solution to prevent tubes from contamination each other or being accidentally swapped, is simple not having an output tube at all.



Proper discipline prevents (cross) contamination of the hoses. Packing the hoses separately in waterproof Ziploc bags is a one way to achieve this, clearly mark the dirty and clean bag!

Old style Katadyn Pocket filters had a spout, which is designed to not accept any tubes (can be "fixed" with some work with a file), to prevent you from using two tubes. That is a bad solution, because it makes filtering from a stream/river/etc directly very hard. New Katadyn Pockets filters now have a spout that accepts tubes. Filter/purifier design that allows the filter to be screw on the top of standard water bottles are the best. They make is easier to filter water. You do not need an extra hand to hold a bottle in place, when you cannot put the bottle down on the ground. Also having a cover for the output nipple/spout prevent contaminants from getting in.



Filters that attach directly to a bottle are great to prevent contamination

Over pressure valve Filters have a maximum capacity of filter speed. Once it has reach, the output will not increase. With other words, pumping quicker does not mean you are getting water quicker. However, when you pumping too quickly, pressure can build up inside the filter housing. There are many people that are concerned about the possibility of getting bacteria being squeezed through the filter, due to extreme high pressure. I could not find any research to back this up. Another problem is that filters will fail when they are exposed to too much internal pressure. Although this is very hard to do manually, some people did managed to blow up there filter due to over pressure. It is however very rare.



A ceramic filter failure The upper filter element is new; the filter element at the bottom is used and has obviously failed. The cause was either overpressure or a crack cause by an impact.

To prevent this, some manufacture added an overpressure valve to prevent pressure from building up to much. This feature is not important for those that just filter at the recommended speed. If you are the kind of person that always seems to rush things, than this might be a feature that fits you.

Weight and size Weight and the size of filters/purifiers are important when you have to carry them many miles for days at the time. In general, the size of the filters determines the weight of the filter. The trade off between size and weight is capacity. Capacity to produce an X amount of water in a minute and the total capacity of the filter element. Big filter have bigger surface area, than there smaller counter parts. Bigger surface means quicker filtering and less

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clogging. So keep in mind what's more important to you. Carry a heavier, but quicker filter or a small filter that need more pumping and time to produce the same amount of water as the bigger ones.

Manufacture advice Manufactures usually give an indication what a filter is designed for. Using a filter outside its design specification is usually asking for trouble. Using a tiny filter for multi day hike for multiple persons, is really demanding on such a filter. Carry a big expedition style filter on day hikes is just overkill.

More information about filters can be found [here](#)

A website with a large list of filter models and there effectiveness can be found [here](#)

A website with many individual reviews can be found [here](#)

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