B2.3 Filtering soluble substances from water – Tracking down technology

1 Household tap water filter

Figure 1: Here you see how the tap water filter pitcher is filled. The receptacle for the filter cartridge is circled.

Figure 2: Filter cartridge: closed in top photo, open in bottom photo ("cartridge" generally means "container").

What a tap water filter does:

Tap water is generally very clean. However, depending on the source of the drinking water, it can have a high mineral content. In addition, chlorine is often added to tap water to disinfect it.
These substances can make the water taste unpleasant. The lime forms a white layer on kitchen devices, such as electric kettles and coffee makers. We can use a filter to remove the lime and chlorine from the water. The filter cartridge must be replaced at regular intervals.

How a tap water filter works:

You pour tap water into the upper pitcher reservoir with the filter cartridge. The water passes through the cartridge, and the cleaned water flows into the bottom of the pitcher.
The cartridge usually contains three different filter layers: The first layer works like a sieve to remove particles, for example, those that have broken off from the water pipe. The second layer consists of activated carbon. It removes chlorine, germs, and bacteria. The activated carbon works partly like a fine sieve and also removes the particles through a chemical reaction in the carbon (an expert calls this "adsorption"). The third layer contains what's referred to as an ion exchanger, which filters out lime. This takes place via a chemical reaction.

2 UV module for water disinfection

Note: UV stands for ultraviolet. UV light has a lot of energy. It is also present in sunlight and is the reason why we get sunburned.

The microorganisms in waste water reach sewage plants via sewer systems. These microorganisms include pathogens of infectious diseases that have been expelled by people via the intestine and the urinary tract. Microorganisms are extremely small. They slip through the many sieves and filters in a sewage plant. They are therefore still present in the water even when the water looks nice and clean. Microorganisms of this sort must not be released into rivers. For this reason, water that comes out of the clarification tanks of the sewage plant is irradiated with UV light. The microorganisms in the water are killed by the UV light.

Lamps that generate the UV light (called low-pressure mercury vapor lamps) are installed in the quartz tubes shown in the photo. The black rings are "wipers." They prevent deposits from settling on the tubes. Many of these tubes with lamps (up to 100) are hung in the channels where the water exits the clarification tanks.

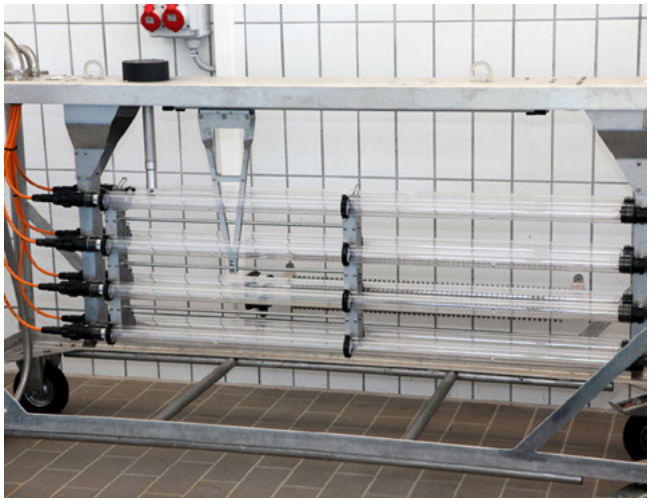

Figure 1: UV module for water disinfection.

Then the UV lamps are turned on. Within a few seconds, nearly all microorganisms are dead. The water is then truly completely clean and can be fed into a river. You can therefore swim in the vicinity of sewage plants without worrying (see also the Bathing Water Directive of the European Union).