Activated carbon filter for water treatment pdf

Activated carbon filtration is usually the technology used based on the adsorption of contaminants to the surface of the filter. This method is effective in removing certain organic substances (such as unwanted taste and odours, micropollutants), chlorine, fluorine or radon from drinking water or waste water. However, it is not effective for microbial contaminants, metals, nitrates and other inorganic contaminants. Adsorption efficiency depends on the type of activated carbon used, water composition and performance parameters. There are many types of activated carbon filters

that can be designed for the needs of households, communities and industry. Activated carbon filters are relatively easy to install, but require energy and a skilled workforce and can have high costs due to regular replacement of the filter material. The use of carbon in the form of charcoal has been used since antiquity for many applications. In Hindu documents from 450 BC. n. Charcoal filters for water treatment are indicated. In the 18th and 19th century, the sugar industry used charcoal, bone and coconut charcoal for decorating solutions (CECEN 2011). Activated carbon is a material prepared to show a high degree of porosity and an enlarged surface. A typical carbon fragment has a number of pores that provide a large surface area for water treatment. Source: LEMLEY et al. (1995) When filtering water through activated carbon, contaminants fit the surface of these carbon granules or become trapped in small pores of activated carbon (AMIRAULT et al. 2003). This procedure is called adsorption. Activated carbon filters are effective for removing certain organic substances (such as unwanted taste and smell, micropollutants), chlorine, fluorine or radon, from drinking water or wastewater. However, it is not effective for microbial contaminants, metals, nitrates and other inorganic contaminants. Activated carbon filtration is usually used in centralised treatment and household levels, for the production of drinking water and in waste water processing industries. It is also an incoming treatment used for the disposal of micropollutants in both the production of drinking water and for the treatment of treated waste water prior to disposal (see also surface removal or surface and sub-networking filling of groundwater). (Adapted from LEMLEY et al. 1995) There are two basic types of water filters: particulate filters and adsorptive/reactive filters. Particle filters by size exclude particles, and adsorptive/reactive filters contain material (medium) that either adsorb or react with contaminant in water. The principles of adsorptive activated carbon filtration are the same as those of any other adsorption material. The contaminant attracts and holds it (adsorbed) on the surface of the carbon particles. Characteristics of carbon material (particle and pore size, surface, surface chemistry, etc.) affect efficiency carbon filters for water treatment. Source: FOCUS TECHNOLOGY CO LTD (2011)The characteristics of the chemical contaminant are also important. Compounds that are less soluble in water are more likely to adsorbie to solids. Another characteristic is the affinity of a dane contaminant with carbon surface. This affinity depends on the charge and is higher in molecules that have less charge. If there are more compounds present in the water, strong carbon adsorbers will be attached in a larger amount than those with weak adsorbed. (Adapted to Drovcu and SKIPTONu 2008) The medium for activated carbon filter is usually petroleum coconut, bituminous coal, lignite, wood products, coconut shell or peanut shell. The carbon medium is activated by subverting it to a stream (gas such as water, argon or nitrogen) and high temperature (800-1000°C) usually without oxygen. In some cases, carbon can also be carried out by acid washing or by a joint to increase the removal of specific contaminants. Activation produces carbon with a lot of pores and a high specific surface. It is then crushed to produce a grainy or repulsed carbon product. Wood dust activated carbon for the treatment of drinking water. Source: PURAIR (n.y.) (Adapted to dreary and SKIPTON 2008)Activated carbon units are commonly used to remove organic substances (odours, micropolutants) from drinking water at a centralised and decentralised level. At a centralised level, they are generally part of one of the last steps before water is fed into the water distribution network. At a decentralised level, carbon filtration units may be activated either by the point of use (POU) or by point of entry (POE) treatment. The POE device is recommended for the treatment of radon and volatile organic compounds, as these contaminants can easily evaporate from water in showers or washing machines and expose users to health hazards. POU devices are useful for the removal of lead and chlorine. The structure of POU devices may be built into a linear, line bypass faucet (see also advanced filters) or oversud (similar to the design of ceramic candles, colloidal silver or bio-ord filters). Types of carbon units activated. Source: AMIRAULT et al. (2003) Activated carbon filters can also be used as tertiary treatment in wastewater treatment plants for the removal of micropollutants from municipal discharges or recalculated pollutants from industrial discharges. Activated carbon is often used as a pre-treatment to protect other water treatment units, such as reversible osmosis membranes and ion resal exchanges from possible damage due to oxidation or ecological foule. The combination of ozone with activated carbon is a very effective technique for eliminating organic matter, including micropollutants. In addition, the lifetime of activated carbon filters is drastically extended when used in combination with ozone, significantly missing operating costs (AEPPLI and DYER-SMITH 1996). (Adapted from AMIRAULT et 2003)Installation costs are moderate, but additional technical equipment is required. Operating costs are usually limited to filter replacement. Depending on the type and concentration of the contaminant to be removed, some carbon filters may require special management of hazardous waste and disposal, which can be expensive. (Adapted from LEMLEY et al. 1995) Carbon filters are relatively easy to install and maintain, but a skilled workforce is required at least occasionally to monitor the disposal capacity of both POU and POE equipment. Activated carbon filters have a limited life span. After prolonged use, their surfaces are saturated with adsorbed pollutants and there is no further purification. The filter material should therefore be replaced at regular intervals in accordance with the manufacturer's instructions. Alternate intervals should be calculated on the basis of the average daily use of water through the filter and the amount of contaminant to be removed. Removing cartridges depends on usage. The carbon input can be exhi dedted and then reused or discarded if non-toxicness is adsorbed. Working principle Pollutants are removed from water by adsorption on the surface of activated carbon. Use in POE or POU (e.g. advanced filters). Capacity/relevance Simple technique with abundant raw materials (e.g. coconut, bituminous coal, lignite, wood products, coconut shell or peanut shell). A skilled workforce is required at least occasionally. Efficiency effective for pollutants with high affinity with activated carbon surface (non-semiar compounds). Costs Relatively low operating costs. Self-help Compatibility Initial water analysis is required to select the appropriate adsorbent (type of activated carbon). O&M Regular replacement or regeneration of the carbon cartridge. Reliability Reliable if the selection of the type of carbon activated to be used as a filter material takes into account the composition of the water. The main power activated carbon can be produced relatively easily anywhere in the world. Main weakness The filter should be replaced regularly. Activated carbon filters are often used for the production of drinking water at the level of households and communities (for the disposal of certain organic, chlorine or radon from drinking water) and for the processing of industrial or urban waste water. Not effective for disinfecting and removing nitrates. Activated carbon adsorption is a simple technology based on materials such as fossil fuels (petroleum coconut, lignite...) and even agricultural waste (e.g. coconut shell, wood, etc.). In order to select the most valid type of activated carbon for a particular use, it is important to analyse in advance the composition of the influential water. The carbon filter should be replaced or renewed regularly to remain effective. Activated carbon can also be used as a pre-treatment to protect other water treatment devices. Units.