HUBER Technology Nordic AB

Removal of micropollutants: Fourth treatment stage with the HUBER Sandfilter CONTIFLOW®

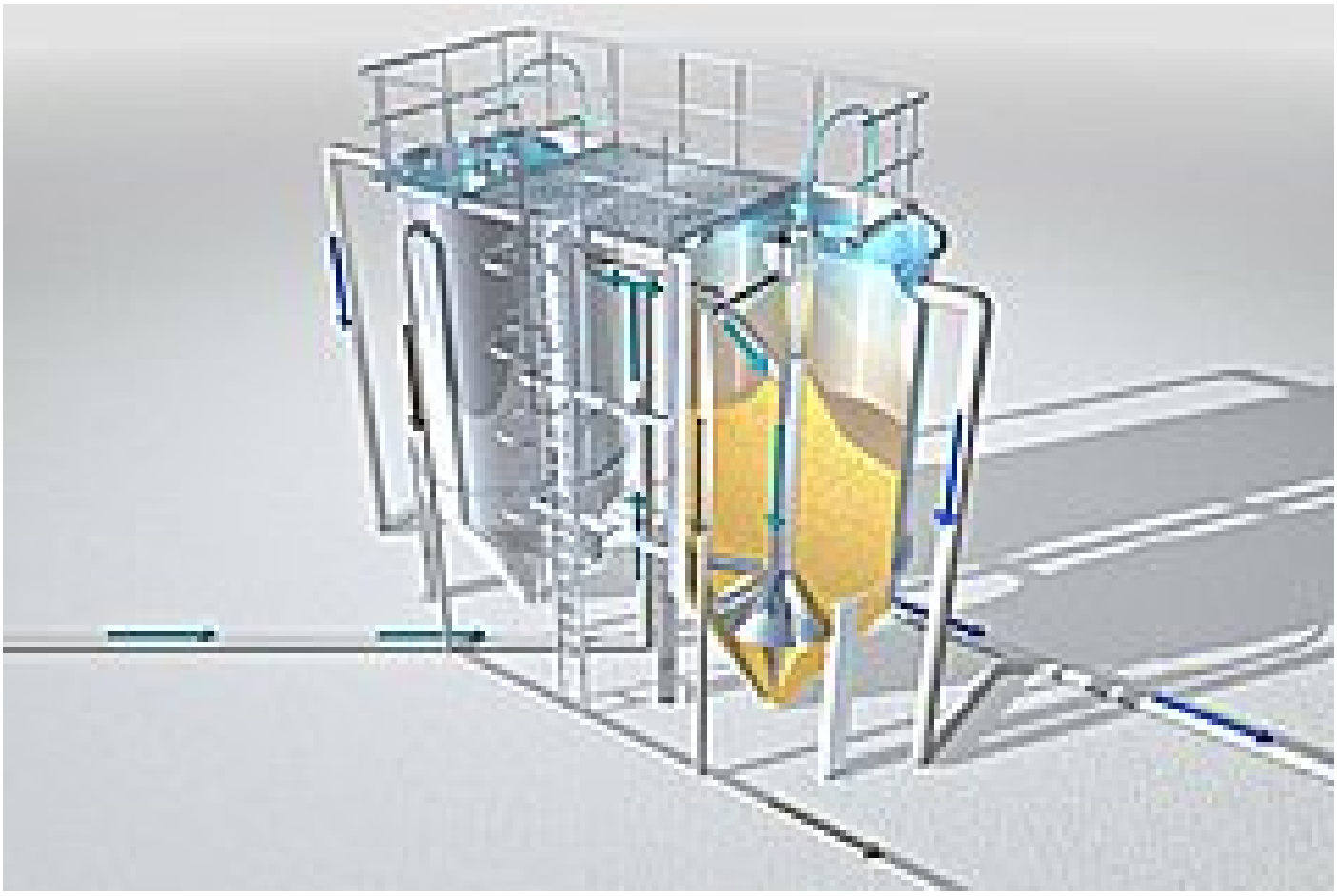

Fig. 1: Operation principle of the HUBER Sandfilter CONTIFLOW®

Pharmaceutical residues are increasingly found in water and soil in Germany. Due to improved methods of analysis a great number of pharmaceuticals can today be detected in surface waters and sometimes also in groundwater, in the concentration range of nanogram to microgram per litre. Due to their very low concentrations these substances are also called micropollutants or trace substances.

The effects these residues of pharmaceuticals, chemicals, hormones and pesticides have on the ecosystems in our waters and on animals and plants have not yet been fully clarified. It is however certain that some of these substances have a high damaging effect on the environment, such as the very commonly used analgesic Diclofenac which can cause kidney damage in fish and has meanwhile been detected in a lot of waters.

Beside diffuse sources and leakage, municipal sewage treatment plants are considered to be the main inlet port for micropollutants. The micropollutants contained in residential wastewater are normally poorly biodegradable and can therefore only insufficiently be removed by conventional wastewater treatment systems. In the present state of knowledge, it is indispensable to integrate additional treatment stages to ensure an as wide as possible spectrum of pollutants are removed.

For the removal of micropollutants in industrial scale plants the so-called quaternary treatment, a fourth treatment stage, has been implemented which is for example based on the process of ozonisation and treatment with active carbon.

Operation principle of the HUBER Sandfilter CONTIFLOW®

The HUBER Sandfilter CONTIFLOW® is a deep-bed type upflow filter. The system is highly efficient as no shutdowns for backwash cycles are necessary for the sand washing process.

As the influent flows from the bottom upward through the sand bed, the solids contained within the influent are retained in the filter sand. The clean filtrate exits over a weir at the top of the filter. The sand bed, along with the accumulated solids, is drawn downward to the trough bottom into the airlift pipe, which is located in the centre of the filter. The airlift transports the mix upwards to the sand

washer. Inside the washer, the solids are separated from the filter sand along with a small portion of the filtrate flow, the so-called wash water. The clean sand falls down through to the bed, generating an internal sand circulation.

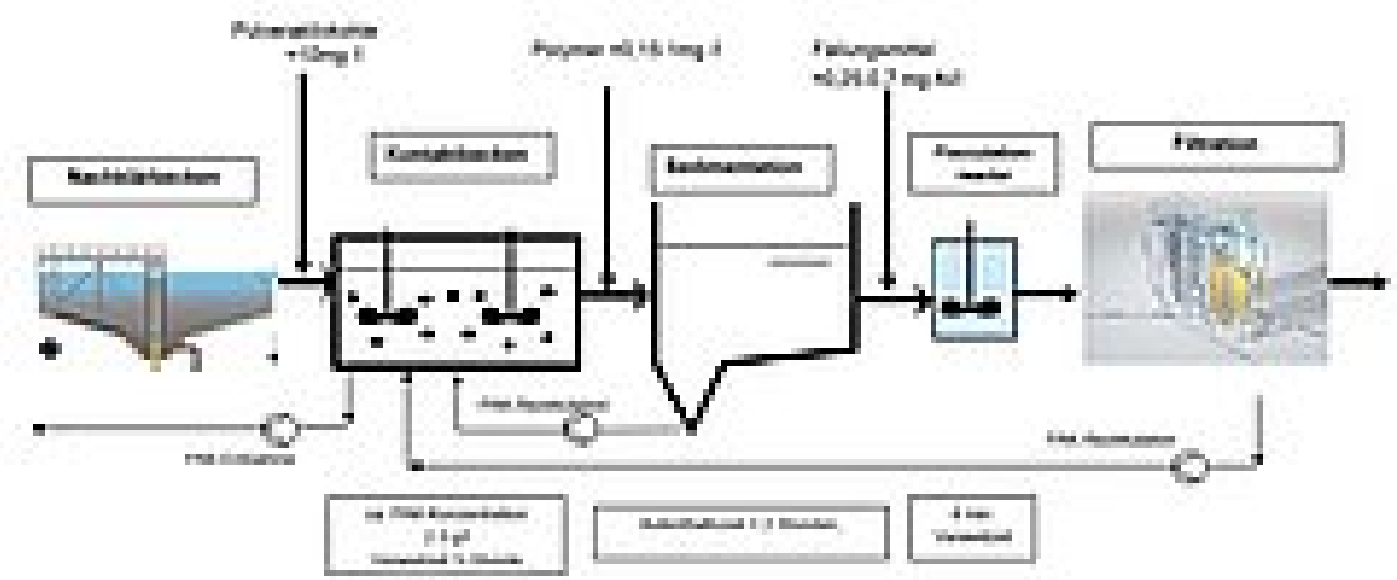

Fig. 2: Commonly applied quaternary treatment using powdered active carbon

Removal of micropollutants with the use of activated carbon and the HUBER Sandfilter CONTIFLOW ®

The most frequently applied methods of advanced wastewater treatment with active carbon are added downstream treatment processes. The application methods can be divided into applications using powdered active carbon (PAC) and applications using granulated active carbon (GAC).

Powdered active carbon (PAC):

In most of the implemented projects the fourth (or "quaternary") treatment stage subsequent to the secondary clarifier consists of a contact reactor, sedimentation tank and downstream sandfilter. In the contact reactor the powdered active carbon is added into the effluent from the secondary clarification tank. After a defined adsorption time the trace substances adher to the large (inner) surface of the powdered active carbon particles and settle in the sedimentation tank. A portion of the fine fraction of powdered active carbon does not settle within the defined time. A filtration system is necessary to remove this rest of fine powdered active carbon after sedimentation. If powdered active carbon is used, it must be ensured that the 'contaminated' active carbon is separated to the greatest possible extent, irrespective of the amount of carbon added.

The HUBER Sandfilter CONTIFLOW® ensures that the powdered active carbon is retained and the effluent is virtually solids-free. An effluent quality of ≤ 1 FNU and AFS ≤ 5 mg/l can reliably be achieved and ensured.

Granulated active carbon (GAC):

The HUBER Sandfilter CONTIFLOW® can optionally be filled with granulated active carbon instead with sand and then operated as a GAC filter. The technical process of the machine remains the same as with sand and also the same retention of AFS can be guaranteed. Contrary to powdered active carbon, granulated active carbon can be regenerated. The current costs for regular carbon replacement can therefore be reduced compared to the use of new granulated active carbon.

Removal of micropollutants with the use of ozone and downstream HUBER Sandfilter CONTIFLOW ®

The substances attacked by the ozone are normally not completely mineralized but only converted into unknown oxidation products. Particularly also poorly degradable carbon is oxidized with ozonisation and thus partly converted into a form in which it is available for microorganisms so that it can be removed from the wastewater in a downstream biological treatment system. Considering the fact that the transformation products can have negative ecotoxicological effects on the life in waters it is recommended to additionally treat the water downstream in a biological treatment stage prior to discharging it to the receiving water course.

As a biofilm forms on the sand grains a sandfilter can be called a biofilter. The biofilm consists of microorganisms which enable the sandfilter to biologically reduce the transformation products in the wastewater.

In combination with ozonisation the well-proven HUBER Sandfilter CONTIFLOW ® can thus be operated with granulated active carbon instead of sand to remove the transformation products. In consideration of the fact that ozonisation and active carbon selectively remove micropollutants from the wastewater the most extensive removal of micropollutants would be achieved through the combination of both.

A member of the HUBER Group

Postadress / Mailing address:
HUBER Technology Nordic AB
Box 125, 437 22 Lindome,Sweden

Besöksadress / Visiting address:
Heljesvägen 4
437 36 Lindome, Sweden

Telephone: + 46 31 99 64 60
E-mail: info@hubersverige.se

www.hubersverige.se
Bankgiro: 5870-0386
Postgiro: 6402198-3