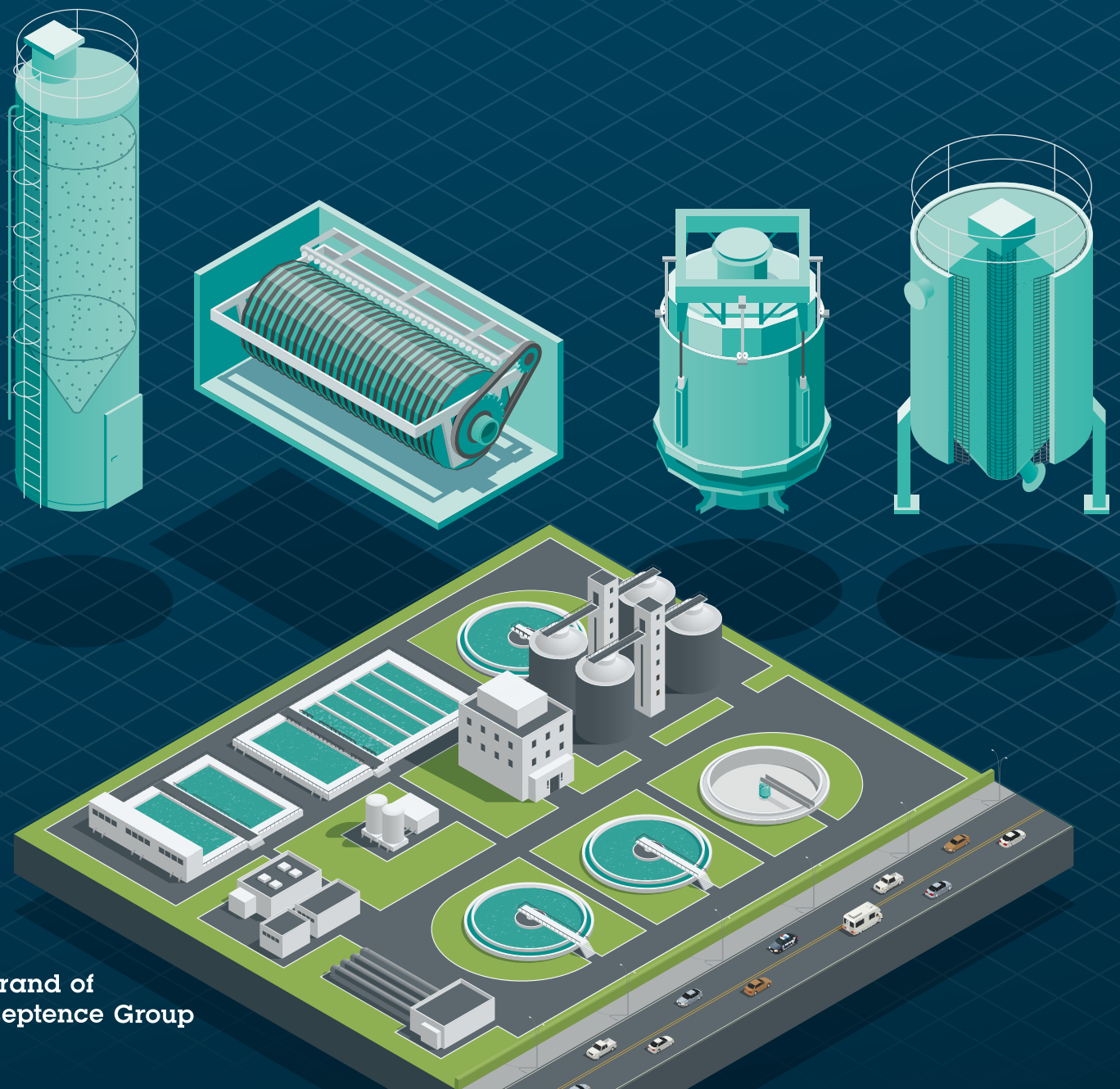
Passavant Geiger

We Build Responsibility

Simple Integration in greenfield or brownfield

Elimination of micropollutants and refining of wastewater:

Solutions for the Advanced Wastewater Treatment



A brand of Aqseptence Group

Problem

Organic micropollutants affect water bodies

In recent decades, residual byproducts from the pharmaceutical, pesticide, cosmetics and textile industries as well as from household sewage have become increasingly problematic for the environment. These chemicals, broadly denominated "micropollutants", are present in both industrial and domestic sewage and, if not specifically targeted during wastewater treatment, find their way into our waters and soils, and ultimately into our food chain.

The concentration of micropollutants in many water bodies often exceed environmental quality standards. This is due to the fact that various micropollutants are only inadequately removed from wastewater during mechanical and biological treatment stages of wastewater treatment. For this reason only targeted, downstream wastewater treatment technology ensures a succesful removal of many micropollutants. This enables water reuse such as irrigation.

Processes using ozonation and particulary activated carbon adsorption are currently considered to be highly effective and cost-efficient, and a combination of both methods is often employed. Such solutions aggregate high effectiveness and a broad spectrum of target micropollutants - easy to maintain -, without taking up too much space or demanding much in terms of resources.

Solution

Refining waste-water

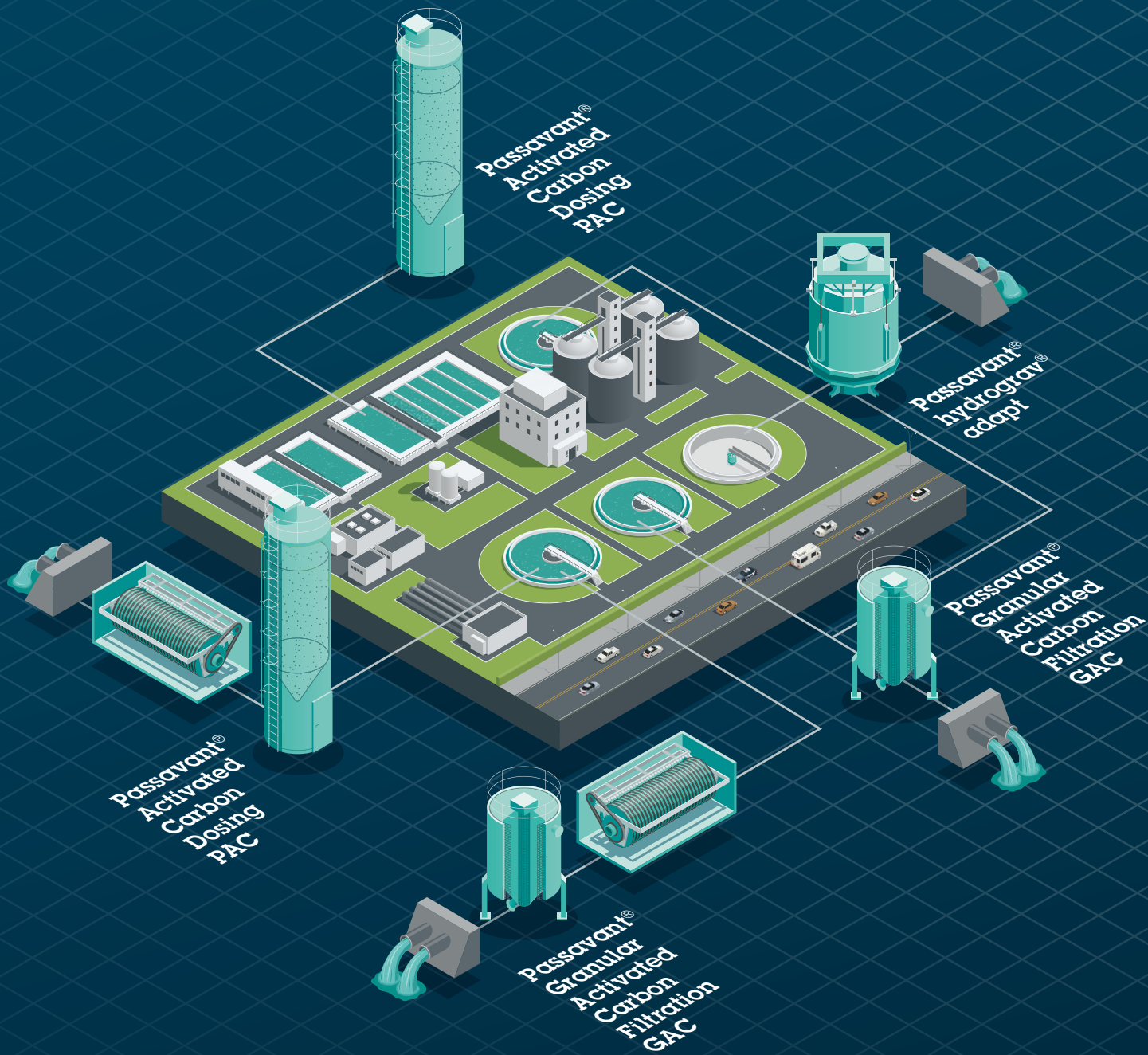
Activated carbon as a suitable agent for the removal of micropollutants

Activated carbon has an exceedingly large surface area. When activated carbon is brought into contact with micropollutants, non-polar substances pass through the porous surface of the activated carbon into the macro- and micropore structure, where they adsorb to the carbon. Activated carbon is used in powder form (PAC) or as granules (GAC).

Powdered activated carbon (PAC) can be added at various points within the treatment process. Subsequently the particles have to be removed after loading with micropollutants (reverse side: Figures 1-3). By using a mixture of activated carbon of different origins (e.g., carbon from wood, coconut shells or other zero-trace carbon), the elimination efficiency can be maximized due to differences in the macro- and micropore structures, since not all micropollutants have the same nature.

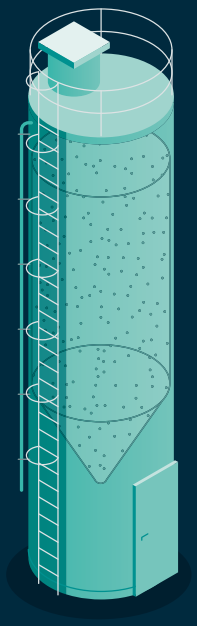
As an alternative to powdered activated carbon dosing (PAC), the use of **granulated activated carbon (GAC)** has proven as well. In this method, several filters are usually employed in parallel. In this way - despite different loading of the GAC with micropollutants - on average a homogeneous elimination performance is achieved (Back-side: Figure 4).

A crucial factor in PAC and GAC applications is combining those technologies with the efficient removal of solids. Such can be an advanced secondary clarification with the **Passavant® hydrograv adapt variable clarifier inlet** or **cloth filtration**. In this regard, Passavant-Geiger offers compact, efficient, and maintenance-friendly technologies in prefiltration and clarification.



Systems

Passavant® Activated Carbon Dosing PAC

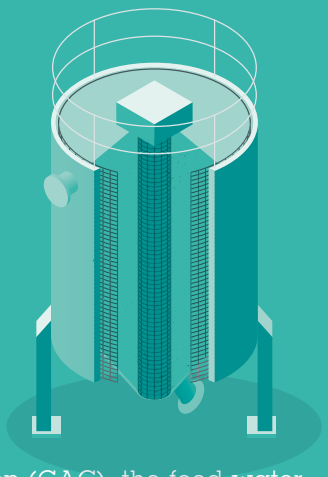


Activated carbon fragmented into powder (particle sizes between 5 and 50 µm – PAC) provides an increased adsorption rate compared to granular filtration (GAC). In combination with the appropriate activated carbon mix, the content of micropollutants in the waste-water can be reduced by approx. 85-90%. In practical terms, the consumption of PAC relates to both the demanded elimination rate as well as an appropriate metering technology as per the state-of-the-art. The Passavant® storage and dosing system has been specially designed to provide a lower carbon consumption and most reliable automatic operation.

- ✔ **broad spectrum elimination of micropollutants (PFAS, hormons, medicals etc.)**
- ✔ **dosing proportional to concentration, adsorption or flow**
- ✔ **precise dosing through gravimetric proportioning scale (state-of-the-art technology by Passavant-Geiger)**
- ✔ **retrofittable, allowing continued usage of existing infrastructure**
- ✔ **low maintenance requirement (approx. 1h/week)**

Please contact us for more information

Passavant® Granular Activated Carbon Filtration GAC

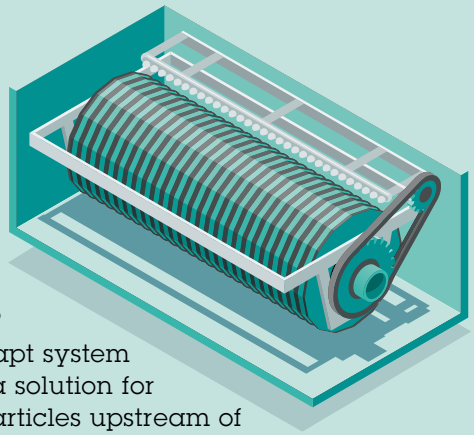


Aiming to minimize the GAC-filtre footprint, we have evolved a particularly efficient and patented solution, based on horizontal filtration. In the Passavant® Granular Activated Carbon Filtration (GAC), the feed water enters the GAC-bed through an inner distribution cylinder. While micropollutants are being adsorbed in the GAC, the treated effluent flows horizontally-radially towards the shell. Between the GAC-bed and the vessel wall are located slit sieves with fine slots. The design of the the slit sieves (manifold and shell) is based on decades of experience with our JohnsonScreens slot sieves/ vee-wire. The system comes along with a back-wash system to control biological growth.

- ✔ **significant increase in flow capacity compared to conventional filters due to horizontal loading**
- ✔ **uncomplicated refilling or replacing of GAC (open top)**
- ✔ **rinsing of filter medium without interrupting continuous operation**
- ✔ **easy outfitting and straightforward control**
- ✔ **low maintenance requirements (approx. 1h/week)**

Please contact us for more information

Passavant® Cloth Filtration MCF

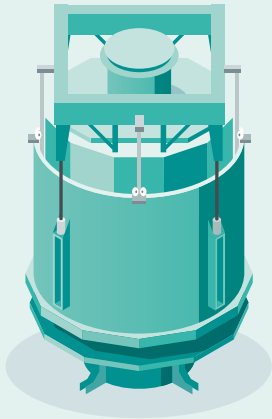


In rectangular clarifier or sedimentation tanks in case the Passavant® hydrograv® adapt system can't be used, a solution for unloading of particles upstream of GAC-filtration is recommended. Like Passavant® Cloth Filtration, which can significantly reduce the concentration of filterable solids (TSS). In addition to the typical filterable solids previously dosed PACs can also be filtrated. The operation principle is simple while very effective: the wastewater flows through the filter cloths from outside and is retained in a precoat filter. Retention accumulates up to a threshold value, which triggers the cleaning of the filter cloths.

- **advanced nutrient removal through separation of the finest-grained TSS**
- **minimizes activated carbon slippage**
- **protects downstream GAK-filter from performance-diminishing solids**
- **easy retrofitting due to low pressure loss**

Please contact us for more information

Passavant® hydrograv® adapt system



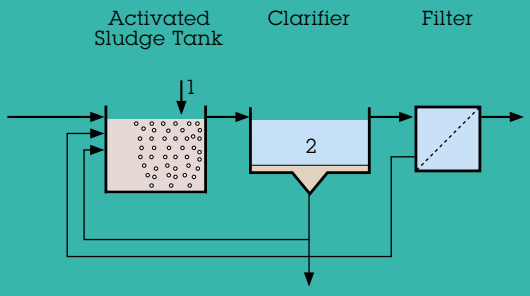
Passavant® adapt technology in combination with activated carbon: A capable sedimentation reduces PAC slippage or the TSS load on downstream GAC filters. The system has been applied in dozens of final clarifiers to optimize hydraulics and to minimize phosphorous discharge. The system automatically varies the inlet level to the clarifier following changing dayline or weather conditions, thus preventing the discharge of filterable substances from secondary clarifiers. This variable inlet system adjusts – decreasing or increasing at different levels – depending on the load.

- **less turbulence in clarifier, due to automatic adaptable inlet system**
- **advanced nutrient removal (e.g. phosphorus) through separation of finest-grained TSS**
- **larger hydraulic capacity**
- **high efficiency and less energy consumption**
- **state-of-the art (DIN EN 12255-6, DWA-A 131)**
- **space and cost saving**

Check our Product brochure for information

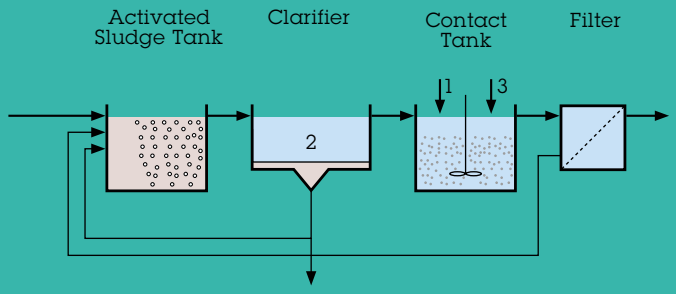
Combination of technologies to adsorb micropollutants

1. Application in the conventional activated sludge process (CAS)



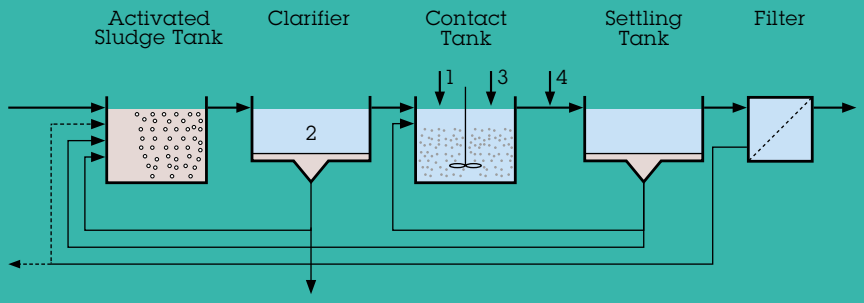
1: Passavant® Activated Carbon Dosing PAC
2: Passavant® hydrograv® adapt

2. Application before a filter



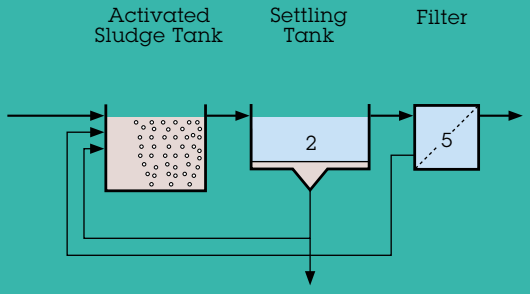
1: Passavant® Activated Carbon Dosing PAC
2: Passavant® hydrograv® adapt
3: Precipitants

3. Application in a downstream stage with enrichment of PAC in suspended form



1: Passavant® Activated Carbon Dosing PAC
2: Passavant® hydrograv® adapt
3: Precipitants
4: Polymer

4. Application of granular activated carbon after conventional activated sludge process (CAS)



2: Passavant® hydrograv® adapt
5: Passavant® Granular Activated Carbon Filtration GAC

We will be delighted to support in particular with our Passavant® Filtration GAC and Passavant® hydrograv® adapt for international projects

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