



# *Activated Carbon for Waste Water Treatment*

HYDRAFFIN® and CARBOPAL®



## Waste Water

Industrial and municipal waste water can contain many impurities, which are divided into different pollutant groups (among others dissolved and undissolved substances, easily degradable organic substances, persistent organic substances, plant nutrients, heavy metals, and salts). The aim of sewage treatment is the elimination of these undesired impurities and the restoration of natural water quality.

The contaminations are usually pre-cleaned with other treatment processes such as flocculation, sedimentation and/or biological treatment. The activated carbon is usually used in a last processing step to remove the most difficult impurities like pharmaceutical micropollutants.

The activated carbon used for cleaning (granular or powder) has to fulfil many different tasks:

- » removal of organic-chemical substances and colorants
- » reduction of trace substances like chemicals or pharmaceuticals
- » enormous decrease of residual COD

In practice it is very difficult to identify the impurities and pollutants in the wastewater individually. Therefore, the concentrations of the components are usually determined as sum parameters (e.g. COD, DOC, AOX). Empirically, as the waste waters basically differ depending on their origin, it might be necessary to do some lab tests with the respective waste water first to choose the optimal quality of activated carbon or use our rental, mobile activated carbon filters for a pilot test.



# Granulated Activated Carbon for Filter Systems

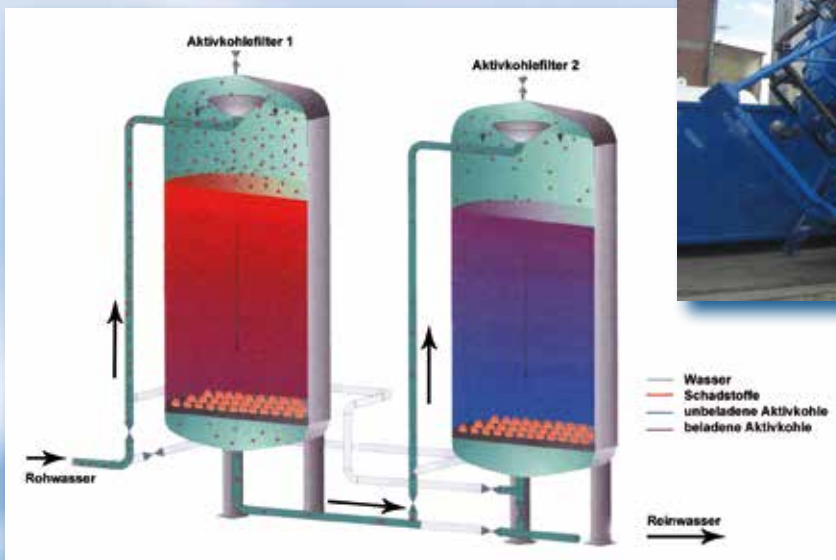
The suspension-free waste water percolates through a filter bed of granular activated carbon. For this purpose, mostly closed pressure filters are used.

To ensure an optimal and efficient loading amount of the activated carbon, several activated carbon filters are connected in series, because then a maximum load in the first filter can be achieved. Impurities which cannot be adsorbed in the first filter anymore are adsorbed in the next filters and therefore cannot return to the water cycle.

The use of granular activated carbon in fixed bed filters also gives the possibility for thermal reactivation of the loaded activated carbon. This is an environment-friendly and cost-saving alternative to waste disposal.

Our Services are for our Customers Benefit:

- » trained personnel for the change of activated carbon (no technicians on site necessary)
- » return of loaded activated carbon according to Recycling Act (elimination of the electronic certification process)
- » exact traceability of the recycling pathway by direct delivery of the loaded carbon to supplier
- » emergency shipment within 48 hours on request possible
- » individual activated carbon deliveries possible (e.g., pH neutral)
- » supply by a 4-compartment vehicle possible
- » rental & sale of "ready to operate" mobile Filter Units
- » logistic and carbon exchange concepts tailored to your specific needs

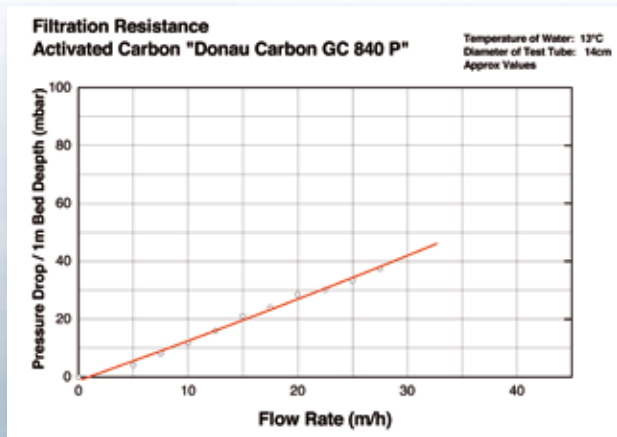


# Treatment of Leachate in Landfills

The deposition of COD (chemical oxygen demand) and chlorinated hydrocarbons is the primary aim of the treatment. COD is the sum of all oxidizable organic ingredients and shows how much oxygen is needed for the complete chemical oxidization of an existing organic impurity (in mg/l O<sub>2</sub>).

A common procedure for the purification of leachate with mostly organic load is the combination of biological treatment with subsequent ultrafiltration and activated carbon adsorption.

The leachate slowly percolates in 10 - 15 minutes through the filter bed filled with activated carbon. For this type of application, activated carbons with an open pore structure are particularly suitable.



## Granular Activated Carbon for Landfill Leachate Treatment

Product name	Specificity	COD load*
Donau Carbon GC 840 P	standard	ca. 20%
Donau Carbon GC 840 P supra	superior	ca. 30%
Donau Carbon GC 840 P premium	premium	ca. 40%

\* depending on landfill seepage water

## Tailor-made Activated Carbons

Depending on the type of waste, landfill age and geological area, the accruing landfill leachate has a different composition. Preparation procedures and used activated carbon must be adapted accordingly to this. The leachate is examined in Donau Carbon's own laboratories to determine the most appropriate quality of activated carbon. Depending on the requirements. The **Donau Carbon GC 840** - series consists of components with different pore size and ensures an optimal operation.

Tailor-made activated carbons from Donau Carbon achieve impurity loads up to 45 weight percent and extend the service life of the filters significantly compared to conventional activated carbon grades. The activated carbon consumption can be reduced decisively - an economic advantage for each landfill.





## Powdered Activated Carbon in Stir Process

Powdered activated carbons are added as dry powder or as aqueous solution before or simultaneously to the flocculation step.

The advantages of powdered activated carbons lie in the flexibility of dosing according to water pollution and reduced investment costs due to existing aeration tanks and secondary settling basins. This is already proofed by independent studies in terms of Micropollutants in different sewage plants.



Powdered Activated Carbon for Waste Water Treatment		
Activated Carbon	raw material	application
Carbopal AP	Lignite	pharmaceutical pollutants & very high COD removal
Hydraffin MB4	Wood	Decolourization and COD removal
Hydraffin P800	bituminous coal	High quality product for COD removal
Hydraffin PR	bituminous coal	Price attractive alternative

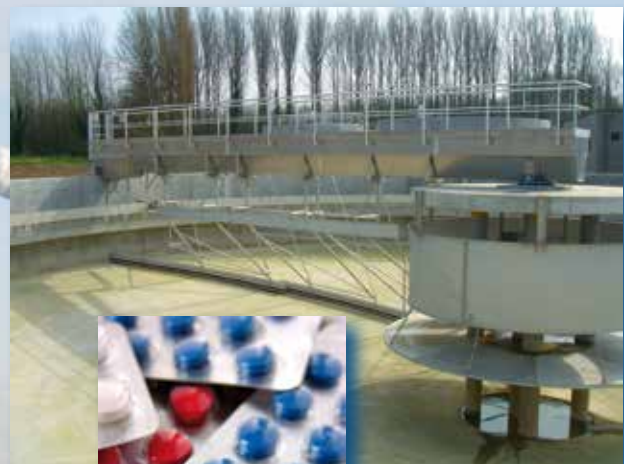
## Municipal Waste Water Treatment Plants

Residuals of pharmaceuticals, endocrine substances and X- ray contrast agents which come to the water cycle are nowadays a problem for the aquatic environment. These trace substances are detected frequently in the drain of municipal wastewater treatment plants and the use of special powdered activated carbon is an effective and inexpensive solution for their removal.

Due to this new challenge for activated carbon Donau Carbon develops and provides successfully since many years innovative activated carbon qualities based on different raw materials especially for water and wastewater treatment. Our field trials, done in close cooperation with various wastewater treatment plants and subject-related research organizations, show that the concentrations of undesirable contaminants can be reduced significantly by using our activated carbon.

The purification of the wastewater is typically done by a physical process (removal of coarse materials), the primary clarifier, a biological stage and a final adsorption/flocculation in a contact reactor. A part of the activated carbon is separated from the wastewater by sedimentation and can be recycled back into the biological aeration tank.

The contact time between activated carbon and sludge is often 20 to 60 minutes and normally a dosage of 10 mg/l PAC is added. The effects of higher doses during the removal of residuals have been proven in studies as insignificant.



## Results & proof of performance

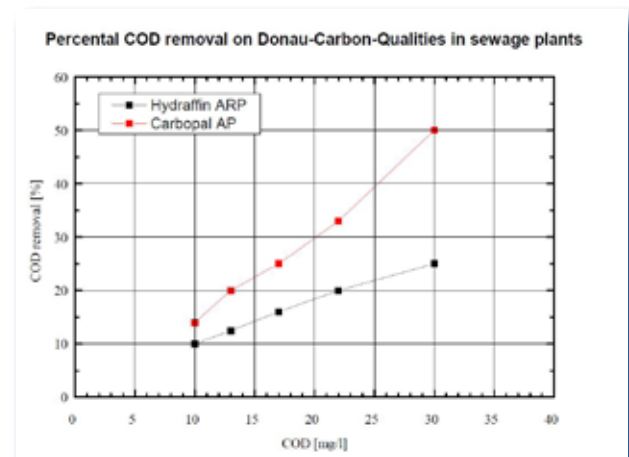
Thanks to new analysis methods drugs from several pharmaceutical families (e.g. analgesics, anticonvulsants) can be detected in many water treatment plants. Especially classic substances like carbamazepine and diclofenac are found at high feed concentrations, often more than 10000 ng / l.

**Powdered activated carbon** is dosed into the inlet area of a contact reactor. The separation is done after the addition of the flocculants in a sedimentation tank and a sand filtration usually follows.

The results of already delivered sewage plants indicate that the treatment with Donau Carbon powdered activated carbon qualities can reduce the concentration of organic trace substances and Micropollutants significantly and compared to other products shows a superior performance.

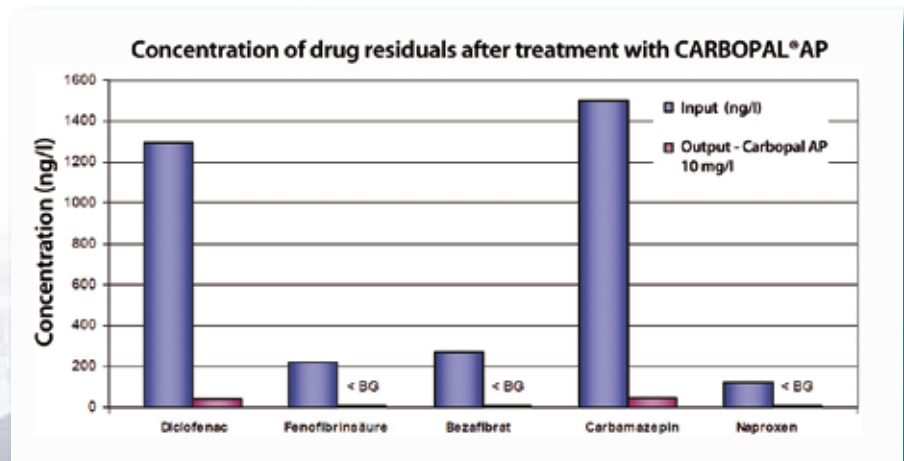
The newest studies showed that in existing, unused flocculation-filtration the use of **granular activated carbons** is not only economically interesting. Due to our long-term experience in water treatment and the continuous development of our products, we offer a wide range of granular activated carbons for this application according to the requirements and specific customer needs.

In several large-scale pilot plants at various wastewater treatment plants with more than 100m<sup>3</sup> of granulated activated carbon, the excellent performance could be paired with showing a very good efficiency of our products.



### Granulated Activated Carbon for Waste Water Treatment

Activated carbon	raw material	applications
Hydraffin A 8x30	Lignite	pharmaceutical Micropollutants & very high COD removal
Hydraffin AR	Selected coal base	Price attractive alternative for Micropollutants
Hydraffin 30N	bituminous coal	High quality product for COD removal





# General Information

## Laboratories / Applications Engineering Support

Evaluation and control of new and used activated carbon qualities will be done in our own laboratories in compliance as well with own methods as also with national and inter-national standard test processes. Our application engineers and our laboratory in Frankfurt (formerly LAT- Laboratory for Adsorption technics) have decades of experience in the field of wastewater treatment.

Donau Carbon is offering a comprehensive service:

- » analyses of adsorbents on mechanical, chemical and physical properties
- » determination of adsorption isotherms
- » separation experiments in water treatment and decolourization
- » support for selecting an optimal activated carbon quality for waste water applications

Mobile filters used as pilot plants for on-site tests are also provided upon request.



## Production Plant Philippines

In April 2011 we have opened our newest site: a plant for production of high quality granular activated carbon for selective filtration.

In our subsidiary **Donau Carbon Philippines Corp.**, a team of experienced employees under German management takes care of the production of special granular activated carbon qualities for our customers world-wide in modern rotary kilns. The production plant is operating according to German quality and safety standards, using state-of-the-art production processes in both activation and processing technology.

Quality assurance is one of our major concerns - beginning already with a selective choice of our approved raw materials and local suppliers to ensure the best possible product quality for our customers. Our state-of-the-art, ISO-certified laboratory, active in both quality assurance and R&D, does not only stand for high-quality products but also for the development of new products and applications.



Rotary kilns of the Donau Carbon production plant on the Philippines



# Donau Carbon world-wide



- Stammhaus / Headquarters
- Donau Carbon-Gesellschaften / Donau Carbon Subsidiaries
- Konzerngesellschaften / Group Companies
- Vertretungen / Representative offices, Agents & Distributors

## Americas:

Argentina  
 Brasil  
 Chile  
 Columbia  
 Ecuador  
 Mexico  
 Peru  
 Venezuela

## Australia:

Queensland

## Europe:

Belgium  
 Denmark  
 Finland  
 France  
 Greece  
 Italy  
 Luxembourg  
 Netherlands  
 Norway  
 Portugal  
 Russia  
 Spain  
 Sweden  
 Switzerland  
 Ukraine  
 United Kingdom

## Middle East:

Iran  
 Israel  
 Saudi Arabia  
 United Arab Emirates

## Africa:

Egypt  
 Ghana  
 Simbabwe  
 South Africa  
 Tanzania

## Asia:

China  
 India  
 Indonesia  
 Malaysia  
 Pakistan  
 Singapore  
 South Korea  
 Thailand  
 Vietnam

## Represented by Group Company Donauchem in:

Austria  
 Czech Republic  
 Hungary  
 Poland  
 Romania  
 Serbia  
 Slovakia

## Donau Carbon GmbH

Gwinnerstraße 27-33  
 60388 Frankfurt/Germany  
 Tel.: + 49 (0) 69 40 11-6 50  
 Fax: + 49 (0) 69 40 11-6 59  
 www.donau-carbon.com  
 e-mail: office@donau-carbon.com

## Donau Carbon Philippines Corp.

Zone 1  
 Sitio Tagbak  
 Bo. Cogon, El Salvador City  
 Misamis Oriental, Mindanao  
 Philippines  
 e-mail: officephilippines@donau-carbon.com

## Donau Carbon US LLC

551 N. US Highway 41  
 Dunnellon, FL 34432  
 Tel.: + 1-352-465-5959  
 Fax: + 1-352-465-0679  
 www.donau-carbon-us.com  
 e-mail: admin.us@donau-carbon.com

## Donau Carbon Pischelsdorf

3435 Zwentendorf/Austria  
 Tel.: + 43 (0) 22 77 25 10-2 79  
 Fax: + 43 (0) 22 77 25 10-3 26  
 www.donau-chemie.com  
 e-mail: donaucarbon@donau-chemie.com

