



For more information: Sweden +46 480 41 75 50. Finland +358 9 643 602.
Germany +49 69 7191070. United Kingdom +44 151 6498344. United States +1 215 546-3900.
www.jacobi.net



Jacobi
CARBONS

Activated Carbon for Liquid Phase Adsorption





Jacobi Carbons manufactures the AquaSorb® range of activated carbons from coal, coconut shell and wood raw materials by steam activation. AquaSorb® activated carbons are supplied as granules, extruded pellets and fine ground powders, which are specifically designed for use in liquid phase adsorption systems. These materials are proven adsorbents (ANSI/NSF 61, DWI, EN12915/12903, AWWA B600 and B604) and are used extensively in municipal, process and effluent water treatment plants all over the world.

- Coal, coconut shell and wood based activated carbons designed to meet individual process requirements.
- Particle size specifications to meet the required adsorption performance and hydraulic characteristics.
- Balance of transportation pores and adsorption pores provide optimum performance in a wide range of applications.
- Highly developed internal surface area for maximum adsorption capacity.
- High density materials for maximum volume activity, granules readily wet minimising losses during commissioning and backwashing.
- Excellent mechanical strength ensures negligible losses during backwashing and reactivation.



PROPERTIES OF AQUASORB® LIQUID PHASE ACTIVATED CARBONS

Grade	Type	Form	Iodine no. mg g ⁻¹	Density kg m ⁻³	Approvals	Application
1000	Coal	Granular	900	430 [†]	NSF 61, AWWA B604, EN12915	General purpose water treatment
2000	Coal	Granular	1050	410 [†]	NSF 61, AWWA B604, EN12915, DWI	Municipal and process water treatment
GXB	Coal	Extruded	1000	430 [†]	NSF 61, AWWA B604, EN12915	Municipal and process water treatment
GXA	Coal	Granular	1050	410 [†]	NSF 61, AWWA B604, EN12915	Municipal and process water treatment
H150	Coal [‡]	Granular	1000	420 [†]	NSF 61, AWWA B604, EN12915	POE/POU, process water treatment
LAK	Coal [‡]	Granular	1000	410 [†]	NSF 61, AWWA B604, EN12915	POE/POU – low As, Sb, Al, Fe product
CS	Coconut	Granular	1050	435 [†]	EN12915	Process water treatment, dechlorination
CX	Coconut	Granular	1150	410 [†]	EN12915	Process water treatment, dechlorination
HS	Coconut [‡]	Granular	1050	435 [†]	EN12915	Boiler feed water treatment, low Si
WT	Coconut [‡]	Granular	1100	490	EN12915	POE/POU – water washed product
LS Ag	Coconut	Granular	1100	510	EN12915	POU – silver impregnated product
BP5	Coal	Powder	550	600	NSF 61, AWWA B600, EN12903	Municipal and effluent water treatment
BP2	Coal	Powder	900	500	NSF 61, AWWA B600, EN12903, DWI	Municipal and effluent water treatment
G9	Wood	Powder	1000	380	AWWA B600, EN12903	Municipal and effluent water treatment
FA75	Anthracite	Granular	n/a	750	AWWA B100, EN12901	Suspended solids/turbidity treatment

[†]Value is based on the backwashing of a bed of AquaSorb® granular activated carbon at 30% expansion, which has been allowed to drain and settle. [‡]Indicates water washed or acid washed product. All granular products are supplied in a variety of standard mesh sizes including, but not limited to 80x325, 50x200, 30x70, 20x50, 20x40, 12x40, 8x30, 10x20 and 8x16. Please consult individual product datasheets for full details.

Soft drinks manufacturers and breweries rely upon AquaSorb® activated carbon for dechlorination and dissolved organics removal.



The Process

Water Treatment Process

The soft drinks and brewing industry will often take water supplied by the local water authority. This water will meet the requirements of water intended for human consumption, but may be variable (within specification limits) for suspended solids, trace organic compounds and possible bacterial contamination from the distribution system.

In order to ensure consistently high quality of the beverages produced it is essential that the water being used is also of equally high quality. In order to meet these demanding water standards, the water is processed using sand filters, multimedia filters, ion exchange resins and AquaSorb® activated carbons.

STANDARD DESIGN CONDITIONS

PARAMETER	TYPICAL VALUE
Concentration	< 100 mg l ⁻¹
Linear velocity	0.15–0.30 m min ⁻¹
Bed depth	1.0–3.0 m
Contact time	5–30 min
Temperature	< 80°C
Pressure	5–20 bar
Backwashing	
• frequency	7–14 days
• duration	10–30 min
• bed expansion	25–35%
• linear velocity	0.35–0.45 m min ⁻¹
Steam sterilisation	
• temperature	100–110°C
• frequency	30–60 days
• duration	120–360 min
Comment	Data based on AquaSorb® CS

For easy conversion to imperial units, please visit www.jacobi.net and use FastConvert™.

In process water treatment disinfection using a strong oxidising agent is often applied in order to destroy bacterial activity. In order to guarantee 100% destruction of the bacteria it is necessary to dose excess disinfectant, which must subsequently be removed from the water.

Chlorine compounds are used in the beverage industry and ozone is applied in swimming pools, these oxidising agents are readily destroyed using AquaSorb® granular activated carbon at relatively short contact times.

As a result of dosing strong oxidising agents into the water, side reactions with secondary organic compounds may occur. By extending the contact time, AquaSorb® granular activated carbons will provide highly efficient removal of trace concentrations of dissolved organic compounds.

TYPICAL APPLICATIONS

AquaSorb® granular activated carbons are commonly used in the manufacture of beverages by most of the major soft drinks and brewing companies.

Swimming pools for public use and in private clubs which utilize ozone treatment will use AquaSorb® granular activated carbon to ensure removal of residual disinfectant.

Materials used in these applications will require periodic replacement on a routine basis.

APPLICATION	SERVICE
Soft drinks disinfection	Dechlorination and removal of dissolved organics
Breweries	Trihalomethane compounds
Condensate boiler feed	Oil and heavy hydrocarbons
Semi-conductor plants	Ultra-high purity water
Swimming pools	Removal of ozone
Aquariums	Decomposed organics
Protection of ion exchange resins	Dechlorination and removal of dissolved organics

Dissolved organic compounds are removed from industrial effluents in adsorbers containing AquaSorb® activated carbon. The material is commonly reactivated.



The Effluent Water Treatment Process

It is common to experience effluent water of widely varying standards and consequently this is reflected in the range of treatment techniques that are applied. The water will often contain high levels of suspended solids, saturation levels of dissolved organic compounds (measured as the chemical oxygen demand – COD) and traces of toxic materials.

An effluent treatment plant will typically use biological treatment techniques to remove the bulk of the COD, followed by settlement to remove the suspended solids. Water from the settlement tanks will often require additional mechanical filtration in sand filters. The remaining COD and toxic materials are adsorbed using AquaSorb® granular activated carbon.

The effluent treatment process will often produce water to the standards required for human consumption.

STANDARD DESIGN CONDITIONS

PARAMETER	TYPICAL VALUE
Concentration	< 1000 mg l ⁻¹
Linear velocity	0.05 – 0.20 m min ⁻¹
Bed depth	1.5 – 4.0 m
Contact time	20 – 300 min
Temperature	< 50°C
pH	5 – 9
Pressure	5 – 10 bar
Backwashing	
• frequency	3 – 7 days
• duration	20 – 40 min
• bed expansion	15 – 20%
• linear velocity	0.2 – 0.3 m min ⁻¹
Comment	Data based on AquaSorb® 1000

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APPLICATION	SERVICE
Polymer manufacture (BPA)	Phenol and bisphenol A
Ground water remediation	Benzene, toluene, ethyl benzene, xylene (BTEX) and total organic halogens (TOX)
Landfill leachate (COD)	Chemical oxygen demand
Car wash effluent	Detergent and surfactants
Waste incineration compounds	COD and halogen
Textiles dyestuffs	Color compounds and
MEA/DEA purification	Degradation products and organic contamination

Due to the high concentration of COD and toxic substances experienced in effluent water treatment, combined with the requirement for low outlet concentration, it is often necessary to use extended contact times. The figures stated in the table are based on empty bed contact times (EBCT), the actual contact time when the vessel is filled with AquaSorb® granular activated carbon will be reduced by approximately 50%.

To maximise the efficiency and performance under these conditions it is important to select an adsorbent with maximum pore volume, consequently AquaSorb® coal based carbon is most commonly used.

On saturation AquaSorb® granular carbons may be reactivated, destroying the adsorbed organic compounds and providing excellent economics of operation.

TYPICAL APPLICATIONS

Effluent water treatment plants are usually designed to meet specific site requirements due to the wide variety of contaminants which may be experienced. It is often useful to initiate contact with the original equipment manufacturers (OEMs) in order to provide the optimum AquaSorb® material at the start of the project.

AquaSorb® activated carbons are approved to numerous worldwide standards including UK-DWI, EN12915/12903, US NSF/ANSI Std. 61, AWWA B600 and B604.



The Municipal Water Treatment Process

In municipal water treatment plants AquaSorb® granular activated carbon (GAC) is packed into open rapid gravity or closed pressure filters. Water enters at the top of the vessel and flows down through the bed of GAC. The dissolved organic compounds are transferred from the liquid phase onto the surface of the GAC by the process of adsorption. The treated water exits at the bottom of the vessel into the supply system.

In most cases the water will contain suspended solids which are filtered by the GAC, increasing the resistance to flow through the bed. The filter is routinely backwashed or air scoured to expand the bed and remove the solids which have been deposited.

STANDARD DESIGN CONDITIONS

PARAMETER	TYPICAL VALUE
Concentration	< 10 mg l ⁻¹
Linear velocity	0.1 – 0.2 m min ⁻¹
Bed depth	1.0–3.0 m
Contact time	5–40 min
Temperature	Ambient
Pressure	< 10 bar
Backwashing	
• frequency	1–30 days
• duration	10–20 min
• bed expansion	20–30%
• linear velocity	0.3–0.4 m min ⁻¹
Air scouring	
• water level	0.2 m
• linear velocity	0.7–0.8 m min ⁻¹
• duration	< 1 min
Comment	Data based on AquaSorb® 2000

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The selection of the optimum grade of AquaSorb® GAC for use in municipal water treatment plants is often the primary factor affecting the efficiency and life of a filter. AquaSorb® GAC manufactured from coal exhibits a high mesopore ($r < 25\text{nm}$) volume enabling bulky organic molecules to rapidly diffuse into the micropore ($r < 1\text{nm}$) structure where adsorption takes place. AquaSorb® GAC manufactured from coconut shell exhibits the optimum micropore ($r < 1\text{nm}$) volume, which is ideal for adsorption of low molecular weight compounds.

Particle size is also an important consideration, smaller particles provide optimum adsorption kinetics and excellent mechanical filtration, larger particles will minimise the pressure loss across a filter and maximise the length of runs between backwashing.

TYPICAL APPLICATIONS

TYPICAL APPLICATIONS
• Removal of taste and odour compounds – geosmin and 2-methylisoborneol
• Control of agricultural chemicals – atrazine and simazine
• Adsorption of color compounds – humic and fulvic acids
• Adsorption of by-products of chlorination – trihalomethane compounds (THM)
• Removal of industrial pollutants – benzene, phenol, trichloroethylene
• Reduction of biological oxygen demand – removal of detergents (BOD)
• Mechanical filtration – reduction of suspended solids

The occurrence of natural substances, chemicals used in agriculture and industrial pollution in water sources will often result in the water not being suitable for human consumption. Consequently the water supply companies will install AquaSorb® GAC in order to comply with local and international regulations and to improve the taste and odour of the drinking water.

Powdered activated carbon (PAC), made from coal, coconut shell or wood, is also used on a regular basis in municipal water treatment when problems with the water is periodic or seasonal.



Jacobi CARBONS

Jacobi Carbons AB – Sweden

Varvsholmen, SE-392 30 Kalmar.
Tel: +46 480 41 75 50. Fax: +46 480 41 75 59.
Email: info@jacobi.net. Web: www.jacobi.net

Jacobi Carbons GmbH – Germany

Feldbergstraße 21, D-60323 Frankfurt.
Tel: +49 69 7191070. Fax: +49 69 71910720.
E-mail: infode@jacobi.net. Web: www.jacobi.net

Jacobi Carbons (Suomen Siv.) – Finland

Ratakatu 1BA3, SF-00120 Helsinki.
Tel: +358 9 643 602. Fax: +358 9 642 900.
Email: infofin@jacobi.net. Web: www.jacobi.net

Jacobi Carbons, Inc. – United States

1518 Walnut Street, Suite 1100. Philadelphia,
PA 19102. Tel: +1 215 546-3900. Fax: +1 215 546-9921.
E-mail: infous@jacobi.net. Web: www.jacobi.net

Jacobi Carbons Ltd – United Kingdom

Niord House, Lord Street, Birkenhead,
Merseyside CH41 1HT.
Tel: +44 151 649 8344. Fax: +44 151 649 8345.
E-mail: infouk@jacobi.net. Web: www.jacobi.net

Sales and Marketing



Jacobi Carbons AB – Sweden

Headquarters of the Jacobi Carbons Group,
coordinating worldwide sales and marketing



Jacobi Carbons (Suomen Siv.) – Finland

Sales and marketing of activated carbon in
Finland and the Baltic States.



Jacobi Carbons GmbH – Germany

Sales and marketing of activated carbon in
Germany and Continental Europe.



Jacobi Carbons Ltd – United Kingdom

Sales and marketing of activated carbon in
the United Kingdom and Republic of Ireland



Jacobi Carbons, Inc. – United States

Sales and marketing of activated carbon in
the United States and Canada.



Jacobi Carbons Agents – Worldwide

A diverse network of agents and distributors
strategically located around the world.

Production and Engineering



Jacobi Carbons Co. Ltd. – China

The manufacture of extruded and granular coal
based activated carbons – ANSI/NSF 61 facility.



Jacobi Carbons (Pvt.) Ltd. – India

The manufacture of granular coconut shell
based activated carbon.



Jacobi Carbons AB – Sweden

Powdered activated carbon manufactured from
coal, coconut shell and wood.



Jacobi Carbons Ltd – United Kingdom

Specialist impregnation facility, technical
activated carbons, media handling and
adsorption equipment.



All Jacobi Carbons products
supplied for drinking water
treatment have NSF Standard 61
approval



Jacobi Carbons operate
in full accordance with
approved ISO-9000 quality
control procedures