



CARBOTECH

PRODUCTS FOR PEOPLE
AND ENVIRONMENT



CarboTech AC
GmbH
Your Adsorption Company



IN PROFILE

GERMANY'S LEADING SUPPLIER OF ACTIVATED CARBONS

CARBOTECH: The company is Germany's leading supplier of powdered, granulated, and extruded activated carbons. In the very heart of the Ruhr industrial area, CarboTech operates integrated production plants for manufacturing, processing and packaging of customised activated carbons, activated cokes and Carbon Molecular Sieves from hard coal, coconut shell coke, brown coal and charcoal.

TRADITION: CarboTech has its roots in Germany's institutional mining research and coal industry. The company sees itself as being a part of the tradition of companies who extract knowledge from Science and Technology in order to apply it for the benefit of the people and the environment in an economically viable way. They are doing this every day, all over the world.

QUALITY: As successor to CarboTech Aktivkohlen GmbH, CarboTech today presents itself as a modern, small-to-medium-sized company. Since CarboTech works consistently with its customers' interests at heart, our top priority is to constantly improve operational achievements. High demands of product and service quality are the top goals for every employee.

EXPERIENCE: CarboTech brings together experiences from production, application and process engineering. From a strategic point of view, it has traditional requirements as much in its sights as it does innovative services. The commitment of experts with a precise knowledge of practical conditions is highly valued by our customers.

COST-EFFECTIVENESS: The use of special activated carbon products from CarboTech makes permanently reliable and cost-effective solutions possible. Achieving this, particularly with complex, demanding tasks, is the daily challenge for the experienced specialists from CarboTech.

IN SUMMARY

PRODUCTS AND SERVICES OF A TRADITIONAL COMPANY

OUR PRODUCTS

ACTIVATED CARBONS

Gas-phase applications

- › Air quality management
- › Flue gas cleaning
- › Solvent recovery
- › Odor control
- › Impregnated activated carbons
- › Honeycombs

Liquid-phase applications

- › Potable water treatment
- › Waste water treatment
- › Purification of oils, fats and sugar in the food industry
- › Purification of intermediate and end products in the chemical and pharmaceutical industry

CARBON MOLECULAR SIEVES (CMS)

- › Nitrogen generation
- › Hydrogen purification
- › Biogas concentration
- › Zeolitic molecular sieves

OUR SERVICES

MOBILE ADSORBER RENTAL SYSTEMS (MAMS)

- › MAMS-W for cleaning liquids
- › MAMS-G for cleaning gases
- › Installation of pilot plants

SERVICES

- › Reactivation of spent activated carbon
- › Technical adsorption analyses
- › Grinding
- › Impregnation
- › Dedusting

In a large number of countries in and outside of Europe, CarboTech's customers receive support from local distributors, sales partners and licensees. Thus it is possible to contact our consulting and organising team even across international borders with ease.



ACTIVATED CARBON THE GAS-PHASE APPLICATIONS



AIR-QUALITY MANAGEMENT: Adsorption plants are being used with ever-increasing frequency for gas and air purification – with good reasoning behind. Alongside legal specifications for environmental protection, health is increasingly becoming the main focus in the workplace and in human habitats. Moreover, expensive electronic equipment and sensitive production processes are demanding low-contaminant environmental conditions. In these cases, CarboTech is supplying improved activated carbons with highly specific micropore structures.

SOLVENT RECOVERY: In many industrial processes, organic solvents are being used as adjuvants for widely-differing applications. The solvent-bearing exhaust airflows must be carefully cleaned. Removal and recovery of solvents from exhaust airstreams is a particularly well-established area of application for CarboTech activated carbons. For each particular application, improved types of activated carbon are available and they stand out for their low loss in pressure and high adsorption rate, while consuming only a small amount of steam for the desorption process.



IMPREGNATED ACTIVATED CARBONS: In order to economically remove certain gas impurities which are difficult to adsorb, such as hydrogen sulphide, mercury or ammonia, the activated carbons can be markedly improved by suitable impregnation. The impurities are no longer removed by adsorption but by chemisorption. Typical impregnating chemicals are sulphur (mercury), potassium iodide

(H_2S , AsH_3 , radioactive isotopes) and potassium carbonate (HCl , HF , SO_2).



FLUE GAS CLEANING: CarboTech products properly ensure that NO_x is removed from flue gases in industrial furnaces. For this purpose, new, particularly active products have been developed and launched on the market. A special carbon catalyst has proved its effectiveness in removing NO_x in a temperature range between 100 and 150 °C. Deposition rates in excess of 90 % can be achieved. The products are implemented technically in close collaboration with bespoke companies in an international large-scale plant construction.

Powdered activated carbons are also being effectively used to clean flue gases. In the case of exhaust gas from waste incineration plants, dioxins, mercury, sulphur oxides and other gas impurities are removed by adding powdered activated carbons. Throughout the world, a dry activated coke process from CarboTech is used to remove sulphur and nitrogen oxides from power station exhaust gas with a desorption phase integrated in the process responsible for regenerating the spent activated coke.

ACTIVATED CARBON

THE LIQUID-PHASE APPLICATIONS



POTABLE WATER PURIFICATION: Waterworks use CarboTech activated carbons on a major scale for processing bank-filtered water and groundwater into drinking water. The activated carbon is effective in several ways at once. Organic odorants and food flavourings are adsorbed, as are pharmaceutical residue, agricultural biocides and chlorinated hydrocarbons which are occurring with increasing frequency. Spent activated carbon from drinking water treatment is economically recycled. It can be thermally reactivated as part of CarboTech's services and resupplied to the customer.



CHEMICAL, PHARMACEUTICAL AND FOOD: Many industrial processes occur in the liquid phase. For this reason, the extraction of end products requires solutions to be concentrated or cleaned. A commonly-used treatment technology for liquid media is mixing in CarboTech powdered activated carbon. It is mainly used in the final stages of purification for decolourising, removing by-products and improving taste. Typical applications are decaffeination, cleaning glycerine and edible oil and the production of fine spirits. The mixing process is highly flexible, as it can be simply adjusted for different products and concentrations. In the case of large product flows, as normal for discolouration in the sugar industry, for example, fixed bed processes, on the other hand, can be recommended. With them, the process flow is directed over a layer consisting of granular CarboTech activated carbon.



WASTE WATER: Three-quarters of our Earth's surface is covered by water. Keeping water clean is vital. CarboTech provides particularly economical adsorption processes for treating industrial and municipal waste water containing a high level of contaminants or containing pathogenic components. The activated carbon products used for this purpose satisfy the highest requirements, both in respect of the absorption capacity and in respect of the legally-required cleaning target or immission values. This occurs without having a negative effect on the cost-effectiveness of the overall process.

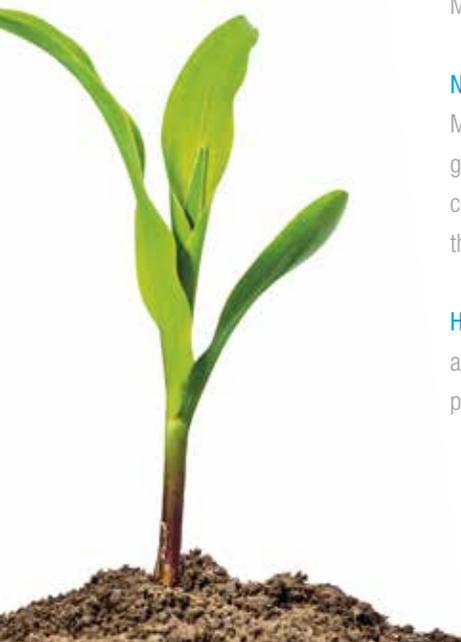


CARBON MOLECULAR SIEVES THE ORIGINAL

CARBON MOLECULAR SIEVES (CMS): CMS form the central component of every pressure swing adsorption plant (PSA plant), being used, for example, for nitrogen generation, biogas concentration or for hydrogen purification. CarboTech is able to demonstrate expertise gained over many years in the area of manufacture and application of Carbon Molecular Sieves. At our Essen production site and with international licensees and worldwide sales partners, competent representatives for CarboTech Carbon Molecular Sieves and pressure swing adsorption plants are available.

NITROGEN GENERATION AND BIOGAS CONCENTRATION: CarboTech's predecessors invented the Carbon Molecular Sieves for producing nitrogen and concentrating biogas, with the aim of achieving natural gas quality. At the same time, a corresponding pressure swing adsorption process was developed and continually improved, making economically viable nitrogen generation and biogas concentration by using the CarboTech Carbon Molecular Sieves.

HYDROGEN PURIFICATION: Carbon Molecular Sieves for extracting hydrogen from reformergas, but also for processing coke-oven gas and methane gas are other significant highlights from the CarboTech product portfolio.



OTHER PSA PRODUCTS: In order to make the very best technological solutions possible, CarboTech provides, on request, basic expertise for many applications in addition to Carbon Molecular Sieves. Since CarboTech maintains a very close relationship with manufacturers of zeolitic molecular sieves (ZMS), CMS and other materials to promote gas separation, additional knowledge can be supplied, using this expertise.

SERVICES

MOBILE ADSORBER RENTAL SYSTEMS (MAMS): CarboTech's Mobile Adsorber Rental Systems are used particularly for gas and water purification on site. CarboTech can provide a complete service by taking care of the overall process chain, including transport of adsorbers as well as replacement and reactivation of the spent activated carbons. The wide-ranging adsorber versions are constantly being improved in line with market requirements and specific uses and are also adapted to detailed customer requirements. On site, experienced service technicians meet the high requirements of CarboTech's range of services who can be made available to the customer on request.

REACTIVATION: Recirculation of used activated carbons, if technically possible, is an absolute necessity from an economic and ecological point of view. CarboTech reactivates the carbons via a unique fluidized-bed process under the same strict regulations which it observes in the manufacturing process. Regenerated activated carbons which produce the original adsorption rate of the initial activated carbons with no limitations are returned to the customer.





HONEYCOMBS

In co-operation with Helsatech GmbH, CarboTech AC GmbH offers activated carbon honeycomb modules, complete filter cartridges and pilot plants based on honeycomb technology for industrial waste air purification.

CarboTech honeycomb modules consist of ceramic-reinforced activated carbon. The base structure features a large number of parallel channels that have the same diameter and which enable a defined flow control with low pressure loss. Our honeycomb modules are a good choice when excellent kinetic characteristics, precise adsorption and reaction conditions and noiseless, energy-efficient operation are important. In addition to that, the honeycomb modules possess a high mechanical hardness and shock resistance. Thanks to their ceramic body, they are non-flammable.

The most important characteristics

- › High cleaning capacity
- › Low pressure loss
- › High capacity
- › Energy-efficient operation
- › Defined flow control
- › No emission of dust
- › Regenerable

CarboTech honeycombs are available both as cylindrical and square-shaped modules and can be combined to create large units (glued together) or implemented in standard filter cartridges. This ensures that almost every geometry that is technically possible can be created. The selection of activated carbon is matched specifically to your project definition based on CarboTech's product range.

Preferred applications for air and gas purification

- › Removal of airborne molecular contaminations
- › Odour control
- › Heterogeneous catalytic reactions
- › Ozone depletion
- › Adsorption of dioxins and furans to values of $< 4\text{pg/m}^3$

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