
HOK® Activated Lignite. The Original.
Activated Lignite HOK® - the low cost adsorbent and catalyst for environmental technology.

Activated Lignite HOK® from Rhenish lignite differs considerably from most activated carbons in both its production and properties. Carbon activation of the lignite extracted in the opencast mines of RWE Power AG located near Cologne is done according to the so-called rotary-hearth furnace process which gave Activated Lignite its brand name HOK® (German abbreviation for Herdofenkoks = rotary-hearth furnace coke). Production, distribution and logistics are based on a consistently implemented quality system according to DIN-EN ISO 9001.

Analytical references values:

- Water content: 0.5 %
- Ash content: 9.0 %
- Volatile compounds (mainly CO & CO₂): 3.0 %
- Fixed carbon: 87.5 %
- Sulphur content (total): 0.5 %
- Heating value: 29.9 MJ/kg
- Specific surface area: 300 m²/g
- Pore volume: 50 %

Separation efficiency of HOK® adsorbers:

<table>
<thead>
<tr>
<th>Pollutant</th>
<th>Raw gas values (mg/m³)</th>
<th>Pure gas values (mg/m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SO₂</td>
<td>20 - 2000</td>
<td>&lt; 2</td>
</tr>
<tr>
<td>HCl</td>
<td>15 - 5000</td>
<td>&lt; 2</td>
</tr>
<tr>
<td>HF</td>
<td>1 - 20</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Hg, Cd, Pb...</td>
<td>0.05 - 0.7</td>
<td>&lt; 0.004</td>
</tr>
<tr>
<td>Dusts</td>
<td>10 - 250</td>
<td>&lt; 2</td>
</tr>
<tr>
<td>H₂S</td>
<td>10000</td>
<td>&lt; 0.015</td>
</tr>
<tr>
<td>Dioxins/furans -TE (NATO/CCMS)</td>
<td>0.1 ng/m³</td>
<td>&lt; 0.1 ng/m³</td>
</tr>
</tbody>
</table>

Numerous Applications.

Owing to its special properties, Activated Lignite HOK® is used as activated carbon for numerous applications in environmental technology, notably:
- as adsorbent for flue gas and waste air purification
- in biotechnology, e.g. in biological waste water clarification
- as filter material in drinking water treatment
- as an adsorbent for cleaning waste dump seepage and industrial sewage water

Separation of pollutants with HOK®.

As a high-grade filtering material, Activated Lignite HOK® can separate all emission-relevant pollutants, such as sulphur dioxide (SO₂), hydrogen chloride (HCl), hydrogen fluoride (HF), hydrogen sulphide (H₂S), heavy metals (Hg, Cd, As, Pb, etc.), dioxins and furans and many organic components. The pollutants are removed from the flue gas or the waste air by adsorption, chemisorption or catalytic conversion. The retention capacity for these pollutants in many cases enables separation to a level below the limit of detection.

Microscopic magnification of Activated Lignite HOK®
APPLICATIONS IN ENVIRONMENTAL TECHNOLOGY.

The activated carbon produced on the basis of Rhenish lignite in a pyrolysis and activation process has the pore structure characteristic of HOK® which results in the high separation efficiency for a multitude of pollutants. The favourable pore structure present in HOK® with high meso-pore and macropore portions (1 to > 50 nm) permits easy access to the inner surface area which is decisive, among other things, for the adsorption of macromolecular compounds such as those of dioxins and furans. Using Activated Lignite HOK® with the technologies that are available on the market, even the strict emission standards for refuse and special waste incineration plants are satisfied with a large safety margin.

PROCESSES.

For purification of flue gases emitted form refuse and special waste incineration plants, a number of processes using Activated Lignite HOK® were developed. These processes are used today in many different production processes for adsorptive purification of flue gases and waste air. The choice of the appropriate process depends among other things on the pollutants to be separated and on their raw gas and the required clean gas concentrations. Their safety and integration into existing plants and processes have been tested on an industrial scale and are state of the art due to the large number of applications implemented today.

Extended flue gas purification with Activated Lignite HOK® (e. g. downstream of refuse incineration plants)
MOVING BED PROCESS.

In the process the flue gases are conducted through a bed of solids consisting of fine-grained Activated Lignite (HOK®-grained). The contaminated sorbent is “quasi-continuously” drawn off, to be replaced by a corresponding amount of fresh Activated Lignite. The contaminated sorbent is generally disposed of by burning in the upstream furnace. Depending on the type of flue gas purification facilities, all the Activated Lignite or only the mercury-free sorbent can be disposed of in this manner. The mercury-contaminated Activated Lignite accumulated in the preceding dry or semi-dry flue gas purification process can be freed of mercury by thermal desorption and so made suitable for burning. The moving bed process has been in use on an industrial scale since 1988. Owing to the high separation capacity of the Activated Lignite HOK® and the long flue gas retention times, this process offers the highest separation efficiency. The process also copes well with momentary peaks in pollutant content.

FILTER BED PROCESS.

In the case of the filter bed process, pulverized Activated Lignite (HOK®-pulverized or HOK®-super) in different proportions is injected with e.g. lime into the flue gas stream or is fed into the gas stream with the milk of lime in the spray adsorber. In the downstream fabric filter a filter bed is formed from fly ash, gypsum and pulverized Activated Lignite. The filter bed separates out acidic components as well as mercury and dioxin/furans. Some of the pulverized Activated Lignite deposited on the fabric filter is returned to the raw gas. The expelled pulverized Activated Lignite can be subjected to thermal treatment or deposited at a refuse disposal site. Given medium raw gas concentrations and little peak loading, the filter bed process satisfies the limit values of the German 17th Federal Emissions Control Ordinance. This process could therefore be an inexpensive means of improving emissions especially for older plants which already operate with a fabric filter.

CIRCULATING FLUIDIZED BED PROCESS.

In this process the flue gases are directed through a circulating fluidized bed of Activated Lignite and e.g. lime, in which the noxious gases are separated out. The separation of the adsorbents takes place in a downstream fabric filters, from where they can be recycled for maximum utilization. The spent sorbent can be subjected to thermal treatment or taken direct to a refuse disposal site.
Separation of dioxins/furans with Activated Lignite HOK® in metallurgical processes

**PURIFICATION OF PROCESS WASTE GASES.**

In addition to fine purification of flue gases from refuse and special waste incinerators, Activated Lignite HOK® is also suitable for purification of process waste gases. Here too, the wide ranging adsorptive pollutant retention capacity of the Activated Lignite HOK® is utilized.

The main components separated out in process gas purification are hydrogen sulphide, heavy metals, organic solvents, odorous substances, and various hydrocarbon compounds such as dioxins (PCDD), furans (PCDF), polychlorinated biphenyls (PCB), hexachlorocyclohexanes (HCH) and polycyclic aromatic hydrocarbons (PAH). The waste gas purification can fundamentally be carried out with any of the processes already described. Applications that are being considered these days are residues co-combustion processes, metallurgical processes and process waste gases with components emanating a strong odour (e.g. matchwood driers, roughage and manure drying plants).

The spent sorbents can be taken back after examining the particular case.

**DISTRIBUTION.**

Activated Lignite HOK® is distributed by Rheinbraun Brennstoff GmbH. The company offers the necessary know-how concerning the preparation and use of the product. Transport is in the capable hands of our subsidiary, RSB LOGISTIC GMBH, which ensures accurate adherence to schedules. With Rheinbraun Brennstoff as a partner, your supplies of Activated Lignite HOK® are assured. RWE Power AG’s past performance is a consistent demonstration of reliability and dependable delivery. Activated Lignite HOK® is supplied in bulk by large capacity dump truck or silo truck and transhipped mechanically or pneumatically in a sealed system on the customer’s site. The sorbent is stored in sheet steel silos of the simplest design. Smaller quantities of Activated Lignite HOK® can be supplied in special units, viz. sacks, big bags or small containers.

**CONSULTING.**

The experience RWE Power AG has accumulated over decades of handling Activated Lignite HOK® and the know-how acquired through close cooperation with many customers are reflected in the service provided by an expert team of advisers. RWE Power AG’s experienced engineers and businessmen will select the right solution for your pollution control needs.

What’s more, RWE Power AG provides a full service that extends through all phases, from developing the concepts, planning the systems, consultation during approval procedures and in matters of safety, all the way to training of personnel, financing options and production cost analyses. Total solutions that carry conviction. Now and in the future. Why not find out first hand?

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**ADSORPTIVE PROCESS GAS PURIFICATION.**

- Heavy metals (e.g. Hg, Cd, Tl, As)
- Hydrogen sulphide
- Organic solvents (e.g. styrene, toluene, chlorobenzene)
- Odorous substances (e.g. pinenes, limonenes)
- Various hydrocarbons (e.g. PCDD, PCDF, PCB, HCH, PAH)
If you talk about environment and industries, say HOK® and it’s OK.