ADD SORB ACTIVATED CARBON

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Jacobi CARBONS

Impregnated Activated Carbon for the Adsorption of Inorganic Gases

Jacobi Carbons manufactures the AddSorb® range of chemically impregnated activated carbons from coal and coconut shell raw materials using the latest production techniques in modern purpose built facilities. AddSorb® activated carbons are supplied as cylindrical extruded pellets and irregular shaped granules, which are specifically designed for the adsorption of inorganic gases from the vapour phase. These materials are proven adsorbents which are used extensively in acid gas control, mercury adsorption and other speciality applications.

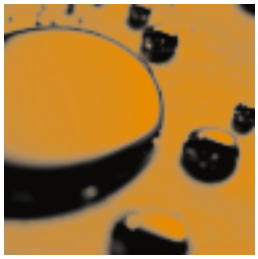
- High quality coal and coconut shell activated carbons as base materials
- Cylindrical extruded pellets (1, 1.5, 2, 3, 4, 5, 6 mm diameter and granular activated carbons (8x16, 6x12, 4x8 and 3x6 US Sieve) are supplied to meet varying pressure drop requirements.
- High density adsorbents for optimum volume activity
- Optimum impregnation levels selected for maximum adsorption capacity
- Excellent hardness and dust-free materials
- Complete flexibility in chemical impregnants, impregnation levels, moisture specifications and particle sizes.
- ISO-9001 quality approved manufacturing

PROPERTIES OF ADDSORB® IMPREGNATED ACTIVATED CARBON

Grade	Type	Form	CTC % (base)	Density g l^{-1}	Impregnation %	Moisture %	Application
VQ1	Coal	Extruded	70	560	14	2	Mercury removal
VA1	Coal	Extruded	70	580	5	10	Acid gases – low concentrations
VA2	Coconut	Granular	60	590	5	10	Acid gases – high efficiency
VA3	Coal	Extruded	70	580	10	10	H_2S removal – high concentrations
VA4	Coal	Extruded	60	560	5	2	H_2S, COS and mercaptans
VS1	Coal	Extruded	60	550	5	2	H_2S and mercaptans from O_2 free gas
VF1	Coal	Extruded	60	580	7.5	10	Formaldehyde removal
VB1	Coal	Extruded	60	580	10	10	Removal of NH_3 and amines

Additional standard products are available along with a wide range of tailor-made speciality products unique to specific applications. Please consult individual product datasheets for full details.

Mercury is potentially corrosive to aluminium heat exchangers, which are critically important in natural gas refining. AddSorb activated carbon is used to ensure efficient protection from mercury contamination.



The Removal of Mercury from Natural Gas

The processing of natural gas is recognised as a significant industry, involving primary refinery operations. The quality of the natural gas will vary subject to the origin of the reserves, and whilst gas purity may be very high, trace contaminants will often be present.

Due to the geology of the reserve the natural gas may contain minute traces of elemental mercury, which exhibiting a significant vapour pressure will readily become entrained in the natural gas.

For efficient distribution the natural gas is compressed at high pressure, and consequently the level of mercury contamination is proportionally increased to a concentration which is potentially problematic. High concentrations of mercury in natural gas will cause severe corrosion to down stream aluminium heat exchangers. AddSorb® activated carbon is used to remove mercury to concentrations below the limit of detection, providing excellent protection for down stream process equipment.

PARAMETER	TYPICAL VALUE
Concentration	< 2 mg Nm^{-3}
Linear velocity	15 – 30 m min^{-1}
Bed depth	0.5 – 3.0 m
Contact time	2 – 10 s
Relative humidity	< 75%
Temperature	< 60°C
Pressure	1 – 50 atm
Adsorption efficiency	> 99.5%
Adsorption capacity	14 – 20%
Comment	Data based AddSorb® VQ1

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

STANDARD DESIGN CONDITIONS

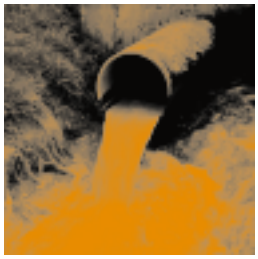
The removal of mercury from natural gas involves the use of specifically developed chemisorbents, operating under very precise design conditions.

AddSorb® VQ1 is specifically produced to provide efficient mercury removal under a wide range of gas conditions, the chemical impregnant is designed to selectively react with volatile mercury compounds – producing a non volatile species which becomes fixed in the pores of the activated carbon.

The contact times are designed to allow for the diffusion and subsequent chemisorption stages to take place for optimum adsorption efficiency. High linear velocities are preferred, which combined with recommended contact time results in deep bed adsorb designs.

Ideally the relative humidity should be <75% to prevent excess moisture deposition, which will negatively influence the adsorption process. An operating temperature of <60°C is recommended, at higher temperatures the chemical impregnant may be released into the gas stream. Adsorption kinetics (mass transfer zone) are significantly influenced by particle size, careful consideration should be given to this important design factor.

AddSorb® VQ1 installed in natural gas refineries will often provide efficient operation for 5–10 years, based on typical natural gas quality and standard filter design.



Sewage pumping operations require venting to atmosphere, the release of highly odorous hydrogen sulphide is controlled using AddSorb activated carbon.

The Removal of Hydrogen Sulphide in Sewage Odour Control

In the collection, processing and treatment of sewage the control of hydrogen sulphide (and organo-mercaptans) emitted from venting points is critical, if the local environment (and residents) is to be protected from highly obnoxious and pungent odour contamination. Hydrogen sulphide is a specific problem, due to the high volatility of the compound and extremely low threshold odour level.

The release of hydrogen sulphide represents a potential problem in pumping stations, primary clarifiers and filter press rooms, the need for sewage odour control becomes increasingly critical in plants which are operating under hot weather climatic conditions.

In order to optimise the performance of activated carbon in sewage odour control systems, a wide range of specialist chemisorbents have been developed. The performance of these materials has been proven under a wide range of operating conditions to meet the most stringent environmental requirements of hydrogen sulpide (and organosulphur compounds) removal.

STANDARD DESIGN CONDITIONS

PARAMETER	TYPICAL VALUE
Concentration	< 10000 mg m^{-3}
Linear velocity	15 - 25 m min^{-1}
Bed depth	0.1 - 1.0 m
Contact time	0.25 - 2.0 s
Relative humidity	> 90%
Temperature	Ambient
Pressure	Atmospheric
Adsorption efficiency	> 98%
Adsorption capacity	10 - 30%
Comment	Data based on AddSorb® VA3

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The removal of hydrogen sulphide (and organosulphur compounds) in sewage odour control is a primary application for chemically impregnated activated carbon. Several methods of adsorption technology have been developed where selection of the required filtration technique is based on individual site requirements or client specified operating conditions. The principal adsorption systems used in sewage odour control are based on the following standard design conditions;

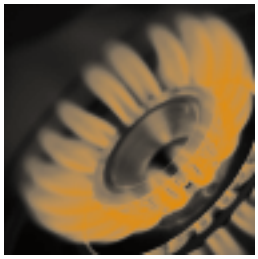
Sacrificial Adsorption: the filter is designed to provide removal of hydrogen sulphide on a single use basis, on saturation the chemically impregnated activated carbon is simply replaced and the spent material is sent to disposal.

Chemical Regeneration: the filter is designed to remove hydrogen sulphide on a multiple adsorption cycle basis, following saturation the chemically impregnated activated carbon is regenerated in-situ of the adsorption unit using chemical washing techniques.

Catalytic Adsorption: the filter is designed to remove hydrogen sulphide on a multiple adsorption cycle basis, following saturation the catalytic activated carbon is regenerated in-situ of the adsorption unit using water washing techniques.

The control of the relative humidity is important in sewage odour control and careful selection of the particle size of the adsorbent can be significant in optimising the performance efficiency and life time of the filter system.

Hydrogen sulphide (and organosulphur compounds) may be present as trace contaminates in natural gas, AddSorb activated carbon is used in the production of natural gas to the highest industrial standards.



The Removal of Hydrogen Sulphide from Natural Gas

Hydrogen sulphide (and organosulphur compounds) may be present in natural gas due to the geology of the reserve, or as a result of reactions which take place under conditions of high relative humidity, forming undesirable contaminants. Due to the high flow volumes of natural gas the contamination is generally present at low levels, but the natural gas must be compressed for efficient distribution to the supply system. As an integral part of the natural gas refining process acidic gases must be removed in order to prevent corrosion in the distribution system.

The chemical composition of the natural gas must be carefully considered, as this will significantly influence the selection of the activated carbon, in particular the oxygen concentration is critical.

In natural gas refineries operations, hydrogen sulphide must be removed in order to minimise the corrosion of process plant and distribution systems.

PARAMETER	TYPICAL VALUE
Concentration	< 10 g m^{-3}
Linear velocity	5 – 15 m min^{-1}
Bed depth	1.0 – 3.0 m
Contact time	10.0 – 30.0 s
Relative humidity	< 80 %
Temperature	< 60°C
Pressure	1 – 50 atm
Adsorption efficiency	> 99.5 %
Adsorption capacity	10 – 20 %
Comment	Data based on AddSorb VA4

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STANDARD DESIGN CONDITIONS

The primary factor in the design of a natural gas purification systems is the composition of the gas, specifically the concentration of hydrogen sulphide (and organosulphur compounds) relative to the concentration of oxygen, which is critical to the chemisorption process. The selection of the activated carbon is based on this specific criteria.

Subsequent adsorber design is common to both types of adsorption systems, based on the inlet concentration of hydrogen sulphide (and organo-sulphur compounds), required removal efficiency and specified life of the operating system. In order to achieve the maximum purity of the natural gas extended contact times are generally used, which result in deep bed adsorption designs.

If necessary the relative humidity of the natural gas is controlled by the use of upstream drying units, and the temperature regulated by the use of heat exchangers.

Operating under standard design conditions hydrogen sulphide (and organosulphur compounds) will be removed with an efficiency exceeding 99.5%, with an adsorber life of 1–5 years, subject to the composition of the natural gas and adsorption system design.

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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.

BVQi ISO 9002

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

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