DIOX SORB ACTIVATED CARBON

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Jacobi CARBONS

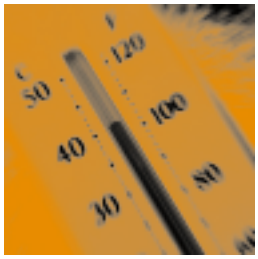
Activated Carbon for Flue Gas Purification

Jacobi Carbons manufactures the DioxSorb® range of activated carbons from coal and coconut shell raw materials by steam activation, using the latest production techniques in modern purpose built facilities. DioxSorb® activated carbons are supplied as fine ground powders and impregnated cylindrical extruded pellets, which have been specifically designed to adsorb dioxins, mercury and heavy metals from flue gas. These materials are proven adsorbents which are used extensively in waste-to-energy, hazardous waste and clinical waste incineration plants.

- Coal and coconut shell activated carbons designed to meet individual process requirements.
- Fine ground powders for optimum adsorption kinetics.
- Maximum pore volume and extensively developed transport pore system for rapid diffusion of contaminants into internal surface area.
- Highly developed internal surface area for maximum adsorption capacity.
- Maximum ignition temperature to ensure safe operation.
- Sulphur impregnated cylindrical extruded pellets for use in fixed bed adsorption systems.

PROPERTIES OF DIOXSORB® ACTIVATED CARBON

Grade	Type	Form	Surface Area $m^2 g^{-1}$	Pore Volume $cm^3 g^{-1}$	Density $kg m^{-3}$	Mean Particle Diameter, µm	Application
BP5	Coal	Powder	600	1.05	600	21	Standard dioxin and mercury adsorbent
BP4	Coal	Powder	750	1.20	550	21	Standard dioxin and mercury adsorbent
BP2	Coal	Powder	1000	1.56	500	21	Optimum dioxin and mercury loading capacity
CP2	Coconut	Powder	950	0.55	550	21	Standard dioxin adsorbent
CP1	Coconut	Powder	1050	0.68	500	21	Excellent performance against dioxin
BPS	Coal	Powder	950	1.05	520	21	High mercury concentrations
VQ1	Coal	Extruded	1050	0.80	600	Extruded	Packed bed, maximum mercury loading capacity



Hazardous waste that can contain mercury is destroyed using high temperature incineration. The flue gas is treated using DioxSorb® activated carbon.

Flue Gas from Hazardous Waste Incinerators

As the chemical manufacturing industry strives to meet the increasingly complex demands of the consumer market it is inevitable that hazardous waste materials will result as a by-product of certain process techniques.

High temperature incineration is widely recognised as the most environmentally acceptable method of destroying these materials. The resulting flue gas requires purification before being discharged to atmosphere. In the semi-dry process this involves dosing DioxSorb® activated carbon into the humified flue gas. This material is subsequently deposited on the fabric filters where the removal of dioxins, mercury and heavy metals take place.

In order to optimise the destruction efficiency of the incinerator, the DioxSorb® may be returned to the start of the process together with incoming hazardous waste.

PARAMETER	TYPICAL VALUE
Processing capacity	9000 kg h^{-1} (total)
Injection method	Semi-dry
Particle collection	Fabric filters
Flue gas volume	65000 Nm^3 h^{-1} (total)
Dioxin	
- inlet	2–4 ng TEQ Nm^{-3}
- outlet	< 0.1 ng TEQ Nm^{-3}
Mercury	
- inlet	50 mg Nm^{-3}
- outlet	< 30 µg Nm^{-3}
DioxSorb® injection	7 kg h^{-1} (105 mg Nm^{-3})
Injection temperature	160°C
Relative humidity	20–25%
Outlet gas	
- ref. conditions	9–10% O_2 v/v dry
Emission standard	EC 692:1997
Comment	Data based on average results obtained during three year period of operation using DioxSorb® BP2

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

STANDARD DESIGN CONDITIONS

Industralised nations manufacture significant quantities of chemicals and consequently the waste by-products arising from these operations must be disposed of in a safe and environmentally acceptable manner. The licensing and regulation of hazardous waste incinerators is stringently controlled, resulting in a small number of large scale operations. Hazardous waste will often be difficult to burn, requiring a high flue gas volume relative to the quantity of waste being incinerated.

Dioxins in the flue gas are usually due to the presence of liquid halogens in the waste and mercury is common due to thermometers and electrodes, however, the concentrations will be variable. Due to the variability of the waste and the need for a high safety factor, the dosage of DioxSorb® may range from 100 to 200 mg Nm^{-3}.

DioxSorb® may be used at temperatures up to 250°C, subject to the operation conditions and equipment design of the flue gas cleaning plant.

STORAGE AND PACKING

DioxSorb® powdered activated carbon is supplied in 500–800 kg moisture proof, laminated, poly-propylene, liner-free, FIBCs (big bags). Dimensions are 95x95x125 cms (500 kg) and 93x93x180 cms (800 kg).

Section of a clinical waste incineration unit manufactured by Evans Tabo Universal Ltd. in Leeds (UK).

Flue Gas from Clinical Waste Incinerators

The operation of a modern day hospital is a highly demanding responsibility, requiring skillful management of the available resources and a detailed understanding of the impact on the local environment. Due to the complexity of advanced medical techniques, the nature of the equipment which is used and the large number of surgical operations which are undertaken, hospitals generate a substantial quantity of chemical and bio-hazardous wastes. In order to safely dispose of these materials, maximise heat recovery and minimise environmental impact, many of the larger hospitals will operate on-site incineration plants. In common with industrial incineration units the flue gas will become contaminated with dioxins, mercury and heavy metals, requiring treatment before being discharged to atmosphere.

PARAMETER	TYPICAL VALUE
Processing capacity	1000 kg h^{-1} (total)
Injection method	Dry
Particle collection	Fabric filters
Flue gas volume	10000 Nm^3 h^{-1} (total)
Dioxin - inlet - outlet	 10–20 ng TEQ Nm^{-3} < 0.1 ng TEQ Nm^{-3}
Mercury - inlet - outlet	 10-20 mg Nm^{-3} < 50 µg Nm^{-3}
DioxSorb® injection	1.5 kg h^{-1} (150 mg Nm^{-3})
Injection temperature	130°C
Relative humidity	8–10%
Outlet gas - ref. conditions	 11% O_2 v/v dry
Emission standard	Directive 94/67/EC
Comment	Data based on average results obtained during three year period of operation using DioxSorb® BP2

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STANDARD DESIGN CONDITIONS

Clinical waste incineration units are generally designed for the treatment of waste generated on-site (or for the treatment of waste from the immediate vicinity) and consequently they tend to be relatively small plants. However, due to the nature of the waste they are processing they tend to have specialist characteristics.

Plastics from medical equipment will inevitably form a very high proportion of the waste leading to a relatively high concentration of dioxins, although this is usually of secondary importance.

The principal consideration is generally the incineration of electrical equipment, batteries and thermometers which give rise to extremely high concentrations of mercury in the flue gas. In order to ensure efficient removal of mercury to below consent level (European limit of 50 µg Nm^{-3}) DioxSorb® activated carbon may be dosed into the flue gas at concentrations of 100–300 mg Nm^{-3}. Lime is often used for acid gas removal at flue gas temperatures ranging from 130–180°C, above this temperature bicarbonate compounds may be used which provide increased reactivity.

STORAGE AND PACKING

Robust multi-ply paper sacks of 20-25 kg net, shrink wrapped on 500 kg pallets, 100x120x110 cms.

In many major cities domestic waste is used as a fuel for the production of electricity and district heating.

Flue Gas from Waste-to-Energy Plants

Disposal of domestic waste is undertaken using high temperature incineration and the recovered energy is used to preheat boiler feed water and to provide district heating for the local area. During the incineration process the flue gas becomes contaminated with particulate matter, acid gases, dioxins and gaseous heavy metals.

Purification of the flue gas involves cooling to the correct temperature followed by dry adsorption. Hydrated lime is injected for neutralisation of the acid gases and DioxSorb® activated carbon is injected for the adsorption of dioxins, mercury and heavy metals. The particulate matter, hydrated lime and DioxSorb® are removed from the flue gas using fabric filters.

The fabric filters are automatically cleaned and the resulting fly ash is disposed of as a non-hazardous material.

PARAMETER	TYPICAL VALUE
Processing capacity	11000 kg h^{-1} x 2
Injection method	Dry
Particle collection	Fabric filters
Flue gas volume	64800 Nm^3 h^{-1} x 2
Dioxin - inlet - outlet	 7 ng TEQ Nm^{-3} 0.07 ng TEQ Nm^{-3}
Mercury - inlet - outlet	 0.15 mg Nm^{-3} < 2 µg Nm^{-3}
DioxSorb® injection	4 kg h^{-1} (30 mg Nm^{-3})
Injection temperature	130°C
Relative humidity	13–15%
Outlet gas - ref. conditions	11% O_2 v/v dry
Emission standard	EPA 1990 (IPR 5/3)
Comment	Data based on results obtained during three year period of operation using DioxSorb® BP2

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STANDARD DESIGN CONDITIONS

Due to the need to dispose of the domestic waste from many major cities and the requirement for efficient energy production, waste-to-energy plants are often very large scale operations. Processing a substantial quantity of waste with a low calorific value, which is primarily organic in nature, results in huge flue gas volumes and relatively low levels of contaminants.

Dioxins are usually the principal contaminants due to the presence of plastics in the waste. Mercury may also be present as a secondary contaminant due to the presence of old batteries in the waste. Consequently the quantity of DioxSorb® activated carbon injected into the flue gas may be very low, values of 30 – 50 mg Nm^{-3} are typical. The temperature at the point of injection has been reduced to 130°C to minimize the volatility of the contaminants, which consequently optimises the adsorption efficiency.

STORAGE AND PACKING

DioxSorb® activated carbons can be supplied in pneumatic bulk trailers. This mode of delivery ensures dust free handling as the DioxSorb® activated carbon is discharged directly into a storage silo by a pressurised blower.

Jacobi CARBONS

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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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