bruno balducci s.r.l.

ACTIVE CHARCOAL FILTERS FOR CENTRALISED SYSTEMS

The process of purifying the air with active charcoal is called adsorption. The technology of adsorption is based on the property of active charcoal to trap most Volatile Organic Compounds – V.O.C. Treatment takes place because active charcoal has a high degree of microporosity, which is difficult to imagine, that can reach over 1500 m2per gram of charcoal. Microscopic pores develop in depth and gradually become more narrow, which forms an extremely vast surface area. Active charcoal is mainly of vegetable origin and, when suitably processed and treated, is presented in the form of granules, chips or small cylinders. This last format is only a millimetres long.

Active charcoal filters/adsorption units are used in industrial sectors on process machinery and workplace environment purification units to protect air quality in the following sectors (for example):

- Removal/recovery of solvents or mixtures of solvents
- Purifying air from production processes
- Removing oily mist from compressed air
- Deodorizing exhaust air and waste gases
- Removal of toxic substances in air conditioning systems

Charcoal is contained in panels, pockets, and cartridges or simply inserted into containers of certain sizes that form the “bed” for the gaseous fluid containing the pollutant to adsorb. The function of active charcoal filters is based on the adsorption process, which is a molecular diffusion phenomenon that occurs between a gaseous component – a VOC – and a solid substrate – charcoal. Charcoal’s adsorption capacity is particularly indicated for the abatement of organic compounds with a molecular weight between 50 and 200. Organic compounds with a lower molecular weight are not adsorbed sufficiently because they are too small. Adsorption capacity is expressed in percentage weight, or rather in kg of organic contaminant adsorbed per 100 kg of active charcoal used. This capacity falls between minimum values of 1% and maximum values of 30%. The efficiency of active charcoal filters is influenced by a series of parameters such as the molecular weight and concentration of pollutants, temperature, humidity, pressure and presence of particulate matter in the flow to treat. Particulate matter reduces the charcoal’s microporosity and also reduces the efficiency of adsorption. Therefore, this type of pollutant should be captured upstream with suitable prefilters. With moderate temperatures and humidity, active charcoal adsorption devices offer the best performance. To obtain the best results, it is advisable to work at temperatures lower than 50° with relative humidity not exceeding 70%, and obviously with the gaseous fluid passing over the charcoal bed at a carefully calculated flow rate.

Ideal, among other uses, for operations of:

- Dry cleaning with VOC or COC
- Printing, Painting, Impregnation, Spreading, Resin application, Adhesive application, Bonding, Pad printing, and Lithography of various types of substrates with solvent products;
- Production of paints, glues, adhesives, pigments and/or similar products with solvents;
- Articles in glass fibre, accessories in polyester resin and in other polymer resins.

It is very difficult to calculate the exact adsorption capacity of active charcoal with regard to a specific substance.
It is more useful to do a spectrum classification.
By defining four adsorption classes, it is possible to expect the results indicated in the table.

ISO 9001:2015

www.brunobalducci.com via Bari, snc 26900 Lodi IT ■ info@brunobalducci.com ■ tel +39.0371.173.06.56 ■ fax +39.0371.193.01.06

dal 1944 bruno balducci s.r.l.

TECHNICAL DATA ACTIVE CHARCOAL FILTERS - Adsorption capacity

VERY LOW 1%	LOW 5%	MEDIUM 10%-15%	HIGH 25% - 30%		
Acetylene	Acetaldehyde	Methyl acetate	Amyl acetate	Crotonaldehyde	Nonane
Carbon dioxide	Hydrobromic acid	Acetone	Butyl acetate	Cyclohexane	Octane
Ethane	Hydrochloric acid	Hydrogen cyanide	Glycol ether acetate	Cyclohexanol	Mesityl oxide
Ethylene	Hydrofloric acid	Formic acid	Ethyl acetate	Cyclohexanone	Ozone
Hydrogen	Nitrogen dioxide	Hydrogen iodide	Isopropyl acetate	Cyclohexene	Pentanone
Methane	Butane	Nitric acid	Methyl-glycol ether acetate	Decane	Percloroetilene
	Butene	Acrolein	Propyl acetate	Dibromoethane	Propyl mercaptan
	Dimethylacetylene	Methanol	Acetic acid	Dichlorobenzene	Ethyl silicate
	Formaldehyde	Ammonia	Acrylic acid	Dichloroethane	Styrene monomer
	Sulphurous dioxide	Sulphur trioxide	Butyric acid	Dichloroetylene	Turpentine
	Seleniuretted hydrogen	Ethyl bromide	Lactic acid	Dichloroethyl ether	Tetrachloroethane
	Propane	Methyl bromide	Propionic acid	Dichloronitroethane	Tetrachloroethylene
	Propylene	Butadiene	Suphuric acid	Dichloropropane	Carbon tetrachloride
		Chlorine	Ethyl acrylate	Diethyleketone	Toluene
		Chloroethane	Methyl acrylate	Dimethyl sulfate	o-Toluidine
		Chloromethane	Acrylonitrile	Dioxane	Trichloroethylene
		Vinyl chloride	Isoamyl alcohol	Dipropylacetone	Xilene
		Dichlorodifluoromethane	Butanol	Essences	
		Dichlor otetrafluoromethane	Ethyl alcohol	Amyl ether	
		Diethylamine	Ethyl alcohol	Butyl Ether	
		Hexane	Propylic alcohol	Isoproyl ether	
		Hexene	Acetic anhydride	Propyl ether	
		Ethyl ether	Aniline	Ethylbenzene	
		Dimethyl ether	Benzene	Ethanethiol	
		Ethylamine	Bromine	Heptane	
		Fluor otrichloromethane	Butoxyethanol	Heptene	
		Ethyl formate	Camphor	Phenol	
		Phosgene	2-Isopropoxyethanol (Cellosolve)	Iodine	
		Freon	Chlorobenzene	Iodoform	
		Toxic gases	Chloroprene	Kerosene	
		Hydrogen sulfide	Chloroform	Menthol	
		Isoprene	Chloronitropropane	Mercaptan	
		Ethylene oxide	Chloropicrin	Methyl butyl acetone	
		Pentane	Chlorobutane	Methoxyethanol	

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