

## **ACTIVATED CARBON FILTERS**

### **What is activated carbon**

Activated carbon is a common coal, made of vegetable or mineral, and activated in special ovens with steam at a very high temperature.

The total available area can reach 1000 m<sup>2</sup> per gram of carbon. This area is created by the activation process that can open the micropores inside the structure of the carbon.

The activated carbon is available in several types and shapes, of different origin (vegetable or mineral), with different average grain-size, and so on.

The action of the activated carbon is featured as three different workings:

1. Physical action.

The action of mechanical filtration, the same way, or better, of a sand multimedia filter.

2. Chemical action

The action of chemical catalysis of reduction with some inorganic groups.

3. Physical-chemical action

The most important feature of a bed of activated carbon is the adsorption, that is the capacity to trap special type of molecules inside the structures of its micropores.

### **Applications**

The activated carbon is commonly used in many fields and many applications, in water (also waste and sewage water) treatment, in air treatment, in the industry of sugar or wine production, and so on.

Particularly, the most common applications in water treatment are :

- To remove chlorine; the chemical action reduces the chlorine into chloride ion.
- To remove bad taste and smell; the adsorption action removes organical substances causing odours and taste.
- To remove pollutants; by the adsorption of pesticides, solvents, detergents, etc.
- To remove turbidity; by mechanical filtration.

The different size of the granules of the carbon allows the bed of activated carbon to work same way, or sometimes better, than the quartz sand filters, in order to filter the water and remove sludge, mud, lime, etc.

It is important to note that, the bed of activated carbon should be backwashed as less often as possible, in order to avoid the "mixing" of the bed and the moving of the upper layer (that could be more polluted) to the bottom of the filter.

The adsorption action of the carbon causes a progressive exhausting of the carbon itself and the simple backwashing of the bed usually cannot re-built its capacity. The exhausted carbon can be re-activated with special thermal process, almost the same of activation of the coal. Naturally, due to the cost of it (including shipping cost), the re-activation process can be acceptable only for large quantity of carbon.

The operating features of utilization of activated carbon depends mainly on the application. Usually, a bed depth of approx 80-120 cm is used.

Whether the activated carbon is used as dechlorination, which is its most common application, a minimum contact time water-carbon of 2 minutes is used.

Longer contact time allows a longer life of the carbon, and a lower pressure drop across the filtering bed (longer contact time = higher quantity of carbon = larger surface of filtration = slower linear flow)

Anyway, with same carbon bed, the lowest is the flow rate of water through the filter the highest is the capacity to remove pollutants .

### **Special notes for activated carbon filter used for dechlorination**

The life of the activated carbon, when used as dechlorination (reduction of chlorine to chloride ion), is very long.

The activated carbon does not have any selective action against the substances the flowing water contains; hence it traps also the organics if contained in water.

It means that the activated carbon could be exhausted by means of the adsorption of pollutants, even if the adsorption is not the main purpose of the installation.

It should be also noted, that exhausted carbon can release in outlet water the same pollutants at higher concentration!

The exhaustion of the activated carbon is not easily realized, and it is not realized with common instruments used during current maintenance.

According to the above it is recommended to avoid the utilization of activated carbon filter without suitable pre-treatment (filtration by sand media, chlorination, etc.).

Nobel activated carbon filters series FACV/T and FAC/D are designed according to a contact time of 2 minutes at max flow rates. See also technical leaflets for more detailed informations.

This bulletin is provide only as general directions about the principles and applications of activated carbon filters.

Apply Nobel Service or Technical Centers for further informations or about special application.