Principle Of Operation

Activated carbon works by the process of adsorption. Adsorption is when one material adheres to the surface of another material by means of physical and/or chemical attraction between the materials. Activated carbon is full of holes. This network of connected pores inside the carbon gives it a large surface area (approx. 1000 sq M per gm of carbon). Organic odor molecules from the air are attracted to the internal carbon surface. These contaminates accumulate on carbon's interior surface until an equilibrium level is reached between the concentration on the carbon surface and the concentration left in the air. The lower the residual concentration required in the air stream, the greater the relative amount of carbon required to achieve that level.

The capacity of activated carbon to adsorb a compound depends on several factors including air temperature, the chemicals boiling point, molecular weight, and concentration in the air stream. The mass transfer zone (MTZ) is the area in the bed where adsorption takes place. The chemicals concentration and air flow rate change the size of the MTZ. The lead edge of the MTZ has no contamination in it while the trailing edge is completely saturated (to the level of contamination in the inlet air). As the MTZ moves through the carbon bed and approaches the end of the bed, breakthrough occurs. The carbon becomes saturated with adsorbate and the contaminate can be detected in the exhaust. When the outlet concentration exceeds a specified limit the bed is spent. The carbon must then be replaced or regenerated. Samples of the carbon drawn from various levels of the bed can be tested for their remaining capacity and used to predict the remaining bed life. In this way, bed replacement can be scheduled in advance of the actual need and avoid timing problems.

Activated carbon can be impregnated with chemicals to enhance its ability to control problem contaminates. Control of acid gases such as Hydrogen Sulfide and Mercaptans is greatly enhanced by impregnation with a caustic compound. General Carbon IPH carbon is treated with Potassium Hydroxide (KOH) for this purpose. The KOH gives carbon the ability to chemically neutralize acidic gases and increase the volume of air able to be treated by the carbon.

For applications with high H2S concentrations, bed life can be partially renewed by a process of in situ "regeneration". The procedure soaks the bed in a caustic solution that dissolves accumulated sulfur. This process is not recommended by Simple Solutions Dist. LLC. because only a limited amount of life can be restored to the carbon.