



Standard Granulated Activated Carbon Adsorption Systems

A number of technologies have been widely applied for removal of VOCs from off-gas streams. However, the application of these technologies to off-gases from manufacturing facilities and site remediation may be quite limited. Bio-Filtration has been widely used for VOC destruction in Europe and Japan, but it has only recently been seen in the United States. Catalytic and Thermal Oxidation are widely used for the destruction of gas-phase VOCs in U.S. industry, yet have only limited applications to site remediation of off-gases. In Europe and Japan vapor phase carbon adsorption has been the most widely used application for VOC removal for site remediation of off-gases.

Factors that limit the effectiveness of standard Granulated Activated Carbon (GAC) systems include:

- Spent carbon transport may require hazardous waste handling.
- Spent carbon must be disposed of and contaminants must be destroyed, often by thermal treatment.
- Elevated temperatures from SVE pumps (greater than 38° C or 100° F) inhibit adsorption capacity.
- Biological growth on the carbon or high particulate loadings reducing flow through the bed.
- Some compounds, such as ketones, may cause carbon bed fires because of their high heat release upon adsorption.
-

Vapor-phase carbon adsorption is a remediation technology in which pollutants are removed from the process air by physical adsorption onto activated carbon grains. Carbon is "activated" for this purpose by processing the carbon to create porous particles with a large internal surface area (300 to 2,500 square meters or 3,200 to 27,000 square feet per gram of carbon) that attracts and adsorbs organic molecules.

New Patented Bio-Reactor Filtercrobe®

American Environmental Fabrication & Supply offers the patented Filtercrobe® bio-reactor vapor phase carbon adsorption system for use at manufacturing plants and site remediation for off-gases. Typically carbon adsorption systems do not destroy the VOC's and require additional rejuvenation, removal or replacement of the activated carbon either by increasing the temperature by steam reforming or destruction by thermal oxidation of the highly concentrated vapors during the rejuvenation phase. With this patented design no additional equipment, controls or fuel costs are borne during the activated carbon's rejuvenation phase. The continual rejuvenation allows the activated carbon to remain within the reaction chamber for up to 20 years within removal.

Typically off-gases are pumped through a series of canisters or columns containing activated carbon to which the organic contaminants are adsorbed. Periodic replacement or regeneration of the saturated carbon is required in a method removing the trapped VOC's from the activated carbon bed. Usually vapor-phase carbon adsorption is not recommended to remove high contaminant concentrations from the effluent air streams with the economics favoring pretreatment of the VOC stream, followed by the use of a vapor-phase granulated activated carbon system as a polishing step.

With the Filtercrobe® patented bio-reactor system the activated carbon rejuvenates during operation and requires no auxiliary heat pump; compressors, nitrogen or chillers for de-adsorption or separate thermal oxidation equipment for high level VOC destruction. All the VOC destruction and removal occurs within the bio-reactors activated carbon chamber by selected microbes. Higher levels of VOC contaminates are allowed to be processed with a very high rate of destruction typically over 98% this is in part due to the continual rejuvenation cycle constantly feeding the microbes.

Though the use of specifically designed microbial digestion the systems microbes digest the VOC's creating CO₂ while the system continually rejuvenates the activated carbon eight times per hour, therefore there is no spent activated carbon removal or replacement necessary.



The microbial population is a particular assemblage of natural microorganisms initially selected to bio-remediate hydrocarbons. The microbes are effective on a wide range of VOC compounds. A major difference between

these microbes and their indigenous cousins is their density, over 90 billion per gram. The organisms also can double in population every 15 minutes in a favorably high VOC environment. They are non-toxic and non-pathogenic. It is due to the special characteristics of this collection of microbes which act as modern filters for the activated carbon within the Filtercrobe® bio-reactor unit.

Microbes must be added at a very low cost every four weeks to maintain a viable colony for consistent VOC degradation. Typical cost of operation, microbes and maintenance on a 20,000 scfm unit are \$8,000.00 USD. These microbes will reduce the contaminants within the bio-reactor to near EPA drinking water standard and may be discharged to any waste water treatment plant without any sludge buildup of any kind.

When removing wastewater odor catalytic carbon is utilized and the carbon bed becomes a large filter for odor removal on pumping stations or wastewater treatment plants. The difference of this system is the method of cleaning the catalytic carbon while in place with no operational downtime. There is no high-acid water to dispose as long as the water bath section is discharged every month before the system is recharged with the microbial product. The water discharge can be dispensed as normal wastewater.



Stationary Filtercrobe Unit



Mobil Filtercrobe® System

Listed below are specific industrial VOC's for which the bio-reactor has been tested:

- COATINGS:** Benzene, Xylene, Toluene, Organics
- PETROLEUM PRODUCTS:** Benzene, Xylenes, Toluene, Diesel, Ethyl Benzene, Naptha, NOX, SO2
- WASTE TREATMENT:** H2S, Mercaptans, Dioxin
- CHEMICAL MANUFACTURING:** Acrylonitrile
- RUBBER MANUFACTURING:** Heptane
- FIBERGLASS PRODUCTION:** Styrene
- FOAM PRODUCTION:** Methylene Chloride
- PRINTING:** Oil based inks
- DRY CLEANING:** Chlorinated Hydrocarbons

The Bio-Reactor is designed to minimally process as 2,500 scfm air flow, should your process require less flow ambient make up air can be supplied to the unit (foot print of 8 ft. diameter X 4 ft. length) or 100,000's of scfm in a modular configuration of multiple 20,000 scfm units (foot print of 10.5 ft diameter X 16 ft. each).

For more information about the Filtercrobe® or specific destruction efficiencies as it may relate to your specific emissions, please contact American Environmental Fabrication & Supply at www.american-environmental.us or call +1 918 708-1253. Representatives will be happy to discuss conversion of older technologies or new system applications