



“Green” Product Renewal and Regulatory Fulfillment Spent Carbon Reactivation

Increasing stringent regulatory compliance regulations and the need to improve carbon products has led to a newer more versatile technology that offers both compliance and higher product quality than previous traditional technologies. Newer technology offers cost effective approach for many industries such as petroleum refineries and natural gas processors that complies with federal, state and local regulations.

With activated carbon costs, disposal and ever increasing transportation costs a new green solution emerges for activated carbons. True 100% recycled carbons are now a reality. Many industries can use these carbons over and over again in their original process. Older rejuvenation techniques such as steam or heat most won't allow the carbon to be reused in the same application due to degradation of the original carbon. Many times these carbons must be used in other applications such as VOC abatement, waste water and vapor phase soil extraction.

Recycling carbon offers a great reduction in operating, transportation and disposal costs. Depending on the facility, they may also receive environmental credits issued by regulatory bodies for waste minimization. But most importantly this new recycling process ends the custodial chain for absorbed emissions removing any exposure and high risk associated with transportation and disposal of these spent carbons and may be considered a recovered resource.

Filtercrobe Bio-Reactor Method of Reactivation

Most systems today offer thermal reactivation, a process by which the spent carbon is heated by steam to elevated temperatures which removes and destroy the organic compounds absorbed into the activated carbon. The system tries to restore the spend carbon as close as possible to the original carbon material. During the process loss to the internal pore structures occur. This procedure of reactivation requires staging at elevated temperatures to dry and boil off higher boiling point organic material. As the process temperature raises pyrolysis of higher boiling organics occur on the surface of the carbon. Lastly gasification of the residues occur, it is at this time that the off gases containing volatilized organics are past to afterburner for final destruction.

By using the “Filtercrobe® Bio-Reactor System” as a carbon treatment or rejuvenation device, the activated carbons pore or cell structure remains intact at 100%. The Filtercrobe® does not damage the carbon by any heat treatment. After any heat treatment process the carbons have a tendency to become brittle and often may not be used in the original application. Industry finds themselves purchasing new or virgin material. The Filtercrobe® system allows the continued use of the same carbon material over and over again. This is due to the microbial Filtercrobe® method of carbon rejuvenation. The Filtercrobe® uses a natural occurring microbial system and does not damage the carbons cells so they won't become brittle:

Advantages of using the Filtercrobe® over conventional heat treating methods:

- High degree of control during the reactivation process
- Lower losses due to microbial wet scrubbing
- Requires no thermal oxidation process
- Lower losses due to physical attrition
- Consumes very little electrical energy during the rejuvenation process
- No natural gas fuel requirements, No NOx or CO formation as a result of afterburners
- Provides flexible operation times
- Requires no skilled operator or high maintenance cost

Evaluating Reactivated Carbon Performance

The performance of reactivated carbon can be measured by a variety of methods including Iodine and Butane Numbers. These standard adsorption capacity tests are used as a basis for determining if



reactivation is complete. Some applications may require Rapid Small Scale Column Test (RSSCT) or bottle point isotherms, these tests will compare the adsorption performance of reactivated carbon.

AEFS Provides Reactivation Services

“Remediate and Return” (offered by American Environmental Fabrication & Supply) is a highly controlled program where activated carbons are removed, reactivated, and replaced for reuse at the client’s facility. The carbon is cleaned by microbiological destruction during liquid phase of reactivation. Virgin carbon is only required to offset a very small amount of physical loss that occurs during the handling and rejuvenation phases.

Microbial reactivation requires only minimal product grouping, our vendors technicians will separate the spent carbons and combined carbon according to application type (vapor phase/liquid phase) and mesh size. These carbons can then be rejuvenated accordingly to the application type and may only require minimal addition of virgin carbon, hereby lowering operating costs.

Field services associated with reactivation program include spent carbon profiling, spent carbon removal and spent carbon rejuvenation and reintroduction into the absorber at the plant or facility. Carbon vessel inspection any minor repairs and vessel loading and reloading. We offer a certificate of reactivation upon completion, confirming that the spent carbon has been recycled in a manner that meets or exceeds all applicable RCRA and NESHAP regulations.

Prior to reactivation, spent carbon must be profiled so it can be safely and efficiently be reactivated at a specified location within your facility. Typically, a profile form on the spent carbon is completed and a small sample of spent carbon provided to us for testing. Some contaminants, such as siloxane or sludge for example, may not be accepted for the rejuvenation process. Determination of the spent carbon’s regulatory status RCRA hazardous, state hazardous, non hazardous is the responsibility of the generator of the spent carbon.

The Green Natural Advantage

If you operate a processing unit using virgin activated carbon to meet environmental compliance for VOC emissions using carbon adsorption method and must meet Benzene NESHAPS rule which requires a 95% reduction of VOC’s (or 98% benzene reduction) from vapor emissions from points throughout the facility. The Filtercrobe® offers significant savings on manpower from contractors or personnel to service existing carbon filters. In addition, the facility will not have to transport or permit any spent saturated carbons. Typically these amounts are very large i.e. 100,000 pounds annually to a disposal facility for landfill or incineration.

The Filtercrobe® Bio-Filtration System offers a huge reduction of costs, manpower requirements, hazardous waste transportation and safety risk/liability while ensuring continued compliance with the consent rule requirements.

Solution

We offer a turn-key solution that will standardize on-site rejuvenation, significantly reduce cost, reduce manpower requirement, reduce overall safety risks/liability, and eliminate maintenance of onsite hazardous waste.

The solution consists of having replacement carbon absorbers available so that the expended saturated absorbers may be taken for rejuvenation; the service contract provides an onsite system “The Filtercrobe®” for carbon rejuvenation. The used or spent carbon absorbers are staged in a separate area within the facility for rejuvenation. This area is where the carbon is removed from the absorber and placed into the carbon rejuvenator for microbiological removal of contaminates. We will provide a vendor (contractor) for the reactivation services, and will also provide refilling the empty absorber vessels with the rejuvenated materials.



Get Results

The new Filtercrobe® system/service combination will allow more efficient exchange of carbon absorber materials under the consent command of timeline constraints (12 hours' or 36 hours) and will reduce carbon separation and manpower requirements at the facility. Since the spent carbon is being reactivated, it is considered an exempt waste, not a hazardous waste; thus, the facility will completely eliminate the transport and disposal of hazardous waste from their process, and meet environmental compliance for handling of the spent carbon, as the carbon will be reactivated in lieu of land filling or incineration. The typical refinery will also reduce safety liability for its workers. Because of all these factors, the refinery operation will have projected cost savings of approximately \$600,000 per year.

Achieving regulatory compliance while operating profitably and producing quality products via the industrial process can be a challenging concern when considering the operational aspect of a typical refinery or natural gas processing unit. Fortunately, for the removal of organic contaminants, activated carbon remains a tested, reliable technology to help achieve regulatory compliance and product purification goals. Furthermore, use of reactivated carbon provides an even more cost-effective and environmentally beneficial solution for facilities to consider for many applications.

Activated carbon is an adaptable adsorbent material that has many common applications in the petroleum or natural gas industries. Regulatory compliance regulations and improvement in various product qualities are the two main forces for the use of activated carbons.

More Common applications include:

- Vapor / Solvent Recovery: Economically valuable products at refineries and terminals can be recovered via pressure swing or temperature swing systems that utilize activated carbon. Microporous carbons (e.g. coconut-shell-based), higher boiling point solvents require (coal-based) carbons. Filtercrobe® reactivated carbons may be used.
- Vapor Phase VOC Treatment and Control: Compliance with the Benzene National Emission Standard for Hazardous Air Pollutants (NESHAP) or local air emission regulations on API separators and DAF systems. Filtercrobe® reactivated carbons may be used.
- Wastewater Treatment: Activated carbon can help refineries meet wastewater discharge permits (COD, BOD, TOC, and bio-toxicity). Filtercrobe® reactivated carbons may be used.
- Hydrogen Sulfide Removal: Sour crude oils often are the source of hydrogen sulfide (H₂S) emissions. Specialty grades of carbon (impregnated or catalytic grades). Filtercrobe® reactivated carbons may be used.
- Groundwater Remediation: Organic compounds (BTEX, MTBE) often migrate into groundwater supplies from leaking underground storage tanks or holding ponds. BTEX removal (coconut-shell-based carbons) with higher adsorptive capacity for trace removal is often selected for MTBE removal. Filtercrobe® reactivated carbons may be used.
- Amine Purification: Various alkanolamines are used in refineries to purify gas streams, during which the amine solution picks up hydrocarbons and organic acids. A slipstream of the amine solution is passed through a carbon adsorption system to prevent a buildup of these hydrocarbons. Filtercrobe® reactivated carbons may be used.
- De-colorization: Activated carbon can be used for color, odor, or contaminant removal from desired end products such as jet fuel, kerosene, gasoline, and lube oil. Granular carbons can be utilized in continuous processes, for this application. Filtercrobe® reactivated carbons may be used.

For more information about the [Filtercrobe®](#) or specific [carbon reactivation or rejuvenation](#) information 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.