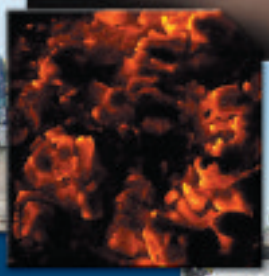
CalgonCarbon

Go Green - Custom Reactivation of Activated Carbon for Drinking Water Treatment



Making Water and Air Safer and Cleaner and Your Operation Greener

Drinking Water Treatment..

Go Green – Activated Carbon Reactivation

Calgon Carbon has been a green company for years – with its spent carbon reactivation program. After an activated carbon's adsorptive capacity has been exhausted, it can be returned to Calgon Carbon for thermal reactivation. This spent carbon can be reactivated for the ultimate disposal of contaminants, or safely and cost-effectively recycled back to customer facilities for continued use. With carbon reactivation facilities in the United States, Europe, and Japan, Calgon Carbon makes it easy to go green!

Reactivation Process and Advantages

After an activated carbon's adsorptive capacity has been exhausted, it can be returned to Calgon Carbon for thermal reactivation. In the reactivation process, the spent activated carbon is heated in furnaces devoid of oxygen using steam as a selective oxidant. The adsorbed organics are either volatilized from the activated carbon or pyrolysed to a carbon char. The volatile organics are destroyed in the furnace's afterburner and acid gases are removed by means of a chemical scrubber. The high-temperature reaction with steam serves to restore the adsorptive capacity of the activated carbon.

Through reactivation, the spent activated carbon can be recycled for reuse, eliminating the costs and long-term liability associated with disposal. The environmental benefits of a reactivated product over a virgin carbon are an efficient, cost effective alternative. Custom reactivation takes what was once a waste product and a potential liability and turns it into a recoverable asset!

Another benefit of reactivating and reusing spent activated carbon is the ability to ensure a reliable supply of media when needed. Custom reactivation protects activated carbon users against potential shortages and ensures the maintenance and consistency of the quality and source of the product selected.

Reactivation Process and Carbon Footprint

Today, we all realize the importance of reducing our carbon footprint. Reactivation of spent activated carbon as an alternative to replacing the spent carbon with new virgin carbon is one way of accomplishing this important goal. Reactivation of carbon produces less than 20 percent of the greenhouse gases that new carbon production does.

Custom Reactivation Process and Advantages

Granular Activated Carbon for Municipal Drinking Water Treatment Plants

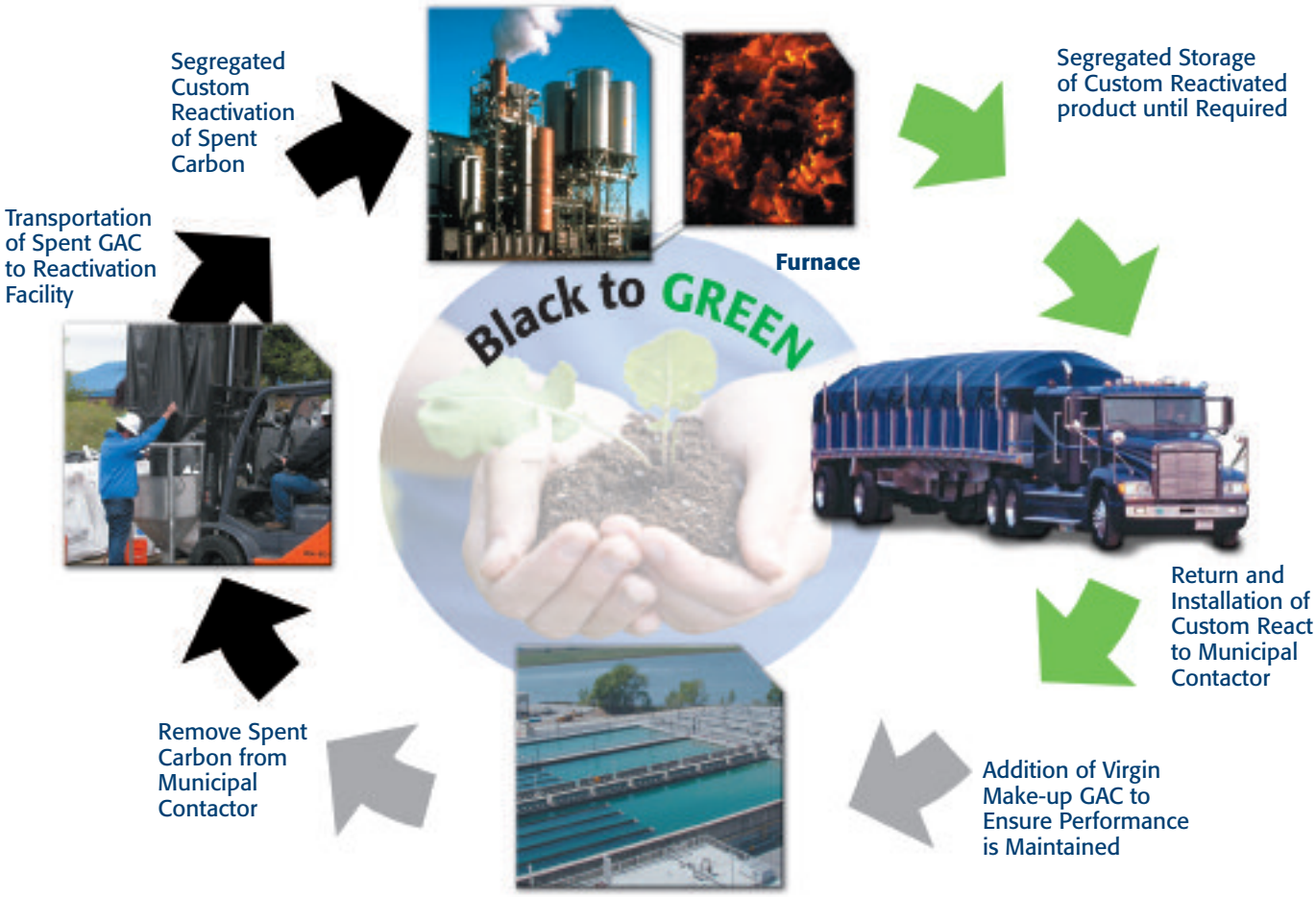
Granular activated carbon has been used for decades in water treatment plants. In the past, GAC has been used for the removal of taste and odor compounds, as well as pesticides and other harmful contaminants. More recently, GAC has been identified by the US EPA as an effective technology for the removal of disinfection by-product (DBP) precursors, as well as DBPs themselves, such as trihalomethanes (THMs). Further, research indicates that GAC is an effective barrier against most endocrine disrupting compounds (EDCs) and pharmaceutical and personal care products (PPCPs), the latest emerging threat to our drinking water supplies. So, the question is not if GAC can be an effective treatment technology for drinking water, but rather, how we can make an effective technology more cost effective.

Custom Reactivation Process for Municipal Drinking Water Treatment Plants

Calgon Carbon's custom reactivation process for municipal drinking water treatment plants is specially tailored to meet the unique demands of the drinking water industry. Activated carbon reactivated for use in drinking water treatment facilities must adhere to requirements of the American Water Works Association (AWWA) standard B605. Perhaps the most important requirement of this standard is that a municipality/water provider must receive back their own activated carbon. Unlike industrial activated carbon reactivation practiced by a number of carbon companies, where carbons from different customers can be co-mingled and reactivated as a pool material, drinking water carbons must be kept carefully segregated. This means that a drinking water provider's activated carbon should be kept separate not only from industrial customers' carbons, but from other drinking water providers' carbons as well, to avoid any potential cross-contamination. Calgon Carbon maintains the integrity of each drinking water provider's carbon, and our potable reactivation facilities and procedures strictly adhere to AWWA B605.

Calgon Carbon Delivers specifically to your needs

Calgon Carbon's Cycle of Custom Reactivation



To achieve optimal performance over time where multiple reactivation and replacement cycles are required, start with Calgon Carbon's premium FILTRASORB® product line. FILTRASORB can also be used for make-up material to maintain bed-life through all reactivation cycles.

FILTRASORB is manufactured using a re-agglomeration process to maximize available pore structure to optimize performance in municipal applications. This Granular Carbon is activated throughout and this is what is needed to ensure product integrity and performance over multiple reactivations.

Modes of Return

Calgon Carbon will work with the customer to find the most cost-effective and efficient modes of return for the spent carbon. Common methods of return include super sacks (each holding approximately 1,000 pounds of carbon) using flatbed trucks and bulk shipments using either Calgon Carbon private fleet potable trailers (more common at sites using steel pressure vessel filters) or dump trucks. Calgon Carbon can also provide Field Services to both remove and install the carbon in the most efficient manner to maximize the customer's economic benefit and minimize disruptions to the customer's operations.

General Information on Spent Carbon Acceptance

Calgon Carbon cannot accept the return of any spent carbon until the material has been tested and approved for reactivation. This is necessary to ensure that the spent carbon can be handled and reactivated safely and that the quality of our reactivated carbon products is maintained. This process is called Carbon Acceptance.

The first step in obtaining Carbon Acceptance is to send us an Adsorbate Profile Document (APD) and a sample of the representative spent carbon for testing. For further information, please visit www.calgoncarbon.com or call 1 800-422-7266. Your local Calgon Carbon representative can advise on the proper methods to collect and send the required sample.

Laboratory Testing

Each new sample is tested to ensure it meets our minimum requirements for safety/toxicity, regulatory compliance and protection of our personnel, process equipment and the quality of the reactivated carbon products. The samples are tested for ignitability, pH, volatile halides (chloride, fluoride, and bromide), volatile sulfur, metals and reactivation efficiency, as well as other specific parameters. Calgon Carbon has internal guidelines and specific permits for a number of parameters.

Carbon Acceptance testing on routine samples typically requires 2 to 3 weeks from receipt of the sample and completed profile document to assignment of a Carbon Acceptance Number (CAN) and notification to the customer that the spent carbon may be scheduled for return to one of our reactivation facilities.

Frequently Asked Questions Regarding Custom Reactivation:

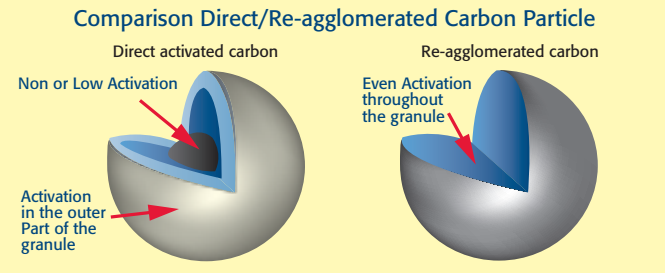
What kind of experience does Calgon Carbon have in custom reactivation?

Calgon Carbon is the world leader in activated carbon reactivation. Calgon Carbon has been providing custom reactivation for municipal drinking water providers in Europe for nearly thirty years, where we custom reactivate nearly 40 million pounds of GAC per year. In North America, custom reactivation is a more recent development, but Calgon Carbon already custom reactivates nearly 5 million pounds per year for municipal customers. In addition, Calgon Carbon has years of experience with both food-grade custom reactivation as well as industrial pool reactivation.

Why does the type of starting activated carbon material matter?

The custom reactivation process subjects the activated carbon to both physical and thermal stresses. The loading, unloading, and transport of spent and subsequently reactivated carbon results in particles moving against one another and other surfaces, potentially breaking them down. The granules are also subjected to very high temperatures, potentially burning away part of the structure. Bituminous coal based re-agglomerated activated carbon, such as Calgon Carbon's FILTRASORB brand, provides the best starting material for custom reactivation, due to the physical strength and hardness of the granule, in addition to the well-developed pore structure. Make-up requirements for bituminous reagglomerated coal-based activated carbon are generally no more than 10% of the original quantity. In contrast, lignite-based carbons and direct activated bituminous coal-based carbons, such as those commonly purchased from overseas suppliers, are generally softer granules with less developed pore structures. While these materials can be custom reactivated, they can require 30% or more virgin make-up material.

The Benefits / Necessity of Re-agglomerated Product over Direct Activated when Reactivation is being considered



Frequently Asked Questions Regarding Custom Reactivation: *(continued)*

Do we get all of our carbon back from the reactivation process, or is some lost in the process?
The reactivation process does result in some loss of starting spent material. Losses occur due to several factors, including handling losses, attrition of carbon particles during movement, and losses in the reactivation furnace. The degree of loss is heavily dependent upon the type of starting material. Material losses are corrected through the addition of virgin make-up activated carbon after the reactivation step.

How does the performance of custom reactivated carbon compare to that of virgin activated carbon?
In general, custom reactivated carbon has very similar adsorption performance to virgin activated carbons. On average, the reactivation process returns the spent carbon typically 80-95% and in some cases as good or better than original virgin carbon performance. This degree to which capacity is restored depends in part on the application (e.g. surface water TOC removal capacity may differ from groundwater VOC removal capacity). Calgon Carbon can reactivate to the optimal pore structure for each application. If there is any question regarding the capacity to remove a particular targeted compound, Calgon Carbon can work with a customer to perform column tests or run test beds of custom reactivated carbon to predict performance.

Will I save money by switching to custom reactivated carbon?
Definitely. Custom reactivation is less expensive than virgin activated carbon. The amount of savings will vary in each case depending upon the application, but even in those cases where the custom reactivated carbon displays a shorter bed life than virgin activated carbon, the customer will realize a cost benefit.

How long does the custom reactivation process take, or, put another way, how long will my filter(s) be down?
Typically, a filter of up to 200,000 pounds can be completely turned around in approximately three weeks. This includes removal and transport of the spent carbon to our reactivation facility, the reactivation of the spent carbon, the addition of virgin make-up carbon, and the return and reinstallation of the reactivated carbon. Some customers with multiple filters or cells choose to put themselves on a schedule where one filter or cell is reactivated every 1-3 month(s), rather than attempting to reactivate all of their carbon at one time. In some cases, the customer's facility can operate with a filter or cell out of service, while in others, the filter whose carbon is out for reactivation must be operational during this time. In those instances, the customer will require a "swing load" of virgin or reactivated carbon equal to the quantity required to fill one cell or filter. Some customers who only operate their filters on a seasonal basis (e.g. some groundwater providers) can afford to take down their filter(s) during their "offseason", getting their carbon reactivated and reinstalled prior to their next season.

What regulations or standards govern the proper use of reactivated carbon for drinking water?
The primary standard for custom reactivation is the American Water Works Association standard AWWA B605. This AWWA standard also references applicable NSF International and Food Chemical Codex standards. Calgon Carbon's custom reactivation program complies with all relevant portions of these standards. As for regulation governing the acceptability of custom reactivation of activated carbon for drinking water, this matter is handled on an individual state level. Customers interested in converting to custom reactivation should check with their state and local departments of health to see what requirements and restrictions may apply to the use of custom reactivated carbon in drinking water facilities. Customers in Canada, Mexico, and non-North American countries should contact the appropriate authority having jurisdiction.

What is the cost of the carbon acceptance testing?
The fee for carbon acceptance testing is $400 (USD) for non-hazardous projects, which should encompass virtually all drinking water facilities.

What should I include when writing a bid specification for custom reactivation?
Bid specifications for custom reactivation of drinking water carbon should reference AWWA B605. B605 lists values for such physical properties as moisture, apparent density, particle size distribution, effective size, uniformity coefficient, and abrasion. Performance criteria should be negotiated with your custom reactivation supplier, but should require a minimum iodine number of no less than 500, again per AWWA B605.

Is my facility a good candidate for custom reactivation?
Nearly every site can realize the economic benefits of custom reactivation. The best candidates for custom reactivation are those sites that either run year round but have multiple filters or cells, allowing individual filters to be reactivated while the plant remains on line, or seasonal sites that can be reactivated during the site's down time.

How can I be sure my carbon was properly reactivated?
Calgon Carbon will provide the customer with an Affidavit of Compliance in accordance with AWWA B605 upon request. This affidavit documents that Calgon Carbon's reactivation services and the reactivated GAC complied with both the AWWA B605 requirements as well as the customer's specifications. This will also be accompanied by a tracking manifest that documents that a handling procedure was in place, assuring that the customer's spent GAC was separated from other GAC's from the time of removal, through the reactivation process, and during storage, until the reactivated product was received by the customer.

How often must the carbon acceptance process be repeated?
When a site has been approved for reactivation at one or more of our reactivation facilities, it is assigned a unique Carbon Acceptance Number (CAN) which will be used to identify the site throughout its lifetime. After the initial acceptance test and assignment of a CAN, the site must be retested every five years per US EPA requirements, or sooner if there is a change in the process that generates the spent carbon.

What happens to the contaminants that were loaded onto my spent activated carbon?
Calgon Carbon's reactivation process drives off and then destroys the contaminants that were loaded onto the spent carbon. The contaminants are either volatilized from the activated carbon or thermally transformed into a carbon char. The volatile organics are destroyed in the furnace's afterburner and acid gases are removed by means of a chemical scrubber.

When should I reactivate my carbon?
In theory, a GAC filter should be reactivated when the outlet concentration of the compound to be removed, such as a pesticide like Atrazine, is nearing the regulatory limit. However, in practice the reactivation frequency is also influenced by factors such as 1) estimated performance based on pilot work and previous experience, 2) security of having extra capacity to handle possible peak concentrations, 3) logistical limitations regarding the removing and replacing the GAC, 4) the rate at which the GAC can be reactivated, and 5) the time period of the year for factors such as peak plant output. The GAC in a filter can be monitored by taking samples from a bed in operation to assess the condition of the GAC. During reactivation, the iodine number of GAC can normally be increased by over 300 mg/g, though not normally to a level higher than the level of the original virgin carbon. FILTRASORB brand activated carbons are typically reactivated when they have an iodine number of 500 to 600, although they are often successfully reactivated when the iodine number is as low as 400.

How many times can activated carbon be reactivated?
Though there is no clear cut-off point where GAC can no longer be reactivated, there comes a point where, because of the very high loading of both organic and inorganic compounds, reactivation losses due to burning away the structure of the GAC become excessive. At that point, total bed replacement with virgin activated carbon is justified.

Protecting our environment is an important task
The quality of our life – and of our children's – depends on how clean we keep the air we breathe and the water we drink. Realizing the importance of reducing greenhouse gas emissions, Calgon Carbon is committed to helping make the world a 'greener' and cleaner place while striving to make water and air safer and cleaner.

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