

# ACTIVATED CARBON DELIVERY OPTIONS FOR WATER TREATMENT APPLICATIONS

## Powdered Activated Carbon

Powdered activated carbon can be delivered in a variety of packages ranging from multiwall bags to bulk deliveries in trucks or rail cars. Multiwall bags come packaged with 40 to 45 pounds per package and are stacked on pallets made up of 33 bags each. The bags are individually opened and emptied and introduced into the application. If bulk bags are the package of choice the bags are delivered filled with 750 pounds of powdered carbon each.



### Powdered Activated Carbon Delivered in Bulk Bags

Powdered activated carbon can be delivered in bulk bags filled to 750 pounds of product in each bag. Powdered carbon delivered in bulk bags can be introduced into process streams and storage and mixing vessels using pre-engineered unloading stands. These stands allow the user to hang the bag and attach the discharge spout directly to a delivery spout that is directly attached to a process vessel lid or metering device such as a gravimetric feeder. The powdered carbon can then be introduced to the process or storage tank using a wet slurry or other conveying method if needed.

### Powdered Activated Carbon Delivered in Pressure Bulk Trucks and Rail Cars

Powdered activated carbon can also be delivered in pressure bulk trucks or pressure rail cars. These methods of bulk carbon delivery do away with the need for personnel to handle the bags of carbon and allow for touch-less delivery to the application. On-site storage of large amounts of carbon that is immediately available for use is another convenience offered by these delivery options. Pressure bulk trucks are filled to up to 30,000 – 32,000 pounds of product while rail cars are filled to approximately 88,000 pounds. The end use of the product and available plant and transportation infrastructure determine the best method of delivery.



## Activated Carbon Handling in Water Treatment

Powdered activated carbon is conveyed through operating plants through the use of pneumatic conveying systems or with wet slurries or both. Storage silos (dry and wet) are used to hold the carbon on-site in preparation for use.

### Pneumatic Unloading and Transfer

Pneumatic systems originate when the carbon arrives on site in pressure bulk trucks or rail cars. When the trucks arrive on-site (filled to 30,000 – 32,000 lb) the trailer is located in close proximity to the storage silo. The trailer is attached to the conveying pipework using flexible hose that comes as part of the trailer accessories. After the transfer lines are connected the trailer is pressurized using a blower integrated into the power plant of the truck. The material is then conveyed directly into the storage silo. The entire unloading process for a pressure bulk trailer typically takes less than 2 hours.



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## Activated Carbon Handling in Water Treatment con't

When powdered carbon is delivered in a rail car the payload is app. 88,000 pounds. The rail car is spotted at the unloading location and a transfer hose (supplied by the customer) is connected. A blower (supplied by the customer) is used to transfer the load from the rail car to the storage silo. The blower is the responsibility of the customer. Unloading a rail car can take up to 8 hours.

### Bulk Powdered Carbon Storage

Storage silos are designed to hold carbon on-site for use in the process as needed. The storage capacity of the silos should be adequate to allow for process



needs and should include enough volume to receive subsequent loads of carbon while not disrupting process needs. The silos can be constructed of mild steel and, in order to facilitate mass flow, should be fitted with a discharge cone with an angle of no less than 70 degrees.

The silo should be fitted with flow exciters or vibrators for use in case the need arises. The silos must have dust control devices such as bin vent dust collectors to control

the dust and expel the transfer air that is generated as the carbon is transferred for the trailer or rail car. The unloading process will deliver up to 500 cfm of continuous air during the unloading process. Level detection is also needed in the silos for inventory control. Rotary air-lock valves are typically used to meter the material out of the silo and into the appropriate conveying or secondary metering system.

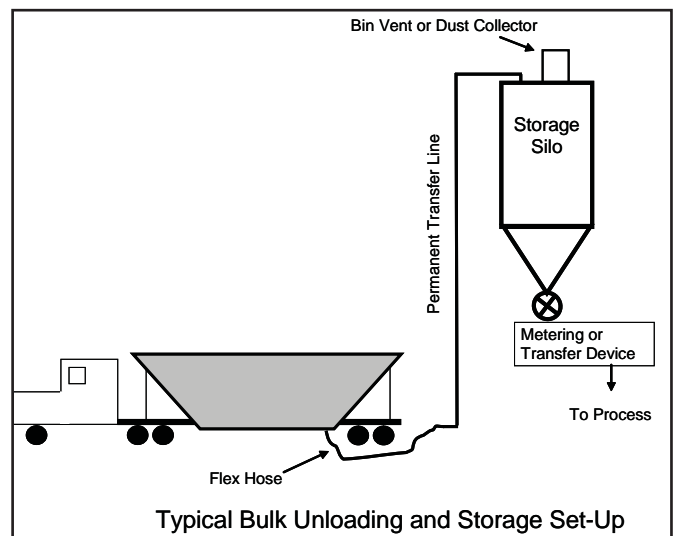
## Packaged Carbon Storage

Activated carbon that is stored in the original package should be stored in a dry location and out of direct sunlight.

### Wet Storage and Transfer of Powdered Carbon

When a wet conveying approach is used to introduce the carbon into the conveying stream, it is common for the bulk carbon to be unloaded directly into a transfer or holding tank from a bulk trailer. These tanks are masonry or epoxy coated concrete and are partially filled with water prior to introducing the carbon. The powdered carbon is transferred directly from the bulk carbon trailer into the tank or chest. The carbon/water mix (1-2 lb carbon/gallon of water) remains continuously mixed to keep the carbon in suspension until it is metered as into the process. When using this wet storage and conveying approach transfer velocities should be maintained at a minimum velocity 250 fpm to thwart carbon settling.

**Caution: Never enter tanks or other confined areas containing wet, activated carbon. Wet, activated carbon will adsorb oxygen and asphyxiation may result.**



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## Packaged Carbon Storage con't

### Powdered Carbon Delivered in Multiwall Bags

When powdered activated carbon (PAC) is utilized from multi-wall bags the bags must be emptied individually. This process must be completed using the appropriate personnel protective equipment such as dust masks and eye protection. Equipment is available to limit the dust exposure and automatically open the bags. Dust collection, transfer (wet or dry) and metering equipment can be integrated into the bag dump station. If the bags are being dumped into a process vessel, the tank should be fitted with adequate dust collection equipment and a partial fill of the process liquid should be in place and mixing as the carbon is loaded into the tank.

### Removal of Powdered Carbon from the Water Stream after Use

After the PAC has performed the process treatment it can be removed from the process stream using several techniques. Once the carbon has been utilized in the process stream the carbon is typically removed through the use of a membrane filtration system or settling with the aid of coagulants and flocculants. If the powdered carbon is fed into a gas stream the carbon is typically removed using cyclonic or filter media separation.

### Granular Activated Carbon (GAC) Handling in Fixed Beds in Municipal Water Treatment

Granular activated carbon arrives on-site in corrugated boxes, bulk bags or pressure bulk trucks and is usually used in a static contact vessel. When handling the granular material delivered in boxes the material is manually emptied into the process vessel or transfer device. Bulk bags of GAC are moved with fork trucks, hoists and cranes. The bulk bags are equipped with lifting straps and discharge spots on the bottom of the bags. GAC can be transferred using a wet slurry, mechanical conveying or manually. Wet slurries are applied by introducing the dry carbon to a wet eduction system and using water or process fluids to convey the material. Excess transfer fluids may need to be drained from the transfer slurry so a screened drain will need to be available at the point where the material resides in the process. When mechanical conveying is applied vibrating conveyors, bucket elevators or screw conveyors are preferred methods used to move the material from point to point. These devices can abrade the granules so short distances are preferred when using these techniques. Tip speeds of screw conveyors should be kept below 17 fpm.

Some grades of GAC can be conveyed directly from the bulk trailer to the process vessel using water conveying. When using this technique the trailer arrives on-site filled with granular carbon (app. 33,000 lbs). Once the trailer is spotted at the unloading point the balance of the trailer volume is filled with water and the trailer is pressurized using the integrated tractor blower. The carbon is transferred through a transfer hose (supplied with the truck) to the receiving pipework that is connected directly to the process vessel or blow tank. This technique requires draining away excess water so a drainage system is necessary. Emptying the trailer takes app. 2 hours.

Once the carbon in the process vessel has been fully utilized the carbon is removed from the vessel and discarded appropriately. The removal can be accomplished through manually removing the material or by using a vacuum truck or trailer. After all of the carbon has been removed the vessel should be inspected for structural integrity and serviced as needed before putting it back in service.

### Granular Activated Carbon

Granular activated carbon can be delivered in corrugated boxes filled to 45 pounds, bulk bags filled to 550 pounds or pressure bulk trucks. Receipt of material in these packages is dictated by the handling technique and end use of the carbon and by the vessel holding the carbon for the application.

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