

CYCLESORB® FP SERIES ADSORBERS

Installation and Operation Instructions

Calgon Carbon's CYCLESORB® FP series adsorbers are individual, compact, transportable liquid phase adsorbers. CYCLESORB® FP adsorbers were developed for convenient installation and operation. CYCLESORB® FP adsorbers can be returned to Calgon Carbon for reactivation of the spent granular activated carbon (GAC) and refilled with fresh GAC. Calgon Carbon offers many types of GAC which can be selected for the specific treatment application. CYCLESORB® FP adsorbers are fiberglass pressure vessels with a polyethylene liner, with piping and accessories of industrial thermoplastics for corrosion resistance. The CYCLESORB® FP adsorbers are available in the following standard units:

- CYCLESORB® FP1: 1,000 lbs. GAC, 30 gpm flow capacity
- CYCLESORB® FP2: 2,000 lbs. GAC, 60 gpm flow capacity

The specific CYCLESORB® FP product bulletin is considered to be part of these instructions and should be referred to when necessary.

Shipment

CYCLESORB® FP adsorbers are shipped as a single adsorber with an integral frame without crating or containers. The CYCLESORB® FP adsorbers are provided with fork channels for moving with fork trucks or can be lifted and moved with a crane. The CYCLESORB® FP adsorbers are shipped filled with the specified amount of dry GAC.

Shipping weights are as follows:

- CYCLESORB® FP1: 1,560 lbs.
- CYCLESORB® FP2: 3,750 lbs.

Wetting and Deaeration

As the CYCLESORB® FP is shipped with dry GAC, the carbon must be wetted and deaerated prior to use. This procedure displaces air from the internal structure of the carbon granule, thus assuring that the liquid to be treated is in contact with the carbon surface.

Prior to operation, the adsorber must be filled with clean, uncontaminated liquid. With the vent valve open, the liquid is introduced through the outlet line, and the unit is filled until the liquid flows out the vent. The CYCLESORB® FP should be allowed to set for a minimum of 24 hours (preferably for 72 hours) to allow most of the carbon internal surface to be wetted. The wetting curve indicates how much of the internal surface becomes wetted over time.

After wetting, the carbon bed can be deaerated by draining the adsorber, and again filling the adsorber upflow with uncontaminated water. This procedure will eliminate any air pockets which may have formed between the carbon granules. The CYCLESORB® FP is now ready for operation.

Installation

The CYCLESORB® FP should be set on a flat surface, capable of supporting the operating weight of the CYCLESORB® FP unit. Operating weight of the units are as follows:

- CYCLESORB® FP1: 4,000 lbs.
- CYCLESORB® FP2: 8,100 lbs.

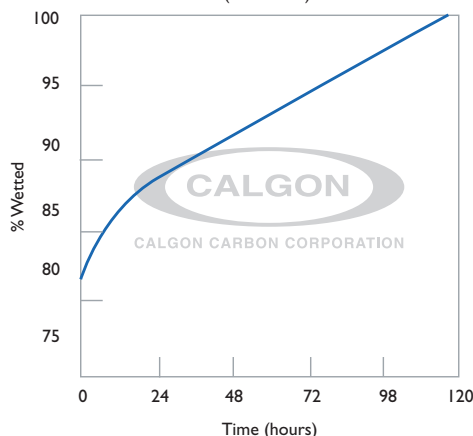
The inlet and outlet piping should be connected to the unit using flexible hoses with 1 1/2 inch Kamlok type female hose connections. The outlet piping should be designed to allow flooded operation of the CYCLESORB® FP at all times to assure effective operation. If the outlet line does not provide for backpressure on the CYCLESORB® FP unit, then the discharge piping should include an elevated piping loop to assure flooded operation.

CYCLESORB® FP adsorbers can be manifolded in parallel operation for higher flow rates. For series operation, two CYCLESORB® FP adsorbers can be connected sequentially, as normal pressure drop will not exceed recommended operating pressure.

A filter should be installed prior to the CYCLESORB® FP if the fluid to be treated contains substantial amounts of suspended solids. A simple cartridge or screen filter helps prevent pressure buildup in the GAC bed.

Wetting Curve for GAC

(77°F/25°C)

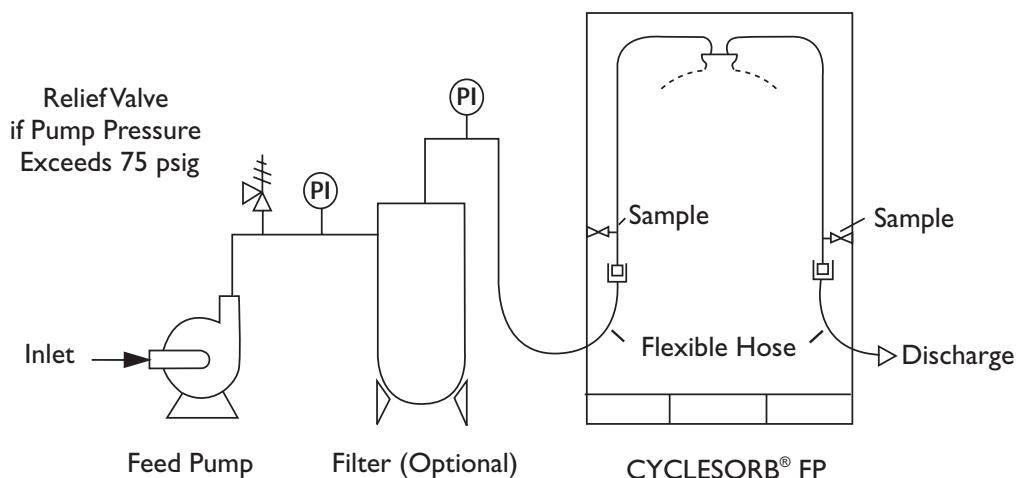


Equipment and Systems

Visit our website at www.calgoncarbon.com, or call 800-422-7266 to learn more about our complete range of products and services, and obtain local contact information.

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Typical CYCLESORB® FP Installation

Operation

With the CYCLESORB® FP full of liquid, flow can be introduced to the unit. Liquid enters the inlet connection, flows downflow through the carbon bed and exits through the outlet connection.

Flow rates to the CYCLESORB® FP should be determined based on the required contact time between the liquid and the carbon media. The required contact time is normally determined prior to installation and operation of the CYCLESORB® FP.

If suspended solids accumulate on the top of the GAC bed, the CYCLESORB® FP can be backflushed to remove solids and resume operation. Clean, uncontaminated liquid should be introduced to the unit through the outlet connection. This liquid flows upflow through the unit and should exit through the vent line that is directed to a backflush water collection point or drain. The flow rate should not be high enough to cause carbon granules to exit. Typical backflush rate is ~15-20 gpm in a FP1 and ~35-40 gpm in a FP2.

CYCLESORB® FP adsorbers are provided with rupture disks to assure that the operating pressure is not exceeded. If the rupture disks burst, do not continue to operate by blinding the rupture disc line. Investigate the cause of the high pressure and remedy. Spare rupture disks are provided in the spare rupture disk holder on the unit. Replace the rupture disks before continuing operation and contact Calgon Carbon for replacement of spare disks.

For short term shutdowns, simply isolate the CYCLESORB® FP unit by shutting inlet and outlet lines and open the vent line. For extended shutdowns, also drain the CYCLESORB® FP to

interstitial liquid.

Monitoring

CYCLESORB® FP units only require periodic monitoring if properly installed. The following items may need to be monitored:

1. Pressure: check inlet and outlet pressure (increase in pressure differential may indicate build-up of filtered solids)
2. Samples: inlet and outlet sample points are provided for liquid analysis to determine system performance
3. Air: check for trapped air by isolating the CYCLESORB® FP (shut inlet and outlet) and opening the inlet sample trap or vent

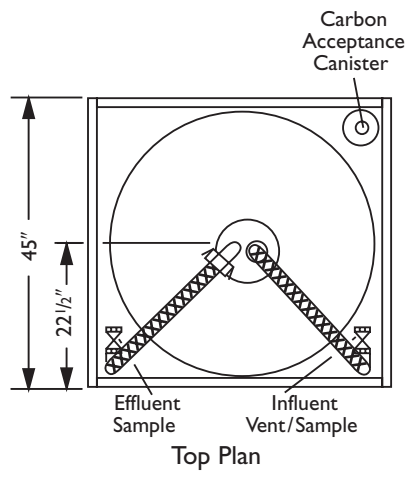
Spent Carbon Acceptance

Prior to return of either the CYCLESORB® FP or the spent GAC to Calgon Carbon, the spent GAC must undergo acceptance testing. The CYCLESORB® FP adsorbers are provided with a carbon acceptance canister and instructions for carbon acceptance testing. Inlet liquid should be introduced to the carbon acceptance canister and allowed to flow for enough time to allow the carbon to adsorb sufficient amounts of contaminants for acceptance testing. The acceptance canister should then be drained, sealed, and shipped to Calgon Carbon in accordance with instructions to allow for testing.

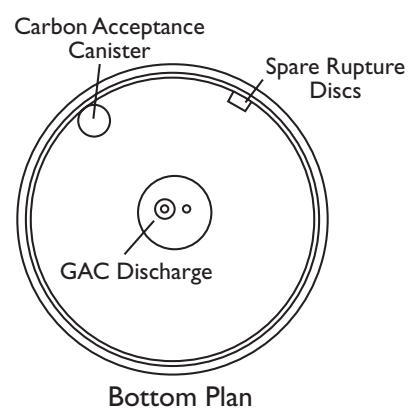
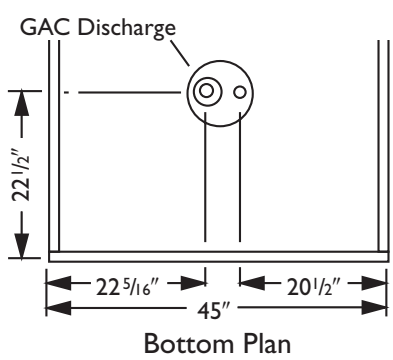
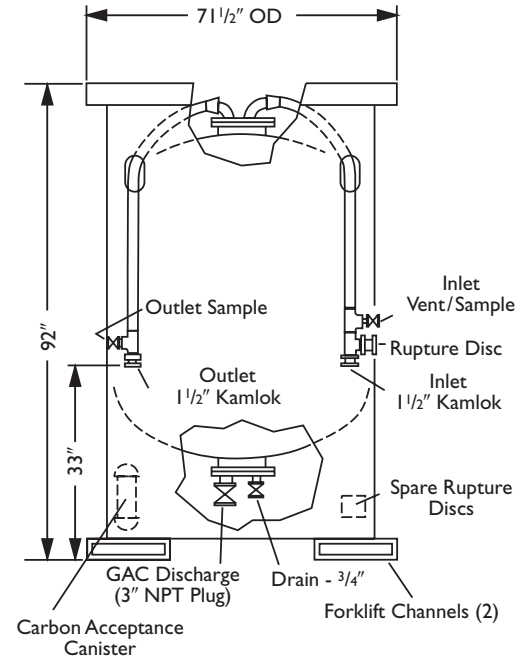
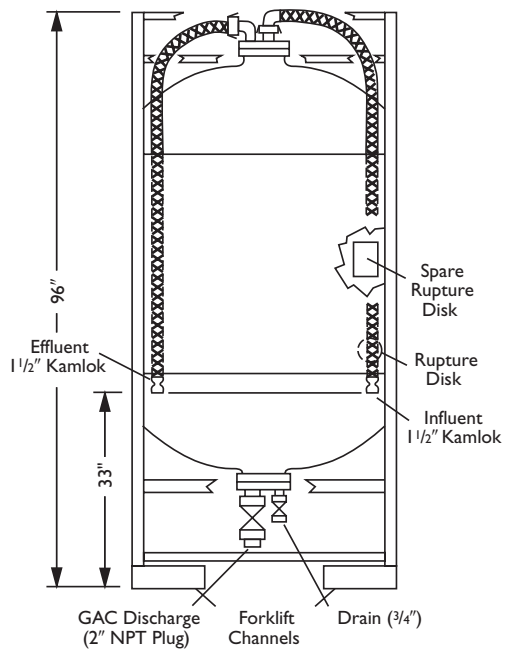
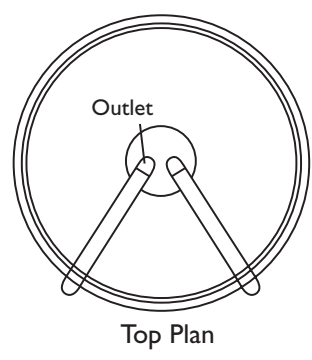
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CYCLESORB® FP1



CYCLESORB® FP2



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CYCLESORB® FP Return

No CYCLESORB® FP adsorber can be returned to Calgon Carbon for refill service or spent carbon reactivation unless the carbon acceptance procedure has been completed and an acceptance number provided.

Prior to return shipment, the CYCLESORB® FP is disconnected from the inlet and outlet lines, and all liquid is drained from the adsorber using bottom drain connection. Do not open the GAC discharge valve to drain liquid from the unit.

After draining, hose caps must be placed on all hose connectors. Calgon Carbon customer service should be notified when the CYCLESORB® FP is ready to ship. The CYCLESORB® FP shipment must be accompanied with the site name and the carbon acceptance number provided by Calgon Carbon.

Spent Carbon Discharge

The CYCLESORB® FP may have the spent GAC removed at the site rather than returning the unit to Calgon Carbon. For spent carbon discharge, the unit is first disconnected from the inlet and outlet, as it would be for shipment. The unit is lifted onto piers or other support to connect the GAC discharge to a receiving container using flexible hose.

The unit is pressurized to 15 psig by using a water connection to the influent hose connection point. When pressurized, the bottom GAC discharge valve is opened (remove plug) and the carbon-liquid slurry is transferred from the CYCLESORB® FP to the receiving container. When the transfer is complete (liquid only in hose), the CYCLESORB® FP may be refilled with liquid and the transfer repeated to assure more complete removal of spent carbon.

After the transfer of spent carbon is complete, it is recommended that the inside of the CYCLESORB® FP be washed to remove all contamination and any trace of spent carbon. After the system is washed, the CYCLESORB® FP should also be checked thoroughly and any minor maintenance conducted.

Fresh Carbon Fill

Fresh carbon is filled using dry GAC. The CYCLESORB® FP should be approximately one-third filled with clean liquid to provide for a cushion to protect the collection nozzle.

The 2 inch inlet hose connection on the top flange is opened, and the GAC filled directly into the CYCLESORB® FP (a funnel is recommended).

When the fill is complete, the inlet hose is reconnected and the start-up procedure is followed including wetting and deaeration.

Safety Considerations

Wet activated carbon preferentially removes oxygen from air. In closed or partially closed containers and vessels, oxygen depletion may reach hazardous levels. If workers are to enter a vessel containing carbon, appropriate sampling and work procedures for potentially low oxygen spaces should be followed, including all applicable Federal and State requirements.

CYCLESORB® FP adsorbers are FRP pressure vessels with a polyethylene liner; do not strike the outside of the vessel or expose the vessel to vacuum, either of which may damage the inner liner.

Limitations of Liability

The Supplier's liability and the Purchaser's exclusive remedy for any cause of action arising out of this transaction, including, but not limited to, breach of warranty, negligence and/or indemnification, is expressly limited to a maximum of the purchase price of spare parts or equipment sold hereunder. All claims of whatsoever nature shall be deemed waived unless made in writing within forty-five (45) days of the occurrence giving rise to the claim. In no event shall the Supplier, for any reason or pursuant to any provision of the warranty, be liable for incidental or consequential damages or damages in excess of the purchase price, nor shall the Supplier be liable for loss of profits or fines imposed by governmental agencies.

Visit our website at www.calgoncarbon.com



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