

Equipment Bulletin

VENTSORB

General Description

VentSorb canisters - each containing 180 pounds of activated carbon - are ideal for low-flow air purification applications at industrial and municipal facilities. These economical adsorption systems control small volume organic contaminant and/or odorous gas emissions from:

- ◆ Storage tank vents
- ◆ Reactor vents
- ◆ API separator vents
- ◆ Sludge thickener tanks at waste treatment plants
- ◆ Sewer gas vents, wet stations and weir boxes at chemical and municipal waste treatment plants
- ◆ Chemical plant wastewater holding tanks
- ◆ Laboratory hood exhausts
- ◆ Landfills
- ◆ Air-stripper off-gases

The 55-gallon VentSorb canisters contain all the elements found in a full-scale adsorption system vessel; activated carbon, inlet connection and distributor, and an outlet connection for the purified air stream. Air is distributed across the carbon bed with a corrosion-resistant stainless steel septum.

Features and Benefits

- ◆ VentSorb canisters offer industrial and municipal users several important features and benefits, including:
- ◆ Effective treatment to remove a variety of vapor phase organic contaminants and odor-causing compounds
- ◆ Continuous treatment at varying flow rates and concentrations
- ◆ Simple installation and operation
- ◆ Flexibility to be installed in series or multiple units in parallel
- ◆ Supplied with the type of activated carbon selected specifically for the application
- ◆ Practical disposal option, as pre-approved spent carbon canisters may be returned to Calgon Carbon Corporation for safe carbon reactivation
- ◆ Low cost per unit makes carbon treatment economical

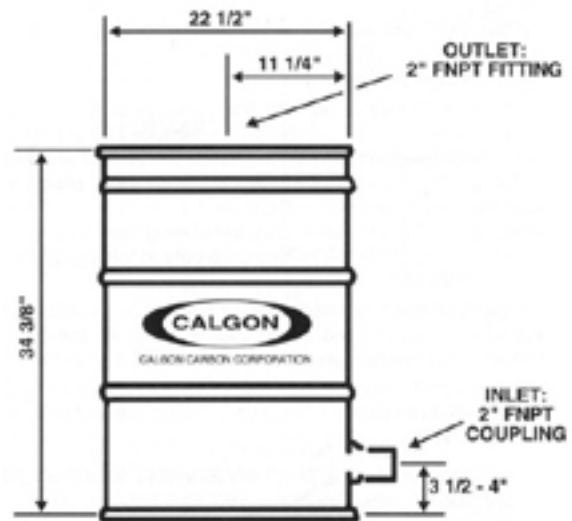
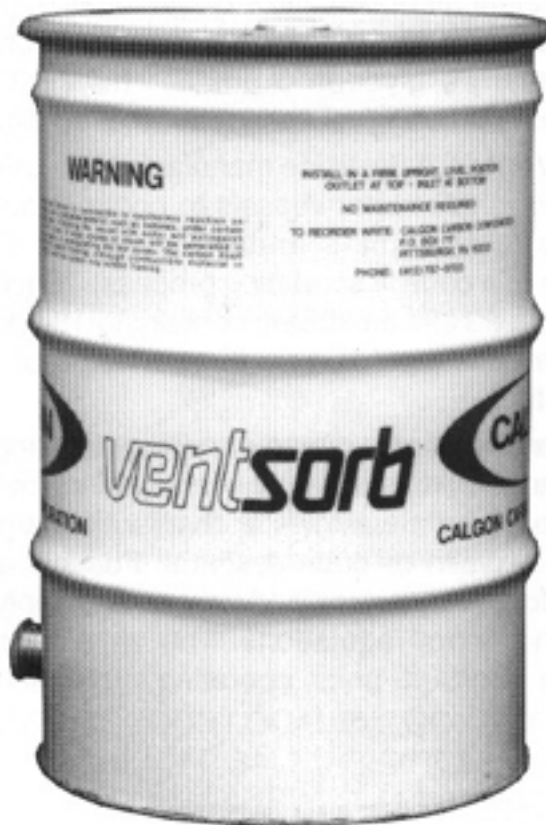
Ventsorb Specifications

| | |
|-------------------------|--|
| Vessel | Open head 16 gauge steel canister |
| Max. Operating Pressure | 4 psig |
| Cover | Removable steel cover, 12 gauge bolt ring with polycord gasket |
| Internal Coating | Heat cured 100% phenolic |
| External Coating | High solids enamel |
| Temperature | 350°F (intermittent) (176.7°C) |
| Inlet | 2" FNPT: 304 stainless steel screen distributor |
| Outlet | 2" FNPT |
| Max. Flow | 100 cfm (2.83m ³ min.) |
| Carbon | 180 pounds Pellet BG or BPL 4x10 or VPR |
| Ship Weight | 247 pounds (112.3 kg) |
| Identification | VentSorbs sequentially numbered for reference |



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Typical Ventsorb Applications

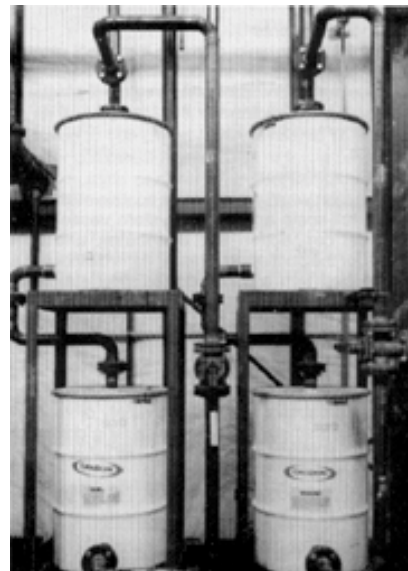
Chemical, petrochemical, food, pulp and paper, and many other industrial plants - along with municipal sewage treatment facilities - are frequent users of VentSorbs for continuous control of vented emissions. Here are a few examples of user applications:

Storage Tank Vents - VentSorbs are widely used to control evaporative losses vented from storage tanks. Typically, these vapors are emitted during tank filling

and emptying. In one application, a glycerin manufacturer is using the canisters to purify ambient air drawn into storage tanks during product transfer. The adsorption process helps prevent contamination of the company's glycerin product. The VentSorb units provide over six months of service for this application.

Reactor Vents - A pesticide manufacturer is using multiple VentSorbs on five reactor vessels to control trace amounts of odorous methylamine and diethylamine (which are by-products of a caustic scrubbing process). Each VentSorb unit handles a 30 sfm air stream containing 15 ppm of amine vapors. The units provide over three months of service for this application.

API Separator Vents - A major refinery is using VentSorb units to control odorous emissions from settling basins where oil is separated from wastewater that is discharged in condensate, blow-down or drain systems. For this application, API separators are covered and vented to comply with local air pollution control regulations. The air stream is pulled through two VentSorb units, operating in parallel configuration, at 100 cfm.



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Ventsorb Installation

VentSorb canisters are shipped ready for installation. Each canister is self-supporting and should be placed on a level, accessible area as near as possible to the emission source. Installation is simple, requiring just a flexible hose or pipe to connect the vent to the 2-inch FNPT bottom inlet of the canister.

If the VentSorb will be vented directly to outside air, a U-shaped outlet pipe or rain hat - such as a pipe tee - is recommended to prevent precipitation from entering the unit.

VentSorb canisters operate from a continuous suction across the vent. The suction can be produced by a blower or by using the positive pressure inside the tank or process vessel. In many cases, the pressure or surge of pressure within the tank or vessel is sufficient to overcome the pressure drop across the canister - thus eliminating the need for a blower. Please consult pressure drop data in this bulletin for more information.

Maximum recommended air flow through a VentSorb is 100 cfm. If higher flows are encountered, plant operators should install two or more canisters in parallel configuration.

When VentSorb canisters are used to control vapors from organic solvent storage tanks, the following precautions are recommended:

- ◆ A safety relief valve must be provided. This protects the storage tank should the VentSorb become plugged or blocked in any fashion. Such a vent would open in this emergency situation, thereby relieving pressure.
- ◆ Under appropriate conditions, a flame arrestor and/or backflow preventor must be installed as shown in this bulletin's storage tank installation drawing. This prevents backflow of air through the VentSorb when the storage tank is empty.
- ◆ Pre-wetting the carbon helps dissipate excessive heat that may be caused by high organic compound concentration (>0.5 to 1.0 Vol.%)

Also, if VentSorb canisters are used to control organic emissions from air-strippers or other high moisture content air streams, Calgon Carbon Corporation recommends that humidity in the air stream be reduced to under 50 percent. Lower humidity optimizes adsorptive capacity of the carbon. In addition, for similar applications that generate a condensate, Calgon Carbon Corporation recommends installation of a drain on the inlet piping.

Return of Ventsorbs

Arrangements should be made at the time of purchase regarding the future return of canisters containing spent carbon. Calgon Carbon Corporation will provide instructions on how to sample the spent carbon and arrange for carbon acceptance testing. The spent carbon is reactivated by Calgon Carbon Corporation and all of the contaminants are thermally destroyed. Calgon Carbon Corporation will not accept VentSorbs for landfill, incineration or other means of disposal.

No VentSorbs can be returned to the company unless the carbon acceptance procedure has been completed, an acceptance number provided, and the return labels (included with the units at the time of purchase) are attached.

VentSorbs must be drained - and inlet/outlet connections must be plugged - prior to return to Calgon Carbon Corporation.



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Theoretical Ventsorb Capacities

Theoretical Ventsorb Capacity Lb Adsorbed/Ventsorb

| | Boiling Point °C | Molecular Weight | 10 PPM | 100 PPM | 1000 PPM |
|----------------------|------------------|------------------|--------|---------|----------|
| Acrylonitrile | 77.3 | 53.1 | 6 | 12 | 24 |
| Benzene | 80.1 | 78.1 | 14 | 23 | 36 |
| n-Butane | -0.5 | 58.1 | 4 | 8 | 13 |
| Carbon Tetrachloride | 76.8 | 153.8 | 40 | 56 | 76 |
| Dichloroethylene | 37.0 | 97.0 | 12 | 21 | 35 |
| Methylene | 40.2 | 84.9 | 3 | 7 | 18 |
| Freon 114 | 3.8 | 170.9 | 11 | 19 | 33 |
| n-Hexane | 68.7 | 86.2 | 18 | 25 | 34 |
| Styrene | 145.2 | 104.1 | 45 | 57 | 71 |
| Toluene | 110.6 | 92.1 | 34 | 44 | 58 |
| Trichloroethylene | 87.2 | 131.4 | 33 | 50 | 73 |

* Theoretical capacity based on 70 degrees F., atmospheric pressure, less than 50 percent humidity and 180 pounds of carbon using isotherm data for Pellet BG carbon.

Ventsorb Carbon Life Estimate

This table lists the theoretical adsorption capacities for several compounds. The adsorption capacity for nonpolar organics increases with the boiling point, molecular weight and concentration of the air contaminant. Estimate the life of a VentSorb canister for other organic compounds by matching them with compounds of similar boiling point and molecular weight in this table. Low molecular weight (less than 50) and/or highly polar compounds such as formaldehyde, methane, ethanol, etc., will not be readily adsorbed at low concentrations.

Note: The standard VentSorb canister contains 180 pounds of Pellet BG carbon. When removing hydrogen sulfide and mercaptans from moist air vented from sewage operations, greater efficiency will be achieved by using a VentSorb canister which contains specially impregnated IVP carbon. A VentSorb containing IVP carbon can remove up to 40 pounds of hydrogen sulfide and 15 pounds of methyl mercaptan.

Ventsorb Safety Considerations

While complying with recommended installation instructions, plant operators should also be aware of these additional heat-related safety considerations

- ◆ When contacting with activated carbon, some types of chemical compounds - such as those from the ketone and aldehyde families and some organic acids or organic sulfur compounds - may react on the carbon surface causing severe exotherms or temperature excursions. **If you are unaware or unsure of the reaction of an organic compound on activated carbon, appropriate tests should be performed before putting a VentSorb in service.**
- ◆ Heat of adsorption can lead to severe temperature excursions at high concentrations of organic compounds. Heating may be controlled by diluting the inlet air, time weighting the inlet concentration to allow heat to dissipate, or pre-wetting the carbon.
- ◆ **Do not use VentSorbs with IVP carbon in petrochemical or chemical industry applications.**
- ◆ IVP carbon can liberate heat by reacting chemically with oxygen. To prevent heat within a vessel, the carbon must not be confined without adequate air flow to dissipate the heat. In situations where there is insufficient or disrupted air flow through the vessel, the chemical reaction can be prevented by sealing the inlet and outlet connections to the vessel.

NOTE: CONTACT YOUR LOCAL CALGON CARBON CORPORATION TECHNICAL SALES REPRESENTATIVE FOR CLARIFICATION OR TO ANSWER ANY QUESTIONS



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The logo for Chemviron Carbon, with "Chemviron" in a stylized, bold font above the word "Carbon" in a simpler, bold font.

Calgon Carbon Corporation Air Purification Systems

VentSorb is a unit specifically designed for a variety of small applications. Calgon Carbon Corporation offers a wide range of carbon adsorption systems and services for a greater range of flow rates and carbon usages to meet specific applications.

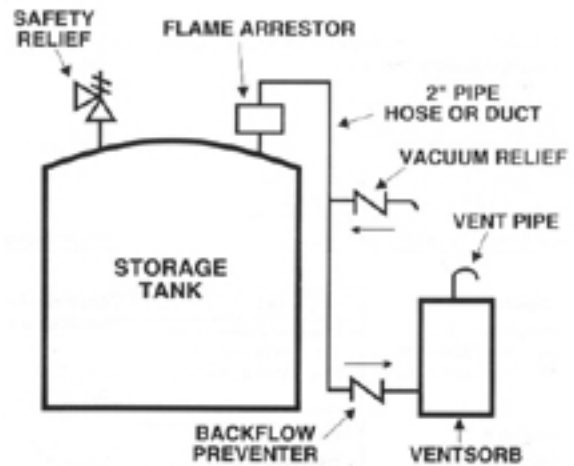
Warranty

There are no expressed or implied warranties - or any warranty of merchantability or fitness - for a particular purpose associated with the sale of this product.

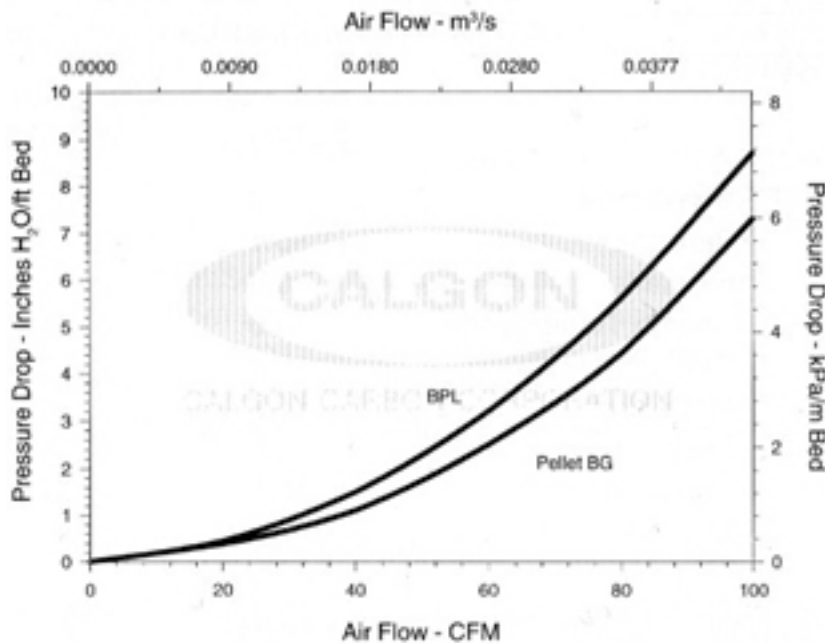
Limitation of Liability

The Purchaser's exclusive remedy for any cause of action arising out of purchase and use of the VentSorb, including but not limited to breach of warranty, negligence and/or indemnification, is expressly limited to a maximum of the purchase price of the VentSorb unit as sold. 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 Calgon Carbon Corporation for any reason be liable for incidental or consequential damages, damages in excess of the purchase price of the VentSorb unit, loss of profits or fines imposed by governmental agencies.

Application information provided in this bulletin is based upon theoretical data. Calgon Carbon Corporation assumes no responsibility for the use of the information in this product bulletin.



Typical VentSorb Installation at Storage Tank



Pressure drop through a VentSorb unit is a function of the process air flow as shown in the graph. A VentSorb canister can handle up to 100 cfm at a pressure drop of less than 15 inches of water column. If higher flows or lower pressure drop is needed, multiple canisters may be installed in parallel operation. The maximum canister pressure should not exceed 4 psig. If at any time our products or services do not meet your requirements or expectations, or if you would like to suggest any ideas for improvement, please call us at 1-800-548-1999.

For detailed information on the products described in this bulleting, please contact one of our Regional Sales Offices located nearest to you.

Safety Message

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.



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