How an Organic Vapor Respirator Cartridge Works

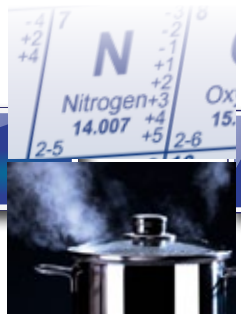
3M makes organic vapor respirator cartridges to help reduce user exposure to many different organic vapors.

To achieve this objective, respirator cartridges are filled with a material called activated carbon. Activated carbon is typically made from coal or renewable resources like wood or coconut shells.

It is "activated" by heating the material in nitrogen or steam at approximate temperatures of 800 – 900 °C. The resulting material has a significant number of micropores that help adsorb various organic vapors. These micropores can be measured and optimized for specific product needs and performance.

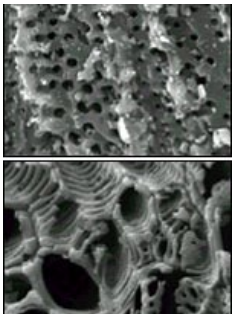
Coal or renewable resources, such as coconut shells

Coal or renewable resources are heated without oxygen



High-temperature steam or nitrogen activation

High-grade activated carbon



Electron micrographs of activated carbon pores

When organic vapors are drawn through an organic vapor cartridge, the air is filtered as vapors condense into the carbon pores. Vapors move through the cartridge from one pore to the next. This occurs more quickly for small volatile vapors with lower boiling points (e.g., acetone). Some migration of organic vapors can even occur during storage, so care must be taken before reusing the cartridge. The effective service life is the time until vapors begin to exit the cartridge.

Unlike particle filters, service life is not indicated by change in breathing resistance. Instead, cartridges must be changed according to local regulations; end-of-service-life indicator; taste, smell, or irritation from the contaminant; or according to 3M™ Service Life Software calculation, whichever comes first.

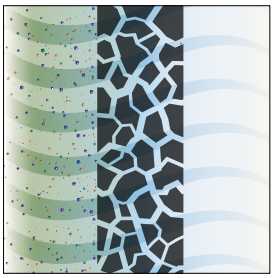
Factors that influence service life:

- Exposure concentration
- Temperature
- Humidity (water vapor takes up space in carbon pores)
- Breathing rate

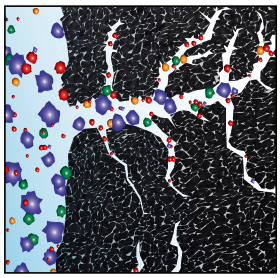
Activated carbon by itself cannot adsorb other types of gases or vapors such as acid gases, ammonia, formaldehyde, etc. In some cases, additional metals and salts are added to the carbon to selectively remove these compounds. For this reason, 3M offers a variety of cartridges and facepieces to help protect workers in different environments and satisfy personal preferences.

3M is committed to develop quality safety products to help protect workers. For more information about 3M organic vapor cartridges, please read Technical Data Bulletin #142 "Reuse of Organic Vapor Chemical Cartridges" at www.3M.com/PPESafetySolutions.

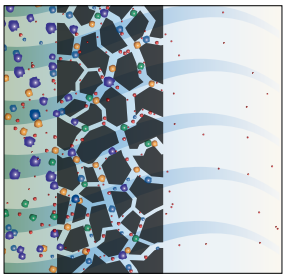
To establish a cartridge change schedule, visit www3.3M.com/SLSWeb/index.html.



Unfiltered organic vapors are drawn into the cartridge.



Activated carbon adsorbs organic vapors on molecular level.



Service life continues until vapors begin to escape the cartridge.

⚠WARNING These respirators help protect against certain airborne contaminants. Before use, the wearer must read and understand the User Instructions provided as a part of the product packaging. A written respiratory protection program must be implemented meeting all the requirements of OSHA 1910.134 including training, fit testing and medical evaluation. In Canada, CSA standards Z94.4 requirements must be met and/or requirements of the applicable jurisdiction, as appropriate. **Misuse may result in sickness or death.** For proper use, see packaging instructions, supervisor, or call 3M OH&ESD Technical Service in USA at 1-800-243-4630 and in Canada at 1-800-267-4414.

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Technical Assistance: 1-800-243-4630
Customer Service: 1-800-328-1667
Web: 3M.com/PPESafety

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