Pollution Solution:
Combination Filter Media Removes Very Low Concentrations of Harmful Particles

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Abstract

Effective air pollution control requires filtration media developed specifically to capture the smallest concentrations of molecules. The ability to combine materials to suit particular applications will result in greater levels of retention. Combination filter media allows filter manufacturers to customize their products for greater pollution adsorption capacity in specific environments.

Introduction

A major challenge for the filtration industry is reducing pollution in medical, home, office, or cabin air environments. Pollution can disrupt technical processes, cause discomfort while driving in the car, and affect air circulated through buildings. Filter manufacturers face obstacles in finding single layers of media that reach specific particle retention levels. To remove not only aerosols, but harmful gas molecules and submicron particles in the lowest concentrations, manufacturers must look to more advanced technologies.

Available solutions

While single layers of carbon filters, enhanced microfibers, and other particle filter media can accomplish some degree of pollution reduction, the combination of carefully selected filter media layers can achieve a new level of submicron particle retention and performance. Combination filter media technology utilizes an advanced method of composition to create customized filters for greater adsorption capacity in specific environments.

What is combination filter media?

Different filter and sorbent material are combined to create combination filter media. This media utilizes well-established technology, and has been available for use in filter manufacturing for several years. It is typically composed of a carrier, sorbent particles, a particulate filter layer, and a low quantity of adhesive. The flexibility of the process allows several different layers of sorbents to be used.

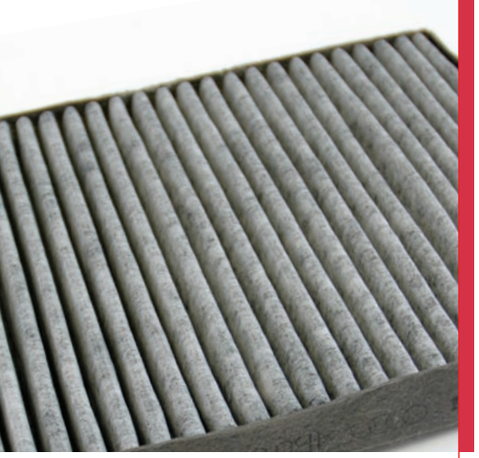
Most sorbents that are available in particle sizes between 0.2 and 0.8 mm can be applied in the process. Dependent on the filtration requirement, several different materials can be incorporated, including molecular sieves (zeolites), ion exchange materials, and activated carbons with varying sizes and impregnations. The sorptive particles are flexibly fixed to each other, to the carrier scrim, and to the final filter layer by using fibrous adhesives.

For particle filter media, the selection criteria are stability, air permeability, low pressure drop, and retention. The combination filter media production line allows the design and manufacture of media customized to specific applications. The line generally includes the application of adhesive to a support layer, followed with the application of sorbent particles and a particle filter. The process includes a laminator and basis-weight detector.

How it works

The particle filter media and sorptive particles are designed to suit specific applications. There is currently a wide variety of sorptive media available in the market, and the media selection process is essential in creating an effective final product.

Sorption is the process in which one substance takes up or holds another, either by absorption or adsorption. The substances, called sorbents, can be adsorbent material, which allows accumulation on the surface, or absorbent material, which takes in particles. Gases are referred to as either adsorbates or absorbates.



Adsorbtion is generally divided into two separate processes, chemisorption or physisorption. Chemisorption is a type of adsorption whereby a molecule adheres to a surface through chemical reactions. In physisorption, or physical adsorption, the adsorbate adheres to the surface only through weak intermolecular interactions.

Dependent on the type of gases which have to be removed from the atmosphere, one or more layers of the appropriate sorbents will be chosen. The particle filter layer is another important factor in the performance of the media. This layer can be a reinforcing material just for processing, or a meltblown with real filtration characteristics or an electrostatic material.

Tests conducted on pure carbon layers and processed media indicate that adsorption capacity and immediate breakthrough properties of combination filter media are at least as good as carbon alone. Although some parts of the carbon surface and some transport pores might be blocked by adhesive fibers, the resulting, more open structure of the layer in the composites gives better adsorption results both for kinetics and capacity.

How is it optimized for this particular problem?

In applications for pollution control, combination filter media removes submicron particles that can be inhaled and are potentially threatening to one's health. Environments can be protected from these dangerous particles with the use of specific filter media, custom-created for applications such as cabin air, clean rooms, air conditioning, and face masks. These products maximize protection for drivers, passengers and workers. With the broad range of potential uses, it is recommended that processors customize combination filter media products to specific application requirements.

Hollingsworth and Vose (H&V) brings a specialized feature to combination filter media with its NANOWEB® technology. NANOWEB® – electrospun polymer fibers – can be combined with standard particulate media within combination filter media. Additionally, while other products have similar composition, H&V's approach, using two different layers of carbons or other adsorbants, make a more versatile product. This unique technology drives the retention of submicron particles to a new dimension. H&V's combination filter media are available as part of their Adsorptive Filter Media (AFM™) product line.

Another significant advantage in H&V's AFM™ product line is their comprehensive approach to the filter media manufacturing process. With the benefit of global experience, H&V's specialized manufacturing process ensures that the adhesives that bond the media layers create a stable and robust product cut to a customer's unique specifications. Using this advanced process, H&V surpasses other companies with the ability to transport the finished materials worldwide without damage to the layers. H&V offers flexibility in designing the media, and has the experience to provide quality materials on a global scale.

Conclusion

The filtration industry faces significant demands for cleaning polluted air in automotive, medical, home, and office environments. Combination filter media allows a greater degree of particle retention over traditional single-layer filter media due to its customized material selection process and its capability to be designed for specific applications.

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About H&V

Established in 1843, Hollingsworth & Vose Company is a global leader in creating, manufacturing, and supplying technically advanced engine, high efficiency, and liquid filtration media; battery materials; and industrial nonwovens. H&V adds value to customers' products by inventing next-generation materials with superior performance. H&V's expertise and process capabilities include wet-laid, dry-laid, meltblown, and composite technologies. The company operates manufacturing sites and research centers in the Americas, Europe, and Asia.

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