

The Role of Nanofiber Filter Media in Motor Vehicle Air Filtration

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Abstract

The purpose of using high efficiency filtration systems in motor vehicles is to improve air quality and cleanliness in car interior. High efficiency can be achieved by the utilization of media with fine and nanofiber filter media. However, when dust particles deposit inside the media, the porosity decreases and the effective fiber diameter increases. As a result, filter efficiency increases and pressure drop increases (for fine dusts drastically) because of decreased porosity that causes increased air velocity inside the partially clogged media. At the same time, the efficiency decreases because of increased fiber diameter. To avoid drastic pressure drop increase, particles, especially the fine “clogging” type, should be kept on the media surface. This can be done by applying nanofiber to media influent side.

Societal concerns for a cleaner environment and factors associated with engine operation and durability drive the use of high efficiency air filtration systems in motor vehicles. These environmental issues affect governmental regulations. The engine operation standards are mainly developed by engine and filter producers and are the foundation for national and international standards. In both cases, advanced separation/filtration systems are necessary to meet environmental requirements or engine and motor vehicle producers' specifications.

This paper focuses on filter media performance requirements and operation in applications to engine and cabin air filtration. Nanofiber filter media physical properties and filtration performance are discussed in details.