

## **Modeling microfiber filter performance by augmentation with nanofibers**

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### Abstract:

Nanofibers have higher capture efficiencies than microfibers in the sub micron particle size range of 0.3-0.8 microns due to increased surface area of the fibers and streamline flow patterns closer to the fibers. Nanofibers with diameters less than 300 nm perform in the slip flow regime and result in less drag force than larger fibers of the same length. Mathematical models show an increase in filter performance of adding nanofibers to microfiber filter media. The filter performance is characterized by a relative quality factor, which is a ratio of quality factors of filter media with and without nanofibers. The amount of nanofibers added to the filter media is measured as the ratio of external surface area of nanofibers to the external surface area of microfibers in the filter media. The model results shows that relative quality factor increases rapidly with small amounts of nanofibers added to the filter, reaches a maximum and gradually decreases as more nanofibers are added to the filter media. Thus, the amount of nanofibers added to the filter design can be optimized.

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