SATURATION AND LIQUID DISTRIBUTION IN NON-WETTABLE COALESCING FILTERS

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Coalescing filters are widely used in petroleum and chemical processes to remove liquid aerosols from gas streams. The saturation or captured liquid in filters constricts gas flow, leading to an increase in pressure drop and a reduction in the life time of filters. There are a small number of saturation models for wettable media, while no empirical models exist to-date for non-wettable media.

The intent of this study is to investigate the saturation and liquid distribution in multilayer non-wettable filters at different loading rates and to develop the saturation model for non-wettable filters based on the capillary theory. The experimented filters were cylindrical elements, which were made up of 4-, 6-, 8- or 10-layer non-wettable glass fiber. DEHS (di-ethyl-hexyl-sebacate) was used as the test liquid aerosol.

The results showed that there existed resistance to the liquid as it transported in the non-wettable media, which was proportional to the number of layers. Larger resistance led to less channels per layer and larger cross-sectional area of each channel. For the filters with the same layers, the number of channels increased and the area of each channel slightly reduced with the increase in the loading rate. Moreover, a new saturation model was developed for non-wettable filters. A good agreement between the predicted values and experimental data was obtained.
Keywords: Coalescing, Filter, Saturation, Liquid aerosols, Wettability