

Effects of Fiber Orientation on Coalescence Filtration

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Coalescing filters are used for various applications throughout industry and improvement in performance due to lower pressure drop and emissions leads to reduced operating costs. Experimental observations show orientation of micro fibers in filter media effect the permeability and the capture separation efficiency of the filter media. The main objective of this work is to study the effects of fiber orientation to improve filter performance. In this paper three different techniques have been used to orient fibers to alter the structure of the media. Results show a significant difference between the three methods. Axially aligned fiber media improves quality factor on the order of 20%, Cutting media in an angle from a thick layered media shows 40% improvement and stacking sheets at an angle shows 55% improved performance. The motivation behind the latter two techniques is that the same filter media has significant variation in performance just by changing its orientation relative to the flow. This also suggests that average fiber angle is not the sole parameter responsible for filter media performance. Average fiber angle for a filter media can be estimated by the Fiber mapping method. A mathematical model is used to estimate a 3D average fiber angle for filter media with different fiber orientations. This technique is simple and cost effective compared to other methods that are being used.