SATURATION MODELING FOR GAS-LIQ COALESCING APPLICATIONS

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Abstract

Coalescing filters are widely used throughout industry for removal of liquid aerosols from gases or the separation of liquid droplets from emulsions. Fibrous filter, with high micron and submicron droplets removal efficiency, is being used widely in industries for coalescing filtration applications. The performance of a fibrous media depends on various parameters like fiber and drop properties, fiber and drop sizes, velocity, type of fluid, etc. The current work aims to take all parameters into account to determine the saturation which will be used to predict the filter performance.

Saturation is a measure of the volume of the liquid present in the pore space. This is an important parameter to predict the overall efficiency. Prior models at steady state show that performance varies significantly with saturation. The steady state model establishes the importance of saturation. Saturation can be predicted theoretically by solving unsteady state multiphase transport equations.

The main objective of this work is to determine the saturation, by taking drainage in to account. Three growth mechanisms and one break up mechanism are proposed. The model counts the number of droplets with position and time. A 2-D model has been developed at the exit boundary to take the vertical and horizontal movement of drops in to account. Saturation is computed using the number of drops as the porosity is known. This model can explain the sensitivity of each parameter on the filter performance. This information can greatly reduce the number of lab experimental trials which in turn will save time and resources.