

S2.2.3 A REALISTIC APPROACH ON FILTRATION MODELING

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For a numerical simulation of filtration, single fiber or monodispersed fibers are normally applied to represent the fibrous filter media. However, it may not be applicable to represent the entire filter media especially when a filter media is composed of a wide range of fibers.

In this study, a realistic filtration modeling method was developed to study the effect of fiber distribution and size on the filtration efficiency estimation. In-house code was developed for the generation of simulation domain. Fibers were randomly generated inside the domain, and the same filter properties as the real filter sample such as the solidity, fiber size, and filter thickness were applied to represent the characteristics of real filter sample. Flow field inside the filter was obtained by the CFD simulation, and the particle trajectory was calculated by applying the Langevin equation. The size of particles challenging the filter media was from 20 nm up to 500 nm. This size range was chosen to show the trend of particle capture dominant by diffusion and interception. For the purpose of verification, experiment was conducted. From both experiment and simulation, pressure drop and filtration efficiency for different size of particles were obtained, and their results were compared.