

Documents

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Deep bed filtration with time-dependent input conditions

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Abstract

This work focuses on the numerical solution of a one-dimensional continuum filtration model with time-dependent filter inlet concentration. Two different types of filter inlet concentration sources are considered. A general mass transfer that characterizes particle attachment and detachment effects is considered. The general problem is solved numerically by an efficient implicit finite-difference method. Comparisons with exact analytical solutions for special cases of the filtration model are performed and found to be in excellent agreement. A parametric study of some physical parameters is conducted and the results are presented graphically to illustrate interesting features of the solutions. It is found that the time-dependent inlet concentration sources have significant changes in the solute concentration, specific deposit, and filter efficiency at all filtration time stages compared with their corresponding constant inlet concentration source cases. © 2015 by Begell House, Inc.

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