



USDA-CSREES 2007 National Water Quality Conference

Modeling Nitrogen Removal in Packed-Bed Filters

A mathematical model was developed to describe the nitrogen removal capability in Packed-Bed Filter systems. This model assumes that the nitrification processes occur in the filter (aerobic) portion of the treatment system, and that the denitrification occurs in the recirculation/blend chamber. Percentage efficiency for each process is used as an input or result, depending on how the model is used for analysis. Incoming concentration of TKN is also used as an input variable or a solution, depending on the analysis. The solution of the mass averages was solved by iteration. However, the equations converge on a solution very quickly, mathematically supporting the empirical observations that Packed-Bed filters are extremely stable systems. Using typical values for concentration of TKN entering the recirculation/blend tank and recirculation ratio illustrate the potential removal efficiencies, and, using 100% individual process efficiencies, the potential reductions that can be achieved by a perfect system. Data from operational systems was input into the model to determine the individual process efficiencies. This was done to illustrate the usefulness of this as a tool for process optimization, and to illustrate the effort and monetary commitment to an arbitrary concentration limit on total nitrogen in the effluent produced from Packed-Bed filter systems.

Author: Bob Smith

University Affiliation: Orenco Systems, Inc.

Co-Author(s): N/A