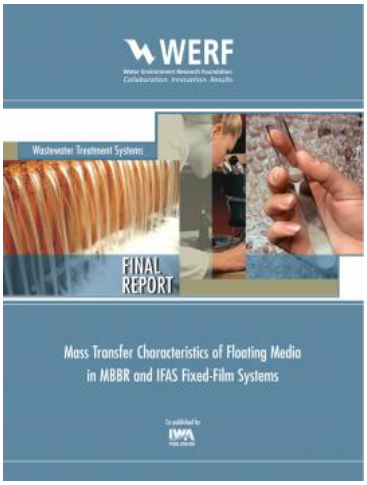
Mass Transfer Characteristics of Floating Media in MBBR and IFAS Fixed-Film Systems



The goals of this project were to establish a standard protocol for measuring mass transfer rates in biofilm media, and to use the resulting data to develop and calibrate an empirical model. Two laboratory-scale continuous flow reactors were loaded with MBBR media donated from two manufacturers, and fed a synthetic wastewater free of organic carbon, but rich in ammonia. The reactors were aerated using coarse-bubble aeration, and operated at two different temperatures for one year. The continuous system was periodically halted to allow for batch testing of the media within each reactor. A total of 200 batch tests were conducted, at varying mixing rates, temperatures, bulk phase dissolved oxygen and ammonia concentrations. Data from the batch tests were used to develop an empirical model of ammonia mass transfer. The model includes half-order terms for bulk phase dissolved oxygen (DO) concentration and the mixing rate (expressed in terms of the velocity gradient), and an Arrhenius-type temperature dependence. A reasonable fit was obtained through non-linear regression, with an average root-mean-squared-error of less than 10 percent between model and observed ammonia flux rates. The protocol and resulting model were successfully used to compare the two media, and to project mass transfer within a nitrifying system.

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