Validation of the Streeter-Phelps Model in Matlab to predict biochemical demand for oxygen DOB and dissolved oxygen OD

Abstract

The article intended the validation of the Streeter Phelps mathematical model that describes the behavior of dissolved oxygen OD and the biochemical oxygen demand BOD, which includes re- aeration and deoxygenation processes, related to hydromorphodynamic processes and the associated dynamics. The verification of the model was implemented from the application of the adjustment of the equation with the tool of non-linear least squares method, which stablishes a least squares analysis to adjust observations with a model that is nonlinear in n unknown parameters. Correspondingly, this approximates the model by a linear one and refines the parameters by successive iterations. The results associated with the research allowed validating, considering the adjustment of the constants ka and kd of the Streeter - Phelps equation, with experimental data. It presents a good fitting which it is of 0.97. The deficit of determined critical dissolved oxygen occurs approximately at kilometer 30 of the segment studied, in which the lowest concentrations of dissolved oxygen are determined. The behavior of the BOD comprises a removal process with a negative concentration gradient, in which it goes from a concentration at the pour point of 16.67 mg / L to 7.48 mg / L at kilometer 80.