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A Modified Laboratory Approach to Determine Reaeration Rate for River Water

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Abstract

It is reported that reaeration rates determined from laboratory investigation may not suit well in predicting reaeration rate of natural streams. Sampling method during reaeration experiment is a potential source of error in laboratory estimation of reaeration rate coefficient for river waters, which has been addressed in this research. A modified method based on sampling procedure in a flume was adopted to develop a reaeration rate equation for Pusu River in Malaysia, which is demographically a very important river. An important feature including several culverts along the course of the river was also considered to model dissolved oxygen (DO) concentration. DO was calibrated and validated using water quality analysis simulation program (WASP) considering appropriate kinetic rate coefficients for Pusu River. Performance of the new reaeration rate equation and other process equations in the calibration and validation data was assessed in terms of root-mean-square error (RMSE), mean error between observed and predicted data and value. Study results revealed that the equation developed in this research considering the impact of culverts on reaeration rate predicted DO in Pusu River with improved accuracy as compared to the other equations. RMSEs were found to be 0.083 and 0.067 mg/L for calibration and validation data, respectively. Mean errors of observed and model-predicted data were 0.06 and 0.05 mg/L for calibration and validation, respectively. The value was 0.99 in both cases. The study results facilitate accuracy in future studies on DO of Pusu River.

Keywords

Author Keywords: Dissolved oxygen; Reaeration rate; Laboratory method; WASP; Pusu River

KeyWords Plus: ATHABASCA RIVER; MANAGEMENT; POLLUTION; QUALITY; STREAMS; EQUATIONS; PERFORMANCE; TURBULENCE; FRAMEWORK; DISCHARGE

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