

Abstract

A mathematical model MIKE 11 was used for prediction of dissolved oxygen (DO) and biochemical oxygen demand (BOD) in the Pakphanang river with a case study on the closure of Uthokvibhajaprasid regulator. Water sampling at 5 stations showed that water quality during the first closing of the gates during the 11–14 September 2005 from downstream at Utokvipakprasit station, Bansongpenong station, Bangsai station, Chein Yai station up to the upstream station at Bankarakat station had the average values of DO of 6.90, 7.28, 2.26, 4.58 and 1.31 mg./l., respectively. At Utokvipakprasit and Bansongpenong stations the water qualities were within the standard value of class 2 water quality standard. At Chein Yai station DO values were within the standard value of class 3 water quality standard whereas water qualities at Bangsai and Bankarakat stations were within the standard value of class 4 water quality standard. The average values of BOD were 1.50, 1.46, 1.39, 1.35 and 5.10 mg./l., respectively. Water qualities at every station were within the standard value of class 2 water quality standard. However, the water quality at Bankarakat station was within the standard value of class 5 water quality standard. Upon the second closing of the gates during 4–7 April 2006, water qualities had the average DO values of 2.68, 2.49, 1.29, 0.46 and 0.57 mg./l., respectively. At Utokvipakprasit and Bansongpenong stations the water qualities were within the standard value of class 4 water quality standard, At Bangsai, Chein Yai and Bankarakat stations the water qualities were within the standard value of class 5 water quality standard. The average values of BOD were 1.75, 2.10, 3.30, 2.18 and 1.61 mg./l., respectively. At Utokvipakprasit and Bankarakat stations the water qualities were within the standard value of class 3 water quality standard, water qualities at Bansongpenong, Bangsai and Chein Yai stations were within the standard value of class 4 water quality standard.

The prediction of water quality by using mathematical model MIKE 11 from upstream at Bankarakat station in amphur Chein Yai to downstream Utokvipakprasit regulator in amphur Pakphanang was carried out. The Manning coefficients derived

from the calibration of hydrodynamic model were ranged from 0.03 to 0.04 Dispersion coefficients from the calibration of dispersion model were 10 to 50 m²/sec. Reaeration coefficient could be derived by O'Connor & Dubbins equation in the quality model. Maximum oxygen production by photosynthesis was 5 g O₂/m²/day. Oxygen consumption by respiration of plant and animal at 20 °C was 3.00 g O₂/m²/day. Whereas decay coefficient was 0.6 per day.

The predicted of DO concentration at Utokvibhajaprasid station in 2007, 2012 and 2017 with the closing of Utokvibhajaprasid regulator showed the average values at Chein Yai and Bansongpenong stations of 4.57 and 5.00 mg./l., respectively. The average values of BOD concentration at Utokvipakprasit and Bankarakat stations were 1.03 and 1.36 mg./l., respectively. They were within the standard value of class 4 water quality standard. Water quality monitoring at different times should be continued in order to confirm the reliability of the model. Moreover, control over the quality of effluents discharged from communities and shimp farming should be taken in order to prevent the degradation of water quality in the Pakphanang river. Moreover, the future plan should allow the Utokvibhajaprasid regulator to drain water from its tributaries in order to upgrade water quality.