Combination of Tank Model and Reservoir Routing for predicting water level at Wonogiri Dam

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Water level predicting model is one of model to support the reservoir operation. This paper, discusses the results of research on the use of tank model combined with reservoir routing to predict the water level of Wonogiri Dam. Tank model was constructed consisting of 2 tank model structured the series, parallel, and parallel-series and 3 models composed tank series and parallel. The objective of this modeling is to obtain the values of tank model parameters are calibrated with measurement data to predict the reservoir water level.

Water level measurement at Wonogiri Dam is only done in spillway location and no water level measurement in the cross-section of the rivers before entering the reservoir. Therefore, combining equations of tanks model and reservoir routing is needed so that the hydrograph outflow generated by the tank model become an input of the routing reservoir and will produce an output of the reservoir water level. The data used in this modeling is the daily rainfall data, climatology, elevation-storage curve, daily average water level in reservoir and daily average discharge outflow from reservoir. Genetic Algorithm is used to optimize the parameters of the model to generate predictions of water level close to the measurement during the calibration process. The results of the model are evaluated by calculating the Root Mean Square Error (RMSE) and Coefficient of Efficiency (COE) between the predictions and observations.

Calibration results obtained that the best model is the model of the architecture comprises a series of 3 tanks and the parameters $k_1 = 8,340$, $k_2 = 1.006$, $k_3 = 0.158$, $k_4 = 2.275$, $k_5 = 3.887$, $k_6 = 0.063$, $d_1 = 176.387$, $d_2 = 81.445$, $d_3 = 21.973$, $s_1 = 46.631$, $s_2 = 7.095$, $s_3 = 5.708$, which generate RMSE = 1.260 m and COE = 0.669. While the verification, is obtained the RMSE = 0.878 m and COE = 0.599. The parameter of k_4 is the most sensitive parameter that will affect to the performance of the model.

Keywords: tank model, reservoir routing, water level predicting, Wonogiri Dam