



Chlorine modeling in water distribution networks using ARX and ARMAX model structures

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ABSTRACT

Chlorination is still the main method of disinfection worldwide. Utilization of chlorine modeling enhances the management of water supply systems toward the reduction of the risks of waterborne diseases and cancer from disinfection byproducts formation. In this paper, the results of chlorine modeling efforts were presented as an extension of a project for Konyaalti Water Distribution Network (KWDN) of Antalya City, in the south of Turkey, using autoregressive with exogenous input (ARX) and autoregressive moving average with exogenous input (ARMAX) model structures. The required data-sets were obtained from the existing online monitoring stations. The ARX and ARMAX model structures modified for time series applications were utilized to predict chlorine concentrations at the critical point of KWDN. Non-representative data-sets were initially identified and excluded from the database. Best fit and Akaike's Final Prediction Error techniques were used as model selection criteria. ARX4-5-3 and ARMAX2-3-3-4 were identified to be the best ARX and ARMAX model structures among several structures tested to predict chlorine concentrations at the critical point of KWDN. This study shows that ARX and ARMAX model structures can be considered as potential for managing chlorine levels in water distribution networks especially when the properties of the components and hydraulics of water distribution network are unknown.

Keywords: ARX and ARMAX model structures; Chlorine modeling; Dynamic modeling; System identification; Water distribution network

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