Development of iron release, turbidity, and dissolved silica integrated models for desalinated water in drinking water distribution systems

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ABSTRACT

To meet the growing demand for potable water, desalinated water is becoming a significant component of the overall water supply. As a result, there is an increased need to understand how the addition of desalinated water within aging water distribution systems impacts water quality and the ability to deliver safe drinking water when unlined cast iron pipes and cement mortar-lined cast iron pipes are both present in the distribution systems. In this paper, we studied the relationship of turbidity, total iron content, and the effects of pH, alkalinity, and hardness on the dissolved silica. Then, we presented the mathematical and pilot-scale empirical development and quantification of three nonlinear regression models and used pH, alkalinity, total hardness, temperature, and hydraulic retention time as water quality variables. The dependent variables were the total iron concentration, the increase in turbidity, and the concentration of dissolved silica. Based on the three models, which use a genetic algorithm, an integrated solution for simultaneously minimizing the release of iron, the increase of turbidity, and the dissolved silica content was presented. This solution provides an economical and efficient method for water plants to identify specific water quality parameters that require adjustment to maintain an acceptable water quality.

Keywords: Desalinated water; Drinking water distribution systems; Iron release; Turbidity; Dissolved silica; Statistical models

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