

Locating optimum water quality monitoring stations in water distribution networks, using genetic algorithm

Khurram Moied

Civil Engineering

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Abstract

Water quality can vary considerably within the water distribution networks, as it travels from the source to the end consumer. Therefore, control and evaluation of water quality is one of the prime objectives, in water distribution and network operations. However, proper location needs to be identified to control and evaluate this water quality. These locations must be optimally identified in such a way that they represent the whole water distribution network.

A methodology based on Genetic Algorithm is developed in this study to optimally identify the monitoring locations in water distribution networks. These locations represent the whole water distribution system under multiple flow scenarios, and prove to be economical if monitoring is carried out at these locations.

At first, the hydraulic model EPANET is used to determine the hydraulic features of the distribution network, and the matrices for water coverage are developed. Based on this information, optimization is performed using Genetic Algorithm to determine the goodness of possible solutions. However, the number of monitoring stations is selected based on the factors of economy. A program named "QUDIS" is developed in MATLAB, for optimizing the water quality monitoring stations using Genetic Algorithm.

The model is quite flexible and can manage to accommodate additional features associated with water quality monitoring which a specific monitoring program usually governs. The model is applied on a hypothetical network as well as on water distribution network of Al-Khobar city in Saudi Arabia.