

Simulation of Contaminant Draining Strategy with User Participation in Water Distribution Networks

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Abstract

A contamination event occurring in water distribution networks (WDNs) needs to be handled with the appropriate mitigation strategy to protect public health safety and ensure water supply service continuation. Typically the mitigation phase consists of contaminant sensing, public warning, network inspection, and recovery. After the contaminant source has been detected and treated, contaminants still exist in the network, and the contaminated water should be flushed out. The recovery period is critical to remove any lingering contaminant in a rapid and non-detrimental manner. The contaminant flushing can be done in several ways. Conventionally, the opening of hydrants is applied to drain the contaminant out of the system. Relying on advanced information and communication technology (ICT) on WDN management, warning and information can be distributed fast through electronic media. Water utilities can inform their customers to participate in the contaminant flushing by opening and closing their house faucets to drain the contaminated water.

The household draining strategy consists of determining sectors and timeslots of the WDN users based on hydraulic simulation. The number of sectors should be controlled to maintain sufficient pressure for faucet draining. The draining timeslot is determined through hydraulic simulation to identify the draining time required for each sector. The effectiveness of the strategy is evaluated using three measurements, such as Wasted Water (WW), Flushing Duration (FD), and Pipe Erosion (PE). The optimal draining strategy (i.e., group and timeslot allocation) in the WDN can be determined by minimizing the measures.

Keywords : Contaminant draining, Hydraulic simulation, User participation, Water distribution network

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